

# *Socioeconomic and governance*

*impacts of marine conservation programs on Fijian communities*



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**Convening Lead Authors**

Patrick Sakiusa Fong, The University of the South Pacific, Fiji Islands

Bill Aalbersberg, The University of the South Pacific, Fiji Islands

**Project Director**

Dr. Giselle Samonte-Tan, Social Science Research, Marine Management Area Science Program, Conservation International

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## **EXECUTIVE SUMMARY**

This report presents the results of a study conducted in four marine managed areas in Fiji Islands. It is one of the first to thoroughly assess the impacts of marine managed areas on the local people, the group that is directly affected by the implementation of resource management programs. The study has two focal areas (socioeconomic and governance) of community functions in relation to the use of the marine areas for the assessment on which specific objectives and questions are based. Between mid-2007 to late 2008, with the assistance of local conservation organizations in Fiji and local communities, data collection was conducted in the four communities to determine the social impacts (The term “social impacts” is used interchangeably to include any impacts of an MMA that affects the social, economic and governance of local local communities) of MMAs. Most of the primary data were collected through household, key informants and focus group interviews carried out in the four locally managed marine areas and two non-locally managed marine area sites. Emphasis was placed on key stakeholders such as fishermen, women’s group, chiefs, Environment Committees, youth and village elders since the four main communities were traditionally Fijian villages. It is evident that fishing is still a major livelihood activity in these communities but they also depend on various other livelihood sources such as tourism, farming, and operating small family business for income.

The four sites that were identified for the study were:

- Waitabu village which established one of the oldest MMA in Fiji and is located on Fiji’s third largest island, Taveuni. This site represents an MMA that is managed by a small community, located in a more isolated area.
- Kubulau district in Bua Province, a community that host some of the best dive spots in Fiji due to its rich reef system and marine biodiversity and represents an MMA that is managed by a large community, also located in isolation
- Navakavu clan in Rewa Province which is located closely to Fiji’s capital city, Suva represents an MMA that is managed by a small community but close to an urban center
- Malolo district in Nadroga Province is located on one of Fiji’s vibrant tourism region and represents an MMA that is managed by a large community with lots of interactions with outside stakeholders, such as the tourism industry.

This selection of sites is roughly representative of the MMAs in Fiji from small, one-village local MMA, medium-sized and multi-villages local MMAs. The four study sites also have a good mix of age of the MMAs and management arrangements.

The findings show that MMAs can effectively and positively impacts the socioeconomic and governance settings of a community. To achieve this conclusion, socioeconomic hypothesis effects were identified and tested in this study.

### *Income*

Results from the study suggested that the establishment of the MMAs improve the household fishing income and the overall household income. The household income of MMA communities is higher compared to non-MMA sites. Income generated by the MMA such as access fees, periodic opening and livelihood enhancement programs have also improve cash flow into the communities. This fund usually assist in community development programs, education scholarships and other communal priorities.

### *Livelihoods source*

The four MMAs have enhanced livelihood options in the four communities and this include programs such access fees, selling handicraft items, small scale eco-tourism ventures, boat transportation, working in tourism ventures, farming, operating small scale family business and others. The situation is very contrasting with that of the non-MMA communities whereby people still rely on the traditional livelihood options which are fishing and farming.

### *Use of marine resources*

Communities in the four MMA sites utilize marine resources in a more sustainable way . This is evident in the use of sustainable harvesting practices such as the use of hook and line, speargun fishing which have replaced the destructive fishing practices such as poison fishing and gillnetting since the establishment of the MMAs. The communities in the non-MMA sites still practices some destructive fishing methods. Also, the results do show that fishing has become easier to the four communities compared to before the establishment of the MMAs.

### *Environmental awareness and knowledge*

Through the various phases of the implementation of the MMAs, the four communities have improved environmental awareness and knowledge which have resulted in the implementation of resource management strategies such as the ban on destructive fishing practices, proper waste disposal and restrictions on fishing efforts.

### *Health of coastal residents*

The four MMA communities are more positive on their health situation than non-MMA reference sites or the pre-MMA period and this is due to the implementation of proper waste disposal strategies. Results support communities in the MMA sites eat more fish than non-MMA communities.

### *Capacity of community*

A major part of the MMA programs in the four communities is providing the local people with the knowledge to effectively implement a sustainable MMA program. These communities have benefitted from these capacity building programs and are able to maximize the return they get from the program. Some of the training conducted in the four sites include environmental awareness, biological and socioeconomic monitoring, leadership and project management, financial literacy, operating small business, handicraft, tourguiding, ecotourism, operating a nursery and others.

### *Management structures and stakeholder participation*

The community organization established to manage the MMA program in each communities, known locally as Qoliqoli Committee, have proven to be effective in the proper management of the marine resources and this mainly due to the proper consultation and participation of the community members in the various phases of the MMA programs. The study also shows that the local people in the four MMA communities are more likely to know the community resources rules and national regulations than those from the non-MMA communities. The four communities are more likely get information and training from partner organizations and dissemination of information and decisions regarding their traditional fishing ground is more efficient.

A few problems were identified as being associated with the establishment of MMAs. Statistical results show that illegal fishing is prevalent in the MMA sites and this is due to the people's awareness of the various illegal activities. Prior to the establishment of the MMAs, local people were not aware that fishing for income without a fishing license is illegal in Fiji but through the various capacity building programs, they are aware and now reporting such cases whereas in the non-MMA communities, the situation is similar to the pre-MMA period in the four communities. Conflicts sometimes arise as people poach in the MMAs and are caught by the locals from the four communities. Also, there are however several expectations from the communities mainly focusing on the enhancement of the natural environment and the provision of facilities for the improvement of livelihoods.

The study recommends the following general needs:

- The marine managed area programs should not focus only on the restoration of the marine environment, but also on rehabilitation of the terrestrial, village area and most importantly, the enhancement of local livelihoods. Identification of possible sustainable alternative livelihood options information should be conducted to allow communities with scarce marine resources in the *i qoliqoli* to generate income and to ease the pressure on the marine environment.
- The adoption by partner organizations of the community adaptive management approach as in the four marine managed areas, should be the basis of resource management initiatives in Fiji. Strengthening the role of communities in MMA programs, rather than weakening it, should be the preferred policy in the management of the inshore areas that are beyond the practical jurisdiction of the Fiji Fisheries Department.
- Socioeconomic and governance issues should be addressed in the planning, design, and implementation of MMA programs. Implementing agencies should be cautious and mindful of the socio-political settings of a community during all phases of the MMA program and especially, during the initial discussion and planning phases.
- The resilience of management and conservation plans is enhanced by the clear access rights that should be a feature of strengthened community-based MMAs. The Fiji Government should act as the provider of the framework within which community decision-making can operate if effective MMA program is to be achieved in Fiji. The marine managed area program needs sustained support from the government and non-government sectors in a manner that does not marginalize local communities.
- This study outlines the strong need for gathering reliable data on the social impacts of MMAs, and illustrates some of the approaches being taken. However, the question of social benefits of MMAs for local people is only a part of the issue at hand. There are also social benefits and costs at national levels and even at global levels which may guide policies and legislative framework to improve the practice of marine conservation programs.

As a final point, this study has established that there is a critical link in the MMA program between human activities, declining marine resources, roles of the people in the restoration process and the impacts of these programs on them. These above recommendations and future refinement and adoption of MMA programs will ensure the sustainable development and management of the marine environment and resources in Fiji inshore and also the achievement of sustainable livelihood in Fijian communities.

## INTRODUCTION

In Fiji, the internal marine waters and the resources associated with it is governed by a dual ownership by the state and the local indigenous communities. Through this arrangement, the Fisheries Act of Fiji states that the internal waters of Fiji is owned by the State however, it also recognizes the rights of Fijians to sustainably utilize and be the custodians of these resources. The latter which is known as the customary marine tenure system is founded on local autonomy and self-reliance. Altogether, Fiji has 410 customary fishing rights area (*i qoliqoli*) a number of which cover river systems. The *qoliqoli* is part of a tribal land-sea arrangement known as *Vanua* and it extends from the watershed to the outer margin of the seaward slope of the barrier or fringing reefs (Ravuvu, 1983).

The marine and coastal ecosystems and the biological system that comprise them provide significant physical, economic, social and cultural benefits to the people in Fiji and especially to the rural coastal communities. Some of the direct benefits include sources of food and income. However, over the years this very fragile system has come under severe threat resulting in the decrease of marine resource stocks. This situation is mainly due to unsustainable fishing and inland activities, the advent of a cash-based economy, the increased ability to catch more fish through the utilization of sophisticated technological devices combined with insufficient implementation of legislation and regulations and the adoption of unsuccessful approaches to resources management over the years. Marine management in Fiji aims to allow living marine resources to continue to exist in numbers great enough for them to maintain their populations, and be a readily available food and income source for the people of the country. Management of the marine environment and its resources has been practiced in the Fiji Islands since the ancestors of the present Melanesian populations inhabited these islands. It has been important because of the small sizes of the islands and the limited resources available.

Today, although the large majority of islands and, especially, the smaller ones in the east and west of Fiji have plentiful supplies of most of their marine resources, there is a need for management because there are signs that fisheries are stressed and fish stocks are declining. Management is becoming even more important because of the economic, technological, environmental and social changes occurring as well as changes in the traditional use of marine resources. Income from fisheries is becoming increasingly important, as people have come to rely on cash for purchasing imported foods and goods. More efficient fishing gear such as gill nets means more fish can be caught in less time; and with availability of storing facilities such as freezers, a surplus of fish can be had, that is, more than can be eaten at one time (Veitayaki, 1995).

Management of the marine environment and its resources to counter the decline and collapse of marine resources fisheries has become the focus of national and concerned institutions' discussions in Fiji. Until recently, resource management activities in Fiji were determined by government and relied on legislations to protect and rehabilitate the fisheries. The recent gradual change of contemporary management paradigms to the community approach is boosted by the continuing realization of the failure of previous strategies, the desire to better utilize finite fisheries resources and the recognition of the potentials that exists in rural communities, especially when there are some existence of rights of the local people to make management decisions (Degnbol, 2002; Jentoft, 1989; Ruddle, 1989; Sen and Nielsen, 1996). In the last decade, the community participation approach known in Fiji as the locally managed marine area approach has emerged as the

best strategy and it is now widely advocated by conservation organizations as the best way to achieve effective resource management due to the institutional arrangement of the fishing ground and the social settings of the Fijian community (Veitayaki, 1998).

The establishment of marine managed areas (MMAs) by communities is an integral part of the broader initiatives of natural resource management in Fiji. The four study sites in this research are part of the Fiji Locally Managed Marine Area (FLMMA) Network, a formal network of institutions in Fiji that are focused on locally managed marine areas or marine reserves, and that are interested in sharing and collectively learning from one another about effective resource management practices at the community and national level. FLMMA's approach encourages local communities in Fiji to take the lead in the management of their natural resources. Since the local people are familiar with their resources and the socio-political setting in their community, FLMMA believes that this is the group that should plan, design, implement and evaluate resource management strategies. When local communities are responsible for the development of resource use rules in the MMA, decisions made are based on their needs and capabilities. In this regard, these MMAs provide a strong sense of ownership of management the project to the local communities. This feeling of owning such undertakings makes the local people more responsible for ensuring the long-term sustainability of the marine resources.

One of the main challenges of this concept in Fiji, however, is that the sustainability of community-based project which depends heavily on the vagaries of the elements that make up a society (economic, political, governance and social).

## **BACKGROUND**

The ecological performance measures (e.g., relative abundance and diversity of species, habitat diversity and complexity) within a protected area and surrounding environment is the most widely used indicator of marine conservation program success (Ward and Kelly, 2009; Davis, 2007; Smith and Weinberg, 2004) . However, defining the performance of MMA programs with biophysical parameters alone is surely incomplete and too narrow as an approach as this is not the only area that is affected by management programs. In the case of MMA program, it is the human behaviour towards the marine environment that is being managed and not the behaviour of natural species and resources, therefore, in the process of MMA implementations, critical areas of societal function are impacted. This study contributes to a growing body of literature that addresses the protection of biodiversity and understanding its linkages on the livelihood of local communities recognizing that many of the local people depend highly on the marine environmental resources and services provided by MMAs to meet their daily needs.

The impacts of MMAs on local communities and economy have changeable but growing appreciation. The study provides information to understand and support the recommendation adopted by several international, regional and national forum. The world conservation community in the Durban Accord was concerned that “many proclaimed protected areas exist more on paper than in practice, especially in developing nations and in the marine realm” and also that “many costs of protected areas are borne locally particularly by poor communities while benefits accrue globally and remain under-appreciated” (WPC 2003: 2). The World Parks Congress then made two commitments which are very important to this study, firstly to “involve local communities... in the creation...of protected areas” and secondly, to “ensure that people who benefit from, or are impacted by, protected areas have the opportunity to participate in relevant decision-making on a fair and equitable basis in full respect of their human and social rights” (WPC 2003: 3). The importance of human rights, especially the rights of indigenous peoples, has also been recognized in the Durban Action Plan, the CBD Programme of Work, WWF Principles, IUCN WCC Resolutions, and elsewhere.

Regionally, during the meeting of Pacific leaders in Vavau, Tonga in November 2007 to discuss the progress on the implementation of the Pacific Plan, a document endorsed by Pacific leaders which is based on the concept of regionalism, that is, countries working together for their joint and individual benefit, stressed the importance and the management of the marine environment. The “Our fish, our future” agreement developed in this meeting recognizes that “fisheries resources remain a key driver for sustainable economic growth in the region, especially for small island states, and that they must as a consequence be supported by responsible and effective stewardship” and made a commitment for the “MANAGEMENT OF COASTAL/INSHORE FISHERIES .... to support food security, sustainable livelihoods and economic growth for current and future generations of Pacific people”.

A major driving force for the establishment of these MMAs in Fiji is the need to conserve marine biodiversity for use by future generations and to provide long-term social and economic benefits to the community involved. Despite the latter, however, very little detail is available in Fiji on this part of coastal communities daily lives; the groups that is directly affected by the implementation of management programs. This

area is being recognized for its importance in achieving resource management goals and sustainable projects but is often neglected by conservation institutions, which commonly focus only on the natural sciences. Unless the local community experiences some benefits from MMAs, especially on their livelihood, these programs are always likely to fail.

Despite various reviews and the favourable political environment internationally, regionally and nationally, little information and study has been completed to test whether MMAs are making a positive or negative contribution to the livelihoods of people living within, immediately adjacent to, or further away from them. Evidence of social impacts is frequently derived indirectly from process indicators and the little information that does exist rarely looks at differentiation of impacts within communities. Significant attention has already been paid to livelihood impacts of MMAs – for example there is a body of literature on the key impacts of protected areas – which can be negative (eg fishing access denial, reduced/lost access to resources) or positive (eg income from tourism, enhanced conservation of essential resources, improved recognition of community conserved areas). The literature is, however, often anecdotal; often based on assertions about specific MMAs or types of MMAs and then generalized to encompass all MMA; often context specific. Furthermore, many of the recorded MMA acts, when considered at a larger scale, may often be limited in scope, scale or distribution.

Reflecting this situation, recent studies are increasingly focused on trying to understand the human dimension of MMAs in Fiji. Several studies on assessing the benefits of MMA to the local people summarized below demonstrate that the results discussed in this report are not uncommon, however, more detail and thorough. The Nature Conservancy study on the linkages between MMA and poverty in Navakavu also showed that the monthly income and economic status of the households is much better in MMA in comparison to a control site. This study showed that being part of the LMMA strongly relates with higher income and better economic status. Also, the study showed improved fish catch by the community, better resource governance and improves social security as a result of the implementation of the MMA (van Beukering *et al*, 2007).

In Ucuivanua, mangrove lobster (*Thalassina anomala*) increased by approximately 250 percent annually, with a spill-over effect of roughly 120 percent outside the protected area (Aalbersberg *et al* 2005). Perhaps more importantly, this paper details how in three communities with locally managed marine areas (Ucuivanua, Kumi and Votua) weekly household income increased an average 43 percent from 2000 to 2003 .

Joeli Veitayaki *et al* , 2003 notes that shellfish in Verata district's Ucuivanua locally managed marine area have shown an annual increase of 300 percent in the no-take area and a 100 percent annual increase in surrounding areas. It also noted an increase in household income and greater catch per unit of effort for the community. Tawake *et al* 2001 notes that Ucuivanua shellfish results led the community to set up no-take areas in the mangroves and coral reefs to encourage lobsters and coral fish production.

Furthermore, in Korolevu-i-wai, Nadroga the implementation of the LMMA has produced notable positive outcomes since its inception in 2004. It has created better overall outcomes after two years than those of the former resource management systems (Fong, 2006). The study reveals that the social cohesion amongst the community members, the perceived condition of the fishery resources, the condition of the terrestrial

and village environment, the community's understanding of the values of their marine environment, and the amount of marine resources have greatly improved in the district. The average catch per unit of effort and the income level of fishers in the district have also increased.

In Navakavu, an analysis of changes in finfish catches over time in Navakavu suggests that there has been an average increase of 3% per year in finfish catch between mid-2002 (period when LMMA was established) and late-2007 (study period). It is suggested that this increase is attributable to the establishment of the LMMA in January 2002. The value of these changes to the local community comes to about FJ\$630,000. It is expected that the economic benefit to local villages from the Navakavu LMMA will continue to increase, as finfish and invertebrate catches continue to increase for several years (O'Garra, 2007) .

### ***OBJECTIVES***

The study intended to measure the effectiveness of community-based marine managed areas in Fiji in terms of social, economic and governance standards of key stakeholders within the managed sites, in this case the communities. Socioeconomic and governance monitoring of MMAs in Fiji is important as it actually measures the effects of conservation programs on the livelihood of key stakeholders, especially the community who are always the direct custodians and sites of marine resources. Also, information collected from socioeconomic assessment always provide strong argument whereby these stakeholders can formulate their decisions to enable the resources that they rely on to be sustainably utilized and effectively managed. This study is part of a larger study conducted in four countries globally and Fiji has been identified as one.

Fiji's marine environment comprises of various complex and integrated habitats including mangroves, seagrass beds, fringing and barrier coral reefs and deep ocean areas. Over the years, this system has been able to sustain the livelihood of most people in Fiji ranging from subsistence coastal dwellers to commercial operators of marine products in urban centers. Fiji's ongoing commitment in the management and sustainable use of its marine resources make it a strategic choice for the implementation of this research project. This study will be conducted in some communities in Fiji, and specifically in coastal communities where marine resource management initiatives have taken place for the last few years.

### ***Research Objective***

In general, this study is divided into two parts. Firstly, it assesses the socioeconomic and governance effects of MMAs in Fiji on MMA project success factors such as household wellbeing, economic development, livelihoods, environmental awareness, stakeholder participation, and policy enforcement. Specifically, the research project will examine the impacts of MMAs:

- on household wellbeings (e.g. income) and their contribution to poverty reduction
- to food and social security in communities
- on the social system and social organization of the local people
- in influencing or shaping fisheries policies at the national level

This part of the assessment also looked into the objectives of the MMAs and which types of MMAs arrangements are effective in meeting their objectives. In order to

evaluate the social and economic impacts of MMAs on individuals of specific user groups, conditions prior to the establishment of MMAs were determined by respondents. CoMMARing the current conditions and trends against the conditions prior to MMA provided a basis for measuring the effect of MMAs.

Also, the study assesses the social, for instance community participation and consensus; and economic such as income level factors that contributed to the success or failure of MMAs. A typical hypothesis for this study would be whether wealthy communities correlated with more or less successful MMAs. The results of this part of the study will substantially contribute to the implementation of more effective MMA management practices in Fiji as the social and economic settings of communities would be considered. Also, the results form the basis for the undertaking other marine-related social and economic studies in Fiji.

### ***Capacity Building Objective***

This study intended to not only gather useful findings but also to contribute to the improvement of skills and knowledge of conservation practitioners involved in the assessment. In terms of capacity building, the study:

- provided training workshops on the different processes for conducting socioeconomic assessment
- improved the awareness of local partner organizations on the importance of doing socioeconomic assessment
- identified MMA socioeconomic information needs for projects sites and information to be the basis for future research

### ***Outreach Objective***

In terms of research findings outreach, this study is intended to:

- develop outreach programme to publicize the objective and the importance of the study in sustainable management of MMAs
- publicize the study through publication, reports and public lectures and engagement.

## RESEARCH METHODOLOGY

### Methods

The two main aims of this study were to assess the socioeconomic and governance effects of MMA on local communities and secondly, to identify key socioeconomic and governance factors that determine the performance of MMAs in Fiji. To accomplish this, a mixture of key informant, focus group and household interviews were conducted in each MMA study sites. All interviews were conducted in the common Fijian language (Bau language) by the interviewers; however, the information was recorded in English. To maintain the FLMMA spirit, all stakeholders in the four study sites were first informed before any activity was undertaken. Letters were sent to the four Provincial Council Offices that look after the administrative matters of the study sites and presentations were conducted in the either in a village council meeting or the district council meeting depending on the settings of the study sites.

The key informants and focus group interviews gathered qualitative data using open-ended questions which were then used to support the explanations for some findings from the statistical analysis. The intention of the focus group discussions and key informant interviews were to address the following specific areas:

- General perceptions of what people feel about the MMA
- General perceptions of the effect of the marine protected area on the livelihoods of households in the community
- Some aspects of education
- Perception on health situation
- Governance system and social cohesion
- Access and use of resources and rights
- Vulnerability (including maintenance of cultural and spiritual values)
- Some aspects of livelihoods and opportunities

Prior to field data collection trips, partner organizations working at the four sites were consulted and the background information on the MMA operation in each site was collected. Through this exercise, the team was able to identify possible key informants and focus group to be interviewed. These key informants and focus group were first informed before the arrival of the study team on the site. The structure for the questionnaire (see Appendix section used in both interviews were similar.

The focus group discussions were conducted in small groups of 4-10 individuals who work together or have similar social responsibility within the study sites and the range includes the MMA Committee, Women's group, Youth group, village male elders, fishermen's group, fisherwomen's group and Village Development Committee. This method was mainly to evaluate how stakeholders feel about the MMA and how they have been affected, respective to individual stakeholder affiliations. Key informants were also asked about the effects of the MMA and this method allowed them to freely express themselves and it gave detail account of the relevant study sections. The key informants interviewed in all the study sites consist of a range of people including local chiefs, Chairman of the MMA Committee, fish wardens, community biological monitors, youth leaders, Women's group leaders, the village nurse, village headman, school teachers, fishermen and fisherwomen, church minister and village elders.

Quantitative data for statistical analysis to test the effects of MMA were collected through household interviews using a structured questionnaire (see Appendix section). It is worth noting here that a household in this context means all people sharing the same kitchen and work together to 'put food on the same table' through economic activities. Relevant institutions including the FLMMA Socioeconomic Monitoring Working Group and partner organizations were consulted on the content of the draft questionnaire. The questionnaire was then pre-tested in some of the households in Navakavu and modified to address gaps and especially, to suit the study sites local conditions. The emphasis of this method was data on community demographics, household economics, personal perceptions on the social and governance component of MMAs and household resource use patterns. The intention of the household interview was to address the following specific areas:

- Household livelihood and food security
- Resource use pattern
- Income and economic activities
- Community health
- MMA Awareness and Compliance
- non-monetary benefits
- Participation and involvement
- Local values and beliefs about marine resources
- MMA Governance

A total of 150 questionnaires were completed in the four study sites. Since all the study sites have limited or no baseline data, two non-FLMMA or control sites were chosen and this was mainly for coMMARison, especially in the statistical analysis of the effects of MMAs. A simpler version of the household questionnaire refined to local condition was used to collect data from 33 households in the non-FLMMA sites. The questionnaire aimed to collect data on current environmental awareness, resource use patterns, resource governance, and community health status and community economics.

### **Research hypotheses**

The collective hypotheses for this study were formulated based on the socioeconomic indicators identified by the core study team.

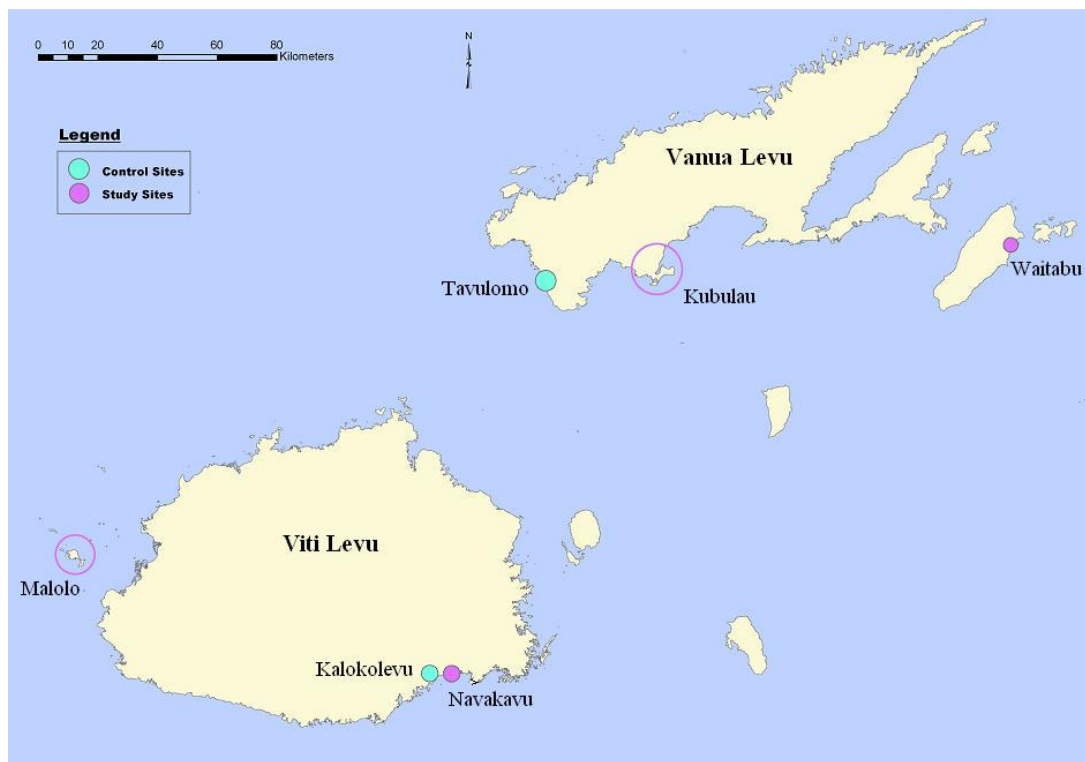
- The MMA has to some extent improved the income level of coastal communities. This can be directly from the increased in fish stock which results in the increase in saleable catch and also from money received through income generating ventures as a result of MMA establishment
- Livelihood source has diversified as local people are aware of the vulnerability of their fishing ground and look for other options to supplement or balance the use of the marine environment
- Local communities now sustainably use their marine resources by utilizing sustainable fishing methods and refrain from the use of destructive fishing methods
- The MMA has improved the community's appreciation of their marine environment, not only through the normal income and food source but also the non-monetary benefits to society
- The MMA has improved the environmental awareness and knowledge of local communities

- The health of the local people has improved after the establishment of the MMA as people have more fish to catch for rich nourishment and also, through implementation of proper sanitary practices and waste management
- The MMA has improved the capacity of local people through continuous capacity building offered by the MMA program
- The MMA has improved the governance of the marine environment by establishing better management structures, wide participation of stakeholder and proper representation, compliance with management plan and proper handling of resource conflicts

### Study Sites

The study sites include four communities that have implemented MMAs for some period and two communities that have never established any management at any time. The communities are within the three biggest island of Fiji which are Vanua Levu, Taveuni and Viti Levu. Also, some detail demographic information for the study sites are summarized in **Table 1**.

**Figure 1: Map of the study sites**



**Table 1: Demographic information of four MMAs, control sites, and cross node**

|                                 | <b>Navakavu<br/>(n=60)</b>                                | <b>Waitabu<br/>(n=25)</b>  | <b>Kubulau<br/>(n=42)</b>   | <b>Malolo<br/>(n=23)</b> | <b>Control<br/>sites<br/>(n=33)</b> | <b>Cross<br/>Node<br/>(n=183)</b> |
|---------------------------------|---|----------------------------|---|--------------------------|-------------------------------------|-----------------------------------|
| <b>Villages and settlements</b> | Muaivusu<br>Waiqanake<br>Nabaka<br>Namakala<br>Ucuinamona | Waitabu<br>Wai<br>Vurevure | Kiobo<br>Namalata<br>Nadivakarua<br>Nakorovou<br>Waisa<br>Raviravi<br>Nasasaivua<br>Kilaka<br>Natokalau<br>Navatu | Solevu<br>Yaro           | Kalokolevu<br>Tavulomo              |                                   |
| <b>Number of households</b>     | 103   | 52                         | 149   | 80                       | 95                                  | 479                               |
|                                 | <b># of persons in the household</b>                      |                            |   |                          |                                     |                                   |
| Mean                            | 5.1   | 5.5                        | 4.9   | 4.6                      | 5.6                                 | 5.1                               |
| Std. Dev.                       | 2.1   | 2.5                        | 2.4   | 1.8                      | 2.8                                 | 2.3                               |
| Min                             | 2.0   | 3.0                        | 1.0   | 1.0                      | 1.0                                 | 1.0                               |
| Max                             | 11.0  | 13.0                       | 11.0  | 7.0                      | 13.0                                | 13.0                              |
| <b>Gender (%)</b>               |   |                            |   |                          |                                     |                                   |
| Female                          | 18  | 24                         | 26  | 26                       | 15                                  | 21                                |
| Male                            | 82  | 76                         | 74  | 74                       | 85                                  | 79                                |
|                                 | <b># of children in the household</b>                     |                            |   |                          |                                     |                                   |
| Mean                            | 1.3   | 1.8                        | 1.4   | 1.1                      | 1.5                                 | 1.4                               |
| Std. Dev.                       | 1.5   | 1.4                        | 1.4   | 1.1                      | 1.4                                 | 1.4                               |
| Min                             | 0.0   | 0.0                        | 0.0   | 0.0                      | 0.0                                 | 0.0                               |
| Max                             | 6.0   | 5.0                        | 4.0   | 3.0                      | 6.0                                 | 6.0                               |
| <b>Age (%)</b>                  |   |                            |   |                          |                                     |                                   |
| 15-19                           | 2   | 0                          | 2   | 0                        | 0                                   | 1                                 |
| 20-24                           | 2   | 0                          | 5   | 0                        | 0                                   | 2                                 |
| 25-29                           | 10  | 4                          | 5   | 4                        | 6                                   | 7                                 |
| 30-34                           | 10  | 20                         | 10  | 0                        | 9                                   | 10                                |
| 35-39                           | 10  | 12                         | 12  | 22                       | 12                                  | 13                                |
| 40-44                           | 10  | 8                          | 12  | 9                        | 9                                   | 10                                |
| 45-49                           | 13  | 12                         | 24  | 13                       | 12                                  | 15                                |
| 50-54                           | 10  | 16                         | 5   | 13                       | 6                                   | 9                                 |
| 55-59                           | 13  | 4                          | 2   | 9                        | 21                                  | 10                                |
| 60-64                           | 5   | 8                          | 7   | 4                        | 0                                   | 5                                 |
| 65 and over                     | 15  | 16                         | 17  | 26                       | 24                                  | 19                                |
| <b>Education (%)</b>            |   |                            |   |                          |                                     |                                   |
| None (0)                        | 0   | 0                          | 5   | 4                        | 0                                   | 1                                 |
| Primary (1-6)                   | 58  | 64                         | 33  | 43                       | 58                                  | 52                                |
| Secondary (7-12)                | 40  | 36                         | 60  | 52                       | 42                                  | 46                                |
| Tertiary (>12)                  | 2   | 0                          | 2   | 0                        | 0                                   | 1                                 |

**Waitabu**

Waitabu, which is located on Fiji's third largest island, Taveuni is a small community with 300 residents where farming is still the main source of income and sustenance. The community is part of the district of Wainikeli and Vanua of Bouma and comprises of Waitabu village, Wai settlement and Vurevure settlement. The Waitabu marine managed area is a vibrant reef system set aside as a no-take fishing zone in 1998 by the community under the Customary Fishing Rights Area regulation of the Fiji Fisheries Act to replenish marine life and fish stocks. Prior to that, this customary fishing rights area was continually and heavily overfished by the local people and especially those from outside the district who have sophisticated fishing gears and have easy access to fish markets.

The Waitabu marine managed area initiative is part of the Bouma National Heritage Park which was established in 1990 with the primary focus of conserving natural resources in this area and at the same time, provide a means of generating income to the community. The local people who are part of the Vanua of Bouma are directly involved in this ecotourism project as tour guides, park managers/caretakers, first-aid instructors, lodge keepers and other work, bringing income into the area.

The Bouma National Heritage Park accentuates community's involvement in sustainable development and resource protection. The local people have opted to manage their resources and in return receive income through the ecotourism program and are committed to developing their land for sustainable development rather than the previous practice of exploitation of their natural resources. The Waitabu community, managing the marine resources in its fishing ground rather than exploiting them has enabled the local people to consistently generate income through access fees paid by tourist to snorkel or swim in the area and tour guiding.

Waitabu marine managed area won the International British Airways Eco-Tourism Award in 2008 and is considered a successful community-driven program. In 2004, it was reported that in six years after the reserve was established, the fish abundance has reached a normal population level and invertebrates, such as giant clams, had reached breeding size. As of June 2004, the reserve had earned around USD \$12,000 for the community. Poaching by people from outside the community and some internal conflicts, especially with other communities within the Vanua of Bouma are the current main threats to the sustainability of the initiative in the long-term.

**Kubulau**

The community of Kubulau in Bua Province is located on the southwestern side of Vanua Levu, Fiji's second largest island and consists of ten villages, namely Kiobo which is the chiefly village, Namalata, Nadivakarua, Nakorovou, Waisa, Raviravi, Nasasaivua, Kilaka, Natokalaus and Navatu and a number of smaller settlements. Kubulau is situated on the western tip of Savusavu Bay while Savusavu Town is located right on the center of the bay. Best known as one of the best diving regions in Fiji, the Kubulau fishing ground is home to over 1,000 species of invertebrates, 400 known corals, 445 documented marine plants and over 1,100 fish species. Also, part of the fishing area is a migratory pathway for cetaceans, small isolated areas provide nesting beaches for green and hawksbill turtles and seabird nesting site.

In the 1980s and 1990s, an increase in different fishing activities from within the community and especially, those from nearby villages and Savusavu town posed a serious threat to the Kubulau fishing ground. Given the uniqueness of this marine environment and its vulnerability to over-exploitation, the local people in 1997 with advice from a tourism operator agreed and established the barrier reef surrounding the resort island as a marine reserve covering an area of approximately 70km<sup>2</sup>. Over the years, with more interest and environmental awareness from external conservation agencies, the community has established 11 more marine managed areas contributing to a network of socially acceptable and scientifically approved system of reef reserves.

Being situated close to Savusavu town, one of the best tourist destinations in Fiji and home to some tourism operators in Fiji, the marine managed areas in Kubulau is able to incorporate income generating mechanisms into the resource conservation program. Through empowerment and capacity building from external institutions, the community has been able to facilitate and secure a more transparent and effective system of operating access fees into the managed area with several tourism operators. The money received is handled by a special institution within the community with representatives from all the villages in the district and is mostly used for community development, education, operation of the managed area and other community financial needs. The arrangement in Kubulau ensures the local people benefit economically from the marine managed areas and is an important step in marine reef conservation work in Fiji.

### **Navakavu**

Navakavu which belongs to the district of Suva in Rewa Province is situated on the western tip of Suva harbor. It is located approximately 13 kilometers by road from Fiji's capital city, Suva, the home to 360,000 people which makes it the main consumer market center in Fiji. The Navakavu community consists of four main coastal villages, Muaihuso which is the chiefly village, Waiqanake, Nabaka and Namakala and a few smaller settlements.

Even though Navakavu is located close to Suva city, subsistence living is still mainly practiced in the local people's daily activities. Fishing is still one of the main livelihood activities in most households in Navakavu, even though some have shifted to farming and livestock rearing. Recently, the younger generations have opted to look for employment in Suva city, made easy through the daily service of a bus coMMAny which makes five return trips to the community. Boat was the main transportation method in Navakavu until the mid-1990s when the government constructed a road that connects all the four villages and some of the settlements in the community.

The fishing ground of Navakavu used to be known locally as the "qoliqoli nei Viti" translated as everyone in Fiji's fishing ground and this was due to the increase in fishing pressure from not only people within Navakavu, but especially those living in Suva who all comes from different parts of Fiji to work and earn a living in this urban center. In 2002, the local people of Navakavu after starting to experience decline in marine resource stocks decided to end this notion by establishing the Vueti Navakavu project, a locally managed marine conservation initiative of resource management. The name Vueti Navakavu means uplifting Navakavu's resources and livelihood of its people and originated from the aim of the community to address the decline in marine resources and controlling destructive fishing, farming and waste disposal practices from people within and outside of the community.

Utilizing the adaptive management approach, the community changed the location of the marine managed area later in 2006 so that it covers a diversity of marine habitats rather than the initial site which only has seagrass patches and also for the community to have a good view of the site for policing purposes. The project in Navakavu has drawn interest from various local and international natural and social science researchers since its establishment and some conclusions noted that through people's participation in making, implementing and enforcing conservation decisions, biodiversity goals are met and at the same time, the community's livelihood goals are also addressed. In one of the studies, a simple analysis of changes in finfish catches over time suggests that there has been an average annual increase of 3% in finfish catch between mid-2002 (period when LMMA was established) and late-2007 (study period). The value of these changes to the local community comes to about FJ\$630,000. It is expected that the economic benefit to local villages from the LMMA will continue to increase, as finfish and invertebrate catches continue to increase for several years. In another study, the results showed that the monthly income and economic status of the households in Navakavu is much better in coMMArison to a control site.

However, given its location and proximity to Suva city, the Vueti Navakavu initiative is faced with the issue of poaching from people within and especially those from outside the community. Also, internal social friction is experienced at times which may affect long term sustainability of the initiative, however, through continuous capacity building from partner organizations the community is able to resolve and progress with the program.

### **Malolo**

Malolo community in Nadroga Province consist of a group of small` white sandy beach islands which has four main villages namely Solevu which is the chiefly village, Yaro, Tavua, Yanuca and a number of smaller settlements and a number of island resorts and hotels. The community is part of Malolo district and is located on the western part of the Fiji Islands group. Best known as the Mamanuca Group, the main tourist destination in Fiji, Malolo as known to the locals, is home to a number of resorts and hotels ranging from small budget backpackers to high class three to five star island resorts. The livelihood of the local people depends heavily on this industry with the majority of the household income derived from direct employment on some of the resorts while some are given goodwill money by the resorts for the use of their land for resort sites or other touristic activities.

In 2005, upon recognition of the value of the marine environment to the booming tourism industry in the area, the local community through partnership with some of the tourism operators started to implement marine managed areas on their fishing ground. The reserves were mainly located on the reef front of several hotels and all the four villages. However, to date only the managed areas situated close to the resorts still remain. Poaching by fishermen from the mainland of Viti Levu, mainly in the Nadi Town area, is still a threat to the program. Also, friction that sometimes exists between the community and the tourism operators and also within the community pose uncertainty with the progress of the program.

### **The Control Sites (Kalokolevu and Tavulomo)**

Two communities were chosen as control sites for the study, Kalokolevu and Tavulomo villages. It is worthy noted at this point that these sites will be called non-FLMMA sites as they both have not engaged with any FLMMA partner organizations in any formal marine management programs apart from the customary marine tenure system which is uniform in all of Fiji's i qoliqoli. Kalokolevu and Tavulomo villages represent the two main categories of fishing communities in Fiji, that is, one is situated to urban centre with more economic activities while the other is located far from urban centers with limited economic activities.

Kalokolevu village is situated approximately 20kms from the capital of Fiji, Suva and close to the main highway that connects the capital city of Suva and the Western Division of Fiji. Transportation to Suva is through 20 minutes driving on tarsealed road. The community is part of the district of Suva in Rewa Province. Fishing plays an important part of the community members' daily activities as a source of income and protein for households. Also, given its proximity to Suva city and nearby employer such as the Naboro Prison and Naboro Landfill, most households rely on paid employment as their major source of income.

Tavulomo village is part of Dama district in Bua Province and is located on the western tip of Vanua Levu island. It is approximately 250km from Labasa town, the main urban center on the island and is accessible through 4 hours driving on gravel road. Fishing is the main source of income in the community, apart from part-time labourer at nearby Indian farms and remittances from relative living outside the community.

The customary fishing ground in both non-FLMMA sites are mainly managed through traditional mode. This means that decisions made in regards to any activities within the fishing ground is always discussed at the Bose vanua, a traditional forum consisting of head of clans within the tribe that owns the fishing ground, with the final approval and endorsement made by the paramount chiefs. This customary system and arrangement can be an effective tool for conservation, however, during this cash based economy in societies, issues such as the issuing of fishing licenses where money is involved can be detrimental as people with paramount power can abuse the system for their own benefits.

Today, the non-FLMMA sites are aware that fish stock are declining and there is a need for management programs to be implemented, however, this aspiration is always negated by the limitation in technical resources and personal and most importantly, the lack of consensual commitments from institutions at the community level and right up to the national level. Also, the social structure within a community can also be a limitation to progress. Issues related to the fishing ground by individuals are always raised in the village council meetings or clan meetings before they can make it to the traditional forum, therefore, this channel of communication can sometimes be a hinderance to the full participation of communities and also, sometimes decisions made can be opaque and based on a particular group's interest.

## RESULTS

From the Fiji component of the Global Socioeconomic and Governance Study, the results of the various socioeconomic and governance categories that will be discussed later, showed that the implementation of the four MMAs have overall improved the socioeconomic and governance standards of the local communities.

### Method

- To test whether weather the socioeconomic and governance variables have been increased or not after the establishment of MMAs, baseline data is needed to test the difference between the current situation and before the establishment of MMAs. Also, we divide the whole sample into two groups, MMA reference sites and non-MMA reference sites to test whether there is any significant difference between two groups. Baseline-Pre MMA
- t test

### t test

A t-test with equal variance<sup>1</sup> is utilized to test the differences in the study. The null hypothesis is that the means of variables of the two groups are equal. The alternative hypothesis is that the mean of variable in MMA reference sites is higher or lower than the mean of variable in the non-MMA reference sites, which will depend on the effects we want to test. The t test with equal variance is given by

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_{12} * \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}}, \quad S_{12} = \sqrt{\frac{(N_1 - 1)S_1^2 + (N_2 - 1)S_2^2}{N_1 + N_2 - 1}},$$

Assume the variance is equal to the Fiji MMAs (Introduction of statistics, 2008).

The results of t-test with equal variance are presented in **Table 2**. The null hypothesis is that the current socioeconomic and governance standards of respondents in the four MMA reference sites is equal to those of the pre-MMA period ( $H_0 : \mu_{Current} = \mu_{Pre-MMA}$ ), while the alternative hypothesis is that the current socioeconomic and governance standards of respondents in MMA reference sites is higher than those of the pre-MMA period ( $H_a : \mu_{Current} > \mu_{Pre-MMA}$ ). The statistical results of the Fiji node analysis show that there is sufficient evidence to conclude that the null hypothesis is rejected.

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<sup>1</sup> t-test with unequal variance is also conducted in the study. The paired t test with unequal variance and

unequal variance is given by  $t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$ , Assume the variance is unequal across countries.

**Table 2: Perception questions on various socioeconomic and governance variables**

|   | <b>Before MMA (n=150)</b> | <b>Today (n=150)</b> | <b>t value</b> | <b>p value</b> |
|---|---------------------------|----------------------|----------------|----------------|
| 1. <b>Livelihoods:</b> The lowest step indicates the worst possible existence, little or no food, inadequate furnishings and shelter, and sickness. The highest step indicates the best possible house, fully furnished, more than enough food, and everyone healthy. | 5.05                      | 7.45                 | -11.39         | 0.00***        |
| 2. <b>Food security:</b> The lowest step indicates a situation where seafood is never available. The highest step indicates a situation where there is always locally harvested seafood available in the markets  | 5.16                      | 8.09                 | -16.44         | 0.00***        |
| 3. <b>Resource use conflicts:</b> The lowest step indicates a situation where people are always arguing and fighting over coastal marine resources. The highest step is a situation where everyone is friendly and cooperates together like one family (outsiders).   | 5.59                      | 7.19                 | -5.31          | 0.00***        |
| 4. <b>MMA conflicts:</b> The lowest step represents a situation where MMA has brought about high levels of conflict and the highest step is a situation where there is no conflict caused by MMA.   | 5.67                      | 6.88                 | -3.96          | 0.00***        |
| 5. <b>Participation in MMA management:</b> The lowest step in the ladder indicates a situation where you cannot join any meeting on MMA management. The highest step represents a situation where you can join all meetings on MMA management.                        | 5.05                      | 7.43                 | -9.30          | 0.00***        |
| 6. <b>Influence on MMA management:</b> The lowest step indicates a situation where whatever you say or do it makes no difference with respect to activities in MMA. The highest step indicates a situation where your opinion has influence on MMA activities         | 5.33                      | 7.73                 | -10.45         | 0.00***        |
| 7. <b>Compliance:</b> The lowest step shows a situation where no-one obeys the resource management rules. The highest step shows a situation where everyone obeys the rules.  | 5.97                      | 7.69                 | -5.07          | 0.00***        |
| 8. <b>Ecological health:</b> The lowest step indicates a situation with no fish or other resources, that the water is so foul nothing could live in it. The highest step is described as rich, clean water, filled with fish and other wildlife.                      | 5.12                      | 8.79                 | -16.84         | 0.00***        |
| 9. <b>Biodiversity:</b> The lowest step indicates a situation with only one or a few different types of fish or corals. The highest step indicates a situation with many different kinds of fish and other wildlife.  | 4.94                      | 9.15                 | -21.51         | 0.00***        |

Note: These questions are not applicable for non-MMA reference sites

Null hypothesis:  $\mu_1 = \mu_2$ ; Alternative hypothesis:  $\mu_1 < \mu_2$  (The higher the better)

Answers for each statements ranges from 1 to 10

\*, \*\*, \*\*\*, represent significant at 10%, 5%, 1%, respectively

## 1. Socioeconomic Effects of MMAs

The first objective of this study is to test the socioeconomic effects of marine managed areas. To achieve this goal, seven socioeconomic hypothesis effects are tested in this study. They are income effect, livelihoods effect, use of marine resources, non-monetary (non-market and non-use) benefits to society, environmental awareness and knowledge, health of coastal residents, and capacity of community.

### 1.1 Income effect

One of the most important socioeconomic effects of MMAs is whether the income of coastal population increased or not after the establishment of MMAs. Income variables in this study include average monthly household income, average monthly household marine related income, income from fishing, and perception of economic situation. The detailed income variables are summarized in Average monthly household income is the total monthly income of all household members while average monthly marine related household income only includes the monthly income of fishing, tourism, and boat drivers or divers' income.

To test whether people's income had been increased or not after the establishment of MMAs, the whole sample is divided into two groups, MMA sites and non-MMA reference sites as shown in **Table 3**. The two non-MMA reference sites are treated as a control for the four MMA reference sites.

**Table 3: MMA reference sites VS non-MMA reference sites**

| Country       | Respondents Surveyed | MMA sites              |            | non-MMA sites          |           |
|---------------|----------------------|------------------------|------------|------------------------|-----------|
| Fiji          | 183                  | <b>Total Subsample</b> | <b>150</b> | <b>Total Subsample</b> | <b>40</b> |
|               |                      | <b>Navakavu</b>        |            | <b>Kalokolevu</b>      | 23        |
|               |                      | Waiqanake              | 28         | <b>Tavulomo</b>        | 17        |
|               |                      | Muaivuso               | 16         |                        |           |
|               |                      | Namakala               | 11         |                        |           |
|               |                      | Nabaka                 | 5          |                        |           |
|               |                      | <b>Waitabu</b>         |            |                        |           |
|               |                      | Wai                    | 5          |                        |           |
|               |                      | Waitabu                | 14         |                        |           |
|               |                      | Vurevure               | 6          |                        |           |
|               |                      | <b>Kubulau</b>         |            |                        |           |
|               |                      | Navatu                 | 15         |                        |           |
|               |                      | Raviravi               | 10         |                        |           |
|               |                      | Kiobo                  | 10         |                        |           |
| Namalata      | 7                    |                        |            |                        |           |
| <b>Malolo</b> |                      | <b>Solevu</b>          | 23         |                        |           |

Descriptive statistics of three income variables of four MMA reference sites, non-MMA reference sites, and the Fiji node are reported in **Table 4**. The respondents from Malolo have the highest income among the four MMA reference sites and two non-MMA reference sites with a mean of \$617 monthly income while the Waitabu respondents have the lowest among five sites with a mean of \$244 monthly income and this may be due to the majority of the local people in Malolo earning a steady income by working in nearby resorts and hotels while the majority of the local people in Waitabu still live on a semi-subsistence basis with poor accessibility to market.

**Table 4: Descriptive statistics of income variables**

| Variable   | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | non-MMAs<br>(n=33) | Fiji            |
|--|--------------------|-------------------|-------------------|------------------|--------------------|-----------------|
|  |                    |                   |                   |                  |                    | MMAs<br>(n=183) |
| <b>Average monthly household income (US Dollar)</b>                |                    |                   |                   |                  |                    |                 |
| Mean   | 387                | 244               | 287               | 617              | 451                | 385             |
| Std. Dev.  | 403                | 275               | 316               | 439              | 409                | 388             |
| Min  | 0                  | 0                 | 28                | 0                | 28                 | 0               |
| Max  | 2323               | 1060              | 1398              | 1804             | 1748               | 2323            |
| <b>Average monthly marine related household income (US Dollar)</b> |                    |                   |                   |                  |                    |                 |
| Mean   | 217                | 31                | 144               | 594              | 141                | 208             |
| Std. Dev.  | 282                | 55                | 279               | 430              | 210                | 314             |
| Min  | 0                  | 0                 | 0                 | 0                | 0                  | 0               |
| Max  | 1804               | 271               | 1336              | 1804             | 958                | 1804            |
| <b>Average monthly fishing income (US Dollar)</b>                  |                    |                   |                   |                  |                    |                 |
| Mean   | 217                | 30                | 133               | 75               | 141                | 140             |
| Std. Dev.  | 282                | 56                | 238               | 97               | 210                | 228             |
| Min  | 0                  | 0                 | 0                 | 0                | 0                  | 0               |
| Max  | 1804               | 271               | 885               | 395              | 958                | 1804            |

Description of respondents' perception of economic situation is summarized in **Table 5**. In total, 67.7% of respondents perceive their economic situation is either much better or better compared to before the establishment of the MMAs while only 6.1% of respondents perceive their economic situation is worse or much worse. The rest of respondents perceive their economic situation unchanged. The improvement in the economic situation of these respondents can be attributed to a mixer of factors which include better market, easy access to market, enabling national legislation for trade and also income deriving rural development programs such as establishing community business ventures, MMA and others. The respondents from MMA reference sites are more positive about their economic situation compared to those from the non- MMA reference sites.

**Table 5: Perception of economic situation**

| How do you rate your economic situation today compared to X <sup>2</sup> years ago? |                          | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | non-MMA<br>(n=33) | Fiji MMAs<br>(n=182) |      |
|---|--------------------------|--------------------|-------------------|-------------------|------------------|-------------------|----------------------|------|
| <b>Frequency</b>  | Much better              | 1                  | 10                | 4                 | 2                | 4                 | 3                    | 22   |
|   | Better                   | 2                  | 23                | 18                | 18               | 17                | 7                    | 83   |
|   | Neither better nor worse | 3                  | 23                | 3                 | 22               | 2                 | 16                   | 66   |
|   | Worse                    | 4                  | 4                 | 0                 | 0                | 0                 | 6                    | 10   |
|   | Much Worse               | 5                  | 0                 | 0                 | 0                | 0                 | 1                    | 1    |
| <b>Percentage</b>   | Much better              | 1                  | 15.3              | 16.0              | 4.8              | 17.4              | 9.1                  | 12.1 |
|   | Better                   | 2                  | 39.0              | 72.0              | 42.9             | 73.9              | 21.2                 | 45.6 |
|   | Neither better nor worse | 3                  | 39.0              | 12.0              | 52.4             | 8.7               | 48.5                 | 36.3 |
|   | Worse                    | 4                  | 6.8               | 0.0               | 0.0              | 0.0               | 18.2                 | 5.5  |
|   | Much Worse               | 5                  | 0.0               | 0.0               | 0.0              | 0.0               | 3.0                  | 0.6  |

<sup>2</sup> The year asked depend on the age of the MMAs for the MMA reference sites while 5 years before was asked for the non-MMA reference sites

### 1. Hypothesis 1 (Effect 1): income

The results of t-test with equal variance are presented in **Table 6**, **Table 7**, and **Table 8**, respectively. The null hypothesis is that the average monthly household income, or average monthly marine related household<sup>3</sup> income, or average monthly fishing income of respondents in MMA reference sites is equal to those from non- MMA reference sites ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that average monthly household income, or average monthly marine related household income, or average monthly fishing income of respondents in MMA reference sites is higher than those who those from non- MMA reference sites ( $H_a : \mu_{MMA} > \mu_{Non-MMA}$ ).

Although the statistical result in **Table 6** shows that average monthly household income in Malolo is higher than those from non- MMA reference sites, the statistical results in Navakavu, Waitabu, Kubulau, and the Fiji node show that there is no sufficient evidence to conclude that the null hypothesis is rejected. The reason is probably that in one of the non- MMA reference sites, Kalokolevu, which have easy access to town, the majority of the households depend on consistently paid jobs, similar to households in Malolo that work in resorts and hotels, whereas in Navakavu, Kubulau and Waitabu the majority of the households still live mainly in a semi-subsistence basis.

The statistical results in **Table 7** show that there is sufficient evidence to conclude that the null hypothesis is rejected in Navakavu, Malolo, and Fiji MMAs, while there is no sufficient evidence in Waitabu and Kubulau to conclude that the null hypothesis is rejected. In Navakavu and Malolo, most income is generated from marine-related activities including fishing for Navakavu and boat transportation, diving and other water activities in Malolo while farming is the main income source in the other two MMA reference sites.

The statistical result in **Table 8** shows that there is sufficient evidence to conclude that the null hypothesis is rejected in Navakavu, while there is no sufficient evidence in all other sites and the Fiji node to conclude that the null hypothesis is rejected. However, Navakavu is the only MMA reference sites out of the four that have similar social and economic settings with that of the control sites in terms of distance and accessibility to market, type of market, size of community, proximity to urban centers, dependence on fishing and employment level, therefore, we can say that MMA reference sites have higher fishing income than non-MMA reference sites.

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<sup>3</sup> Average monthly marine related household income includes the fishery income, tourism income, and boat driver or diver income of all household members.

**Table 6: t test results of average monthly household income (US Dollar)**

| Variable                             | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji<br>MMAs<br>(n=183) |
|--------------------------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| MMA<br>reference sites               | 387.40             | 244.35            | 286.81            | 617.24           | 370.63                  |
| non-MMA<br>reference sites<br>(n=33) | 450.85             | 450.85            | 450.85            | 450.85           | 450.85                  |
| t-value                              | 0.72               | -2.18             | -1.96             | 1.45             | -1.08                   |
| p-value                              | 0.76               | 0.98              | 0.97              | <b>0.08*</b>     | 0.86                    |

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 7: t test results of average monthly marine related household income (US Dollar)**

| Variable                             | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji<br>MMAs<br>(n=183) |
|--------------------------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| MMA<br>reference sites               | 216.57             | 31.12             | 144.21            | 594.44           | 223.34                  |
| non-MMA<br>reference sites<br>(n=33) | 140.97             | 140.97            | 140.97            | 140.97           | 140.97                  |
| t-value                              | 1.35               | -2.55             | 0.06              | 5.24             | 1.37                    |
| p-value                              | <b>0.09*</b>       | 0.99              | 0.48              | <b>0.00***</b>   | <b>0.09*</b>            |

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 8: t test results of average monthly household income for fishing (US Dollar)**

| Variable                             | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji<br>MMAs<br>(n=183) |
|--------------------------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| MMA<br>reference sites               | 216.57             | 29.54             | 133.47            | 74.76            | 140.39                  |
| non-MMA<br>reference sites<br>(n=33) | 140.97             | 140.97            | 140.97            | 140.97           | 140.97                  |
| t-value                              | 1.35               | -2.58             | 0.14              | -1.41            | -0.01                   |
| p-value                              | <b>0.09*</b>       | 0.99              | 0.56              | 0.92             | 0.51                    |

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

The results of t-test of economic situation are presented in **Table 9**. The null hypothesis is that the perception of economic situation from respondents in MMA reference sites is equal to those from non-MMA reference sites ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that perception of economic situation from respondents in MMA reference sites is stronger than those from non-MMA reference sites ( $H_a : \mu_{MMA} < \mu_{Non-MMA}$ ), since the lower the number the better their economic situation they perceived. Statistical results in **Table 9** show that MMA reference sites are more positive on their economic situations than non-MMA reference sites

**Table 9: t test results of perception of economic situations**

| Variable                          | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji MMAs<br>(n=149) |
|-----------------------------------|--------------------|-------------------|-------------------|------------------|----------------------|
| MMA reference sites               | 2.37               | 1.96              | 2.48              | 1.91             | 2.26                 |
| non-MMA reference sites<br>(n=33) | 2.85               | 2.85              | 2.85              | 2.85             | 2.85                 |
| t-value                           | -2.52              | -4.23             | -2.09             | -4.34            | -4.03                |
| p-value                           | 0.01***            | 0.00***           | 0.02**            | 0.00***          | 0.00***              |

Answers for perception on economic situation: 1=Much better; 2=Better; 3=Neither better nor worse; 4=Worse; 5=Much Worse

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

Since household income in communities can be affected by various factors such as market characteristics and geographical locations, there is limitations in testing the income effect of MMA based on comparison of MMA reference sites and non-MMA reference sites. Therefore, baseline information from these MMA reference sites were compared with the current household income. The results of t-test with equal variance are presented in **Table 10** and **Table 11**, respectively. The null hypothesis is that the current average monthly household income, or current average monthly household fishing income is equal to the baseline data ( $H_0 : \mu_{Current} = \mu_{Baseline}$ ), while the alternative hypothesis is that current average monthly household income, or current average monthly household fishing income is higher than the baseline data ( $H_a : \mu_{Current} > \mu_{Baseline}$ ).

The statistical result in **Table 10** shows that there is sufficient evidence to conclude that the null hypothesis is rejected in Waitabu, Malolo and the Fiji node, while there is no sufficient evidence in all other sites to conclude that the null hypothesis is rejected, even though there is a notable increase in monthly household income for all the sites. The statistical result in **Table 11** shows that there is sufficient evidence to conclude that the null hypothesis is rejected in Navakavu, Malolo and the Fiji node, while there is no sufficient evidence in all other sites to conclude that the null hypothesis is rejected, even though there is a notable increase in monthly household income in Kubulau. As already mentioned above, the community in Waitabu and Kubulau depend heavily on farming activities as their main source of income, whereas for Navakavu, fishing is the main

source of income and to some extent for communities in Malolo. From this analysis, we can conclude that the establishment of MMA in the MMA reference sites has greatly improved the monthly income or fishing income of households within these communities.

**Table 10: t test results of average monthly related household income (US Dollar)**

| Variable           | Navakavu<br>(n=59) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji MMAs<br>(n=149) |
|--------------------|--------------------|-------------------|-------------------|------------------|----------------------|
| Baseline (Pre-MMA) | 323                | 133               | 230               | 478              | 291                  |
| Current (Post MMA) | 387                | 244               | 287               | 617              | 385                  |
| t-value            | 0.61               | 2.96              | 0.68              | 4.64             | 2.34                 |
| p-value            | 0.35               | <b>0.00***</b>    | 0.48              | <b>0.00***</b>   | <b>0.09*</b>         |

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 11: t test results of average monthly household fishing income (US Dollar)**

| Variable                         | Navakavu<br>(n=59) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji MMAs<br>(n=149) |
|----------------------------------|--------------------|-------------------|-------------------|------------------|----------------------|
| Baseline (Pre-MMA establishment) | 157                | 40                | 63                | 80               | 88                   |
| Current (Post MMA establishment) | 217                | 30                | 75                | 133              | 140                  |
| t-value                          | 2.54               | -0.07             | 0.09              | 1.13             | 1.47                 |
| p-value                          | <b>0.00***</b>     | 0.99              | 0.48              | <b>0.00***</b>   | <b>0.09*</b>         |

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

Furthermore, income analysis was not only limited to household level, but income to the entire community as a result of MMA implementation was also gathered. In Kubulau, infrastructure developments which have economic value are also implemented such as the electric power system in Navatu village by Seacology. Periodic opening of one of the MMAs has assisted in the construction of the church in Navatu village. The major economic benefits derived from the Kubulau MMA program is the income received by the community from the dive access fee system. Being situated close to Savusavu town, one of the best tourist destinations in Fiji and home to some tourism operators in Fiji, the marine managed areas in Kubulau is able to incorporate income generating mechanisms into the resource conservation program.

Through CORAL's assistance who oversees the printing of dive tags; a plastic tag which a guest diver in Kubulau waters needs to wear while diving, the community is able to generate income from the MMA program. Continuous empowerment and capacity building by CORAL and WCS, the community has been able to facilitate and secure a more transparent and effective system of operating access fees into the managed area with several tourism operators. Towards the end of each year, the stakeholders, including the Kubulau Qoliqoli Committee, dive and tourism operators,

government representatives and staff from CORAL and WCS usually meet to plan and decide on the number of dive tags that each operator will purchase for the following business year. A dive tag can be purchased by an operator at \$FJ30. In 2007 alone, 1000 dive tags were sold by the community which generated \$FJ30,000 to the community's coffer.

The Kubulau Resource Management Committee is the recipient of the fund. The money is usually used for community development, scholarships for Kubulau tertiary students, meeting operational costs of the MMA program such as patrolling, fuel, and mooring maintenance and other expenses. The arrangement in Kubulau ensures the local people benefit economically from the marine managed areas and is an important step in marine reef conservation work in Fiji.

In Malolo, MMAs which are co-managed by the community and resorts are common in that region. This arrangement usually brings income to the community as a whole. For instance, in Navini Island Resort, the resort pays FJD5000 annually to the community for the renewal of an agreement for the establishment of the MMA. The money is handled by the clan and is always used for education and development needs of members of the chiefly clan. Also, the resort provides assistance to the local primary school through the purchase and supply of library books and other stationeries, community health center and provide assistance to other village development projects. The resort also assists in some community development projects by providing resources, cash or labor. The total value of these benefits is in excess of FJD10,000 annually.

In terms of the cash benefits, this arrangement is guided in an agreement between Navini Island Resort Limited and the Tui Law clan. The agreement is renewable in every 12 months. Towards the end of each year, the two parties meet and decide on the renewal and the terms of agreement for the following 12 months. Once the agreement is finalized by both parties, the resort then makes payments for the FJD5000.

In Waitabu, the main income derived from the Waitabu MMA program for the community is the income received by the community from the snorkeling access fee system, home stay initiative and the camp site ecotourism project. Also, the community also earns extra cash from the sales of T-shirts, sarong, handicraft and other souvenirs which has the slogan of the MMA. Being situated on Taveuni Island, one of the best tourist destinations in Fiji and home to some tourism operators in Fiji, the marine managed areas in Waitabu is able to incorporate income generating mechanisms into the resource conservation program. The access fee obtained from visitors to the park is also a catalyst to the conservation work of the community. The income from this community initiative is usually channeled into community development initiatives and continuous operation of the MMA. According to Sykes (2010), over the last twelve years of the MMA, the project has earned over FJ\$50, 000 for the community.

The income from this project is handled by the Park Committee and is responsible for dividing the money to the various categories and also in reporting back the monetary transactions to the village council.

## 4.2 Livelihood options

The second hypothesis of socioeconomic effect is whether the livelihood options of coastal populations have diversified after the establishment of MMAs. The null hypothesis is that the number of fishermen among MMA reference sites is equal to those among non-MMA reference sites ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that the number of fishermen among MMA reference sites is greater than those among non-MMA reference sites ( $H_a : \mu_{MMA} > \mu_{Non-MMA}$ ). The diversity of livelihood and marine related livelihood of respondents is summarized in **Table 12** and **Table 13**, respectively. The livelihood is divided into non-marine related livelihood and marine related livelihood, which includes fishing, tourism, and boat drivers or divers.

The results of t-tests with equal variance are presented in **Table 14**. The statistical results in tourism and boat drivers or divers show that there is sufficient evidence to conclude that the null hypothesis is rejected, while there is no sufficient evidence to conclude that there is significant difference between MMA reference sites and non-MMA reference sites when it comes to fishing, however, there are more respondents who are involved in tourism among MMA reference sites than those among non-MMA reference sites.

Through the implementation of MMAs in Fiji, livelihood enhancement program or the search for alternative livelihood source is one of the many key components of community adaptive management that partner organizations focus on, which results in the development of training programs and implementation of other alternative sources. Some of the training conducted in MMA communities by partner organizations which result in actual implementation of livelihood enhancement projects include handicraft and weaving, beekeeping, development of ecotourism ventures, fish aggregation device and boat/sea transport operation. The identification of new alternative livelihoods options and related economic opportunities is a principal mechanism for strengthening the relationship among these Fijian coastal communities and the natural environment on which they depend. A strong relationship with broad acknowledgement of the livelihood benefits that may be derived from the environment is the best incentive for a community to become intensely involved in the sustainable utilization and conservation of the resource base, therefore, the MMAs establishment is not only advocated as a tool for conserving biodiversity to Fijian communities but moreso, a strategy to enhance livelihood.

**Table 12: Diversity of Livelihood**

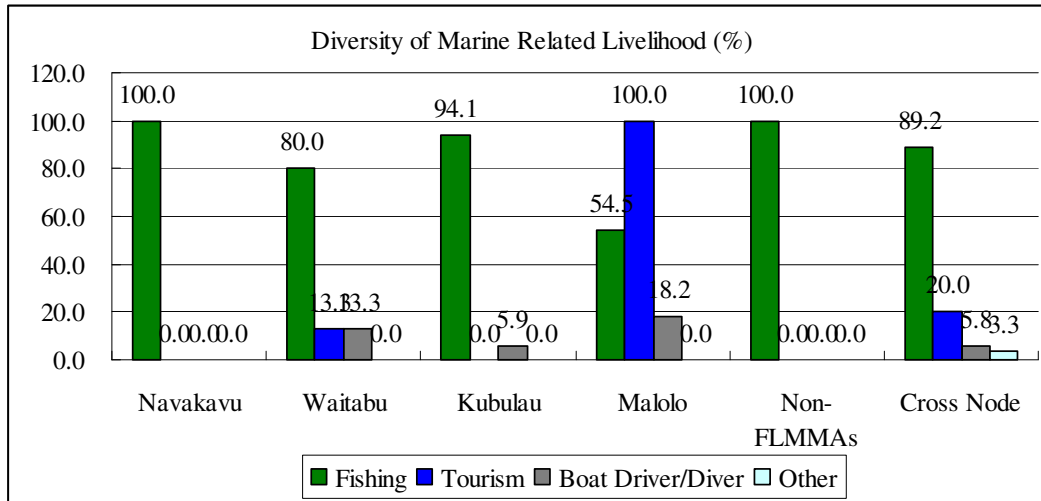
|                    | Navakavu  | Waitabu | Kubulau | Malolo | non-MMA | Fiji             | Navakavu   | Waitabu | Kubulau | Malolo | non-MMA | Fiji             |
|--------------------|-----------|---------|---------|--------|---------|------------------|------------|---------|---------|--------|---------|------------------|
|                    | (n=60)    | (n=25)  | (n=42)  | (n=23) | (n=40)  | MMAAs<br>(n=183) | (n=60)     | (n=25)  | (n=42)  | (n=23) | (n=40)  | MMAAs<br>(n=183) |
|                    | Frequency |         |         |        |         |                  | Percentage |         |         |        |         |                  |
| Marine Related     | 48        | 15      | 17      | 22     | 19      | 120              | 80.0       | 60.0    | 38.1    | 96.0   | 58.0    | 65.6             |
| Fishing            | 48        | 12      | 16      | 12     | 19      | 107              | 80.0       | 48.0    | 38.0    | 52.0   | 58.0    | 80.0             |
| Tourism            | 0         | 2       | 0       | 22     | 0       | 24               | 0.0        | 8.0     | 0.0     | 96.0   | 0.0     | 16.0             |
| Boat Driver/Diver  | 0         | 2       | 1       | 4      | 0       | 7                | 0.0        | 8.0     | 2.0     | 17.0   | 0.0     | 5.0              |
| Other*             | 0         | 0       | 0       | 0      | 0       | 4                | 0.0        | 0.0     | 0.0     | 0.0    | 0.0     | 2.2              |
| non-marine Related | 12        | 10      | 25      | 1      | 14      | 63               | 20.0       | 40.0    | 61.9    | 4.3    | 42.0    | 34.4             |
| Total              | 60        | 25      | 42      | 23     | 33      | 183              | 100.0      | 100.0   | 100.0   | 100.0  | 100.0   | 100.0            |

\*Middle man for marine related products and mangrove collection

**Table 13: Diversity of Marine Related Livelihood**

|                   | Navakavu  | Waitabu | Kubulau | Malolo | non-MMA | Fiji             | Navakavu   | Waitabu | Kubulau | Malolo | non-MMA | Fiji             |
|-------------------|-----------|---------|---------|--------|---------|------------------|------------|---------|---------|--------|---------|------------------|
|                   | (n=60)    | (n=25)  | (n=42)  | (n=23) | (n=40)  | MMAAs<br>(n=183) | (n=60)     | (n=25)  | (n=42)  | (n=23) | (n=40)  | MMAAs<br>(n=183) |
|                   | Frequency |         |         |        |         |                  | Percentage |         |         |        |         |                  |
| Marine Related    | 48        | 15      | 17      | 22     | 19      | 120              | 100.0      | 100.0   | 100.0   | 100.0  | 100.0   | 100.0            |
| Fishing           | 48        | 12      | 16      | 12     | 19      | 107              | 100.0      | 80.0    | 94.1    | 54.5   | 100.0   | 89.2             |
| Tourism           | 0         | 2       | 0       | 22     | 0       | 24               | 0.0        | 13.3    | 0.0     | 100.0  | 0.0     | 20.0             |
| Boat Driver/Diver | 0         | 2       | 1       | 4      | 0       | 7                | 0.0        | 13.3    | 5.9     | 18.2   | 0.0     | 5.8              |
| Other             | 0         | 0       | 0       | 0      | 0       | 4                | 0.0        | 0.0     | 0.0     | 0.0    | 0.0     | 3.3              |

**Figure 2: Diversity of marine related livelihood (%)**



**Table 14: t test results of livelihood-the Fiji node**

| Variable                   | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji<br>MMAs<br>(n=183) |
|----------------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| <b>Marine Related</b>      |                    |                   |                   |                  |                         |
| MMA sites                  | 0.80               | 0.60              | 0.38              | 0.96             | 0.67                    |
| non-MMA<br>(n=40)          | 0.58               | 0.58              | 0.58              | 0.58             | 0.58                    |
| t-value                    | 2.35               | 0.18              | -1.69             | 3.43             | 1.07                    |
| p-value                    | 0.01***            | 0.43              | 0.95              | 0.00***          | 0.14                    |
| <b>Fishing</b>             |                    |                   |                   |                  |                         |
| MMA sites                  | 0.80               | 0.48              | 0.38              | 0.52             | 0.59                    |
| non-MMA<br>(n=33)          | 0.58               | 0.58              | 0.58              | 0.58             | 0.58                    |
| t-value                    | 2.35               | -0.71             | -1.69             | 0.39             | 0.12                    |
| p-value                    | 0.01***            | 0.46              | 0.95              | 0.65             | 0.46                    |
| <b>Tourism</b>             |                    |                   |                   |                  |                         |
| MMA sites                  | 0.00               | 0.08              | 0.00              | 0.96             | 0.16                    |
| non-MMA<br>(n=33)          | 0.00               | 0.00              | 0.00              | 0.00             | 0.00                    |
| t-value                    | n.a.               | 1.67              | n.a.              | 26.45            | 2.49                    |
| p-value                    | n.a.               | 0.05**            | n.a.              | 0.00***          | 0.01***                 |
| <b>Boat Drivers/Divers</b> |                    |                   |                   |                  |                         |
| MMA sites                  | 0.00               | 0.08              | 0.02              | 0.17             | 0.05                    |
| non-MMA<br>(n=33)          | 0.00               | 0.00              | 0.00              | 0.00             | 0.00                    |
| t-value                    | n.a.               | 1.67              | n.a.              | 2.59             | 1.26                    |
| p-value                    | n.a.               | 0.05**            | n.a.              | 0.00***          | 0.10*                   |

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

### 4.3 Marine resources uses

The third hypothesis of socioeconomic effect is whether coastal populations use marine resources more sustainably after the establishment of MMAs. Sustainable use of marine resources includes resource use pattern (fishing methods), frequency of use, and fishing change.

Frequency of use is derived from the question about how often do you fish or collect seafood. Fishing change is generated from the question of whether fishing or seafood collection has become easier or more difficult since the establishment of the MMA, or has there been any change?

The results of t-test with equal variance are presented in **Table 15** and **Table 16**, respectively. The null hypothesis is that respondents from MMA reference sites use marine resources equally frequent to those from non-MMA reference sites ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that respondents from MMA reference sites use marine resource less frequently than those from non-MMA reference sites ( $H_a : \mu_{MMA} > \mu_{Non-MMA}$ ). The statistical results show that there is no sufficient evidence to conclude that there is significant difference between MMA reference sites and non-MMA reference sites. However, when it comes to whether fishing became easier or not, MMA reference sites did think fishing became easier compared to non-MMA reference sites.

**Table 15: t test result of frequency of use of marine resources**

| Variable                             | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji<br>MMAs<br>(n=183) |
|--------------------------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| MMA<br>reference sites               | 2.87               | 3.8               | 2.62              | 3.00             | 2.97                    |
| non-MMA<br>reference sites<br>(n=33) | 2.72               | 2.72              | 2.72              | 2.72             | 2.72                    |
| t-value                              | 0.49               | 3.11              | -0.39             | 0.72             | 0.93                    |
| p-value                              | 0.31               | 0.00***           | 0.65              | 0.24             | 0.18                    |

Note: 1=Every day;2=Every two days;3=Every three days;4=Once a week;5=Every two weeks;6=Once a month;7=Never

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 16: t test result of fishing change**

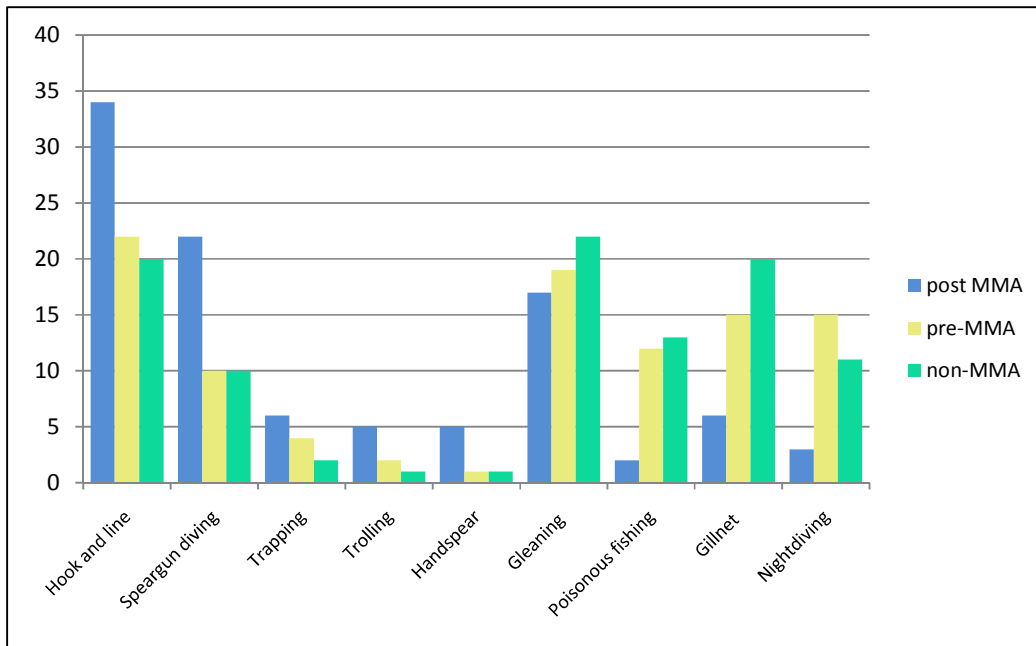
| Variable                             | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji<br>MMAs<br>(n=183) |
|--------------------------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| MMA<br>reference sites               | 2.05               | 2.4               | 1.75              | 2.17             | 2.05                    |
| non-MMA<br>reference sites<br>(n=33) | 4.18               | 4.18              | 4.18              | 4.18             | 4.18                    |
| t-value                              | -10.64             | -5.97             | -10.07            | -7.52            | -11.30                  |
| p-value                              | 0.00***            | 0.00***           | 0.00***           | 0.00***          | 0.00***                 |

Note: 1=Fishing has become very easy; 2=Fishing has become easier; 3=Fishing has become difficult; 4=Fishing has become more difficult; 5= no change

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

The sustainable use of marine resources on a fishing ground is mainly dependent on the type of fishing gears that the community utilizes for fishing. The summary of the range of fishing methods that the respondents from the MMA reference sites (pre-MMA and current) and the non-MMA reference sites uses are given in Figure 3. In the MMA reference sites, the most common fishing methods are the use of hook and line, spear gun, and gleaning while gleaning, gillnetting and hook and line are the main fishing methods in the non-MMA reference sites. In the pre-MMA period, the most common fishing methods are hook and line, gleaning, gillnetting and night dive fishing. From the graph, the pre-MMA period and non-MMA reference sites are more similar in the type of fishing methods they employ, especially in both situations, community uses destructive fishing methods such as gillnetting, poisonous fishing, night dive fishing and gleaning to some extent. However, the situation is different with that of the MMA reference sites as more respondents now use sustainable fishing methods which are selective and less destructive.

**Figure 3: Percentage of households with main fishing methods**



During management action planning workshops in the MMA reference sites, communities usually identify threats to their resources and also develop management strategies to mitigate the threats. One of the main threats that always arise in these discussions is the use of destructive fishing methods which the community usually decides to ban at the end through discussions and endorsement at the village council and traditional council meetings. For instance, during the management action planning workshop in Navakavu in 2003, participants highlighted the use of poisonous root for fishing as an environmental issue which has been practiced for the past decades. The issue was then raised in Waiqanake village on November, 2003 during one of the traditional council meetings whereby the council elders discussed and deliberated on the issue and towards the end of the discussion, a decision was made to totally ban the use of the destructive fishing method within their fishing ground. Similar processes were followed to address destructive fishing methods in the other MMA reference sites.

Also, the establishment of no-fishing zones within the MMAs is a tool that ensures the sustainable use of marine resources within a fishing ground. Restricting local communities from accessing certain parts of the fishing ground for fishing and extractive activities means the marine resources are sustainably managed. To date, the MMA program in Fiji covers 13 of the 14 provinces covering around 189 villages that have established and traditionally manage over 200 no-take zones within their fishing ground, around 20 forest reserves and 10 freshwater riverine reserves and implement other management activities such as proper waste management and sustainable fishing, farming and logging practices.

#### **4.4 Non-monetary (non-market and non-use) benefits to society**

Non-monetary benefits to society include eight statements on the indirect non-market value, existence value, bequest value, and option value of marine resources such as mangroves and coral reefs. Respondents were asked to choose among strongly agree, agree, neutral, disagree, and strongly disagree.

##### **Hypothesis 4 (effect 4) Non-monetary benefits to society**

The results of t-tests with equal variance in Navakavu, Waitabu, Kubulau, Malolo, and the Fiji nodes are presented in **Table 17**, **Table 18**, **Table 19**, **Table 20** and **Table 21** respectively. The null hypothesis is that the perception of non-monetary benefits of respondents from the MMA reference sites is equal to those from the non-MMA reference sites ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that the perception of non-monetary benefits of respondents from the MMA reference sites is higher than those from the non-MMA reference sites ( $H_a : \mu_{MMA} > \mu_{Non-MMA}$ ). The statistical results and the Fiji node analysis show that there is sufficient evidence to conclude that the null hypothesis is rejected. In the Fiji node analysis, the perception of non-monetary benefits of respondents from the MMA reference sites is stronger than those from non-MMA reference sites except statements 6, 7, and 8. There are no significant difference between MMA reference sites and non-MMA reference sites when it comes to statements such as “In the long-run, fishing would be better if we cleared the coral”, “Coral reefs are only important if you fish or drive”, “Sea grass beds have no value to people”.

During awareness raising programs in the MMA sites, the roles of the various habitats are always highlighted to the community together with the importance of managing and sustainably use resources from these habitats. In the community management action planning workshop, which all the four communities have already undertaken, one of the various sessions which reflect the above statement is the Marine ecology session. In this part of the workshop program, facilitators usually give examples of the relationship between the various habitats and marine species and their relationship with people but most importantly, the value of maintaining these biotic relationships. However, in the non-MMA reference sites, the communities really lack the awareness and knowledge of these marine systems.

**Table 17: Non-monetary (non-market and non-use) benefits to society in Navakavu**

| Statements  | Navakavu<br>(n=60) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|--------------------|--------------------------------|---------|---------|
| 1. The reefs are important for protecting land from storm waves (indirect non-market value)   | 1.83               | 2.21                           | -1.20   | 0.12    |
| 2. Unless the mangroves are protected, we won't have any fish to catch (indirect non-market value)  | 1.53               | 2.39                           | -3.29   | 0.00*** |
| 3. I want future generations to enjoy the mangroves and coral reefs (bequest non-use value)   | 1.52               | 2.15                           | -2.87   | 0.00*** |
| 4. Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow (existence value) | 1.95               | 2.88                           | -4.62   | 0.00*** |
| 5. We should restrict development in some coastal areas so that future generations will be able to have natural environments (bequest value)          | 2.15               | 3.00                           | -3.75   | 0.00*** |
| 6. In the long-run, fishing would be better if we cleared the coral (indirect non-market value)   | 3.40               | 4.21                           | 2.78    | 0.99    |
| 7. Coral reefs are only important if you fish or drive (existence non-use value)  | 1.97               | 2.82                           | 3.50    | 0.99    |
| 8. Sea grass beds have no value to people (existence value)   | 3.48               | 3.67                           | 0.55    | 0.71    |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 18: Non-monetary (non-market and non-use) benefits to society in Waitabu**

| Statements  | Waitabu<br>(n=25) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|-------------------|--------------------------------|---------|---------|
| 1. The reefs are important for protecting land from storm waves (indirect non-market value)   | 1.28              | 2.21                           | -3.18   | 0.00*** |
| 2. Unless the mangroves are protected, we won't have any fish to catch (indirect non-market value)                                  | 2.12              | 2.39                           | -0.73   | 0.23    |
| 3. I want future generations to enjoy the mangroves and coral reefs (bequest non-use value)   | 1.96              | 2.15                           | -0.57   | 0.29    |
| 4. Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow | 1.48              | 2.88                           | -9.95   | 0.00*** |
| 5. We should restrict development in some coastal areas so that future generations will be able to have natural environments        | 1.60              | 3.00                           | -16.13  | 0.00*** |
| 6. In the long-run, fishing would be better if we cleared the coral (indirect non-market value)                                     | 4.44              | 4.21                           | 0.91    | 0.18    |
| 7. Coral reefs are only important if you fish or drive (existence non-use value)  | 3.28              | 2.82                           | 1.41    | 0.08*   |
| 8. Sea grass beds have no value to people (existence value)   | 3.16              | 3.67                           | -1.54   | 0.94    |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 19: Non-monetary (non-market and non-use) benefits to society in Kubulau**

| Statements  | Kubulau<br>(n=42) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|-------------------|--------------------------------|---------|---------|
| 1. The reefs are important for protecting land from storm waves (indirect non-market value)   | 1.17              | 2.21                           | -4.37   | 0.00*** |
| 2. Unless the mangroves are protected, we won't have any fish to catch (indirect non-market value)                                  | 1.38              | 2.39                           | -3.62   | 0.00*** |
| 3. I want future generations to enjoy the mangroves and coral reefs (bequest non-use value)   | 1.38              | 2.15                           | -3.85   | 0.00*** |
| 4. Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow | 1.83              | 2.88                           | -9.80   | 0.00*** |
| 5. We should restrict development in some coastal areas so that future generations will be able to have natural environments        | 2.10              | 3.00                           | -9.00   | 0.00*** |
| 6. In the long-run, fishing would be better if we cleared the coral (indirect non-market value)                                     | 4.88              | 4.21                           | 4.49    | 0.00*** |
| 7. Coral reefs are only important if you fish or drive (existence non-use value)  | 3.14              | 2.82                           | 1.39    | 0.09*   |
| 8. Sea grass beds have no value to people (existence value)   | 3.21              | 3.67                           | -1.58   | 0.94    |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 20: Non-monetary (non-market and non-use) benefits to society in Malolo**

| Statements  | Malolo<br>(n=23) | non-MMA<br>reference<br>(n=33) | t Value | P Value  |
|---|------------------|--------------------------------|---------|----------|
| 1. The reefs are important for protecting land from storm waves (indirect non-market value)   | 1.26             | 2.21                           | -3.12   | 0.00***  |
| 2. Unless the mangroves are protected, we won't have any fish to catch (indirect non-market value)                                  | 2.13             | 2.39                           | -0.68   | 0.25     |
| 3. I want future generations to enjoy the mangroves and coral reefs (bequest non-use value)   | 2.00             | 2.15                           | -0.43   | 0.33     |
| 4. Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow | 1.39             | 2.88                           | -13.42  | 0.000*** |
| 5. We should restrict development in some coastal areas so that future generations will be able to have natural environments        | 1.61             | 3.00                           | -16.08  | 0.00***  |
| 6. In the long-run, fishing would be better if we cleared the coral (indirect non-market value)                                     | 4.57             | 4.21                           | 1.57    | 0.06*    |
| 7. Coral reefs are only important if you fish or drive (existence non-use value)  | 3.43             | 2.82                           | 1.88    | 0.03**   |
| 8. Sea grass beds have no value to people (existence value)   | 3.30             | 3.67                           | -1.09   | 0.86     |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 21: Non-monetary (non-market and non-use) benefits to society in Fiji-Fiji MMAs**

| Statements  | MMA<br>(n=150) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|----------------|--------------------------------|---------|---------|
| 1. The reefs are important for protecting land from storm waves (indirect non-market value)   | 1.47           | 2.21                           | -3.45   | 0.00*** |
| 2. Unless the mangroves are protected, we won't have any fish to catch (indirect non-market value)  | 1.68           | 2.39                           | -3.48   | 0.00*** |
| 3. I want future generations to enjoy the mangroves and coral reefs (bequest non-use value)   | 1.63           | 2.15                           | -2.51   | 0.01*** |
| 4. Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow (existence value) | 1.75           | 2.88                           | -7.33   | 0.00*** |
| 5. We should restrict development in some coastal areas so that future generations will be able to have natural environments (bequest value)          | 1.96           | 3.00                           | -6.29   | 0.00*** |
| 6. In the long-run, fishing would be better if we cleared the coral (indirect non-market value)   | 4.16           | 4.21                           | -0.19   | 0.58    |
| 7. Coral reefs are only important if you fish or drive (existence non-use value)  | 2.74           | 2.82                           | -0.33   | 0.63    |
| 8. Sea grass beds have no value to people (existence value)   | 3.33           | 3.67                           | -1.23   | 0.89    |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

#### 4.5 Environmental awareness and knowledge

Environmental awareness and knowledge include six statements. Respondents were asked to choose among strongly agree, agree, neutral, disagree, and strongly disagree. These non-monetary benefit variables were only collected among MMA reference sites. Therefore, statistical analysis in this section is not applicable.

The results of t-tests with equal variance in Navakavu, Waitabu, Kubulau, Malolo, and the Fiji nodes are presented in **Tables 22, 23, 24, 25, 26** respectively. The null hypothesis is that the perception of environmental awareness and knowledge of respondents from the MMA reference sites is equal to those from the non-MMA reference sites ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that the perception of environmental awareness and knowledge of respondents from the MMA reference sites is higher than those from the non-MMA reference sites ( $H_a : \mu_{MMA} > \mu_{Non-MMA}$ ). In the Fiji node analysis, the perception of environmental awareness and knowledge of respondents from the MMA reference sites is stronger than those from the non-MMA reference sites.

Environmental awareness and knowledge is one of the main areas in MMA management that partner organizations and community focus on in Fiji and this is basically due to the understanding that most marine environment issues experienced today are inflicted by communities' lack of awareness and knowledge. Environmental awareness strives to improve awareness and understanding of the environment through education. Environmental education implemented in Fiji as part of MMA programs encoMMAss an ethic that ensures improved attitudes and behaviour for the marine environment among all the stakeholders within a community. It also attempts to facilitate the harmonizing of economic and social goals with ecologically sound management of the marine environment and its resources.

The statistical results have highlighted that these strategies are now working. For instance, in the non-MMA reference sites which is similar to the pre-MMA situation in the four MMA reference sites, the use of poisonous fishing using *derris* root is always seen as a traditional fishing practices as it has been practiced in the community for decades. However, in the four MMA reference sites, this practice has been banned by the communities and eliminated to some extent as the locals are more aware and have the knowledge on the negative impacts of this fishing practice and this is the result of the various marine education programs implemented by partner organizations over the years.

The environment education programs implemented by partner organizations in MMA communities include environmental awareness workshops and meeting whereby various topics are highlighted such as critical environmental issues in Fiji, consequences of resource harvesting practices, biology of key resources and possible strategies to mitigate environmental issues. Development of awareness posters, pamphlets and other materials are also strategies for environmental awareness outreach. The media also plays an important role in raising environmental awareness to the communities and public in Fiji and this include newspaper articles, television advertisement and series, news, radio advertisement and talk back show.

**Table 22: Local values and beliefs in Navakavu**

| Statements  | Navakavu<br>(n=60) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|--------------------|--------------------------------|---------|---------|
| 1. Institutions that manage the fishing ground are taking the bread out of people's mouths.     | 4.08               | 3.00                           | 4.80    | 0.00*** |
| 2. We do not have to worry about the sea and the fish. God will take care of it for us.         | 3.73               | 3.30                           | 1.54    | 0.06**  |
| 3. We should manage the sea to ensure that there are fish for our children and their children.  | 1.25               | 2.82                           | -11.81  | 0.00*** |
| 4. We have to take care of the land and sea or they will not provide for us in the future.      | 1.23               | 2.09                           | -7.20   | 0.00*** |
| 5. We want to protect the land and the sea but this is hard because we have economic needs now. | 2.43               | 2.03                           | 1.79    | 0.04*** |
| 6. Protecting the land and the sea brings us more benefits than not protecting these resources. | 1.63               | 2.82                           | -8.37   | 0.00*** |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 23: Local values and beliefs in Waitabu**

| Statements  | Waitabu<br>(n=25) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|-------------------|--------------------------------|---------|---------|
| 1. Institutions that manage the fishing ground are taking the bread out of people's mouths.     | 4.24              | 3.00                           | 4.74    | 0.00*** |
| 2. We do not have to worry about the sea and the fish. God will take care of it for us.         | 4.24              | 3.30                           | 4.10    | 0.01**  |
| 3. We should manage the sea to ensure that there are fish for our children and their children.  | 1.36              | 2.82                           | -8.45   | 0.00*** |
| 4. We have to take care of the land and sea or they will not provide for us in the future.      | 1.48              | 2.09                           | -2.92   | 0.00*** |
| 5. We want to protect the land and the sea but this is hard because we have economic needs now. | 2.56              | 2.03                           | 1.77    | 0.04**  |
| 6. Protecting the land and the sea brings us more benefits than not protecting these resources. | 1.36              | 2.82                           | -8.29   | 0.00*** |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 24: Local values and beliefs in Kubulau**

| Statements  | Kubulau<br>(n=42) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|-------------------|--------------------------------|---------|---------|
| 1. Institutions that manage the fishing ground are taking the bread out of people's mouths.     | 4.43              | 3.00                           | 6.35    | 0.00*** |
| 2. We do not have to worry about the sea and the fish. God will take care of it for us.         | 3.10              | 3.30                           | -0.88   | 0.81    |
| 3. We should manage the sea to ensure that there are fish for our children and their children.  | 1.14              | 2.82                           | -11.62  | 0.00*** |
| 4. We have to take care of the land and sea or they will not provide for us in the future.      | 1.31              | 2.09                           | -5.66   | 0.00*** |
| 5. We want to protect the land and the sea but this is hard because we have economic needs now. | 2.81              | 2.03                           | 3.78    | 0.00*** |
| 6. Protecting the land and the sea brings us more benefits than not protecting these resources. | 1.48              | 2.82                           | -8.80   | 0.00*** |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 25: Local values and beliefs in Malolo**

| Statements  | Malolo<br>(n=23) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|------------------|--------------------------------|---------|---------|
| 1. Institutions that manage the fishing ground are taking the bread out of people's mouths.     | 4.26             | 3.00                           | 4.71    | 0.00*** |
| 2. We do not have to worry about the sea and the fish. God will take care of it for us.         | 4.48             | 3.30                           | 6.39    | 0.03**  |
| 3. We should manage the sea to ensure that there are fish for our children and their children.  | 1.30             | 2.82                           | -6.49   | 0.00*** |
| 4. We have to take care of the land and sea or they will not provide for us in the future.      | 1.48             | 2.09                           | -2.82   | 0.00*** |
| 5. We want to protect the land and the sea but this is hard because we have economic needs now. | 2.65             | 2.03                           | 2.03    | 0.02**  |
| 6. Protecting the land and the sea brings us more benefits than not protecting these resources. | 1.35             | 2.82                           | -8.09   | 0.00*** |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 26: Local values and beliefs in Fiji-Fiji MMAs**

| Statements  | MMA<br>(n=150) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|----------------|--------------------------------|---------|---------|
| 1. Institutions that manage the fishing ground are taking the bread out of people's mouths.     | 4.23           | 3.00                           | 5.56    | 0.00*** |
| 2. We do not have to worry about the sea and the fish. God will take care of it for us.         | 3.75           | 3.30                           | 1.85    | 0.03**  |
| 3. We should manage the sea to ensure that there are fish for our children and their children.  | 1.25           | 2.82                           | -12.72  | 0.00*** |
| 4. We have to take care of the land and sea or they will not provide for us in the future.      | 1.33           | 2.09                           | -6.16   | 0.00*** |
| 5. We want to protect the land and the sea but this is hard because we have economic needs now. | 2.59           | 2.03                           | 2.57    | 0.01*** |
| 6. Protecting the land and the sea brings us more benefits than not protecting these resources. | 1.50           | 2.82                           | -9.21   | 0.00*** |

Answers for each statements: 1=Strongly agree; 2=Agree; 3=Neutral; 4=Disagree; 5=Strongly disagree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

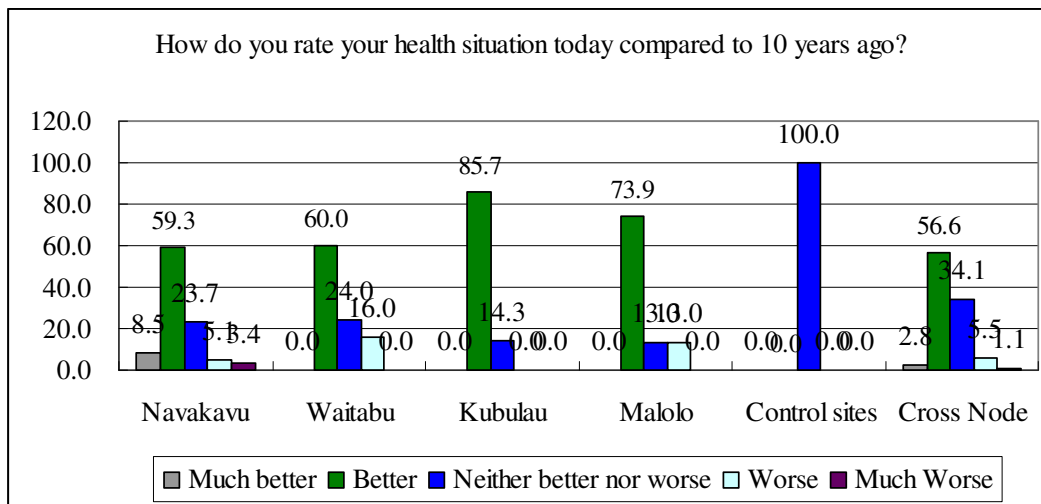
#### 4.6 Health of coastal residents

Health of coastal residents includes perception on health condition, frequency of fish or seafood consumption, and change in fish or seafood diet. Description of respondents' perception of health situation is summarized in **Table 27**. In total, 59.4% of respondents perceive their health situation is either much better or better compared to 10 years ago while 6.6% of respondents perceive their health situation is worse or much worse. The rest of respondents perceive their health situation no change.

**Table 27: Perception of health situation in Fiji**

| How do you rate your health situation today compared to before MMA/5 years ago? |                          | Navakavu (n=59) | Waitabu (n=25) | Kubulau (n=42) | Malolo (n=23) | non-MMA reference (n=33) | Fiji MMAs (n=182) |
|---|--------------------------|-----------------|----------------|----------------|---------------|--------------------------|-------------------|
| <b>Freq.</b>  | Much better              | 1               | 5              | 0              | 0             | 0                        | 5                 |
|   | Better                   | 2               | 35             | 15             | 36            | 17                       | 103               |
|   | Neither better nor worse | 3               | 14             | 6              | 6             | 33                       | 62                |
|   | Worse                    | 4               | 3              | 4              | 0             | 3                        | 10                |
|   | Much Worse               | 5               | 2              | 0              | 0             | 0                        | 2                 |
| <b>Percen.</b>  | Much better              | 1               | 8.5            | 0.0            | 0.0           | 0.0                      | 2.8               |
|   | Better                   | 2               | 59.3           | 60.0           | 85.7          | 73.9                     | 56.6              |
|   | Neither better nor worse | 3               | 23.7           | 24.0           | 14.3          | 13.0                     | 34.1              |
|   | Worse                    | 4               | 5.1            | 16.0           | 0.0           | 13.0                     | 5.5               |
|   | Much Worse               | 5               | 3.4            | 0.0            | 0.0           | 0.0                      | 1.1               |

**Figure 4: Percentage of respondents to health ratings**



The results of t-test are presented in **Table 28**. The null hypothesis is that the perception of health from respondents from the MMA reference sites is equal to those from the non-MMA reference sites ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that perception of health from respondents in the MMA reference sites is stronger than

those from the non-MMA reference sites ( $H_a : \mu_{MMA} < \mu_{Non-MMA}$ ). The statistical results in all MMA reference sites and the Fiji node show that there is sufficient evidence to conclude that the null hypothesis is rejected.

**Table 28: t test results of perception of health situations Fiji-Fiji MMAs**

| Variable                    | Navakavu<br>(n=59) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji<br>MMAs<br>(n=182) |
|-----------------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| MMA                         | 2.36               | 2.56              | 2.14              | 2.39             | 2.34                    |
| non-MMA reference<br>(n=33) | 3.00               | 3.00              | 3.00              | 3.00             | 3.00                    |
| t-value                     | -4.36              | -3.30             | -13.88            | -4.86            | -5.34                   |
| p-value                     | 0.00***            | 0.00***           | 0.00***           | 0.00***          | 0.00***                 |

Answers for perception on health situation:1=Much better;2=Better;3=Neither better nor worse;4=Worse;5=Much Worse

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

Overall, there is a common perception that the local people’s health has improved. In the 4 MMAs, there are now improved waste management practices. A major issue that always arises during issues identification is improper waste management and the most common one is the dumping of rubbish in the sea. Due to these, the communities are more receptive and, with proper advice, they come up with strategies to mitigate the issue of waste disposal in the surrounding coastal waters. Rubbish dump are dug in strategic areas within the village boundary where solid wastes such as tins and bottles are buried and incenerator constructed for burning of papers and leaves.

As part of the national government initiative in the past years through the *I Taukei* Affairs, the department that looks after the wellbeing of the indigenous communities, Monday is usually the community clean-up workday and once a waste pit is entirely filled, the men may dig another one. The MMA program has raised the awareness of the community in practicing proper waste disposal and this is usually discussed in this forum .

Fishing or seafood consumption is derived from the question of how often does your family eat fish or seafood. Fish or seafood diet change is generated from the question that has your family’s fish or seafood diet change after the establishment of the MMA.

The results of t-test are presented in **Table 29**. The null hypothesis is that the frequency of fish or seafood consumption from respondents who use resources in MMA is equal to those who do not use resources in MMA ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that fish or seafood consumption from respondents who use resources in MMA is more frequent than those who do not use resources in MMA ( $H_a : \mu_{MMA} < \mu_{Non-MMA}$ ). The statistical results in the Fiji node show that there is sufficient evidence concludes that the null hypothesis is rejected.

**Table 29: t test result of frequency of fish or seafood consumption-Fiji MMAs**

| Variable             | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji MMAs<br>(n=183) |
|----------------------|--------------------|-------------------|-------------------|------------------|----------------------|
| MMA reference        | 2.82               | 3.48              | 2.52              | 3.48             | 2.95                 |
| non-MMA<br>reference | 3.33               | 3.33              | 3.33              | 3.33             | 3.33                 |
| t-value              | -2.48              | 0.42              | -4.21             | 0.43             | -1.59                |
| p-value              | 0.01***            | 0.66              | 0.00***           | 0.67             | 0.06*                |

Frequency of fish or seafood consumption :1=Every day;2=Every two days;3=Every three days;4=Every week;5=Every two weeks;6=Once a month;7=Almost never  
\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

The results of t-test are presented in **Table 30**. The null hypothesis is that the fish or seafood diet change from respondents who use resources in MMA is equal to those who don't use resources in MMA ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that respondents who use resources in MMA ate more fish than those who don't use resources in MMA ( $H_a : \mu_{MMA} > \mu_{Non-MMA}$ ). The statistical results in the Fiji node show that there is sufficient evidence concludes that the null hypothesis is rejected and favour the alternative hypothesis.

**Table 30: t test result of fish or seafood diet change Fiji MMAs**

| Variable                     | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji<br>MMAs<br>(n=183) |
|------------------------------|--------------------|-------------------|-------------------|------------------|-------------------------|
| MMA                          | 2.48               | 2.16              | 2.31              | 2.30             | 2.35                    |
| non-MMA reference<br>( n=33) | 2.03               | 2.03              | 2.03              | 2.03             | 2.03                    |
| t-value                      | 2.58               | 0.51              | 1.51              | 1.03             | 2.07                    |
| p-value                      | 0.01***            | 0.31              | 0.07*             | 0.15             | 0.02**                  |

Change in fish or seafood diet: 1=Eat less fish; 2=No change;3=Eat more fish  
\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

#### 4.7 Capacity of community

The results of t-test are presented in **Table 31, 32, 33, 34 and 35**. The null hypothesis is that the perception of capacity of community from respondents who use resources in MMA reference is equal to those who don't use resources in non-MMA reference ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that perception of capacity of community from respondents who use resources in MMA reference is stronger than those who don't use resources in MMA reference ( $H_a : \mu_{MMA} > \mu_{Non-MMA}$ ). The statistical results in the Fiji node show that there is sufficient evidence concludes that the null hypothesis is rejected and the alternative hypothesis is favoured except the statements "We are now better able to afford the school fees" and "The chances for going to school is the same for boys and girls".

**Table 31: Capacity of community improved in Navakavu**

| Statements   | Navakavu<br>(n=60) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|--|--------------------|--------------------------------|---------|---------|
| 1. It has been easier for our children to go to school                             | 2.37               | 1.91                           | 2.16    | 0.02**  |
| 2. We are now better able to afford the school fees                                | 2.18               | 2.52                           | -1.58   | 0.94    |
| 3. My family has learned new and practical skills to earn in income                | 2.20               | 1.55                           | 3.23    | 0.00*** |
| 4. It is important for my children to attend school                                | 2.90               | 2.64                           | 1.81    | 0.04*   |
| 5. Establishment of the MMA has shown the importance of education to the community | 2.52               | 1.36                           | 5.22    | 0.00*** |
| 6. The chances for going to school is the same for boys and girls                  | 2.32               | 2.61                           | -1.29   | 0.90    |

Answers for each statements: 0= Don't know; 1=Disagree; 2=Neutral; 3=Agree  
\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 32: Capacity of community improved in Waitabu**

| Statements   | Waitabu<br>(n=25) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|--|-------------------|--------------------------------|---------|---------|
| 1. It has been easier for our children to go to school                             | 2.28              | 1.91                           | 1.48    | 0.07*   |
| 2. We are now better able to afford the school fees                                | 1.92              | 2.52                           | -2.47   | 0.99    |
| 3. My family has learned new and practical skills to earn in income                | 2.32              | 1.55                           | 2.93    | 0.00*** |
| 4. It is important for my children to attend school                                | 3.00              | 2.64                           | 1.83    | 0.04**  |
| 5. Establishment of the MMA has shown the importance of education to the community | 2.84              | 1.36                           | 6.21    | 0.00*** |
| 6. The chances for going to school is the same for boys and girls                  | 3.00              | 2.61                           | 2.98    | 0.00*** |

Answers for each statements: 0= Don't know; 1=Disagree; 2=Neutral; 3=Agree  
\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 33: Capacity of community improved in Kubulau**

| Statements   | Kubulau<br>(n=42) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|--|-------------------|--------------------------------|---------|---------|
| 1. It has been easier for our children to go to school                             | 2.69              | 1.91                           | 4.67    | 0.00*** |
| 2. We are now better able to afford the school fees                                | 2.50              | 2.52                           | -0.09   | 0.54    |
| 3. My family has learned new and practical skills to earn in income                | 2.19              | 1.55                           | 3.15    | 0.00*** |
| 4. It is important for my children to attend school                                | 2.98              | 2.64                           | 2.19    | 0.02**  |
| 5. Establishment of the MMA has shown the importance of education to the community | 2.98              | 1.36                           | 9.53    | 0.00*** |
| 6. The chances for going to school is the same for boys and girls                  | 2.86              | 2.61                           | 2.11    | 0.02**  |

Answers for each statements: 0= Don't know; 1=Disagree; 2=Neutral; 3=Agree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 34: Capacity of community improved in Malolo**

| Statements   | Malolo<br>(n=23) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|--|------------------|--------------------------------|---------|---------|
| 1. It has been easier for our children to go to school                             | 2.78             | 1.91                           | 4.14    | 0.00*** |
| 2. We are now better able to afford the school fees                                | 2.57             | 2.52                           | 0.25    | 0.40    |
| 3. My family has learned new and practical skills to earn in income                | 2.35             | 1.55                           | 3.37    | 0.00*** |
| 4. It is important for my children to attend school                                | 2.96             | 2.64                           | 1.52    | 0.07*   |
| 5. Establishment of the MMA has shown the importance of education to the community | 3.00             | 1.36                           | 7.22    | 0.00*** |
| 6. The chances for going to school is the same for boys and girls                  | 2.78             | 2.61                           | 1.13    | 0.13    |

Answers for each statements: 0= Don't know; 1=Disagree; 2=Neutral; 3=Agree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 35: Capacity of community improved in Fiji-Fiji MMAs**

| <b>Statements</b>  | <b>MMA<br/>(n=150)</b> | <b>non-MMA<br/>reference<br/>(n=33)</b> | <b>t Value</b> | <b>P Value</b> |
|--|------------------------|---|----------------|----------------|
| 1. It has been easier for our children to go to school                             | 2.51                   | 1.91                                    | 3.72           | 0.00***        |
| 2. We are now better able to afford the school fees                                | 2.29                   | 2.52                                    | -1.40          | 0.92           |
| 3. My family has learned new and practical skills to earn in income                | 2.24                   | 1.55                                    | 4.14           | 0.00***        |
| 4. It is important for my children to attend school                                | 2.95                   | 2.64                                    | 3.30           | 0.00***        |
| 5. Establishment of the MMA has shown the importance of education to the community | 2.77                   | 1.36                                    | 9.41           | 0.00***        |
| 6. The chances for going to school is the same for boys and girls                  | 2.65                   | 2.61                                    | 0.31           | 0.38           |

Answers for each statements: 0= Don't know; 1=Disagree; 2=Neutral; 3=Agree  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

Through the implementation of the MMA programs, the communities are able to acquire skills and knowledge such as environmental monitoring, financial literacy, running a committee and its finances, Qoliqoli policing and proper resource governance. Researchers from the various partner organizations who work with communities in the four MMA reference sites usually bring skills to the communities and people have come to appreciate newfound knowledge acquired from such visits by studies carried out by such research groups. Also, there is ample recognition that the MMA has brought many opportunities like workshops and training in the realm of environmental education, awareness and understanding on marine environment and environmental issues more broadly.

## 5. Governance Effects of MMAS

The first objective of this study is to test the socioeconomic and governance effects of marine managed areas. Six socioeconomic effects have been test in chapter four. In this chapter, five governance hypothesis effects are test. They are effective management structures and strategies maintained, effective stakeholder participation and representation ensured, management plan compliance by resource sites enhanced, reduced resource conflicts, effective legal and institutional structures and strategies for management established and maintained

### 5.1 Management structures and strategies

Management structures and strategies include information sharing by Qoliqoli management body, local understanding of MMA rules and regulations and level of participation in development of management plan.

#### Method (Baseline-Pre MMA, non-MMA reference sites, t test)

##### Information sharing by Qoliqoli management body

The result of paired t-test with equal variance is presented in **Table 36, 37, 38, 39 and 40**. The null hypothesis is that the degree of information sharing by Qoliqoli management body of MMA reference sites is equal to that of the non-MMA reference ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that the degree of information sharing by Qoliqoli management body of MMA reference sites is stronger than those of the non-Mma reference sites ( $H_a : \mu_{MMA} > \mu_{Non-MMA}$ ). The statistical result in the four MMA reference sites and the Fiji node show that there is sufficient evidence concludes that the null hypothesis is rejected. Therefore, we can say that the MMA reference sites have management bodies which are transparent and encourage information sharing amongst the community compared to the non-MMA reference sites.

**Table 36: Information shared by Qoliqoli management body- Navakavu**

| Does the Qoliqoli management body share information with you or your family as it relates to the:  | Navakavu<br>(n=60) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|--|--------------------|--------------------------------|---------|---------|
| 1. Size and boundaries of the Qoliqoli?  | 1.12               | 2.00                           | -15.64  | 0.00*** |
| 2. Any rules and regulations within the qoliqoli?  | 1.12               | 2.00                           | -15.64  | 0.00*** |
| 3. Eco-system impacts of having a marine protected area or management strategies ?(eg: the impacts of having mangroves or the reef system) | 1.22               | 2.00                           | -10.80  | 0.00*** |
| 4. Biodiversity found within the Qoliqoli?(eg: give information on the kinds of animals and plants)  | 1.58               | 2.00                           | -1.63   | 0.05**  |
| 5. Use of the natural resources within the Qoliqoli?(eg: use of the animals, plants, corals, beaches, mangroves)                           | 1.63               | 2.00                           | -1.45   | 0.08*** |
| 6. Social and economic benefits you can get from managing Qoliqoli?  | 2.77               | 2.00                           | 1.54    | 0.94    |
| 7. How you can participate in management activities related to the Qoliqoli?   | 1.70               | 2.00                           | -0.86   | 0.19    |

Answers for each statements: 1=Yes; 2=No; 9=Don't know or Not sure

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 37: Information shared by Qoliqoli management body- Waitabu**

| Does the Qoliqoli management body share information with you or your family as it relates to the:  | Waitabu<br>(n=60) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|--|-------------------|--------------------------------|---------|---------|
| 1. Size and boundaries of the Qoliqoli?  | 1.20              | 2.00                           | -11.29  | 0.00*** |
| 2. Any rules and regulations within the qoliqoli?  | 1.12              | 2.00                           | -15.29  | 0.00*** |
| 3. Eco-system impacts of having a marine protected area or management strategies ?(eg: the impacts of having mangroves or the reef system) | 1.24              | 2.00                           | -10.04  | 0.00*** |
| 4. Biodiversity found within the Qoliqoli?(eg: give information on the kinds of animals and plants)  | 1.76              | 2.00                           | -0.63   | 0.26    |
| 5. Use of the natural resources within the Qoliqoli?(eg: use of the animals, plants, corals, beaches, mangroves)                           | 1.16              | 2.00                           | -12.93  | 0.00*** |
| 6. Social and economic benefits you can get from managing Qoliqoli?  | 1.24              | 2.00                           | -10.04  | 0.00*** |
| 7. How you can participate in management activities related to the Qoliqoli?   | 1.16              | 2.00                           | -12.93  | 0.00*** |

Answers for each statements: 1=Yes; 2=No; 9=Don't know or Not sure

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 38: Information shared by Qoliqoli management body- Kubulau**

| Does the Qoliqoli management body share information with you or your family as it relates to the:  | Kubulau<br>(n=60) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|--|-------------------|--------------------------------|---------|---------|
| 1. Size and boundaries of the Qoliqoli?  | 1.19              | 2.00                           | -3.76   | 0.00*** |
| 2. Any rules and regulations within the qoliqoli?  | 1.19              | 2.00                           | -3.76   | 0.00*** |
| 3. Eco-system impacts of having a marine protected area or management strategies ?(eg: the impacts of having mangroves or the reef system) | 1.76              | 2.00                           | -0.58   | 0.28    |
| 4. Biodiversity found within the Qoliqoli?(eg: give information on the kinds of animals and plants)  | 1.57              | 2.00                           | -1.18   | 0.12    |
| 5. Use of the natural resources within the Qoliqoli?(eg: use of the animals, plants, corals, beaches, mangroves)                           | 1.40              | 2.00                           | 1.98    | 0.03**  |
| 6. Social and economic benefits you can get from managing Qoliqoli?  | 1.00              | 2.00                           | n.a.    | n.a.    |
| 7. How you can participate in management activities related to the Qoliqoli?   | 1.21              | 2.00                           | -3.63   | 0.00*** |

Answers for each statements: 1=Yes; 2=No; 9=Don't know or Not sure

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 39: Information shared by Qoliqoli management body- Malolo**

| Does the Qoliqoli management body share information with you or your family as it relates to the:  | Malolo<br>(n=60) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|--|------------------|--------------------------------|---------|---------|
| 1. Size and boundaries of the Qoliqoli?  | 1.17             | 2.00                           | -12.29  | 0.00*** |
| 2. Any rules and regulations within the qoliqoli?  | 1.09             | 2.00                           | -18.28  | 0.00*** |
| 3. Eco-system impacts of having a marine protected area or management strategies ?(eg: the impacts of having mangroves or the reef system) | 1.22             | 2.00                           | -10.70  | 0.00*** |
| 4. Biodiversity found within the Qoliqoli?(eg: give information on the kinds of animals and plants)  | 1.78             | 2.00                           | -0.55   | 0.29    |
| 5. Use of the natural resources within the Qoliqoli?(eg: use of the animals, plants, corals, beaches, mangroves)                           | 1.17             | 2.00                           | -12.29  | 0.00*** |
| 6. Social and economic benefits you can get from managing Qoliqoli?  | 1.22             | 2.00                           | -10.70  | 0.00*** |
| 7. How you can participate in management activities related to the Qoliqoli?   | 1.13             | 2.00                           | -14.57  | 0.00*** |

Answers for each statements: 1=Yes; 2=No; 9=Don't know or Not sure

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

**Table 40: Information shared by Qoliqoli management body- Fiji MMAs**

| Does the Qoliqoli management body share information with you or your family as it relates to the:  | MMA reference sites (n=60) | non-MMA reference sites (n=33) | t Value | P Value |
|--|----------------------------|--------------------------------|---------|---------|
| 1. Size and boundaries of the Qoliqoli?  | 1.16                       | 2.00                           | -6.73   | 0.00*** |
| 2. Any rules and regulations within the qoliqoli?  | 1.13                       | 2.00                           | -7.08   | 0.00*** |
| 3. Eco-system impacts of having a marine protected area or management strategies ?(eg: the impacts of having mangroves or the reef system) | 1.37                       | 2.00                           | -2.72   | 0.00*** |
| 4. Biodiversity found within the Qoliqoli?(eg: give information on the kinds of animals and plants)  | 1.64                       | 2.00                           | -1.08   | 0.14    |
| 5. Use of the natural resources within the Qoliqoli?(eg: use of the animals, plants, corals, beaches, mangroves)                           | 1.42                       | 2.00                           | -2.52   | 0.01*** |
| 6. Social and economic benefits you can get from managing Qoliqoli?  | 1.78                       | 2.00                           | -0.64   | 0.26    |
| 7. How you can participate in management activities related to the Qoliqoli?   | 1.39                       | 2.00                           | -2.42   | 0.01*** |

Answers for each statements: 1=Yes; 2=No; 9=Don't know or Not sure

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively.

In four MMA reference sites, the Qoliqoli management body comprises of representatives from villages within a particular customary fishing rights area, also know as Qoliqoli Committee or Environment Committee. These Committees usually plan and implement activities and strategies related to the management and development of their marine environment while the endorsement and approval is given by the traditional council. Some activities that these Committees look into include conservation, issue of fishing licenses and equal distribution of income to member villages. However, in the two non-MMA reference sites, the Qoliqoli is solely manage by the traditional council and the paramount chief and in most instances, this particular group always deal with licensing and other development activities. This arrangement usually lead to suspicious feeling and obscure perspective from people within a community.

For instance, in Kubulau, the Kubulau Resource Management Committee comprises of representatives from all the villages within the district of Kubulau. In addition to these members, an Advisory Panel made up of reps from NGO, government, and industry representatives also exists to provide policy, scientific and financial support when needed. The Committee work closely with, and under the guidance of traditional and elected community leaders. When management issues arise, the Committee meet, discuss and make decisions in order to adapt management policy and practice to solve problems. The structure of the Kubulau Resource Management Committee together with the names of the Committee is shown below (WCS, 2005). The committee usually meet when the need arises, however, should meet regularly (four times a year) and a quorum of 2/3 members present is necessary for decisions. A yearly budget is always developed and published at the beginning of each year (January) and an annual report produced at year's end (December). In this process, the committee ensures that all finances are transparent, meaning that accurate accounting reports be made to the community at regular intervals with detailed description on how monies are spent.

### Awareness of rules and regulations

The result of paired t-test with equal variance for awareness of rules and regulations variable is presented in **Table 41**. The null hypothesis is that the awareness of regulation and rules of MMA sites is equal to those who do not use resources in MMA reference ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that the awareness of regulation and rules of MMA sites is stronger than those who do not use resources in MMA reference ( $H_a : \mu_{MMA} > \mu_{Non-MMA}$ ). The statistical result in four MMA reference and the Fiji node show that there is sufficient evidence concludes that the null hypothesis is rejected. Therefore, we can say that marine sites are more aware the regulation and more active in the management of MMA reference sites.

**Table 41: Effective management structures and strategies maintained-Rules and regulations**

| Variable          | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji MMAs<br>(n=150) |
|-------------------|--------------------|-------------------|-------------------|------------------|----------------------|
| MMA reference     | 0.88               | 0.88              | 0.98              | 0.91             | 0.91                 |
| non-MMA reference | 0.00               | 0.00              | 0.00              | 0.00             | 0.00                 |
| t-value           | 15.63              | 15.29             | 36.28             | 18.28            | 18.55                |
| p-value           | 0.00***            | 0.00***           | 0.00***           | 0.00***          | 0.00***              |

Answers for the statement: 1=Yes; 0=No

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

## 5.2 Stakeholders participation and representation

Level of capacity building/training provided to stakeholders in participation is used to measure the effective stakeholder participation. The results of t-test with equal variance<sup>4</sup> in , and the Fiji nodes are presented in **Table 42, 43, 44, 45 and 46** respectively. The null hypothesis is that the level of participation to capacity building/training programs in the MMA reference sites is equal to that of the non-MMA reference sites ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that the level of participation to capacity building/training programs in the MMA reference sites is higher than that in of the non-MMA reference sites ( $H_a : \mu_{MMA} < \mu_{Non-MMA}$ ). The statistical results in the Fiji node show that there is sufficient evidence concludes that the null hypothesis is rejected and favoured the alternative hypothesis.

**Table 42: Level of capacity building/training provided to stakeholders in participation-Navakavu**

| Statements  | Navakavu<br>(n=60) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|--------------------|--------------------------------|---------|---------|
| 1. Have you or anyone in your family ever received training in Environmental Education related to the MMA?  | 1.38               | 2.00                           | -3.24   | 0.00*** |
| 2. Have you or anyone in your family ever received any tour guide training as a result of the MMA?  | 1.55               | 2.00                           | -5.14   | 0.00*** |
| 3. Have you or anyone in your family ever received any arts and craft training that uses marine resources since the establishment of the MMA?                                   | 1.65               | 2.00                           | -4.17   | 0.00*** |
| 4. Have you or anyone in your family ever received a scholarship to attend formal schooling (primary or high school) as a result of assistance from the marine management body? | 1.77               | 2.00                           | -3.13   | 0.00*** |
| 5. Have you or anyone in your family ever gotten a job related in some way to the MMA?  | 1.58               | 2.00                           | -4.80   | 0.00*** |

Answers for each statements:1=Yes;2=No;9=Don't know or Not sure  
\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

<sup>4</sup> The results of paired t-test with unequal variance are available upon request.

**Table 43: Level of capacity building/training provided to stakeholders in participation-Waitabu**

| <b>Statements</b>   | <b>Waitabu<br/>(n=25)</b> | <b>non-MMA<br/>reference<br/>(n=33)</b> | <b>t Value</b> | <b>P Value</b> |
|---|---------------------------|---|----------------|----------------|
| 1. Have you or anyone in your family ever received training in Environmental Education related to the MMA?  | 1.36                      | 2.00                                    | -7.53          | 0.00***        |
| 2. Have you or anyone in your family ever received any tour guide training as a result of the MMA?  | 1.28                      | 2.00                                    | -9.05          | 0.00***        |
| 3. Have you or anyone in your family ever received any arts and craft training that uses marine resources since the establishment of the MMA?                                   | 1.84                      | 2.00                                    | -2.46          | 0.00***        |
| 4. Have you or anyone in your family ever received a scholarship to attend formal schooling (primary or high school) as a result of assistance from the marine management body? | 2.80                      | 2.00                                    | 1.97           | 0.97           |
| 5. Have you or anyone in your family ever gotten a job related in some way to the MMA?  | 1.56                      | 2.00                                    | -5.00          | 0.00***        |

Answers for each statements: 1=Yes; 2=No; 9=Don't know or Not sure  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 44: Level of capacity building/training provided to stakeholders in participation-Kubulau**

| <b>Statements</b>   | <b>Kubulau<br/>(n=42)</b> | <b>non-MMA<br/>reference<br/>(n=33)</b> | <b>t Value</b> | <b>P Value</b> |
|---|---------------------------|---|----------------|----------------|
| 1. Have you or anyone in your family ever received training in Environmental Education related to the MMA?  | 1.24                      | 2.00                                    | -10.14         | 0.00***        |
| 2. Have you or anyone in your family ever received any tour guide training as a result of the MMA?  | 1.71                      | 2.00                                    | -1.31          | 0.10*          |
| 3. Have you or anyone in your family ever received any arts and craft training that uses marine resources since the establishment of the MMA?                                   | 2.00                      | 2.00                                    | 0.00           | 0.50           |
| 4. Have you or anyone in your family ever received a scholarship to attend formal schooling (primary or high school) as a result of assistance from the marine management body? | 1.98                      | 2.00                                    | -0.89          | 0.19           |
| 5. Have you or anyone in your family ever gotten a job related in some way to the MMA?  | 1.81                      | 2.00                                    | -2.75          | 0.00***        |

Answers for each statements: 1=Yes; 2=No; 9=Don't know or Not sure  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 45: Level of capacity building/training provided to stakeholders in participation-Malolo**

| <b>Statements</b>   | <b>Malolo<br/>(n=23)</b> | <b>non-MMA<br/>reference<br/>(n=33)</b> | <b>t Value</b> | <b>P Value</b> |
|---|--------------------------|---|----------------|----------------|
| 1. Have you or anyone in your family ever received training in Environmental Education related to the MMA?  | 1.35                     | 2.00                                    | -7.72          | 0.00***        |
| 2. Have you or anyone in your family ever received any tour guide training as a result of the MMA?  | 1.26                     | 2.00                                    | -9.50          | 0.00***        |
| 3. Have you or anyone in your family ever received any arts and craft training that uses marine resources since the establishment of the MMA?                                   | 1.87                     | 2.00                                    | -2.18          | 0.02**         |
| 4. Have you or anyone in your family ever received a scholarship to attend formal schooling (primary or high school) as a result of assistance from the marine management body? | 2.91                     | 2.00                                    | 2.18           | 0.98           |
| 5. Have you or anyone in your family ever gotten a job related in some way to the MMA?  | 1.57                     | 2.00                                    | -4.95          | 0.00***        |

Answers for each statements: 1=Yes; 2=No; 9=Don't know or Not sure  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

**Table 46: Level of capacity building/training provided to stakeholders in participation-Fiji MMAs**

| <b>Statements</b>   | <b>MMA<br/>(n=150)</b> | <b>non-MMA<br/>reference<br/>(n=33)</b> | <b>t Value</b> | <b>P Value</b> |
|---|------------------------|---|----------------|----------------|
| 1. Have you or anyone in your family ever received training in Environmental Education related to the MMA?  | 1.33                   | 2.00                                    | -4.94          | 0.00***        |
| 2. Have you or anyone in your family ever received any tour guide training as a result of the MMA?  | 1.51                   | 2.00                                    | -3.57          | 0.00***        |
| 3. Have you or anyone in your family ever received any arts and craft training that uses marine resources since the establishment of the MMA?                                   | 1.81                   | 2.00                                    | -1.47          | 0.07*          |
| 4. Have you or anyone in your family ever received a scholarship to attend formal schooling (primary or high school) as a result of assistance from the marine management body? | 2.17                   | 2.00                                    | 0.69           | 0.75           |
| 5. Have you or anyone in your family ever gotten a job related in some way to the MMA?  | 1.64                   | 2.00                                    | -4.28          | 0.00***        |

Answers for each statements: 1=Yes; 2=No; 9=Don't know or Not sure  
 \*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

### 5.3 Management plan compliance

Degree of information dissemination to encourage stakeholder compliance is used to evaluate the management plan compliance by resource sites. The results of t-test with equal variance in the Fiji nodes are presented in **Table 47**. The null hypothesis is that the degree of information dissemination to encourage stakeholder compliance for those who use resources in MMA is equal to those who do not use resources in MMA (  $H_0 : \mu_{MMA} = \mu_{Non-MMA}$  ), while the alternative hypothesis is that the Degree of information dissemination to encourage stakeholder compliance for those who use resources in MMA is higher than those who don't use resources in MMA (  $H_a : \mu_{MMA} < \mu_{Non-MMA}$  ). The statistical results in the Fiji node show that there is sufficient evidence concludes that the null hypothesis is rejected.

**Table 47: Degree of information dissemination to encourage stakeholder compliance in Fiji**

|   | MMA<br>reference<br>(n=150) | non-MMA<br>reference<br>(n=33) | t Value | P Value |
|---|-----------------------------|--------------------------------|---------|---------|
| 1. Is the information easy to understand?   | 1.26                        |                                |         |         |
| 2. Has this information provided by these MMA's changed the way you or your family access the resources within the MMA? | 1.31                        |                                |         |         |
| 3. Has this information provided by these MMA's changed the way you or your family use the resources within the MMA?    | 1.25                        |                                |         |         |
| 4. Would you share the information with others to protect the MMA resources?  | 1.28                        |                                |         |         |

Answers for each statements:1=Yes;2=No;9=Don't know or Not sure  
\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

### 5.4 Resource conflicts

How often is there a conflict related to fishing?

The null hypothesis is that the resource conflicts for those who use resources in MMA is equal to those who don't use resources in MMA ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that the resource conflicts for those who use resources in MMA reference is higher than those who do not use resources in MMA reference ( $H_a : \mu_{MMA} < \mu_{Non-MMA}$ ). The results of t-test with equal variance in the Fiji nodes are presented in **Table 48**. The statistical results in the Fiji node show that there is sufficient evidence concludes that the null hypothesis is rejected. Although there are very few conflicts among MMA reference sites, there is more conflict in MMA reference sites than non-MMA reference sites.

**Table 48: Reduced resource conflicts**

| Variable          | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji MMAs<br>(n=150) |
|-------------------|--------------------|-------------------|-------------------|------------------|----------------------|
| MMA reference     | 2.77               | 2.80              | 3.07              | 2.83             | 2.87                 |
| non-MMA reference | 3.61               | 3.61              | 3.61              | 3.61             | 3.61                 |
| t-value           | -5.80              | -5.71             | -3.24             | -5.81            | -5.81                |
| p-value           | 0.00***            | 0.00***           | 0.00***           | 0.00***          | 0.00***              |

Answers for each statements: 1=Regularly; 2=Occasionally; 3=Rarely; 4=Never

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

### 5.5 Legal and institutional structures and strategies for management

How often do you encounter people using illegal fishing practices (for example, dynamite, chlorine, acid, fishing in marine reserves, etc.) or find evidence that people have recently used illegal practices in an area?

The null hypothesis is that the resource conflicts for those who use resources in MMA is equal to those who do not use resources in MMA ( $H_0 : \mu_{MMA} = \mu_{Non-MMA}$ ), while the alternative hypothesis is that the resource conflicts for those who use resources in MMA reference is higher than those who don't use resources in MMA reference ( $H_a : \mu_{MMA} < \mu_{Non-MMA}$ ). The results of t-test with equal variance in the Fiji nodes are presented in **Table 49**. The statistical results in the Fiji node show that there is sufficient evidence concludes that the null hypothesis is rejected. Although there is very few illegal fishing among MMA reference sites, there is more illegal fishing in MMA reference sites than non-MMA reference sites.

**Table 49: Illegal fishing**

| Variable                        | Navakavu<br>(n=60) | Waitabu<br>(n=25) | Kubulau<br>(n=42) | Malolo<br>(n=23) | Fiji MMAs<br>(n=150) |
|---------------------------------|--------------------|-------------------|-------------------|------------------|----------------------|
| MMA reference Beneficiaries     | 3.02               | 2.52              | 3.10              | 2.57             | 2.89                 |
| non-MMA reference Beneficiaries | 3.52               | 3.52              | 3.52              | 3.52             | 3.52                 |
| t-value                         | -2.72              | -4.78             | -2.28             | -4.55            | -3.67                |
| p-value                         | 0.00***            | 0.00***           | 0.01***           | 0.00***          | 0.00***              |

Answers for each statements: 1=Regularly; 2=Occasionally; 3=Rarely; 4=Never

\*, \*\*, \*\*\*, represents significant at 10%, 5%, and 1%, respectively

#### 4.8 Summary-Key messages

1. Four variables, average monthly household income, average monthly marine related income, average monthly fishing income, and perception of economic situation, are used to measure coastal population's income. Statistical results of the Fiji nodes analysis show that respondents who use marine resources from MMA reference have higher marine related income than respondents who use marine resources from non-MMA reference. Perceptions of economic situation are also stronger for MMA reference sites than their non- MMA reference sites counterpart.
2. Statistical results show that MMA reference sites are likely to have more diversified livelihoods than non-MMA reference sites. In other words, the percentage of tourist guide, and boat drivers or divers among MMA reference sites is higher than their counterparts among non-MMA reference sites. However, there is no significant difference between the percentage of fishermen among MMA reference sites and non-MMA reference sites
3. There is enough evidence to conclude that MMA reference sites take advantage of marine resources in a more sustainable way. Also, statistical results do show that fishing has become easier compared to 10 years ago for MMA reference sites.
4. Respondents who use marine resources from MMA reference have stronger perceptions of non-monetary benefits of MMAs than respondents who use marine resources from non-MMA reference. There are no significant difference between MMA reference sites and non-MMA reference sites when it comes to statements such as "In the long-run, fishing would be better if we cleared the coral", "Coral reefs are only important if you fish or drive", "Sea grass beds have no value to people"
5. Respondents who use marine resources from MMA reference have stronger environmental awareness and knowledge and local values and beliefs than their counterparts who do not use marine resources from MMA reference.
6. Statistical results of four MMA reference and the Fiji nodes show that MMA reference sites are more positive on their health situation than non-MMA reference sites. Statistical results support MMA reference sites eat more fish than non-MMA reference sites.
7. Statistical analysis results show that education in MMA sites improved compared to non-MMA reference sites except the statements "We are now better able to afford the school fees" and "The chances for going to school is the same for boys and girls".
8. MMA reference sites perceive management in MMA reference are more effective than non-MMA reference compared to non-MMA reference sites. Fiji MMAs analysis shows that MMA reference sites are more likely to know the rules and regulations than non-MMA reference sites. Statistical results also show that MMA

reference sites are more likely to be involved in MMA reference meetings and management plan activities.

9. MMA reference sites are more likely get information and training from MMA reference bodies than non-MMA reference sites.
10. Information dissemination is more efficient among MMA reference sites than non-MMA reference sites
11. Statistical results show that conflicts have not been reduced among MMA sites compared to non-MMA reference sites. Although there is very few conflicts among MMA reference sites, there is more conflicts in MMA reference sites than non-MMA reference sites.
12. Statistical results show that illegal fishing have not been reduced among MMA reference sites compared to non-MMA reference sites. Although there is very few illegal fishing among MMA reference sites, there is more illegal fishing in MMA reference sites than non-MMA reference sites.

## **Conclusions and Policy Implications**

### **For effective and sustainable MMA programs at the community level**

1. The marine managed area programs in Fiji should not focus only on the restoration of the marine environment, but also on rehabilitation of the terrestrial, village area and most importantly, the enhancement of local livelihoods. Therefore, to compliment the restoration of biodiversity, managers and practitioners should holistically approach resource conservation and address community livelihood needs.
2. The marine managed area program needs sustained support from the government and non-government sectors in a manner that does not marginalize local communities. In this arrangement, the people should take the leading role in all aspects of the program while partner organizations facilitate the processes. The local people should plan, design, decide and implement management and sustainable actions rather than partner organizations.
3. The adoption by partner organizations of the community adaptive management approach as in the four marine managed areas, should be the basis of resource management initiatives in Fiji. In most cases, implementing agencies tend to focus more on their own agenda and neglect the needs of the communities. This scenario leads to distrust and suspicion among partners and to the failure of projects.
4. Socioeconomic and governance issues should be addressed in the planning, design, and implementation of MMA programs. These factors provide the links between resource management and people's wellbeing and if not addressed adequately, it may shake the very foundation of achieving effective resource management in communities.
5. Implementing agencies should be cautious and mindful of the socio-political settings of a community during all phases of the MMA program and especially, during the initial discussion and planning phases. This is important because such initiatives should be rightly channeled into the existing social framework rather than creating or boosting an existing self-styled framework which is not always recognized legally and traditionally. Generally, mainstreaming MMA activities into such institution lead to unsustainable projects and project failure because often those who represent these institutions always use these initiatives for their own personal gain and not for the community as a whole. Other stakeholders within a community such as tourism operators, should be involved so that their activities can be well managed to minimize environmental damage and maximize local benefits. Full collaboration is necessary among government, private sector, and local communities. Local resort owners and dive operators can assist in protecting the reefs they most frequent with paying guests if approached by communities, such as in the Navini Island Resort case.

### **For effective and sustainable MMA programs at the national level**

1. Strengthening the role of communities in MMA programs, rather than weakening it, should be the preferred policy in the management of the inshore areas that are beyond the practical jurisdiction of the Fiji Fisheries Department. The MMA study sites have demonstrated that subsistence fishing still dominates and the local

communities that are dependent on the resources for their livelihoods should be in a position to manage those resources.

2. Also, where commercial exploitation of local resources is a possibility, for example in the cases of beach-de-mer, strengthened CBM puts the local communities in a more advantageous position to negotiate with traders rather than the Fisheries Department doing the work.
3. The resilience of management and conservation plans is enhanced by the clear access rights that should be a feature of strengthened community-based MMAs.
4. The Fiji Government should act as the provider of the framework within which community decision-making can operate if effective MMA program is to be achieved in Fiji. The framework has to be more effectively concentrated on providing appropriate information to provide a fair foundation for community decision making rather than trying to make those decisions at the government level.

#### **For research work**

1. This study outlines the strong need for gathering reliable data on the social impacts of MMAs, and illustrates some of the approaches being taken. These are many and operate at a variety of scales and for a variety of purposes, using both top down, bottom up data gathering approaches or a combination of both.
2. The study identifies that the question of social benefits of MMAs for local people is only a part of the issue at hand. There are also social benefits and costs at national levels and even at global levels. Tracking these costs and benefits at multiple scales very hard but possible with interesting findings which may guide policies and legislative framework for sustainable marine environment.
3. Identification of possible sustainable alternative livelihood options information should be conducted to allow communities with scarce marine resources in the *i qoliqoli* to generate income and to ease the pressure on the marine environment.

#### **Other recommendations**

1. This case study has noted that women and youths play a vital role in the management of the marine environment and associated resources because they account for most fishing activities and they also have existing groups such as the *i soqosoqo vakamarama* (women's group). Implementing agencies therefore, should facilitate the mainstreaming of such groups into MMA programs.

As a final point, this study has established that there is a critical link in the MMA program between human activities, declining marine resources, roles of the people in the restoration process and the impacts of these programs on the socioeconomic and governance standards of the communities. It is hoped that government, implementing agencies, communities and concerned institutions will adopt, among other pertinent plans some of the proposed recommendations. These recommendations and future refinement and adoption of MMA programs will ensure the sustainable development and management of the marine environment and resources in Fiji for the present and future generations.

## Reference

1. Aalbersberg, B., Tawake, A. and Paras, T. 2005. Village by village: recovering Fiji's coastal fisheries. World Resource Institute Report, Washington.
2. Fong, P.S. 2006. Community-based coastal resource management in Fiji Islands; Case study of Korlevu-i-wai district, Nadroga. Master of Arts thesis. The University of the South Pacific
3. O'Garra, T. 2007. Estimating the total economic value of the Navakavu LMMA: Final Report. Cora Reef Initiatives for the Pacific (CRISP): Component 1A2. Noumea, New Caledonia.
4. Ravuvu, A. 1983. *Vaka i Taukei*: The Fijian way of life. Institute of Pacific Studies, University of South Pacific, Suva, Fiji.
5. Smith, K. and Weinberg, M. (2006) Measuring Success of Conservation programs. *Amber Waves*, 4: 14-21. USDA Economic Research Service: USA.
6. van Beukering, P., Scherl, L.M., Sultanian, E., Leisher, C. and Fong, P.S. (2007a) Case study 1: Navakavu Locally Managed Marine Area (Fiji). The role of marine protected areas in contributing to poverty reduction. The Nature Conservancy.
7. Veitayaki, J. 1998. Traditional and community-based marine resources management system in Fiji: An evolving integrated process. *Coastal Management* 26: 47-60.
8. Veitayaki, J. 2001. Empowerment and the challenges of involving local communities. The University of the South Pacific, Unpublished.
9. Veitayaki, J., Aalbersberg, W., and Tawake, A. 2003. Empowering local communities: Case study of Votua, Ba, Fiji. The University of the South Pacific, Suva.
10. Ward, J., Kelly, M., 2009. Measuring management success: experience with United States fisheries. *Marine Policy* 33, 164–171

~~11.~~ WPC (World Park Congress) 2003. Recommendations (R 1-32)  
<http://www.iucn.org/themes/wcpa/wpc2003/english/outputs/recommendations.htm>  
~~12.~~ 11. \_\_\_\_\_

**APPENDIX**

**Household Survey Questionnaire**

|                                |  |                                    |  |
|--------------------------------|--|------------------------------------|--|
| <i>I. Name of Interviewer:</i> |  | <i>III. Location of interview:</i> |  |
| <i>II. Date of interview:</i>  |  | <i>IV. Yaca ni Yavu ni Vale</i>    |  |

**SECTION 1: POPULATION, EDUCATION AND HOUSING**

**0. Interviewer: Record the main material of the walls and roof of the house without asking**

| <b>a.</b> | <b>House type</b>  | <b>b</b> | <b>Roof</b>        | <b>c</b> | <b>Toilet type</b> |
|-----------|--------------------|----------|--------------------|----------|--------------------|
| 1         | Bamboo             | 1        | Thatch/ leaves     | 1        | No toilet          |
| 2         | Corrugated iron    | 2        | Tile               | 2        | Pit toilet         |
| 3         | Wood               | 3        | Corrugated         | 3        | Water seal         |
| 4         | Brick/ cement      | 4        | Concrete and tiles | 4        | Flush              |
| 5         | Other, specify.... | 5        | Other, specify.... | 5        | Other, specify...  |

Complete list of all the people who normally live and eat their meals together in this household beginning with your immediate family and then the extended family.

| <b>1.</b><br>NAME | <b>2.</b><br>SEX             | <b>4.</b><br>AGE | <b>5.</b><br>SCHOOL  | <b>6.</b><br>LEVEL   |
|-------------------|------------------------------|------------------|--|--|
|                   | <i>Male. 1<br/>Female. 2</i> | Age              | Is [NAME] attending school now?<br><br><i>Yes. 1<br/>No. 2<br/>&lt;if "2",<br/>continue to<br/>next member&gt;</i> | Highest level of education by?<br><br>1. No Edu<br>2. Primary<br>3. Secondary<br>4. Tertiary<br>5. Other (specify) |
| NAME              | SEX                          | YEARS            | SCHOOL   | LEVEL  |
|                   |                              |                  |  |  |
|                   |                              |                  |  |  |
|                   |                              |                  |  |  |
|                   |                              |                  |  |  |
|                   |                              |                  |  |  |
|                   |                              |                  |  |  |
|                   |                              |                  |  |  |
|                   |                              |                  |  |  |
|                   |                              |                  |  |  |

**7. Do all the children between the age of 6 and 16 in your household attend school? And if not, why not?**

- 1 Yes, they all go to school                      4 No, the school is too remote  
 2 No, we cannot afford the school fees                      5 No one in age group/no children  
 3 No, we need the children to help out at home / at work

| <b>Statements on Education:</b><br>Now I would like to read a list of statements on education. Can you indicate to what extent you agree or disagree with each of these statements? Compared to before MMA establishment ...<br><b>(Tick one option for each statement)</b> |   | 0 Don't know | 1 Disagree | 2 Neutral | 3 Agree |
|---|---|--------------|------------|-----------|---------|
| <b>8.</b>   | It has become easier for our children to go to school                           |              |            |           |         |
| <b>9.</b>   | We are now better able to afford the school fees                                |              |            |           |         |
| <b>10.</b>  | My family has learned new and practical skills to earn an income                |              |            |           |         |
| <b>11.</b>  | It is important for my children to attend school                                |              |            |           |         |
| <b>12.</b>  | Establishment of the MMA has shown the importance of education to the community |              |            |           |         |
| <b>13.</b>  | The chances for going to school is the same for boys and girls                  |              |            |           |         |

**SECTION 2: LIVELIHOOD AND FOOD SECURITY (INCOME AND RESOURCE USE PATTERN)**

**14. Please indicate which are the sources of income that your family rely on and the amount earned per month? Also coMMAre how these have changed after the establishment of the MMA.**

|  | <i>Tick if source</i> | c. Cash income Generated<br>[in FJD / month] | d. Compared to before MMA<br>[0 = less, 1 = more, 2 = no change] |
|--|-----------------------|--|--|
| 1. Fin fish fishing  |                       |  |  |
| 2. See Cucumber collecting   |                       |  |  |
| 3. Other Sea food collection (e.g. shells / mud crab / sea urchin) |                       |  |  |
| 4. Farming Staple and Cash crops                                   |                       |  |  |
| 5. Farming Vegetables  |                       |  |  |
| 6. Canteen business (groceries, kava, cigarette etc.)              |                       |  |  |
| 6. Tourism (hotel and land lease                                   |                       |  |  |

|  |  |  |  |
|--|--|--|--|
| etc.)                                    |  |  |  |
| 7. Coral / ornamental fish collection    |  |  |  |
| 8. Handicraft / basket weaving           |  |  |  |
| 9. Boat operation / sea transportation   |  |  |  |
| 10. Middle-men agent for marine products |  |  |  |
| 11. Seaweed cultivation                  |  |  |  |
| 12. Wood/mangrove collection             |  |  |  |
| 13. Remittances                          |  |  |  |
| 14. Social welfare                       |  |  |  |
| 15. Other income sources, specify ...    |  |  |  |

**15. Resource use pattern and dependency on Marine Resources**

| Habitat Category           | Resources * | Family and Shared Use |                       | Commercial Use      |                       |                    |                     |
|----------------------------|-------------|-----------------------|-----------------------|---------------------|-----------------------|--------------------|---------------------|
|                            |             | Harvest Frequency**   | Quantity and Unit *** | Harvest Frequency** | Quantity and Unit** * | Market Demand **** | Sale Value per Unit |
| Mangrove                   |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
| Inner reefs                |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
| Barrier and fringing reefs |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
| Outer reef                 |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |
|                            |             |                       |                       |                     |                       |                    |                     |

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|

\*list important resources by name, first land then marine      \*\*weekly, monthly, annually    \*\*\*e.g., 1 bundle, 2 bags, 3 items  
 \*\*\*\*1=can never sell,    2=can rarely sell,    3=can sometimes sell,    4=can often sell,    5=can always sell

**16. What is the 1<sup>st</sup> and 2<sup>nd</sup> most important fishing technique you use now? And what were they before implementation of the MMA?**

|  | Now                |                    | 5 years ago        |                    |
|--|--------------------|--------------------|--------------------|--------------------|
|  | a. 1 <sup>st</sup> | b. 2 <sup>nd</sup> | c. 1 <sup>st</sup> | d. 2 <sup>nd</sup> |
| 1. Hook & line (less than 100ft / 30 meters)   |                    |                    |                    |                    |
| 2. Gill net                                    |                    |                    |                    |                    |
| 3. Trolling                                    |                    |                    |                    |                    |
| 4. Cast net                                    |                    |                    |                    |                    |
| 5. Gleaning (seashell, crabs etc)              |                    |                    |                    |                    |
| 6. Trapping (fish, octopus, crabs, etc.)       |                    |                    |                    |                    |
| 7. Snorkel spear fishing                       |                    |                    |                    |                    |
| 8. Scuba spear fishing                         |                    |                    |                    |                    |
| 9. Hand spear                                  |                    |                    |                    |                    |
| 10. Use of poison                              |                    |                    |                    |                    |
| 11. Breaking of corals (e.g <i>vutu guru</i> ) |                    |                    |                    |                    |
| 12. Other techniques, specify ...              |                    |                    |                    |                    |

**17. How often do you fish or collect seafood? [Circle one answer]**

- |                    |                   |
|--------------------|-------------------|
| 1 Every Day        | 5 Every two weeks |
| 2 Every two days   | 6 Once a month    |
| 3 Every three days | 7 Never           |
| 4 Once a week      |                   |

**18. Has fishing or seafood collection become easier or more difficult since the establishment of the MMA, or has there been no change?**

- |                                |                                     |
|--------------------------------|-------------------------------------|
| 1 Fishing has become very easy | 4 Fishing has become difficult      |
| 2 Fishing has become easier    | 5 Fishing has become more difficult |
| 3 No change                    |                                     |

**19. What do you think is the main reason for this change? Please indicate the 1<sup>st</sup> and 2<sup>nd</sup> most important reasons.**

|  | 1 <sup>st</sup> most important reason | 1 <sup>st</sup> most important reason |
|--|---------------------------------------|---------------------------------------|
| 1. Because I am more/less efficient                          |                                       |                                       |
| 2. Because fish availability has changed (quantity and size) |                                       |                                       |
| 3. Because fish species have changed                         |                                       |                                       |
| 4. Because competition has changed                           |                                       |                                       |
| 5. Because fishing areas have changed significantly          |                                       |                                       |
| 6. Because I use better/worse boats or techniques            |                                       |                                       |
| 8. Other, specify ...  |                                       |                                       |
| 9. Don't know  |                                       |                                       |

**In your opinion, how has the quality of the following components of the marine environment in your area changed after implementation of MMA?**

|            |                                   | 1. Increased | 2. Remained stable | 3. Decreased | 4. Don't know |
|------------|-----------------------------------|--------------|--------------------|--------------|---------------|
| <b>20.</b> | Live coral abundance              |              |                    |              |               |
| <b>21.</b> | Fish and invert abundance         |              |                    |              |               |
| <b>22.</b> | Fish and invert size              |              |                    |              |               |
| <b>23.</b> | Fish and invert species diversity |              |                    |              |               |
| <b>24.</b> | Water quality                     |              |                    |              |               |

**25. How often does your family eat fish/seafood? We eat fish/seafood... [Circle one]**

- 1 Every Day
- 2 Every two days
- 3 Every three days
- 4 Once a week
- 5 Every two weeks
- 6 Once a month
- 7 Never

**26. Has your family's fish/seafood diet change after the MMA establishment?**

- 1 Eat less fish
- 2 No change (skip following question)
- 3 Eat more fish
- 4 Don't know

27. What is the 1<sup>st</sup> and 2<sup>nd</sup> most important reason that your family's diet of fish/seafood had changed?

|   | a. 1 <sup>st</sup> most important | b. 2 <sup>nd</sup> most important |
|---|-----------------------------------|-----------------------------------|
| 1. We fish less/more  |                                   |                                   |
| 2. We fish the same amount of time but catch less/more              |                                   |                                   |
| 3. There is less/more sharing of fish between family, friends, etc. |                                   |                                   |
| 4. Change to other food (e.g. spam)                                 |                                   |                                   |
| 5. We travel near/far to catch fish                                 |                                   |                                   |
| 6. Availability of certain local species changed                    |                                   |                                   |
| 7. Preference for fish has changed (don't like fish as much)        |                                   |                                   |
| 8. The availability of food/fish has improved                       |                                   |                                   |
| 9. Other, specify ...   |                                   |                                   |
| 10. Don't know  |                                   |                                   |

### SECTION 3: HEALTH

|    |  |                       |                  |                                    |                 |                      |
|----|--|-----------------------|------------------|------------------------------------|-----------------|----------------------|
| 28 | <b>How do you rate your health situation today compared to before MMA establishment?</b>                                       | <b>1. Much Better</b> | <b>2. Better</b> | <b>3. Neither Better nor Worst</b> | <b>4. Worse</b> | <b>5. Much Worse</b> |
|    | <b>Please tick the correct response</b>  |                       |                  |                                    |                 |                      |
|    | <b>Interviewer: If answer is Much Better or Better then go on to Q 29; If answer is Worse or Much Worse then go on to Q 30</b> |                       |                  |                                    |                 |                      |

|           |  |                    |                   |                      |
|-----------|--|--------------------|-------------------|----------------------|
| <b>29</b> | <b>What has contributed to making your health condition better or much better?</b>                             | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/Ns</b> |
|           | a) better health care services are now available in the community  |                    |                   |                      |
|           | b) I can afford to get better healthcare services either in the community or another location                  |                    |                   |                      |
|           | c) Drinking water supply is cleaner and better   |                    |                   |                      |
|           | d) Sanitation (toilets, etc.) is cleaner and better  |                    |                   |                      |
|           | e) The drainage system and village surrounding is cleaner and better   |                    |                   |                      |
|           | f) have access to better information on healthy lifestyle practices  |                    |                   |                      |
|           | g) Other (please specify) _____  |                    |                   |                      |
| <b>30</b> | <b>What has contributed to making your health condition worse or much worse?</b>                               | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/Ns</b> |
|           | a) the healthcare service in the community has decreased   |                    |                   |                      |
|           | b) I am unable to access the healthcare service in the community or other location due to cost                 |                    |                   |                      |
|           | c) Drinking water supply is dirty and worse  |                    |                   |                      |
|           | d) Sanitation (toilets, etc.) is dirty and worse   |                    |                   |                      |
|           | e) The drainage system and village surrounding is dirty and worse  |                    |                   |                      |
|           | f) Other (please specify) _____  |                    |                   |                      |
| <b>31</b> | <b>Was any of the above in (29 or Q30) directly related to the establishment of the marine protected area?</b> | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/Ns</b> |

#### **SECTION 4: MANAGEMENT PLAN COMPLIANCE**

**32. How often is there a conflict related to fishing? [Circle only one]**

- 1 Regularly                      3 Rarely  
2 Occasionally                      4 Never

**33. How often do you encounter people using illegal fishing practices (for example, dynamite, chlorine, acid, fishing in marine reserves, etc.) or find evidence that people have recently used illegal practices in an area? ...**

**[Circle only one]**

- 1 Regularly                      3 Rarely  
2 Occasionally                      4 Never [skip following question]

**34. If you do witness these practices, who are the violators?**

- 1 People from the community
- 2 People from outside the community, specify from which village/community:
- 3 Don't know

**35. Are you or any of your family members involved in a committee on the management of the MMA?**

- 0 No
- 1 Yes, namely..... [Name Committee]

| <b>Statements on the Marine Protected Area</b>  |  |              |            |           |         |
|---|--|--------------|------------|-----------|---------|
| Could you indicate to what extent you agree with the following statements on the Marine Protected Area or Reserve and its effect on the community?<br><b>[Tick one option for each statement]</b> |  | 0 Don't know | 1 Disagree | 2 Neutral | 3 Agree |
| <b>36</b>   | Destroying the reserve now will cause problems in the future                 |              |            |           |         |
| <b>37</b>   | The protected area has helped to increase my family's income                 |              |            |           |         |
| <b>38</b>   | Since the start of the reserve we are less dependent on fishing only         |              |            |           |         |
| <b>39</b>   | The reserve helped to improve the position of women in our community         |              |            |           |         |
| <b>40</b>   | Fish catch has increased because of the protected area                       |              |            |           |         |
| <b>41</b>   | My family can influence decisions about the protected area                   |              |            |           |         |
| <b>42</b>   | Decisions by the management of the reserve are well communicated             |              |            |           |         |
| <b>43</b>   | Access to natural resources has worsened since creation of the reserve       |              |            |           |         |
| <b>44</b>   | Villagers are responsible to protect the reserve                             |              |            |           |         |
| <b>45</b>   | The reserve has helped us to maintain our culture & traditions               |              |            |           |         |
| <b>46</b>   | Due to the reserve we feel safer in difficult times (disasters, bad weather) |              |            |           |         |

|    |  |  |  |  |  |
|----|--|--|--|--|--|
| 47 | The reserve has helped to improve infrastructure and services for us     |  |  |  |  |
| 48 | The reserve has led to better access to markets to sell/buy our products |  |  |  |  |
| 49 | It is good for the future of my family that there is a protected area    |  |  |  |  |

|           |  |            |            |              |
|-----------|--|------------|------------|--------------|
| <b>50</b> | <b>Does the MMA body share information with you as it relates to the:</b>  | <b>(1)</b> | <b>(2)</b> | <b>(9)</b>   |
|           |  | <b>Yes</b> | <b>No</b>  | <b>Dk/Ns</b> |
|           | a) the size and boundaries of the marine protected area?   |            |            |              |
|           | b) Rules and regulations of the marine protected area  |            |            |              |
|           | c) Eco-system impacts of having a marine protected area? (eg: the impacts of having mangroves or the reef system?)             |            |            |              |
|           | d) Biodiversity found within the marine protected area (e.g. give information on the kinds of animals and plants)              |            |            |              |
|           | e) Use of the natural resources within the marine protected area? (eg: use of the animals, plants, corals, beaches, mangroves) |            |            |              |
|           | f) Social and economic benefits you can get from the marine protected area?  |            |            |              |
|           | g) How you can participate in activities related to the marine protected area  |            |            |              |
|           | h) Other (Specify: _____)  |            |            |              |
|           | <b>INTERVIEWER: IF “NO” TO ALL, THEN SKIP TO SECTION XI</b>  |            |            |              |
| <b>51</b> | <b>How has this information been shared?</b>   | <b>(1)</b> | <b>(2)</b> | <b>(9)</b>   |
|           |  | <b>Yes</b> | <b>No</b>  | <b>Dk/Ns</b> |
|           | a) Community meetings  |            |            |              |
|           | b) District meetings   |            |            |              |
|           | c) During community workshops  |            |            |              |
|           | d) Brochure/ pamphlets   |            |            |              |
|           | e) Newspaper articles  |            |            |              |
|           | f) Verbally by others and those directly involved at the MMA   |            |            |              |
|           | g) Other (specify: _____)  |            |            |              |
|           |  |            |            |              |
| <b>52</b> | <b>Is the information easy to understand?</b>  | <b>(1)</b> | <b>(2)</b> | <b>(9)</b>   |
|           |  | <b>Yes</b> | <b>No</b>  | <b>Dk/Ns</b> |
| <b>53</b> | <b>Has this information provided by these MMA’s changed the way you access the resources within the MMA?</b>                   | <b>(1)</b> | <b>(2)</b> | <b>(9)</b>   |
|           |  | <b>Yes</b> | <b>No</b>  | <b>Dk/Ns</b> |
| <b>54</b> | <b>Has the information provided by these MMA’s change the way you use the resources within the MMA?</b>                        | <b>(1)</b> | <b>(2)</b> | <b>(9)</b>   |
|           |  | <b>Yes</b> | <b>No</b>  | <b>Dk/Ns</b> |
| <b>55</b> | <b>Would you share the information with others to protect the MMA resources?</b>   | <b>(1)</b> | <b>(2)</b> | <b>(9)</b>   |
|           |  | <b>Yes</b> | <b>No</b>  | <b>Dk/Ns</b> |

**SECTION 5: NON-MONETARY BENEFITS**

|           |  |                       |              |                |                 |                          |
|-----------|--|-----------------------|--------------|----------------|-----------------|--------------------------|
| <b>56</b> | <b>Please state your status as it relates to the following statements below?</b> | <b>Strongly Agree</b> | <b>Agree</b> | <b>Neutral</b> | <b>Disagree</b> | <b>Strongly Disagree</b> |
|           |  | <b>(1)</b>            | <b>(2)</b>   | <b>(3)</b>     | <b>(4)</b>      | <b>(5)</b>               |

|    |  |  |  |  |  |  |
|----|--|--|--|--|--|--|
| 1. | The reefs are important for protecting land from storm waves (indirect non-market value)   |  |  |  |  |  |
| 2  | In the long-run, fishing would be better if we cleared the coral (indirect non market value)   |  |  |  |  |  |
| 3  | Unless the mangroves are protected, we won't have any fish to catch (indirect non market value)  |  |  |  |  |  |
| 4. | Coral reefs are only important if you fish or dive (existence non use value)   |  |  |  |  |  |
| 5. | I want future generations to enjoy the mangroves and coral reefs (bequest non use value)   |  |  |  |  |  |
| 6. | Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow (existence value) |  |  |  |  |  |
| 7. | We should restrict development in some coastal areas so that future generations will be able to have natural environments (bequest value)          |  |  |  |  |  |
| 8. | Sea grass beds have no value to people (existence value)   |  |  |  |  |  |

## **SECTION 6: COMMUNITY PARTICIPATION AND AWARENESS**

| <b>57</b> | <b>Statements on the Community</b>  |            |          |         |       |
|-----------|---|------------|----------|---------|-------|
|           | Now I would like to read a list of statements on the community. Can you indicate to what extent you agree or disagree with each of these statements? Compared to before MMA establishment.....<br><br><b>[Tick one option for each statement]</b> | 0          | 1        | 2       | 3     |
|           |   | Don't know | Disagree | Neutral | Agree |
| 1         | Members of my family are more often taking part in community meetings   | 0          | 12       | 8       | 80    |
| 2         | Women are more often involved in community meetings   | 0          | 4        | 0       | 96    |
| 3         | The youth has more voice and opportunities in our communities   | 0          | 24       | 16      | 60    |
| 4         | The community has become more united  | 0          | 12       | 40      | 48    |
| 5         | There are more conflicts amongst community members  | 0          | 64       | 12      | 24    |

|   |  |    |    |    |    |
|---|--|----|----|----|----|
| 6 | There are more conflict between neighbouring communities | 0  | 36 | 44 | 20 |
| 7 | Support from the government has improved                 | 24 | 60 | 16 | 0  |
| 8 | Support from other organizations has improved            | 0  | 4  | 4  | 92 |

|           |   |                    |                   |                           |
|-----------|---|--------------------|-------------------|---------------------------|
| <b>58</b> | <b>Have you received any training in Environmental Education related to the marine protected area?</b>  | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/N<br/>s</b> |
| <b>59</b> | <b>Have you received any tour guide training as a result of the marine protected area?</b>  | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/N<br/>s</b> |
| <b>60</b> | <b>Have you received any training in resource governance as a result of the marine protected area?</b>  | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/N<br/>s</b> |
| <b>61</b> | <b>Have you received any arts and craft training that uses marine resources since the establishment of the MMA?</b>   | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/N<br/>s</b> |
| <b>62</b> | <b>Have you or anyone in your family ever received a scholarship to attend formal schooling (primary or high school) as a result of assistance from the marine management body?</b> | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/N<br/>s</b> |
| <b>63</b> | <b>Have you or anyone in your family ever gotten a job related in some way to the marine protected area?</b>  | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/N<br/>s</b> |

### **SECTION 7: LOCAL VALUES AND BELIEFS ABOUT MARINE RESOURCES**

|           |                   |                       |              |                |                 |                          |
|-----------|-------------------|-----------------------|--------------|----------------|-----------------|--------------------------|
| <b>64</b> | <b>Statements</b> | <b>Strongly Agree</b> | <b>Agree</b> | <b>Neutral</b> | <b>Disagree</b> | <b>Strongly Disagree</b> |
|           |                   | <b>(1)</b>            | <b>(2)</b>   | <b>(3)</b>     | <b>(4)</b>      | <b>(5)</b>               |

|    |   |  |  |  |  |  |
|----|---|--|--|--|--|--|
| 1. | Organizations that manage the resources are taking the bread out of people's mouths         |  |  |  |  |  |
| 2  | We do not have to worry about the sea and the fish; God will take care of it for us         |  |  |  |  |  |
| 3  | We should manage the sea to ensure that there are fish for our children and their children  |  |  |  |  |  |
| 4. | We have to take care of the land and sea or they will not provide for us in the future      |  |  |  |  |  |
| 5. | We want to protect the land and the sea but this is hard because we have economic needs now |  |  |  |  |  |
| 6. | Protecting the land and the sea brings us more benefits than not protected these resources  |  |  |  |  |  |
| 7  | Local values is coMMAtible with MMA goals   |  |  |  |  |  |

**SECTION 8: LEVEL OF UNDERSTANDING OF HUMAN IMPACTS ON RESOURCES**

| <b>65</b> | <b>Do you think that any of the following have affected or are affecting the natural environment?</b> | <b>(1)<br/>Yes</b> | <b>(2)<br/>No</b> | <b>(9)<br/>Dk/Ns</b> |
|-----------|---|--------------------|-------------------|----------------------|
|           | a) Hurricanes and Storms  |                    |                   |                      |
|           | b) Coastal development  |                    |                   |                      |
|           | c) Uncontrolled Fishing by outsiders (neighboring <i>i qoliqoli</i> etc.)                             |                    |                   |                      |
|           | d) Use of destructive fishing methods   |                    |                   |                      |
|           | e) Waste and Pollution  |                    |                   |                      |
|           | f) Lack of Surveillance   |                    |                   |                      |
|           | g) Population Growth  |                    |                   |                      |
|           | h) Other (specify: _____)   |                    |                   |                      |

| 66 | How do you consider the changes as it relates to the level of impacts from each below? | 1. Very Negative | 2. Negative | 3. Neither negative nor positive | 4. Positive | 5. Very Positive |
|----|--|------------------|-------------|----------------------------------|-------------|------------------|
|    | a) Hurricanes and Storms   |                  |             |                                  |             |                  |
|    | b) Tourism Development   |                  |             |                                  |             |                  |
|    | c) Uncontrolled Fishing by outsiders (neighboring <i>i qoliqoli</i> etc.)              |                  |             |                                  |             |                  |
|    | d) Use of destructive fishing methods  |                  |             |                                  |             |                  |
|    | e) Waste and Pollution   |                  |             |                                  |             |                  |
|    | f) Lack of Surveillance  |                  |             |                                  |             |                  |
|    | g) Population Growth   |                  |             |                                  |             |                  |
|    | h) Other (specify: _____)  |                  |             |                                  |             |                  |

**SECTION 9: SOCIO-ECONOMIC BENEFITS TO COMMUNITIES**

| 67 | How do you rate your economic situation today compared to before MMA establishment?   | 1. Much Better | 2. Better | 3. Neither Better nor Worst | 4. Worse | 5. Much Worse |
|----|---|----------------|-----------|-----------------------------|----------|---------------|
|    | <b>Please tick the correct response</b>   |                |           |                             |          |               |
|    | <b>Interviewer: If answer is Much Better or Better then go on to Q 67 ; If answer is Worse or Much Worse then go on to Q 68</b> |                |           |                             |          |               |

|           |  |                |               |                  |
|-----------|--|----------------|---------------|------------------|
| <b>68</b> | <b>What has contributed to making your economic situation better or much better?</b>                           | <b>(1) Yes</b> | <b>(2) No</b> | <b>(9) Dk/Ns</b> |
|           | a) I sell more fish and invertebrates  |                |               |                  |
|           | b) I get more pay for the work I do  |                |               |                  |
|           | c) I have alternative sources of income now  |                |               |                  |
|           | d) I get a better price for what I sell  |                |               |                  |
|           | e) I saved my money  |                |               |                  |
|           | f) I invested my money   |                |               |                  |
|           | g) Other (please specify) _____  |                |               |                  |
| <b>69</b> | <b>What has contributed to making your economic situation worse or much worse?</b>                             | <b>(1) Yes</b> | <b>(2) No</b> | <b>(9) Dk/Ns</b> |
|           | a) less fish and invertebrates for sale now  |                |               |                  |
|           | b) I get paid less for the work I do   |                |               |                  |
|           | c) the cost of living is high (eg: the cost of bread, rice, gas has gone up)                                   |                |               |                  |
|           | d) I have had to spend a lot of money on medical expenses  |                |               |                  |
|           | e) the interest rates for loans are too high   |                |               |                  |
|           | f) Other (please specify) _____  |                |               |                  |
| <b>70</b> | <b>Was any of the above (Q 67 or Q 68) directly related to the establishment of the marine protected area?</b> | <b>(1) Yes</b> | <b>(2) No</b> | <b>(9) Dk/Ns</b> |

**SECTION 10: OTHER QUESTIONS (OTHER EFFECTS AND CRITICAL DETERMINING FACTORS)**

**71.** Do you feel that MMA has been successful?

(check one) Y\_\_\_\_ N\_\_\_\_

**71.** If yes, what have been the successes?

- 1.
  - 2.
- 

**72.** If no, what were the failures?

- 1.
  - 2.
- 

**73.** Did you support MMA?

In the beginning or early phases of MMA Y\_\_\_\_ N\_\_\_\_

During implementation of MMA Y\_\_\_\_ N\_\_\_\_

Today Y\_\_\_\_ N\_\_\_\_

**74.** If you supported MMA in the beginning, why did you support it? (You can choose more than one of the following)

— Expected economic benefits

- Increase the number of fish
- Make the marine life better
- Minimum sacrifice
- Provide for alternative livelihoods (from tourism, etc.)
- Having conservationists out there and with good policing solves a totally unrelated problem in a novel way (e.g. drug beach, squatters driven off)
- Other reasons \_\_\_\_\_

**75.** If you didn't support MMA in the beginning but supported it later, what changed your mind?

- Expected economic benefits
- Increase the number of fish
- Make the marine life better
- Minimum sacrifice
- Provide for alternative livelihoods (from tourism, etc.)
- Having conservationists out there and with good policing solves a totally unrelated problem in a novel way (e.g. drug beach, squatters driven off)
- Other reasons \_\_\_\_\_

**76.** Has the availability of fish from local waters increased/decreased/stayed the same since the establishment of the MMA?

- Increased
- Decreased
- Stayed the same

If there has been an increase or decrease, what is the reason?

\_\_\_\_\_

---

**77.** Has your household's quality of life ( health, household assets) increased/decreased/stayed the same since the establishment of the MMA?

- Increased
- Decreased
- Stayed the same

If there has been a change, what is the reason?

\_\_\_\_\_

## 78. Critical success factors (CDFs)

If you answered “yes” to **Q. 70** above, in your opinion, what were the most important factors affecting the success of MMA? (Note: interviewer will ask open ended question, what were the most important factors? Interviewer will tick off the top 3 responses from the list.)

- There was legislation to support MMA’s implementation
- External help in planning and implementing MMA (NGO, Academic, etc.)
- Continuing advice from implementing organization
- The size of MMA is appropriate to enable effective management
- It is clear who can participate in decision making
- Tangible increase in fish
- Those who are impacted by MMA can participate in decision making
- Leadership
- There was training and education provided
- Community organizations
- Long term support of local government
- Adequate financial resources
- Accountable management within MMA
- Small population size
- Conflict management mechanism
- Clear objectives
- Management rules enforced
- The benefits exceed the costs
- Successful alternative livelihoods
- Benefits are shared
- There was a perceived crisis in the resource
- Other (specify)

**79. Questions checking/probing on the Critical Determining Factors and their timing**

The next set of questions asks about the timing of factors that might be important in establishing and managing an MMA. (Check appropriate box if “yes”)

|   | In the beginning or early phases of MMA | During implementation of MMA | Today |
|---|---|------------------------------|-------|
| 1. Were community members able to influence the size and location of the different reserve areas?               |   |                              |       |
| 2. Did MMA receive any advice or support from external groups or organizations in planning or implementing MMA? |   |                              |       |
| 3. Does MMA have sufficient funds to achieve its objectives?  |   |                              |       |
| 4. Was there a community education and training program associated with MMA?                                    |   |                              |       |
| 5. With respect to the development of MMA, were there community consultations?                                  |   |                              |       |
| 6. Were alternative/supplemental income opportunities developed or promoted by MMA?                             |   |                              |       |
| 7. Are there or were there clear leaders who pushed this project forward?                                       |   |                              |       |
| 8. Did the project receive financial inputs from the local government?  |   |                              |       |
| 9. Is there legislation in place that supports MMA?   |   |                              |       |
| 10. Are there any community organizations (formally or informally) associated with MMA?                         |   |                              |       |
| 11. Are the managers of MMA accountable to community members?   |   |                              |       |
| 12. Is there conflict management mechanism?   |   |                              |       |
| 13. Is there effective enforcement of MMA rules and regulations?  |   |                              |       |
| 14. Do the benefits to community members arising from MMA exceed the costs?                                     |   |                              |       |
| 15. Are there shared benefits from MMA to community members?  |   |                              |       |



## 80. Perception questions

Please use the 1 to 10 ladder diagram to respond to the following questions:

|   | Before MMA | Today |
|---|------------|-------|
| 1. <b>Livelihoods:</b> The lowest step indicates the worst possible existence, little or no food, inadequate furnishings and shelter, and sickness. The highest step indicates the best possible house, fully furnished, more than enough food, and everyone healthy. |            |       |
| 2. <b>Food security:</b> The lowest step indicates a situation where seafood is never available. The highest step indicates a situation where there is always locally harvested seafood available in the markets  |            |       |
| 3. <b>Resource use conflicts:</b> The lowest step indicates a situation where people are always arguing and fighting over coastal marine resources. The highest step is a situation where everyone is friendly and cooperates together like one family (outsiders).   |            |       |
| 4. <b>MMA conflicts:</b> The lowest step represents a situation where MMA has brought about high levels of conflict and the highest step is a situation where there is no conflict caused by MMA.   |            |       |
| 5. <b>Participation in MMA management:</b> The lowest step in the ladder indicates a situation where you cannot join any meeting on MMA management. The highest step represents a situation where you can join all meetings on MMA management.                        |            |       |
| 6. <b>Influence on MMA management:</b> The lowest step indicates a situation where whatever you say or do it makes no difference with respect to activities in MMA. The highest step indicates a situation where your opinion has influence on MMA activities         |            |       |
| 7. <b>Peace and order:</b> The lowest step indicates a situation where the peace and order situation is very bad. The highest step indicates a situation with the best possible level of peace and order.   |            |       |
| 8. <b>Crime:</b> The lowest step indicates a situation with the highest possible amount of crime in the area. The highest step indicates a situation with no crime at all in the area.  |            |       |
| 9. <b>Village-level conflict:</b> The lowest step indicates a high degree of disputes or conflict in the village/town, and the highest step indicates no disputes or conflict at all (any conflicts)  |            |       |
| 10. <b>Compliance:</b> The lowest step shows a situation where no-one obeys the resource management rules. The highest step shows a situation where everyone obeys the rules.   |            |       |
| 11. <b>Ecological health:</b> The lowest step indicates a situation with no fish or other resources, that the water is so foul nothing could live in it. The highest step is described as rich, clean water, filled with fish and other wildlife.                     |            |       |

|   |  |  |
|---|--|--|
| 12. <b>Biodiversity:</b> The lowest step indicates a situation with only one or a few different types of fish or corals. The highest step indicates a situation with many different kinds of fish and other wildlife. |  |  |
|---|--|--|

**Thank you for your cooperation!**

**81. Any other response by the respondent can be filled here (optional)**

**82. Any relevant observation by the interviewer can be filled here (optional)**

### ***Education/new skills***

- Has the MMA had any effect in the availability of education for children at this community?
- Has the MMA had any effect on people being able to afford to pay school fees?
- Has the MMA contributed to members of this community being able to learn new skills?
- Has the MMA contributed to teach children in this community about any cultural or traditional values?

### ***Health***

- Has the MMA helped or hindered access to the practice of traditional health? In what ways?
- Has the MMA contributed or not to having more health care available in this community? In what ways?
- Has the MMA contributed or not to health in general in this community? In what ways?
- Does you think everyone has sufficient to eat everyday and a mixture or a limited amount of things?
- Does the MMA contributed or not to the food supply in your household?
- Have there been any improvements to sanitation in this community since the declaration of the MMA? (eg toilets, water storage etc.)

### ***Governance and social cohesion***

- Have there been other committees or community groups established since the declaration of the MMA?
- Is anyone in this group a member of any committee related to the management of the MMA? Which one?
- Is anyone in this group involved in any other activity related to the management of the MMA? In what ways?
- Do members of this group feel that in general they can influence decisions related to the management of the MMA? Are there mechanisms for more general participation in decisions?
- Do members of this group feel that in general there is transparency in the way decisions are made related to the management of the MMA?
- Do members of this group feel that in general they are properly informed about decisions related to the management of the MMA?
- How often are there meetings related to the management of the protected area? What are the things addressed in those meetings?
- Has the formation of committees and groups related to the management of the MMA helped this community in any ways?
- From your perception has the MMA helped the community to be more united?
- From your perception has the MMA created more conflict amongst community members?
- From your perception has the MMA created more conflict between neighbouring communities?

***Role of Woman and Man and the lives of children***

- Has the MMA changed what a woman does in her daily activities in this community?
- Has the MMA changed what a man does in his daily activities in this community?
- Has the MMA changed anything about how children can grow up in this community?

***Access and use of resources, rights and ownership***

- Has the MMA had an effect on access to natural resources by members of this community (e.g., fisheries, water and timber?)
- Has the MMA had an effect on the ownership of, and rights to, natural resources by members of this community?

***Vulnerability***

- Do you feel that the MMA helped this community to have a better natural environment with more plants, animals and environmental resources like cleaner water?
- Does the MMA help your family to feel a sense of more or less security when you go through difficult times or when there is an environmental disaster?
- Has this community received more or less support from the government or from other organizations because you live in or near a MMA?
- Has the MMA helped or not this community to maintain traditional and spiritual customs?