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Ecosystem management: Evaluating the impact of Marine Protected Areas on local communities in Kia, Fiji. A case study
University of Kent, Durrell Institute of Conservation and Ecology

MSc by Research: Biodiversity Management
Monica Stalio



CONTENTS

Acknowledgements	4
Abstract	5
List of acronyms	8
List of figures	9
List of tables	10
Chapter 1 Introduction	11
1.1 Background of the study.....	11
1.2 Rationale of the research.....	12
1.3 Aim and Objectives.....	13
Chapter 2 Literature review	15
2.1 Protected Area: A brief history.....	15
2.2 Categories of PAs.....	17
2.3 The planning of PAs.....	20
2.4 Governance.....	21
2.4.1 Government PAs.....	21
2.4.2 Co-managed PAs.....	21
2.4.3 Private PAs.....	22
2.4.4 Communities Conserved Area (CCA).....	22
2.4.5 NGOs PAs.....	23
2.5 Values and benefits of PAs.....	23
2.6 Marine Protected Areas (MPAs).....	24
2.6.1 History.....	24
2.6.2 The importance of protecting the oceans.....	25
2.6.2.1 Unsustainable fisheries.....	26
2.6.2.2 Coral reefs.....	26
2.6.2.3 Climate change.....	28
2.7 MPAs effectiveness and downfalls.....	28
2.8 Local communities.....	29
2.9 Pacific region.....	31
2.9.1 Fiji.....	31
2.9.2 Social structure in rural communities.....	32
2.9.3 MPAs in Fiji.....	33
Chapter 3 Methodology	36
3.1 Community Centred Conservation (C3).....	36
3.2 Research site.....	37
3.3 Research methodology.....	40
3.3.1 Justification of participants' selection.....	42
3.3.2 Data collection.....	43
3.3.2.1 Pilot interviews.....	44
3.3.2.3 Analysis of semi structured interviews.....	46

3.3.4 Focus Groups.....	46
3.4 Participatory observations.....	49
3.5 The constraints of working on Kia.....	50
Chapter 4 Results.....	52
4.1 Demographic data.....	52
4.1.1 Age.....	53
4.2 Financial data.....	54
4.2.1 Primary income.....	54
4.2.2 Secondary income.....	56
4.3 Changes in fishing routines.....	58
4.3.1 Locations.....	58
4.3.2 Techniques.....	58
4.4 Ecological changes.....	61
4.5 Perception of the MPA.....	64
4.5.1 Changes related to the MPA.....	64
4.5.2 Regulations.....	66
4.5.3 Social changes.....	67
4.6 Future generations.....	69
Chapter 5 Discussions.....	70
5.1 Social data.....	70
5.2 Financial data.....	72
5.3 Fishing techniques.....	76
5.4 Ecological data.....	77
5.5 Social changes.....	82
Chapter 6 Conclusions and Recommendations.....	84
6.1 Conclusions.....	84
6.2 Recommendations.....	87
References.....	90
Appendix I.....	98
Appendix Ia.....	98
Appendix Ib.....	101
Appendix Ic.....	102
Appendix II.....	105

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ABSTRACT

More than one billion people, mostly from developing countries, rely on fish as their primary source of income and protein. With fishing pressure increasing rapidly, fish stocks across the world are fast declining. The consequences are already visible; nearly two-thirds of the global fish stocks have been overexploited, leaving disruption to food webs and marine ecosystems, and declining income for fishermen dependent on fisheries for their livelihoods. With predictions of further decline in fish stocks in the near future, it is crucial to reinforce marine environment protection. Marine Protected Areas (MPAs) have been recognized as an effective management tool to protect fish populations, showing benefits beyond areas delimited by the MPA, thus adding further valuable support to local fisheries. The presence of MPAs is particularly important in areas with coral reef systems. With more than 30% of the world's coral reefs negatively affected by ocean acidification, combined with the broader effect of global climate change and overfishing, resulting predictions indicate that 60% of the world's reefs will be lost by 2030. MPAs are regarded as a useful tool in mitigating these impacts. With the prominent role MPAs play in marine conservation, monitoring and evaluating their status is necessary to ensure that marine management measures are effective and efficient.

This research explores the role of an MPA established in the vicinity of Kia Island, a remote island off the North coast of Vanua Levu, Fiji, and enveloped by the world's third longest continuous barrier reef system. Semi-structured interviews and focus groups were conducted in the 3 villages of Daku, Ligau, and Yaro, in order to investigate stakeholders' perceptions on ecological, financial, and social changes occurring after the establishment of the MPA.

Participants observed that since its establishment, the marine environment appears to be healthier inside and outside the MPA. Fish species, previously absent from the area have been observed, fish populations appear more abundant, and fish size may also have increased. Stakeholders also reported that they believe corals are recovering, and sea grass is now more prosperous.

The improved health of the ecosystem means that fish catches are more abundant, and fishermen's income has consequently increased. The access to better finances has driven women to undertake fishing on a regular basis, empowering them to become breadwinners alongside their family's men. The role of women is slowly changing both within their family structure and at community level. However, in a society like the Fijian's, where patriarchy has strong roots, it is currently too early to assess what the consequences of women's new role may be within the traditional society.

Recommendations to further assess the impact of the MPA include an assessment of income versus expenditure, landing site surveys, and ecological sampling to monitor change occurring inside and outside the MPA. Combined, these assessments will support efficient planning of future resource management. Social research on the change in women's role and consequences on the family and wider community should also be developed.

*Ocean: A body of water
occupying two-thirds of a world
made for man - who has no gills.*

Ambrose Bierce (1842 – 1913)

LIST OF ACRONYMS

CBA: Child Bearing Age (as from C3 data)

CBD: Convention on Biological Diversity

CBNRM: Community-Based Natural Resources Management

CCA: Community Conserved Area

C3: Community Centred Conservation

CPUE: Catch Per Unit Effort

FLMMA: Fiji Locally Managed Marine Areas

GSR: Great Sea Reef

HHW: Humphead wrasse (*Cheilinus undulatus*)

HHP: Humphead parrotfish (*Bolbometopon muricatum*)

IUCN: International Union for Conservation of Nature

MCA: Marine Conservation Area

MMA: Marine Managed Area

MPA: Marine Protected Area

NGO: Non-Governmental Organisation

NPS: National Park Service

NTZ: No Take Zone

PA: Protected Area (In several occasions the term PA is used to indicate both PAs and MPAs)

SST: Sea Surface Temperature

TEK: Traditional Ecological Knowledge

UNCED: United Nations Conference on Environment and Development

WCS: Wildlife Conservation Society

WWF: World Wide Fund for Nature

LIST OF FIGURES

Figure 1 Growth in nationally designed areas from 1872 to 2008	17
Figure 2 Interaction between coral reefs and other ecosystems	27
Figure 3 The Great Sea Reef	37
Figure 4 Macuata Tabu Area	38
Figure 5 Kia island	39
Figure 6 First pilot interview with Maleli and Tulipai in C3 office, Yaro	45
Figure 7 Reefs surrounding Kia, focus group conducted in Ligau, Kia	47
Figure 8 Focus group on alternative income, Ligau	48
Figure 9 Seba and cousins during grog session on Easter Day	50
Figure 10 Change in finances after the MPA	55
Figure 11 Source of income	56
Figure 12 The bomb	59
Figure 13 A modern spear gun (left) and the traditional Tukidodo (right)	60
Figure 14 Fishermen’s perception of the MPA	63
Figure 15 Ecological changes of sea grass and coral reef	63
Figure 16 Changes people would like to see in the MPA	65
Figure 17 Social changes after the MPA	68
Figure 18 Traditional sulu women form Daku	77

LIST OF TABLES

Table 1 Population distribution	52
Table 2 Age groups of the participants	53
Table 3 Ecological changes after the MPA	61

CHAPTER 1: Introduction

This chapter presents the background, rationale, aim and objectives of the study, and why there is a need to better understand the social impact of Marine Protected Areas.

1.1. Background of the study

The poor availability of data on the ecological and social conditions of MPAs makes the evaluation of their effectiveness a very complex task (UN, 2010). In order to determine if a MPA is successful or not, West *et al.* (2006) suggest analysis of the following elements:

- How an MPA affects the artisanal fishery in general
- How an MPA affects the marine ecosystem
- The balance between loss of fishing grounds and benefits of the MPA
- Increased fishing interest near the MPA
- Declared and observed frequencies of fishing in the zone adjacent to the MPA

These elements are valid indicators of the effectiveness of an MPA, and should be constantly monitored. However, it must be taken into account that every MPA is different, as are the local communities living in its adjacency, the interaction between the community and the MPA, and the ecology of the area. Therefore, it may be easier, for example, to assess how artisanal fisheries have been affected by the MPA in rural communities where dependence on the fishery for income is very high (Palumbi, 2001).

Reef management requires combined action of a variety of groups, but local communities must play a vital role. The key to minimizing human impact lies in the involvement in management decisions by the communities depending on coral reefs. Coral reef managers have to balance sustainable use of marine resources with reef conservation and to understand that the relations between human behaviour and reef ecosystems are critical (Bunce *et al.*, 2000).

Russ *et al.* (2004) argue that, although there is emerging evidence demonstrating that MPAs enhance adjacent fisheries, if rural communities are unable (and unwilling) to perceive the benefits of the MPAs and the adjacent areas, such as, for example, spillover, they are far less likely to support and recognise MPAs as a fisheries management tool. This would explain why so many MPAs are regarded as ineffective.

In their research, Russ *et al.* (2004) observed that fishermen from villages with properly managed MPAs perceived these areas and their effectiveness more positively than fishermen from villages with poorly managed MPAs or without any MPAs. In fact, where the MPA is well managed, fishermen observe larger fish populations, more abundant

catches, larger sizes of fish, and healthier adjacent coral reefs than fishermen from villages without MPAs present, or from villages with inefficient MPAs.

Another important factor not to be underestimated is that coastal communities, like the majority of isolated communities, have begun to be exposed to the global economy, and desire to be part of it (Brook and MacLachlan, 2005).

The desire for financial wealth, combined with a shift in priorities ('easy cash' over sustainable resources use) means that traditional management practices are disrupted, and local communities could face problems they are then unable to address on their own, such as overexploitation of resources, or loss of traditional knowledge (Brook and MacLachlan, 2005).

Although objectives, priorities, size, and governance vary enormously between MPAs, the inconveniences such an establishment can create to local communities are similar. In fact, MPAs (and protected areas in general) may affect the people living in them, or adjacent to them; they can change physical and perceived boundaries, limit or prevent access to resources, and displace communities in remote areas where resources, and source of income, are scarce (Agardy *et al.*, 2003).

While in the past conservationists and ecologists have often been accused of being indifferent to social issues like, for example, the wellbeing of rural communities, customary laws, or bio piracy, in the last few years they have considerably transformed their attitude and approach to the point that studies on communities' perceptions, and beliefs related to MPAs have been recognized as topics in need of research (Brook and MacLachlan, 2005). In the past, research on MPAs used to focus on the ecological aspects of the management approach, rather than on its social dimension (Pita *et al.*, 2011).

1.2 Rationale of the research

A literature review based on Fiji's network of MPAs, revealed a general lack of understanding by the parties involved with MPAs (*i.e.* government, fishery department, NGOs), of the stakeholder's perception of the MPA, the role local communities play in the environmental management of these areas, and what are the biggest challenges/impacts local communities face when living in the proximity of an MPA.

Leleu *et al.* (2012) found that the acceptance by local communities of an MPA improves when fishers are directly involved in MPA establishment and management. Stakeholder perception of the performance of MPAs is now considered fundamental for the social acceptance of these areas, and it is believed to be significant for monitoring the effects

of MPAs on extractive activities. Perception studies can ultimately help in the development of actions aim to improve MPAs.

Three main points have emerged from this new found 'current of thought':

- a) Local communities must be involved in the establishment and management of MPAs because without significant stakeholder support, the success of such conservation programs cannot be accomplished
- b) The presence of an MPA must not have a negative impact on local communities
- c) Local communities are provided with alternative resources (*i.e.* food, income) where necessary

The lesson learned from every MPA is clearly different, but on the whole, community involvement enhances the effectiveness of management programmes (Mascia and Claus, 2008).

1.3 Aims and objectives

Studies on fishery management have in recent years increased, due to fish stock availability decreasing and concerns for the uncertain future of coastal communities around the world. Despite this strategic direction, the literature reveals that relatively little is known about coastal communities in Fiji, in particular in small and remote islands. MPAs are increasing in numbers throughout the country, with the aim of protecting vulnerable oceans and fishery. However, the effectiveness of some MPAs, including the subject of this research, has yet to be properly assessed due to a number of reasons, ranging from lack of ecological data, unclear management objectives, and limited communities involvement with the effective management of the MPA.

Consequently, this research aims to narrow this research gap and conduct research into stakeholder perceptions towards the MPA, and to understand stakeholders involvement with the MPA.

This study aims to: a) investigate the impact of the MPA on the people on Kia, and the marine environment used as fishing ground by Kians; b) understand the involvement of Kians in the MPA management; c) offer recommendations for further studies on local communities heavily dependent on fishery.

The main objectives of this thesis are:

- To document environment, social and financial changes observed by the community, using semi-structured interviews, focus groups, and informal chats with both stakeholders and non
- To explore traditional knowledge of marine species, including fish, and corals, and how Kians envisage the future of their fish stock
- To identify the role played by women in the social changes (already highlighted in previous research conducted by C3 volunteers), and to explore what contribution to the community women could give
- To determine the level of involvement and commitment of the community towards the MPA, and the support government, fishery department and the WWF, and to identify factors that could potentially affect or promote the involvement of the community with the MPA.

This first chapter is followed by Chapter 2, a literature review that explores the history of Protected Areas, and presents the different categories of protection provided to the environment. It also includes a more detailed analysis of MPAs, their effectiveness, and the importance of involving local communities in the management of the MPAs.

Chapter 3 describes the different methodologies adopted in this study. The results are presented in Chapter 4, where are organised into 6 subchapters, and discussed in Chapter 5. The concluding chapter is a summary of the main findings, and includes recommendations for further research.

CHAPTER 2: Literature review

The term Fijian in this document refers to "indigenous Fijians" or "*I Taukei*", as the term Fijian generally includes all citizens of Fiji.

This chapter is divided into three parts. The first is an introduction to the concept of protected areas and their aims that through time have changed or adapted to the most pressing environmental issues, with a detailed explanation of protected area categories and different structures. The second part is dedicated to the topic of marine protected areas, and what are the environmental and social challenges they face. The last part of this chapter is an introduction to the Pacific region, and Fiji in particular, where this research took place.

2.1 Protected Area: A brief history

The history of Protected Areas (PAs) goes back to the end of the 19th Century, when America created the first National Park. Many believe mistakenly that the first official national park in US was Yellowstone, established in 1872 by president U.S. Grant, with the support of Theodor Roosevelt. What is now called Hot Spring Reservation was, in fact, the first form of environmental protection in our history. It was established nearly 200 years ago, when President Jackson signed a bill to protect the environment around Hot Springs in Arkansas, in order to "*protect the surrounding environment for the future disposal of the US government*" (Lockwood *et al.*, 2006).

With numerous reasons to care for the environment (e.g. aesthetic value, natural resources extraction, and natural monuments), America moved fast towards ensuring its environment was under protection. By the beginning of the 20th Century, America had created nearly 40 national parks. Most of the parks were managed individually and independently, with little or no involvement from the government. It was only in 1916 that the National Park Service (NPS), a governmental agency in charge of managing and protecting the national parks and monuments across the country, was established (McClanahan *et al.*, 2006). Australia followed America, establishing the first National Park in 1879, what is now called Royal National Park. From Australia, the idea of protecting the environment soon spread to Canada, New Zealand, Sweden, Belgium, and France. By the 1970s, an incredible 218 million hectares of land (in developed countries) were under protection (Lockwood *et al.*, 2006).

Due to their biodiversity richness (*i.e.* rainforests, endemic species, natural resources), and the fast environmental decay (*i.e.* deforestation, resources extraction, pollution) they have been exposed to in the past two decades, developing countries have lately also put in place the concept of environmental protection, following in the footsteps of developed countries (Klein *et al.*, 2008).

Through time PAs role has transformed, and has acquired importance in protecting endangered species, and conserving biodiversity for both economic and social wellness. More recently, PAs have been established to prevent further decline of habitats and resources linked to poverty (Pasquaud *et al.*, 2011). With the network of PAs growing fast, and at international level, the imminent need to provide a classification of the different categories of PAs, and to enable people involved with PAs to share their information and experience, grew too. In 1978 a complete classification guide of PAs was created and published by the International Union For Conservation of Nature (IUCN). The aim of this guide was to "*classify the wide variety of specific aims, concerns, and objectives of Protected Areas*" (Feary *et al.*, 2010, pg.319). Encouraged by the extent of available information on PAs, and by the increasing understanding of the role environmental protection could play (e.g. combatting poaching, sustainable development, etc.), more than 150 countries participated to the first conference solely dedicated to PAs; the 1982 World Parks Congress in Bali. Here it was agreed to set 10% of the world's terrestrial landmass under protection (Jenkins *et al.*, 2005).

A decade later, in 1992, at the United Nations Conference on Environment and Development (UNCED), delegates from around the world discussed the importance of protecting biodiversity, and the importance of PAs as conservation programmes were once again underlined. One-hundred and sixty-seven nations signed on to the Convention on Biological Diversity (CBD), which goals are: 1) conserving biodiversity, 2) sustainable use of its components, 3) fair and equitable sharing of benefits arising from genetic resources, and pledged to protect *in situ* biodiversity through a system of PAs (Naughton-Treves *et al.*, 2005).

While conservationists' main focus was land protection, the protection of the marine environment was neglected until 2003, when at the 5th World Park Conference in Dubai, the concept of Marine Protected Areas (MPAs) was addressed for the first time (McNeely, 1992). In the last decades the number of terrestrial PAs has rocketed from a few hundred to more than 100,000, and now more than 13% of the Earth's terrestrial surface is protected (Fig.1). By contrast, only 6,800 MPAs have been established to date, covering an area of just over 1.9 % of the world's oceans. The vast majority of terrestrial PAs (84.5% of those with assigned IUCN categories) are open to some form of human use (UN, 2010).

The whole attitude and priorities of various conferences, and their participants, towards protected areas have dramatically changed over time, as environmental issues have also changed. From an initial focus on the aesthetic and religious meaning of certain areas (e.g. hunting grounds, sacred groves), priorities have shifted to the protection of all biome, improvement of resources management, and more recently, to the

involvement of local communities in the management of natural resources, in order to improve human wellbeing and to alleviate poverty (Mills *et al.*, 2011).

There has also been a change in attitude towards the countries involved with conservation initiatives; initially, the first PAs were created in North and South America (e.g. the Cerrado, Tropical Andes), in Central America (e.g. the Amazon forest), in the Caribbean, and Europe (e.g. Mediterranean basin). In recent years, conservationists have focused their attention to Africa, and the Asia-Pacific region (Naughton-Treves *et al.*, 2005).

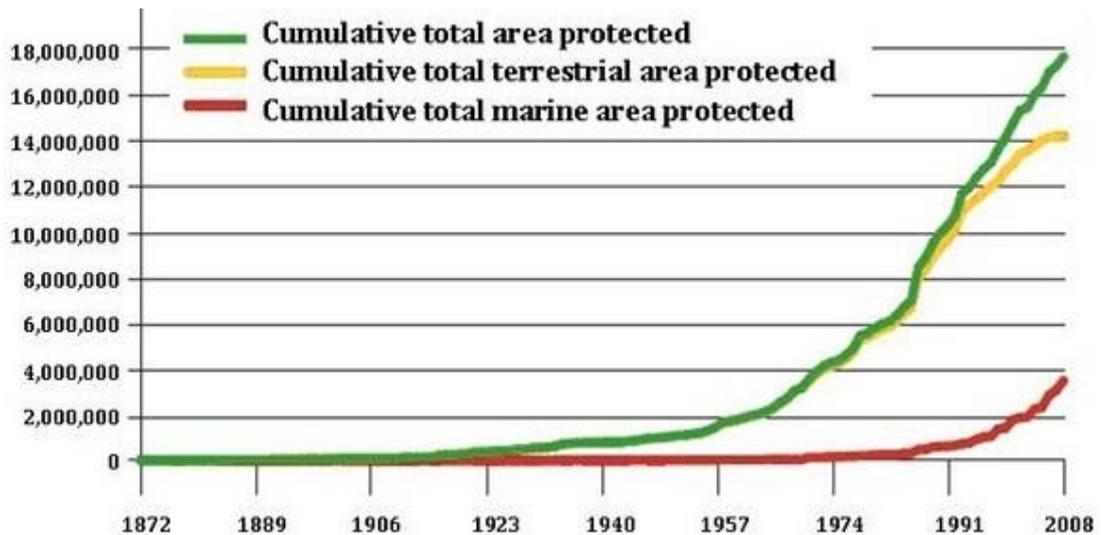


Figure 1 Growth in nationally designed areas from 1872 to 2008

(Source UNEP-WCMC, 2012)

2.2 Categories of PAs

The aims of the classification guide created by IUCN were a) to divide PAs into categories, depending on their management objectives, b) to provide a framework where various management and protection strategies can be combined, and c) to ensure PAs are managed as long term strategies (Dudley, 2008). There are also specific caveats within the framework to prevent:

- The use of categories to expel people from their lands
- The change of categories to downgrade the environmental protection
- The use of categories to argue/support environmentally insensitive development in protected areas

The guidance provided by IUCN is a tool treasured by many conservationists around the world because “All categories make a contribution to conservation”. However “The objectives should be chosen with respect to the particular situation; not all categories are equally useful in every situation” (West et al., 2006, pg.417). All categories, listed below, are internationally recognised by national governments and international bodies.

Category I – Protected area managed mainly for science or wilderness protection

1a Strict Nature Reserve: Strictly protected area, human visitation, use and impacts are strictly controlled and limited. It is an area with some outstanding/representative ecosystems, features and/or species, available primarily for scientific research and/or environmental monitoring.

1b Wilderness Area: Usually large unmodified areas. Managed mainly for wilderness protection, without permanent or significant human habitation. Retaining its natural characteristics.

Category II – Protected area managed mainly for ecosystem protection and recreation

National Park: Large natural areas. They are managed mainly to a) protect the ecological integrity of its ecosystems for present and future generations, b) exclude exploitation, c) provide a foundation for spiritual, scientific, educational, recreational opportunities.

Category III – Protected area managed mainly for conservation of specific natural features.

Natural Monument: Set aside to protect a specific natural monument (because of their outstanding or unique value, or cultural significance).

Category IV – Protected area managed mainly for conservation through management intervention.

Habitat/Species Management Area: Mainly aimed to protect particular species or habitats through management intervention (in order to maintain the habitats for the specific species requirements).

Category V – Protected area managed mainly for the sustainable use of natural ecosystems.

Protected Landscape/Seascape: Mainly managed for conservation or recreation. The interaction between people and nature over time has produced an area of distinct character, and managing the area will safeguard the integrity of this interaction.

Category VI – Protected area managed mainly for the sustainable use of natural ecosystems.

Managed Resources Protected Area: Managed mainly for the sustainable use of natural resources, to ensure long term protection and maintenance of biological diversity, while also providing sustainable resources to meet the community needs. They are generally large, with most of the area in a natural condition.

Categories I and II are predominantly managed for biodiversity conservation, and categories III to VI are established to ensure the sustainable use of resources.

Categories V and VI are generally applied to MPAs, although category VI is the most common form of protection for the marine environment (Naughton-Treves *et al.*, 2005). Not all PAs and MPAs are congruent in size, importance, level of ecosystem services, or management objectives. In the mid-1980s, British ecologist Norman Myers promoted a conservation strategy that focused on regions with exceptional high concentration of endemic species (34 regions containing 75% of all threatened mammals, birds, and amphibians in only 2.3 % of the earth), and high habitat loss. These regions, known to conservationists as ‘biodiversity hotspots’, have been the focus of several conservation initiatives led by international Non-Governmental Organisations (NGOs) like, for example, Conservation International, and World Wild Fund for Nature (WWF) (Frid *et al.*, 2008).

As Clarke and Jupiter (2010, pg. 102) argued, some areas are “*Biologically more important than others, and every PA represents a part of the planets evolutionary history, and important info for educating future generations*”. In their application, PA categories are distinct, and they may provide a straightforward guideline, at least on paper. In reality, the terms are not used consistently, and their names often do not represent the level of protection they allow (Mora and Sale, 2011). Protected areas are often left unprotected, providing limited or no sanctuary for their inhabitants (Dudley, 2008).

There is also little consistency or standardisation of categories among and within stakeholder groups. For example, different people may consider a MPA a Marine Managed Area (MMA) or a Marine Conservation Area (MCA), and the level of protection may also be perceived differently (Sobel and Dahlgren, 2004).

2.3 The planning of PAs

Certainly the level of threatened biodiversity of a region is one of the most important criteria to be considered when selecting a potential PA. However, prior to the establishment of a PA, whether terrestrial or marine, there are numerous dynamics that need to be addressed (Frid *et al.*, 2008).

Many studies concur that costs, governance, impact, location, objectives, and size of the Protected Area are six elements PA managers should focus upon, not only during the planning, but throughout the running of the PA (Mora and Sale, 2011). These elements are dynamic, and they may influence one another. For example, it is fundamental that the location and the size of PA are carefully selected. Smaller PAs tend to be established nearer human settlements where human – conservation conflict can be easily mitigated throughout a better understanding of both potential and existing conflicts, and their potential impact in the future. This could be achieved with, for example, analysing quantitative and qualitative data on wildlife behaviour and ecology, alongside the understanding of human's perception of wildlife (*i.e.* wildlife as source of income, resource depletion rate). This would help to develop management strategies to prevent and/or mitigate these conflicts (West *et al.*, 2006). Managing costs may be determined by, for example, the number of staff necessary to run efficiently the project.

Cultural, economic, political, and religious tensions can prevent or damage PAs objectives, especially in developing countries where the economic and political situation can be precarious. One of the most recent and disconcerting episodes was the killing of 10 Mountain gorillas (*Gorilla beringei beringei*) at the hands of armed rebels in the Democratic Republic of Congo (DRC) in 2007 (Jenkins, 2008).

To fully understand the social context in which PAs are created has recently become the biggest challenge for conservationists. There are several social aspects that, if not taken into account, could compromise the success of a PA (Lockwood *et al.*, 2006). Among these social aspects, researchers have identified capacity building of stakeholders (with particular focus on local communities and indigenous people); providing support and benefits, especially financial, to the local communities; empowering local stakeholders to become an active role within the management and protection of the PA, and the evaluation of the development processes outside and inside PAs as the most important (Naughton-Treves *et al.*, 2005).

2.4 Governance

PAs are established and/or managed by governments, NGOs, indigenous groups, local communities, and private companies. Governments, at least on paper, manage most of the world's PAs. However, in the last decade the number of collaborations among parties has increased, largely due to the recognition of the importance of Community Conserved Area (CCA) (for both biodiversity and communities), and the importance of the role played by NGOs in decision-making, planning and managing PAs (Jones *et al.*, 2013). This has resulted in an increase in the number of privately managed PAs (Drew, 2005). Funding availability is another explanation behind such a shift in PAs governance. In the past decade, the proportion of subsidies destined to PAs provided by government agencies has significantly decreased, while funding provided by NGOs and users fees has increased (Mills *et al.*, 2011).

The diversification of parties involved has meant multidisciplinary collaboration, better understanding of the differences amongst PAs, better planning, and that PAs could be established not only at national level (usually managed by government agencies) but also at local, provincial and regional level (West *et al.*, 2006). As Lockwood *et al.* (2006) argued, smaller PAs are easier to manage, require a smaller budget, may be more readily accepted by stakeholders, and could help to better understand and manage larger PAs.

2.4.1 Government PAs

Management of a PA is allocated by the government to a subsidiary body (e.g. forestry or fishery department), or to a specific NGO (e.g. WWF), private individual or a community. The government is responsible for setting and maintaining conservation objectives, and is held responsible for the project. However, they have no legal obligations to inform or consult other stakeholders in regard to the management of the PA (Lockwood *et al.*, 2006), and PA restrictions may be lifted whenever the management body decides (e.g. for short periods, perhaps a few times a year, for religious or cultural events) (Jones *et al.*, 2013).

2.4.2 Co-managed PAs

Management and responsibilities are shared among several actors (e.g. NGOs, rural communities, private donors). The strength of the collaboration depends on the level of involvement of the actors (Duncan and Nakagawa, 2006). An example of co-managed PA is the Kayan Mentarang National Park. Established in 1980, this PA is co-managed by WWF (Kayan Mentarang project), the Dayak people (an indigenous community living

within and around the park), and representatives of the central government. The WWF's main contribution is to facilitate full involvement of the indigenous people with decision making and biodiversity management using, for example, participatory planning, and workshops. The body representing the government is the agency for Forest Protection and Nature Conservation, whose primary role is to ensure the forest and its resources are protected from exploitation. The role of the Dayak people consists of managing the resources in a sustainable manner (Eghenter, 2000).

2.4.3 Private PAs

Private PAs, also known as private reserves, are owned by communities, individuals, or corporations, without the need of formal government recognition. They can fall under any of the IUCN Protected Areas Categories (Klein *et al.*, 2008). For example, 13 % of the total area of Tanzania is classified as Privately Protected Areas. In private PAs the landowner has full authority in managing the land and its resources, and in decision making. An NGO privately managed PA may focus, for example, on the conservation of biodiversity, while an individual landowner may have interest in pursuing financial revenues like, for example, hunting concessions (Carter *et al.*, 2008).

2.4.4 Community Conserved Areas (CCA)

PAs cannot be seen in isolation from the communities that have always inhabited and used these areas (West *et al.*, 2006). Rural people were the first people to protect an area for its spiritual and natural value. Such areas include the sacred groves in India, the Uluru (Ayer's rock) in Australia, and the sacred cacao groves of the Maya (Klein *et al.*, 2008). Rural communities have changed their surrounding environment through time, and each community has evolved specific skills to manage their natural resources (Verschuuren, 2006).

Over time, rural communities have developed a lifestyle that integrates with the surrounding environment, and have developed customary laws that regulate their use of natural resources. Traditional Ecological Knowledge (TEK) is fundamental to both maintaining cultural identity, and for the protection of the environment, because with their daily activities (e.g. fishing, agriculture, and pasture) people are shaping the land- and seascapes, and continue on their traditional practices (Lockwood *et al.*, 2006). Scientists and policy-makers have only recently begun to understand the importance of TEK. This has led to the establishment of the Ad Hoc Working Group on Article 8j of the CBD, the entering into force of the 2003 UNESCO Convention on Intangible Heritage,

and the recognition of cultural services of ecosystems in the Millennium Ecosystem Assessment (2003-2005) (Cinner and Aswani, 2007).

2.4.5 NGOs PAs

The role of NGOs has become increasingly important, especially by involvement with governmental agencies in developing countries, and where they possess the tools to effectively work with local communities, aiding them to gain rights over resources, and manage their own PA (Cinner and Aswani, 2007).

NGOs act as ‘middlemen’ between governments and local communities, and also as government’s delegates whether the PA is co-managed or it belongs to a single actor. Often NGOs provide technical advice to governments, acting as communicators, conflict managers, administrative and technical support, and mentors. They also raise funds for specific projects (e.g. reintroduction of endangered species), and where there are enough resources, they manage PAs on their own (for example, WWF) (Naughton-Treves *et al.*, 2005).

Because the IUCN classification of PAs is not associated with any particular form of ownership or authority, any of the six categories can be managed by any type of governance describe above, or a mix of them (Lockwood *et al.*, 2006).

2.5 Values and benefits of PAs

The importance of PAs has been widely recognised by the conservationists around the world as a fundamental tool to protect biodiversity (Naughton-Treves *et al.*, 2005).

But what does ‘success’ mean for a PA, either terrestrial or marine? And how can it be measured?

As Borrini-Feyerabend *et al.* (2013) argue, the goals of protected areas have become very diverse in recent years, and are directly related to the stakeholders involved. However, in their paper, the authors emphasize the importance of focusing on what they believe being essential to manage protected areas:

- To identify threats, problems, solutions and opportunities
- Achieve sustainability in the use of resources (inside and outside the PA), while ensuring that the resource users are not affected
- Conserve natural areas of national and international significance for cultural, spiritual and scientific purposes

- Conserve the composition, structure and function of biodiversity and of associated ecosystems (outside and inside the PA)
- Deliver benefits to resident and local communities
- Facilitate low impact of scientific research activities
- Help to provide educational opportunities and to develop public support
- Potential for continued self-organization (capacity to develop, regenerate and evolve under normal circumstances)
- Resilience (the ecosystem's ability to respond to additional stress)

2.6 Marine Protected Areas (MPAs)

MPA is an umbrella term used to describe different types of protection for the marine environment.

The definition Kelleher coined in 1999 was originally adopted by IUCN, and it is now widely used by international and national bodies. He defines MPA as “*Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part of the entire enclosed environment*”. A MPA defines a geographical space, recognises this space and the binding commitments to conserve and protect its biodiversity (*i.e.* national, local and customary law, international conventions and agreements, etc.) (Kaplan and Levin, 2009).

The structure of a MPA should be a mix of strong science and design, active community involvement, and careful development of governmental support (Sobel and Dahlgren, 2004). The planning, understanding the dynamics of the rural communities living nearby the area, the challenge of the establishment, and the approaches needed to overcome all these challenges are all part of this mix (Kaplan and Levin, 2009).

2.6.1 History of MPAs

The rapid degradation of our marine resources has motivated a global movement to protect the oceans (Adams *et al.*, 2011). MPAs are established for a multitude of purposes (*i.e.* recreational, financial, ecological), but mostly as tools for fisheries and other resources management. MPAs vary widely in category and the level of protection applied, ranging from areas that allow multiple-use to No Take Zones (NTZ) (Pita *et al.*, 2011). The most effective MPAs, in terms of increased fish stock, stable ecosystem, and benefits to the local community using the MPA or its surrounding area, are the NTZ

marine reserves, in which all forms of extraction and disturbance by humans are permanently banned.

Their primary aim is to protect critical habitat and biodiversity, to sustain or enhance fisheries by preventing spawning stock collapse, to avoid anthropogenic perturbations to individual species, and to provide recruitment to fished areas (Gell and Roberts, 2003). No-take areas prevent the removal of components of marine ecosystems, allowing the system itself to be untouched. Marine no-take reserves are closed to fishing and other extractive activities (Gell and Roberts, 2003). However, one issue with MPAs is that only a small percentage of these areas are no-take, and most of them are no more than paper parks (*i.e.* a conservation area that exists on map and in legislation, but is not effective in protecting the environment it delimits) (Ladle and Whittaker, 2011). In the Philippines, for example, only about 15% of the MPAs are achieving the goals they were set for (Pita *et al.*, 2011).

The oldest PA with a marine component is the Royal National Park in New South Wales, Australia, established in 1879. Louisiana followed in 1904, Malaysia in 1906, and the Tsitsikamma Marine Protected Area in South Africa was established in 1964 (Ladle and Whittaker, 2011). The MPA network has grown steadily since the mid-1970s in coincidence with international conservation initiatives coming into force like, for example, the Ramsar Convention in 1971. But it is only in the last 15 years that the network of MPAs has expanded, and now covers multiple regions across the world: the Caribbean, Europe, Southeast Asia, Latin America, North and South Pacific, and America (Sobel and Dahlgren, 2004).

At the World Summit on Sustainable Development in 2002, world leaders committed to create a representative network of Marine Protected Areas around the world (West *et al.*, 2006). In 2010, only about 1.9 % of the world's oceans were designated as an MPA against the 13% of global terrestrial protected area coverage. CBD's goal is to put 10% (a small percentage compared with terrestrial PAs) of the world's marine areas under MPA designation by 2020 (Al-Abdulrazzak *et al.*, 2011). However, the problem with MPAs is that, although they have positive objectives, a great deal of time is required before evidence of its effectiveness can be properly evaluated (Leleu *et al.*, 2012).

2.6.2. The importance of protecting the ocean

More than half of the world's population lives within coastal zone, and the majority depends on marine resources for livelihoods and income. The belief that marine resources were infinite has proved to be without grounds, as we are witnessing the disappearing of marine fauna, especially those species harvested for (legal and illegal) commercial purposes like, for example, sharks, salmon, and tuna. The exploitation of

certain species (both prey and predators) not only can cause disruption to the food web, but create disturbance to the whole marine ecosystem (e.g. population outbreaks of the crown-of-thorns starfish that can lead to reef destruction. Crown-of-thorns, in fact, feed on live corals but during outbreaks they prevent the recruitment of juvenile corals) (Palumbi, 2001).

MPAs offer tremendous potential to protect, save and study the world's marine biological diversity. They have the potential to address the problem of sustainable fisheries, and can be used to ensure the sustainable use, protection and conservation of marine biodiversity and its ecosystems (Agardy *et al.*, 2003).

2.6.2.1 Unsustainable fishery

One of the main threats to oceans is unsustainable fisheries (Pita *et al.*, 2011). Although there are still areas (e.g. natural reserves) where fishing is not occurring or, at least is having low impact on the marine ecosystem, enhanced technology and rising market prices of certain marine species (e.g. tuna, lobster) is pushing for exploitation of unfished areas and previously non-target species. The problem with unsustainable fisheries is not the decrease in number of marine organisms *per se*, but it is a combination of detrimental practices like, for example, cyanide fishing, trawling, and by catch. These activities are altering the genetic structure of some marine species (as indiscriminate size classes and sexes are fished), influencing the marine food web (the depletion of a single predator species can have a huge impact on prey and other affected species), and modifying the marine ecosystem (Agardy *et al.*, 2003). As a result, some of these areas are becoming less resilient (e.g. more susceptible to environmental changes, and empty ecological niches) and they may not be able to support the ecosystem and the fisheries as they used to do (Sobel and Dahlgren, 2004).

2.6.2.2 Coral reefs

The world's most valuable, widespread and fragile natural ecosystem, the coral reefs, is declining. In the Status of the Coral Reefs of the World: 2000 (Wilkinson, 2000), the author assessed that 27% of the world's reefs had been lost, 11% of it due to human impacts such as destructive fishing, pollution, and coastal development.

Coral reefs exist in close relation with other ecosystems, like sea grass beds and mangroves (fig. 2). Coral reefs protect coastlines against high wave action and erosion and as such, create lagoons that favour the growth of mangroves and sea grasses. Mangroves and sea grass beds stabilize salinity levels in the coastal zone and act as sinks for high nutrient concentrations in terrestrial run-off (Mora *et al.*, 2006). The sea

grass and mangrove habitats associated with coral reefs are also threatened by over exploitation, pollution, invasive species, and habitat destruction.

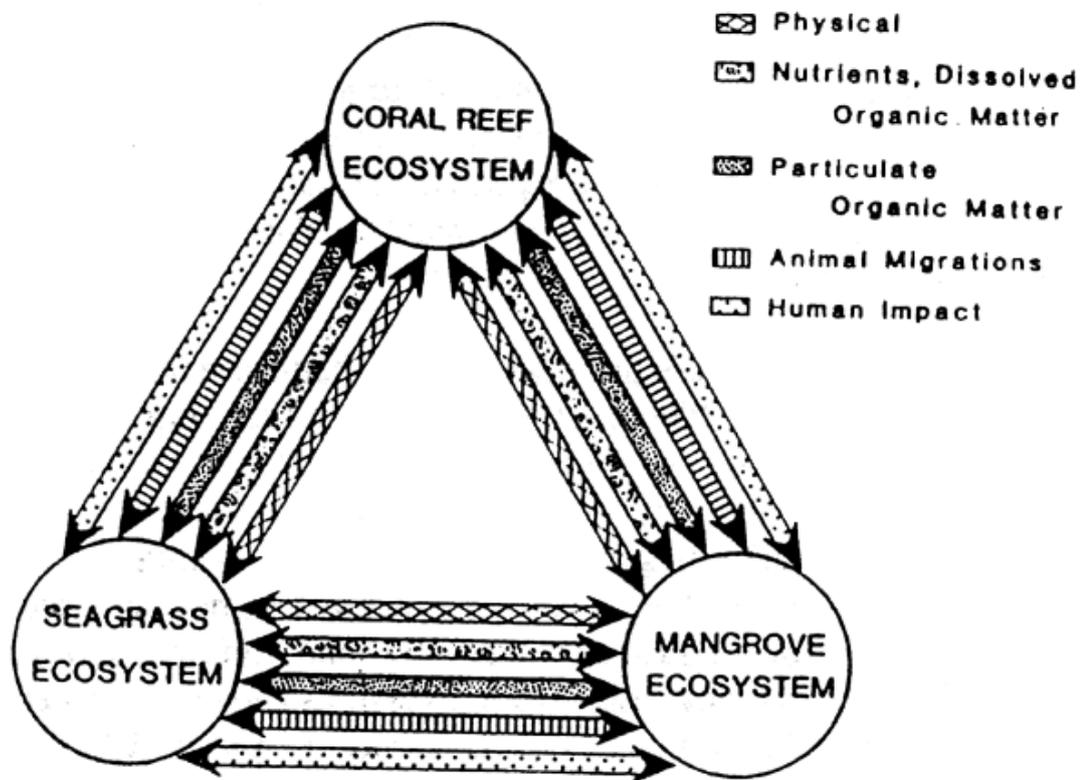


Figure 2 Interaction between coral reefs and other ecosystems (Source Ogden and Gladfelter, 1983)

The rapid decline of these marine ecosystems has an impact not only on the environment, but also on the coastal communities that rely upon them for livelihoods and income. Coral reefs support fisheries that provide protein food sources for people, as well as important tourism economies in many areas (Bunce *et al.*, 2000).

Because of the complexity of reef ecosystems and the fundamental role they play in many rural economies, the management of their resources must be based on understanding and evaluation of human use (Bunce *et al.*, 2000). Wilkinson (2002) argued that MPAs are possibly one of the most effective solutions to address, and reverse, coral reef decline. In fact, MPAs protect the reef communities from further damage (*i.e.* fishing, pollution created by tourism-related activities) and allow the corals and other reef organisms to reproduce, facilitating recovery of adjacent communities. However, he also argued that MPAs may not be enough to save the world's coral reefs. His research underlined that, although coral reefs are not experiencing loss of live coral cover, the exploitation of several species of coral fish and other key reef species is increasing. This loss could have a disastrous impact on coral reefs in the years to come (Sobel and Dahlgren, 2004).

2.6.2.3 Climate change

The ocean's waters are dynamic and play a major role in regulating the climate and the weather systems of the Earth, affecting living conditions in the sea and on land. Ocean currents flow in complex patterns and are affected by the Earth's rotation, salinity, water temperature, and wind. For this reason they are vulnerable to climate change (SPC, 2011). Coastal and marine ecosystems are threatened by climate change through acidification, melting of the Poles, sea-level rise, and changes in weather patterns and water temperatures (Hoegh-Guldberg *et al.*, 2007).

During the 1998 events *El Nino* and *La Nina* (anomalous warm and cold ocean temperatures that can cause climate changes across the Pacific Ocean), 16% of the world's coral reefs were destroyed in 9 months by an effect known as coral bleaching due to the sudden change in water temperatures. Sites like Seychelles and Maldives lost between 50 and 90% of their corals during this worldwide bleaching event (Lockwood *et al.*, 2006).

Climate change poses a threat to human welfare too. Many industries (e.g. fisheries, tourism, and transportation) that rely on the oceans for food and other resources have already been affected. For example, the Arctic cod fishery is diminishing as a consequence of the melting of the sea ice (Hoegh-Guldberg *et al.*, 2007).

2.7 MPAs effectiveness and downfalls

Many MPAs do not achieve their goals often due to high levels of corruption, easing of rules and regulations, lack of political will, insufficient funding and training, reduction of alternative fishing grounds, and scarce opportunities/alternatives for fishermen (Cinner *et al.*, 2007). Governments, especially in developing countries, use centralized manners that do not generally include consultation and participation of the resource users. Government agencies lack the expertise, and often the funds, to assess and manage resources. This can easily result in failure to incorporate popular knowledge and skills, with the consequent loss of Traditional Ecological Knowledge (TEK) (Agardy *et al.*, 2003). Loss of TEK is affecting indigenous communities all over the world (Camargo *et al.*, 2009). For example, fishing communities in American Samoa have long depended upon marine resources for subsistence and related traditional uses. Natural resources in the region were managed at the village level, and local traditional management methods were in place to protect local marine resources. However, due to the establishment of several MPAs that lack involvement of local communities, combined with cultural and economic changes in the islands (mainly due to globalisation), much of their TEK is now at risk of being lost in less than a generation (Reid, 2011).

Because of the lack of involvement of local communities, the majority of MPAs are often ineffective due to limited acceptance, understanding and support by adjacent communities (Bunce *et al.*,2000).

2.8 Local communities

The deterioration of living conditions for those communities depending on coral reefs is unprecedented (Greene, 2004). Coral reefs provide food for these communities that are generally heavily marginalized by several factors such as peninsula isolation, poverty, and lack of alternative resources (Klein *et al.*,2008).

The management of MPAs requires the combined action of a variety of groups: NGOs, governments departments, and local communities. This is defined as collaborative management. Improving of communities' wellbeing could be a secondary goal in conjunction with the goal of protecting and improving the resources (Mills *et al.*,2011).

In collaborative management TEK plays a fundamental role in the protection of the environment, but also in the understanding of the interaction between local communities and their environment. TEK underpins the choices people make about what, when and where to fish, hunt, or gather plants. Part of the TEK also includes a deep understanding of natural cycles in the environment, such as weather, climate, migration, and species interaction which, as a consequence, can ease the understanding of particular environmental changes (e.g. seasonal differences in weather, timing of mating and fish spawning) that have led to the current situation (e.g. resources exploitation, environmental degradation) (Greene, 2004). Local people have knowledge of these events, and can schedule their own activities (*i.e.* fishing, planting and collect plants, hunting) accordingly.

Conservationists and other parties involved with the protection of these areas have to rely on local people's knowledge not only to understand the human-environment relationship, but also to plan and apply effective environmental protection (Drew, 2005).

Incorporating TEK into marine resources planning means to identify marine areas and cultural sites of particular concern to local peoples. Reef sites and associated features that are environmentally sensitive, as well as other areas that are significant in a traditional cultural context, can be designated as sensitive areas. These areas can include traditional religious sites, marine eco-zones containing traditionally used marine resources, or endangered species habitat (Greene, 2004). Also, it is important to take into account that local communities' ability to understand and predict trends in their environment can benefit all the parties involved in management of MPAs. Understanding the future of the environment (e.g. prediction of changes in migratory routes, or changes in species availability) can influence local communities' behaviour,

and it can be used to investigate possible options for both communities and the environment (Lauer and Aswani, 2010).

Preservation of TEK is important for social and cultural reasons, and for resource conservation. The IUCN Program on Traditional Knowledge for Conservation summarises five practical benefits of TEK:

- Traditional knowledge may be useful for new biological and ecological insight
- Traditional knowledge for resource management is of great value
- Traditional knowledge is often used for protected areas and for conservation education
- With respect to development planning, traditional knowledge may benefit development agencies in providing more realistic evaluations of environment, natural resources, and production systems
- Traditional knowledge is useful for environmental assessment. Local people who depend on local resources for their livelihood are in good positions to assess the true costs and benefits of development better than outside researchers

Local people do have an enormous contribution to make in each of the five areas outlined above. On a more practical level, TEK can be used for mapping coral reef and other marine bio geographic features. The data collected could be used to encourage local participation, to support the local decision-making process, and to provide essential ecological information to maintain the monitoring in place. In this way local communities could empower themselves by making local decisions that could increase government resource management efforts (Breckwoldt, 2012).

Australia and America have been more successful than other countries in incorporating communities and stakeholder desire/needs into management and conservation objectives, and have had a positive outcome. In their study, McClanahan *et al.* (2006) investigated 11 MPAs between Papua New Guinea and Indonesia. The findings showed that average size and biomass of fish were higher in the areas where traditional management was in place, and that management strategies that have common goals with the local communities, and where TEK is integrated, are more successful than others.

2.9 Pacific Region

Many resources dependent communities in the Pacific are vulnerable to both anthropogenic and natural factors such as climate change, flooding, coral bleaching, and overfishing. To aggravate the situation, many are geographically isolated, and their governments lack the means to support them by protecting their environment, and developing community-based adaptation (Spalding, 2001).

The coral reef habitats in the Pacific have been greatly affected by agricultural and onshore construction projects, overexploitation of reef areas, increased siltation in bays and estuaries, growing population, and tourism. The coral reefs of the region, which support much of the coastal fisheries productions, are expected in the next decade to be degraded severely by the acidification of the ocean, the projected increases in Sea Surface Temperature, and intensification of extreme weather events (SPC, 2011).

Using their ecological knowledge, Pacific people, alike to other communities in developing countries especially the most remote, have the great opportunity to benefit scientists and non-scientists in the protection of reefs from some of these impacts, and to work towards finding alternative source of income (Spalding, 2001).

2.9.1 Fiji

The Republic of Fiji is a group of islands located in the South Pacific Ocean. Fiji's territory covers 18,274 sq. km, with a coastline of 1,129 Km. It does include 332 islands, of which 110 are still inhabited. Population is 874,742 (over half of Fiji's population is indigenous). Fiji, endowed with forests (nearly 50% of the territory is covered by natural forests), minerals (gold and copper), and fish resources, is one of the most developed of the Pacific island economies. Sugar exports account for nearly one third of the Fijian economy, remittances from Fijians working abroad (since the 1987 coups, a large number of Fijians has permanently left the country. In the last few years the remittances received by Fijians living abroad have grown fast), and a growing tourist industry - with 400,000 to 500,000 tourists per year - are the major sources of foreign exchange. GDP per capita is \$4,400. Indigenous Fijians communally own 85% of the land, and make up most of the rural population living in Fijian villages (CIA, 2012).

Fiji's industrial sector is more developed than other Pacific countries due to the provision of tax-free zones and tax-free factories. The country plays a major role for re-exports to the rest of the Pacific, and a reasonably large food processing industry that exports to other Pacific Islands Countries, and a well-established tourism industry that was built on Fiji's proximity to Australia and New Zealand (WWF, 2011).

Fiji is located in the Polynesia-Micronesia hotspot, one of the smallest hotspots in terms of land area, covering only 46,488 km². The region stretches from the Mariana and Palau archipelagos in the northwest to Easter Island (Rapa Nui) in the east, and from the Hawaiian Islands in the north to the Cook Islands, Tonga, and Niue in the south. Fiji has a high number of endemic plants (1,307), birds (109), and reptiles (25) (Dumar, 2010).

Fiji is one of the top 10 geographical locations with global significant coral system (4% of the world's coral reef is in Fiji). Fiji's marine environment comprises of ocean reefs, near-shore fishing reefs, sea grass beds, mangrove forests, lagoons and estuaries. Although low in species endemism, Fijian waters are an important migratory route for cetaceans (its territorial waters being designated a whale sanctuary) and turtle nesting (Green turtles, and Hawksbill turtle). Fiji is part of the world's richest fishing ground for tuna, contributing to about 15% of tuna catches in the Pacific region (Veitayaki *et al.*, 2011)

2.9.2 Social structure in rural communities

There are around 1170 villages grouped into 187 *tikina* (districts) in the 14 provinces of Fiji. Men usually carry out laborious tasks (artisanal fishing, agriculture, carpentry), while women carry out domestic duties (food preparation, cleaning, child rearing), and occasionally fishing (Veitayaki *et al.*, 2011).

A village has a few *mataqali*, which are sub-clans or land-owning units. Each *mataqali* has a chief, from these a village chief is chosen and from these a *tikina* chief and a provincial chief are chosen, usually along the hereditary lines (C3, 2010). *Mataqali* are commonly the land-owning units, which include a number of extended families (*tokatoka*) made up of individual households. From the different *mataqali* or *tokatoka* come the chiefs (*turaga ni vanua*), heralds (*mata ni vanua*), warriors and planters (*bati*), fishers (*gonedau*), priests (*bete*) and carpenters (*mataisau*). The chiefs and their clansmen are the traditional owners and guardians of the land, waters, and resources (C3, 2010). Each *tikina* usually has a central village where the chief resides. The *vanua* (people, culture, land, and sea), *lotu* (church), and *matanitu* (state) are the three pillars of governance in a Fijian village.

Normally each village has a *turaga ni vanua* (traditional chief), *turaga ni koro* (village administrator) and a *talatala* (church minister), who is usually an outsider appointed by the church. The *turaga ni vanua* is the most powerful of the 3, with executive powers over natural resource use. The *turaga ni koro* (TK) is chosen by the village members to coordinate the day-to-day village development and operational activities, as well as liaise with the state and other external factors (C3, 2010).

Community leaders like *turaga ni vanua* and *turaga ni koro* should guide and lead their people into the modern world, as well as look after the interests of their future

generations. Decisions are made at the weekly village meeting (generally only men are allowed) held by the *turaga ni koro*. The meeting agenda can include, for example, management of the community water or power supply, children's educational needs, and agriculture and fishery management (C3, 2010).

2.9.3 MPAs in Fiji

MPAs are spreading rapidly in the Asia-Pacific region. The Fiji Government has pledged at the 2005 Mauritius Meeting of Small Island Developing States to manage 30% of its national waters by 2020 (Bunce *et al.*, 2000).

MPAs have greatly benefited coastal communities throughout Fiji. People understand the critical importance of maintaining the health and productivity of their fishing grounds, and how these are related to all the ecosystems around them (Lockwood *et al.*, 2006). Life of many people involved with MPAs has improved. They now spend less time out fishing as the catches are more abundant due to increased prevalence of species; resources that have not been found in recent times have reappeared, and the income generated through fishing has increased (Kaplan and Levi, 2009). Rural communities have also realised the need for alternative sources of income, and are searching for different ways of using their natural resources. With the assistance of conservation partners, activities such as eco-tourism, fisheries development, forestry activities, and the sale of handicrafts have been put in place as a secondary source of income. In their study, Sinha and Bushell (2002) found that eco-tourism ventures (increasing rapidly especially on Viti Levu) can contribute to biodiversity conservation, promoting respect for natural environment and traditional culture.

Marine resource management is undertaken in various forms in Fiji's communities. Most of these communities collaborate with partners from non-government organisations (NGOs) and institutions, while others work independently or through local chiefs, officials and academics, or they learn from neighboring communities and relatives. Through training, and education (often provided by collaborating NGOs), the villagers understand their responsibilities as stakeholders. They recognize their dependence on marine resources for their livelihoods, not only in the present but also for the future generations (Kaplan and Levi, 2009).

In many cases, resource management activities are dependent on the ambitions of the communities and individuals involved and the approach adopted by the group. Local communities act to protect their marine resources that are in danger of depletion and overexploitation, and they have shown more commitment to manage their resources than the government itself. This is mainly due to the fact that the Fijian's government

and fishery department lack funding to invest in environmental protection (Muehlig-Hofmann, 2008).

At the core of these community-based resource management activities is the profound relationship between the rural people in the Pacific Islands and their natural resources (Sinha and Bushell, 2002). Fijians have exclusive customary fishing rights in their *Qoliqoli* (fishing ground), extending from the coast to the barrier reefs and some offshore reefs. The location and size of the tenured fishing grounds is based on traditional and geographical factors, and historical developments and societal (WWF, 2011). In these islands, community-based resource management is a “*Dynamic system of social interventions, shaped by local practices and influenced by a combination of internal and external events*” (Sinha and Bushell, 2002, pg. 45). For example, in certain islands, the community has developed practices to reduce and restrict fishing, collecting, and gleaning. This is where people’s knowledge, perceptions, belief, and community dynamics have an effect on their resource-management activities. This creates the need to better understand both the role played by cultural factors on the effectiveness of MPAs, and how traditional practices can address the present and future challenges faced by these communities, together with assessing people’s motives, ethics, interests and cultural notions (Kaplan and Levin, 2009). Several of these community-based projects are supported by non-government organisation (NGO) partners and are part of the Fiji Locally Marine Managed Areas (FLMMA) network, whose establishment demonstrates the recognition of community-based resource management practices (WWF, 2011).

However, in the more remote islands, FLMMA’s are still struggling for efficient and effective MPAs, and to make marine resources management more appealing to all stakeholders. Firstly, in rural villages, resource management decisions are made by a small group of stakeholders (usually the elders), the village chief, and partner organisations. The involvement of the larger group depends on how well these decisions are disseminated through the community (C3, 2010). The importance of effective communication is critical for the community’s resource management efforts. The strength of the traditional system is based on everyone observing the group’s decision. This is only effective when the entire community is repeatedly reminded and involved in resource management practice. Successful communication requires follow-up activities so that stakeholders are kept informed and consulted on issues related to the MPAs and its progress, regular visits from partner representatives, and involvement of the whole community in the planning for the future of the MPA (WWF, 2003).

Good leadership (being the *turaga ni vanua*, *turaga ni koro*, or the *talatala*) is also needed to ensure that all of the people, including future generations, are engaged with the MPA (Dumar, 2010). The role of the leaders is also to encourage people to protect

their natural resources, to prevent starvation and fight poverty, and to protect the wellbeing of future generations (Duncan and Nakagawa, 2006).

Modernisation could be seen as an obstacle to resources protection. Rural communities in Fiji (and other parts of the world) have increasingly been exposed to modernisation. For example, shifting cultivation, which provided food for consumption and social obligations, has been replaced by permanent plantations (Dumaru, 2010). European goods, cash crops, commercial activities, and wages, have now become part of the village life throughout the country transforming villages to mirror modern societies. Although island communities may not be affected by all these changes as much as communities on mainland, the dynamics of their livelihood is changing (from subsistence to income-generated) due to the increasing need for money to pay for food, commodities, transport, as well as community obligations like education and church contributions (Duncan and Nakagawa, 2006). As fishing is the main (often the sole) source of household income, fishing effort is rapidly intensifying to meet the necessity of earning more money to buy the goods. As a consequence more fishermen are using more effective (e.g. night diving is very productive as fish are asleep and therefore easy to catch) and destructive fishing methods (e.g. dynamite fishing) that are causing extensive damage to the reefs, resulting in algae and seaweed dominating some of the coastlines (Dumaru, 2010). In Macuata's Qoliqoli Cokovata (and other provinces in Fiji), where Kia Island (my research site) is located, commercial and subsistence fishing are driving people into deeper and more distant offshore areas, threatening their sources of livelihood and food (Bolabola *et al.* 2006).

CHAPTER 3: Methodology

The objective of this study was to investigate the impact of the establishment of an MPA adjacent to Kia Island, Macuata Province, Fiji, in regard to ecological, economic, and social changes occurring after the establishment of the MPA, and how the Kian community perceives these changes. Pasquaud and Lobry's (2011) identified that when conducting research involving management objectives of the environment, three key aspects must be addressed: ecology, socio-economic, and governance. These elements are of equal and significant importance in the planning, management, and success (or failure) of conservation initiatives like, for example, MPAs (Voyer *et al.*, 2011).

In this chapter I will a) introduce C3, the NGO I have collaborated with during my research, b) introduce the research site c) explain the research methodology d) justify the selection of participants, e) describe data processing and analysis, f) define research limitations.

3.1 Community Centred Conservation (C3)

My research was conducted in collaboration with C3, an NGO established in the UK in 2002. The mission of the organisation is, as reported on their website, *"To develop conservation efforts worldwide by building the capacity of local individuals and institutions through grassroots research and training initiatives"*.

C3 works closely with stakeholders, including resource user groups, government departments and private sector companies. The NGO currently operates projects in Madagascar, Fiji, and Philippines. In Fiji, C3 has two offices, one in Yaro, Kia Island, and one in Suva, Fiji's capital.

In 2010 C3 initiated a five years project on Kia, with its objectives being looking at the local conservation needs in Macuata province, with a particular focus on the Kian community; educating the community about conservation issues; exploring the Great Sea Reef and collecting data on species of importance; exploring alternative livelihoods; developing suitable alternative sources of income to sustain livelihoods, and understanding and recording traditional knowledge.

The work the NGO is carrying out on Kia is supervised by Maleli Qera (programme coordinator) and Akosita Rokomate (programme coordinator based in Suva). On Kia, the NGO focuses on presentations and workshops on ecological changes; qualitative interviews and focus groups; data analysis; documenting local environmental knowledge, and preparing publications.

3.2 Research site

Part of the Macuata province (one of Fiji's largest provinces), Kia is a small island with a monolithic rocky mountain backdrop. One hour by fiberglass boat from Labasa (the largest town on the neighboring island of Vanua Levu), Kia is the nearest inhabited island to the Great Sea Reef (in Fijian *Cakaulevu Reef*), the third longest barrier reef in the world, covering an area of 203,000 square kilometres (Fig.3).



Figure 3 The Great Sea Reef

(Source Jenkins *et al.*, 2005)

The levels of biodiversity present in the Great Sea Reef are of great importance both locally and on a global scale. A survey conducted by the WWF in 2004 revealed that the reef directly supports 55% of coral reef fish found in Fiji, 74% of the known coral in the region, and overall, 40% of the marine flora and fauna of the Fiji Islands (WWF, 2011). At least twelve species listed as threatened on the IUCN Redlist were recorded during the survey, including the endangered Green turtle (*Chelonia mydas*), and the nationally endangered Bumphead parrotfish (*Bolbometopom muricatum*) (Jenkins *et al.*, 2005).

Following an assessment of the data collected during the survey, WWF, in collaboration with the Fijian Fishery Department, and local communities, created several locally managed MPAs across the Great Sea Reef, with a particular focus on the section that runs parallel to the coastline of Vanua Levu, stretching along the shores of Dreketi, Macuata, Sasa & Mali.

The first MPA was established in 2002. In 2004, an additional 9 MPAs were added under the influence of rural communities that demanded protection for the marine environment they heavily relied upon. By 2008, the network included 25 protected and managed areas comprising 16 MPAs (among which the one subject of my study), 4 mangrove reserves, 1 forest reserve, 1 fresh water managed area, and 3 turtle nesting sites (West *et al.*, 2006).

Established in 2005, the MPA is 3 miles off the West coast of Kia, and covers 13% of the *Tui Macuata's Qoliqoli* (Macuata fishing ground). It was created in response to community identified threats, such as diminished CPUE, smaller fish, and increasing length of fishing time. The main objective of the MPA is to reduce these threats, protecting selected coral reefs where marine diversity was rapidly declining.

Known as a turtle nesting site, Kia island comprises three villages, Yaro, Daku, and Ligau. Due to Kia's proximity to the Great Sea Reef, and the interaction with its people and the marine environment (Kians are heavily dependent on fishing for both dietary protein and source of income), Kia (encircled in black, Fig. 4) was recommended by the University of the South Pacific (in collaboration with C3) as a priority site for ecological and social research.

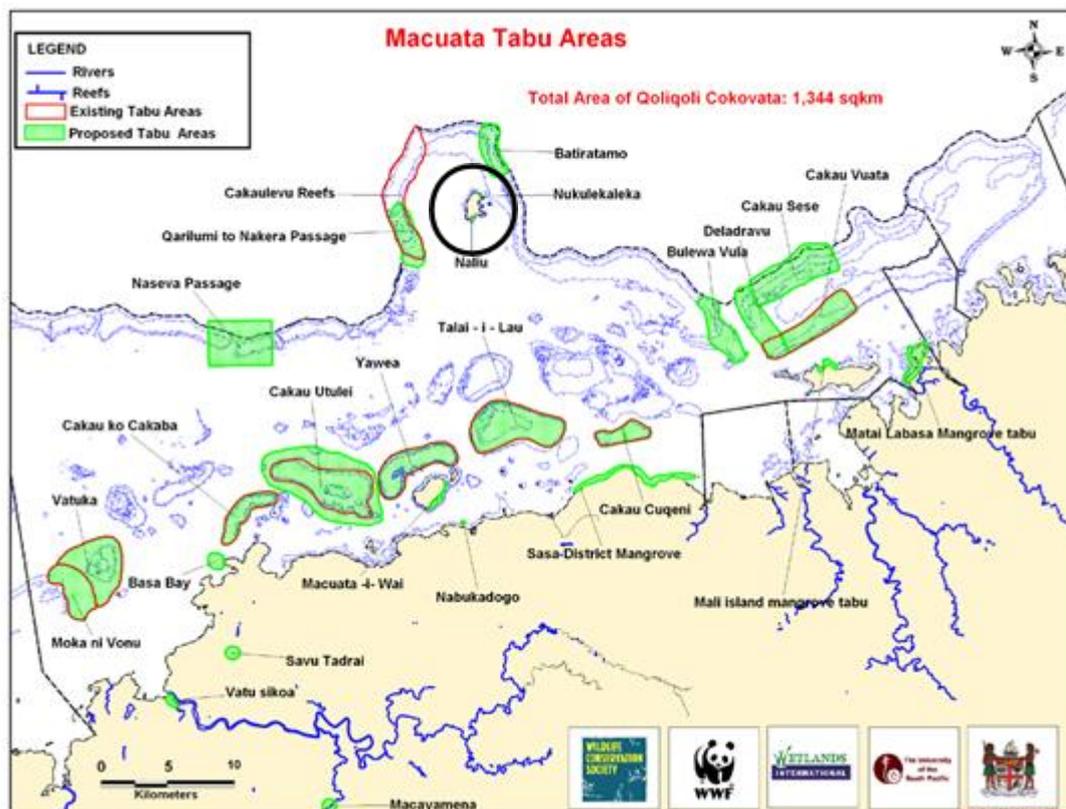


Figure 4 Macuata Tabu Area

(Source WWF, 2011)

Kia (Fig. 5) is one of the 37 villages from five districts of the Macuata province involved in the development of one of Fiji's first MPA networks, which aims to protect 30% of Fijian waters by 2020. The *Tui Macuata's Qoliqoli* covers an inshore area of 1,344 km², stretching from the mouth of the Dreketi River, to Korotubu in Sasa and to the islands of Kia and Mali, and bound to the seaward side by the GSR (WWF, 2011).



Figure 5 Kia island (Source C3, 2010)

With a summit of about 300m, approximately 2 km² of land, the small, ruggedly steep island of Kia has a total population of 262 split between three villages; Yaro on the South-East side facing Vanua Levu and Labasa; Ligau, located in the sandy bays of the South-West coast; and Daku, on the North-West side (both villages facing the MPA). Yaro, the most recently established village, is the most populous, with 152 inhabitants.

The elders tell the story of their ancestors:

“300 years ago Kia ancestors settled in Ligau on the hill overlooking the (reef) passage on all sides of the island so that they were able to see if there was any (enemy) ship coming through. This explains the presence of the canon on top of Ligau Hill which was used as a weapon then. Time passed and some of the ancestors separated and went to settle in Daku Village. Therefore, Ligau and Daku were the only two places where early Kia settlers settled in. Several years later, when war were still strong in the province of Macuata, a group of warriors from Mouta declared war upon themselves which affected

the whole coastal villagers down south including Kia. This triggered another separation on the island, and Yaro was established. Therefore, that separation of villages have existed until now” (village elder in conversation with Losalimi Loloma, C3 program coordinator, recorded as part of an informal conversation, 2013. Direct translation).

3.3 Research methodology

A qualitative research methodology was adopted for this research, using face to face semi-structured interviews and focus groups.

Although competency levels for spoken English are high among the community, the technical language of the questions rendered the need for translators throughout the research. The main translator for this project was Maleli; however in few occasions either C3 staff or students from USP (University of the South Pacific) who have fluent spoken and written English and Fijian, and experience in social research, would act as translators.

The choice of methodology was driven by the necessity to adopt a research strategy which facilitated the collection of data that not only documented the perception of stakeholders, but also gave respondents the opportunity to express their views on selected issues (White *et al.*, 2005). Semi-structured interviews were chosen because a) while providing a guide to be followed by the interviewer, they allow for opportunities to follow topics that may stray from the interview guide (Vaccaro *et al.*, 2010), and b) as the most suitable tools for studies involving stakeholders in environmental management (Berg, 2001) where the amount of information held by resource users (*i.e.* understanding of the surrounding environment, knowledge of their resources, or harvesting techniques) plays a central role in resource management assessment (Neis *et al.*, 1999). Semi-structured interviews are more flexible than, for example, structured-interviews; open ended questions found in semi-structured interviews create a two-way conversation, with discussions and follow-up questions on each point, meaning stakeholders are encouraged to reveal, for example, more about themselves, or express their opinion in full (Babbie, 2011). Using this technique can bring in new ideas for the researcher, as the participant may discuss something which the researcher had not previously considered related to their research. As the interview is informal, participants may feel a lot more at ease in the situation. This can help to build a relationship of trust with the researcher which may encourage a greater degree of honesty in the answers, providing the researcher a more accurate view of the research (Newing, 2010).

Specifically for this research, a semi-structured interview (Appendix Ia) was used to collect information on perceptions of the effects of the MPA on the environment, and whether any social changes (e.g. financial, at community level) had occurred as a

consequence of its establishment. The interviews were guided by a predetermined list of questions. The wording of questions was kept short and easy-to-understand, avoiding technical terminology to simplify the process of translation and to avoid misunderstanding. Questions like, for example, “*Have you noticed any change in species, size, and population density since the establishment of the MPA?*” that encouraged informants to compare and contrast as a mean of analysis were used, while leading questions, like for example “*What marine species have reappeared since the establishment of the MPA?*” were avoided. Prior to preparing the interview schedule of the interview, I analysed secondary data (collected and provided by C3 between 2010 and 2011) on community perceptions of terrestrial and marine resources (Appendix Ib) and coastal activities (Appendix Ic).

I made use of the fishery data (Appendix II) from C3 to investigate changes in fish population, species richness, and abundance. Resources perception data was further explored in the interviews as I wanted to understand the reasons behind people’s opinion on their resources, while coastal activities data was integrated in a number of interview questions. The interviews were developed in-line with SEM-Pacifika, a socioeconomic monitoring guideline for coastal managers in Pacific Island Countries that both the University of The South Pacific and C3 have employed to conduct previous research on Kia. The questions were designed to elicit the perceptions and attitudes of the fishermen towards the present, past and future status of their reefs and fish stocks and towards the use of MPAs as a coral reef management strategy (Kronen *et al.*, 2007). The goal of SEM-Pacifika is to improve site management of the coastal and marine areas in the Pacific region. It aims to gather information such as cultural, social, economic and political conditions as well as information on households, groups, communities, and resources. It is a method of gathering information about individuals, communities and common topics such as resource use patterns, resource governance, demographics, stakeholder characteristics and perceptions, and local knowledge (Wongbusarakum and Pomeroy, 2008).

Interviews were divided in four sections. Demographic defined age, gender, household size, primary source of income, and frequency of fishing trips on a weekly basis. The Coastal and marine resources section, focused on changes in harvesting methods, fishing locations, fish price, outsider’s access to the MPA, and gender role in the community.

The third section focused on Threats, such as perceptions of the condition of terrestrial and marine resources. This section follows from the findings of previous research on socio-economic assessment of the island fisheries conducted on behalf of C3. This study explored the physical and ecological background to marine resource degradation using socio-economic surveys to quantify fishing practices of the island, and analysed

stakeholder's current attitude towards the environment (both terrestrial and marine) (Hauzer *et al.*, 2007).

The fourth section, *Management* explored participant's knowledge of MPA ownership, their general opinion on the MPA (e.g. ecological benefits) and on the process of its establishment. Like other South Pacific Islands, Kia has customary rights over near-shore waters and reefs, with the fishing ground (Qoliqoli Cokovata) extending from the shore for 5 miles. The management of the MPA is promoted at community level, and the fishing area is owned by the *Tui Macuata* (chief) that regulates its use. Those wishing to use the fishing ground must seek permission from the Tui Macuata, and anyone caught breaking the law or found to be infringing upon the rules would be punished directly by the community (e.g. their boat confiscated, or other sanction applied), reducing the need for formal enforcement. The usefulness and utility of investigating stakeholders' knowledge of MPA ownership is to understand their level of acceptance of the MPA regulations, and people's commitment (and willingness) to protect the area.

Data collection through interviews was complemented by three focus groups. The primary purpose of the focus groups was to reach all the stakeholders that could not be interviewed individually (for example due to lack of time, or fishermen preferring group interviews instead of a one-to-one), but also to bring out contrasting views, encourage reflection and encourage participants to state the reasoning behind the views they expressed (Berg, 2001). Bringing together a group to discuss a particular topic provides a more natural setting than one-to-one interviews; it allows participants to share their stories and through discussion can enable new strands of thought to emerge, allowing a more in-depth exploration (Vaccaro *et al.*, 2010). This approach had already been tested successfully during previous research conducted by a group of students collaborating with C3 to evaluate possible alternative livelihoods on Kia.

Forty-one semi-structured interviews were conducted between January and April 2012, in the three villages of Kia: Yaro, Ligau, and Daku. Three focus groups, comprising of 4 to 5 participants each, were conducted between March and April 2012 in the villages of Daku and Ligau.

3.3.1 Justification of participants' selection

A list of potential stakeholders suitable for the research was prepared in collaboration with Maleli Qera. His work with C3 requires constant interaction with the community on Kia, therefore his input on creating the list of participants was crucial. He knew which stakeholders would be keener to participate the research, and those that would not agree. He suggested the specific fishermen for the pilot interviews because "*although not experienced fishermen they would be more than happy to participate in your research and share anything they know*".

Stakeholders were selected on the basis that they had been resident on Kia long before the establishment of the MPA subject of this study. The reason for choosing stakeholders that have spent most of their life on Kia was to capture their experience as fishermen, and their knowledge of the marine environment (*i.e.* species diversity, fishing locations, and spawning seasons) and fishing practices. The list included fishermen of both genders, ranging from the age of 19 to 60, from all three villages.

3.3.2 Data collection

The initial few weeks on Kia were spent approaching stakeholders to arrange dates and times for interviews. However, on many occasions, this proved to be of little use as Kian's do not share the same cultural approach to time as, for example, we do in more developed countries. As a result, the pre-arranged meetings were often delayed or cancelled due to non-attendance of participants. Surveying depended heavily on the availability of the primary fishers, who were usually absent during the day. In order to ensure interviews would take place with no further delays, it was decided with Maleli to approach the stakeholders at particular times of the day when, for example, they were not busy with other activities (e.g. immediately after returning from a fishing trip, in the evening after a church function, or on a community day, when only few fishermen go out fishing for the community), and to arrange the interviews at short notice. Living within the community throughout the research period provided an opportunity to establish a relationship and build rapport with the villagers, which proved to be advantageous during the interviews as participants were observed as being more at ease.

In Yaro, where the majority of participants lived, interviews were conducted in the C3 office. The office is strategically located at the centre of the village, in front of the local shop. People (mainly men) in Yaro socialize at the C3 office daily, and it was easier to arrange meetings and interviews, sometimes with interviews happening without prior arrangement. Interviews with women were arranged in the comfort of their houses. This was in order to allow women to carry on their domestic duties like, for example, looking after their children, or cooking.

Maleli explained that throughout his time on Kia (originally from Koro Island, Maleli has been living on Kia since 2010 as a C3 employee) women have showed interest in the work C3 is conducting on the island. However, their level of participation has been (to date) little, mainly because they are not greatly involved with fishing activities, which are the main focus of the work of C3. Furthermore, women are not accustomed to expressing their opinions on issues regarding the village or the community; Maleli believed this to be the main obstacle to having women more involved in the village life, and the work C3 is undertaking on the island.

In Daku and Ligau, where C3 does not have an office, interviews would normally take place in the participant's house. With Daku and Ligau being on the other side of Kia, it was nearly impossible to pre-arrange any interviews, as people from these villages did not come to Yaro frequently. As there were fewer fishermen in these two villages, I and Maleli completed the interviews over four days.

Participants were introduced to the scope of the research with a brief statement (Appendix Ia), and reassured that none of the information provided would be disclosed with local authorities. Confidentiality was fundamental to this research; not only to build trust between myself, C3, and the Kian people, but also because some of the participants were rather shy, and needed to be put at ease and ensured that their opinions would not be shared with others. Interviewees were asked for their consent to be recorded via (dictaphone) during the interview, to use their pictures taken during the research, and that they were happy for results to be anonymously shared with the community and third parties (e.g. universities, C3, scientific journals). Respondents were given the opportunity to decline to answer individual questions.

3.3.2.1 Pilot interviews

Three pilot interviews were run with less frequent fishermen from Yaro to test the suitability of the questions, and to eliminate any possible bias (*i.e.* the questions being closed-ended). An assessment of the pilot interviews was produced and analysed and discussed with Maleli. The outcome of the analysis showed that a small number of questions, and words, were either irrelevant or not comprehensible to participants, and therefore needed rephrasing. For example, one of the initial questions "*Do you own your own boat?*" was removed from the questionnaire. We realized that it was irrelevant to the research as there are only few boats on the island, and the owners were mainly older fisherman that rented their boat and no longer went to the sea for fishing purposes. There were also problems with translating the concept of resource rights and formal tenure from English to Fijian, as stakeholders were not familiar with the lexicon. Maleli had to explain this further to the majority of stakeholders, although the relevant question was simplified. The pilot interviews were around 1 hour 30 minutes long, but the time frame needed to be re-considered; participants felt the interviews were tiresome and time consuming, preventing interviewees from selling their daily catch and enjoying their free time relaxing. For this reason, it was agreed that interviews should not last longer than one hour but more time would be permitted where necessary if the interviewees wanted to continue because they felt they had important information.



Figure 6 First pilot interview with Maleli and Tulipai in C3 office, Yaro (Source Stalio, 2012)

During the interviews participants (Fig. 5) were encouraged to introduce new information they may have felt relevant to the research. For example, one participant, although a retired fisherman for some time, was appointed as ‘official consultant’ in the establishment of the MPA, and the information he provided was significant to the research scope. At the end of each interview, the stakeholders were given the opportunity to add anything they felt was relevant to the research. This approach unwittingly resulted in a snowball sampling, with some of the participants spontaneously suggesting suitable candidates for the interviews, according to their experience in fishing. In this way, participants felt they could further contribute to my research.

At the end of each day, the interviews were uploaded from the dictaphone to a laptop computer, played and transcribed using the Key Informant Interview template in Word format (Appendix Ia). Transcribing the interviews at the end of the day proved to be crucial not only at practical level (there was not always electricity), but also to record ‘fresh’ opinion and information that sometimes the participants would only release after the interview because *“I just forgot to mention that...”* or *“I would like to add something”*, or when the dictaphone was off.

3.3.3 Analysis of semi structured interviews

While still on site, a preliminary analysis of the data collected was carried out. Once interviews were transcribed, the data was clustered in an excel spreadsheet and divided into categories: demographic (e.g. age, gender, village), economic (e.g. sources of income), ecological (e.g. coral reef status, population density), and social (e.g. change in women roles). The data was subsequently sent electronically to Ako Rokomate and The University of Kent for reference and backup purposes. The spreadsheet proved to be a valuable visual aid to initiate preliminary data analyses, and to produce drafts of the charts and tables later included in the Results chapter.

Upon my return to UK the data was analysed using Nvivo 10, a qualitative data analysis software, often used in social research. The interviews (including the three pilots) were uploaded to Nvivo in a Word format. The material was gathered into topics (the so-called *child nodes* on Nvivo). An initial list of 101 child nodes was created, and reduced to seventy nodes. These were subsequently grouped in nine parent nodes (a parent node is an aggregation of child nodes with similar attributes such as child nodes Age, Gender, and Villages being clustered under the parent node Demographic): 1) changes in fishing routines, 2) demographic, 3) ecological changes after the MPA, 4) financial, 5) involvement of WWF and the government, 6) outsiders, 7) overall opinion on MPA, 8) regulations, 9) social changes after the MPA. The data organised by Nvivo showed, for example, where two or more themes occurred together consistently, suggesting a cause and effect relationship. The software was also used to identify patterns and frequency of a theory, or an opinion, which are further discussed in the Results chapter.

3.3.4 Focus groups

The intent of the focus groups was to target those stakeholders that could not be interviewed individually in Daku and Ligau. A list of more generic questions for the focus groups was extrapolated from the semi-structure interviews (i.e. change in fishing locations after the establishment of the MPA, ecological knowledge of spawning areas, marine species distribution, and MPA boundaries), also including participatory mapping. As suggested by Fagerholm and Kayhko (2009), participatory mapping (defined as the production of a map undertaken by a group of individuals to show information relevant to a research) has been used for many different purposes, especially for natural resource management, and to collect indigenous and cultural knowledge. Recording traditional knowledge is important for resource management. Local people who depend on local resources for their livelihood are in a good position to assess the true costs and benefits of development. Their knowledge of the local area is a crucial aspect of any impact assessment (Calamia, 1999).

Participants were divided in three groups of four to five people (sometimes fishermen would leave or join the groups) mixing young and older fishermen, so as to provide different opinions based on experience and/or knowledge. Participation in the focus groups was on a voluntary basis; this ensured all contributors had knowingly consented prior to participation, and that they were aware of what the focus group discussions would entail prior to commencement. Participants were told that they were able to withdraw at any time, that their identities would be withheld, and that replying was completely voluntary during the sessions. There was no time limit allocated for focus group sessions. In previous focus groups conducted by C3 and previous research students, it was observed that setting a time limit to the focus groups was disadvantageous, because discussions among participants had to be interrupted due to time limitation (Vaccaro *et al.*, 2010). For this reason a time limit was not imposed. Furthermore, without a time limit, participants would speak at their own pace, without feeling the pressure of making a quick contribution to the group.

Participants were introduced to the scope of the research, asked permission to record the discussion with a dictaphone, and it was agreed that the outcome of focus groups in conjunction with the collective interview findings would be shared at a later stage with the community. The focus groups were facilitated by myself and supported by Maleli, or a translator from the University of South Pacific. The participants were provided with paper and markers as they were asked to draw the coral reefs adjacent to Kia, the boundaries of the MPA, and the fishing locations where they fished before and after the establishment of the MPA (Fig. 6).

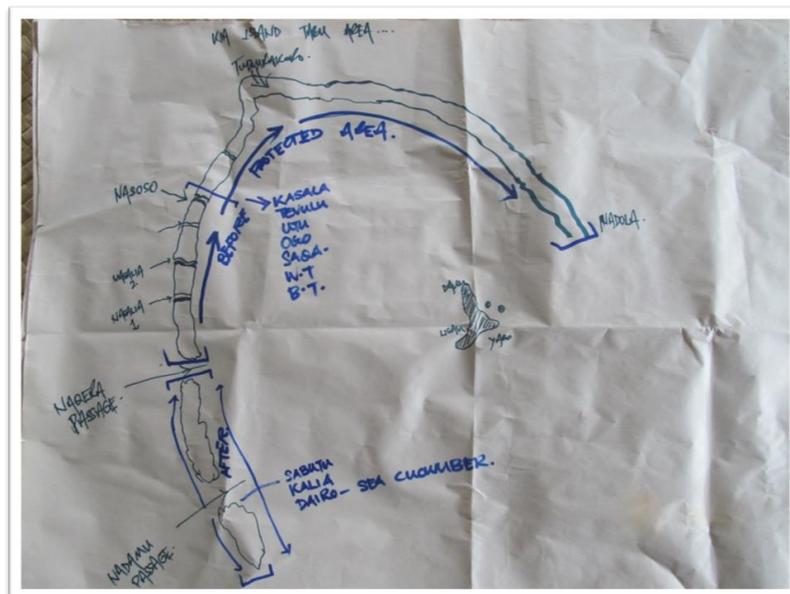


Figure 7 Reefs surrounding Kia, focus group conducted in Ligau, Kia

(Source Stalio, 2012)

Stakeholders expressed their view on the benefits and the difficulties of fishing in new locations, as the MPA encompasses the majority of reefs surrounding Kia (Fig. 6 reefs labelled 'before' is where people used to fish, and the ones labelled 'after' is where they currently fish). Stakeholders also named what fish species were found and at which locations. At the end of each focus group the conversations were uploaded from the dictaphone to a laptop computer, played and transcribed to a Word document. Nonverbal communication, such as gestures and behavioral responses, in addition to the way members of the group used words and the tone with which words were used, were also recorded by myself as participatory observations on a notebook. These data were used to support statements and opinion expressed during the semi-structured interviews, but due to the small number of focus groups, further analysis was not conducted.

I opportunistically participated in six focus groups ran by another research student (Fig. 7) on possible alternative livelihoods on Kia, to better understand the Kians perception of the future of their marine environment, and to evaluate the level of awareness among people of what the future holds in terms of a source of income (*i.e.* exploitation of marine resources will eventually lead to stock depletion).



Figure 8 Focus group on alternative income, Ligau

(Source Qera)

Two focus group sessions were conducted in each of the three villages of Kia, one each for men and women, without distinction of age. Due to women being increasingly involved in the fishing effort (especially for commercial purposes) on the island, it was felt by the researcher an important step to equally hold both male and female focus group sessions in order to build accurate representation, and to allow participants to speak openly and freely in groups where there was an assumed level of comfort, with the benefit for the research to identify any trends among male and female groups.

The focus groups were initiated with a warm-up activity, where the participants were asked to think the way people on Kia used to live fifty years ago (e.g. source of income, food, and environmental changes), and what may have changed compared to now. The discussion provided a broad understanding of the social changes Kians (likewise for other rural communities in the Fiji Islands) are going through to adapt to modernisation. Once this scenario was set, the participants were asked to imagine themselves in fifty years' time. Questions such as "*Will the fish stock last for future generations?*", "*Are people preoccupied about their future?*" "*Is there any feasible source of income apart from fishing for the Kians?*" were then discussed. Although I did not include the results of these focus groups in my research, I was interested in their outcome. Understanding if stakeholders were aware of the risk of fish stock depletion, for example, would have helped me in analysing my data on perception of the MPA or, for example, how the stakeholders see the future of the MPA and their dependency on fishing for income.

Data collected from these focus groups was recorded using a dictaphone, and transcribed on a word document. The results and discussion were made available online by C3 in November 2012.

3.4 Participatory observations

During the research period, my time was spent living within the community on Kia, meaning that I participated in their daily activities, and adapted well to their way of living. A 'grog session'¹ (Fig. 8), fishing trip, or a long ride to Labasa, were opportunities that not only helped me understand the community's social and environmental realities, but it also allowed me to record extra information in the form of a personal diary (e.g. recurrent themes found in interviews, biases, personal considerations), which proved to be beneficial in adding an extra element of depth and understanding to the collected data.

¹ Grog is a drink made by pounding sun-dried kava root into a fine powder and mixing it with cold water, and it is drunk from the shorn half-shell of a coconut, called bilo. Traditionally only men are allowed to grog sessions, and they usually are held outside, during the day, and in the community hall at night upon the return from fishing trips. On a few occasions, like for example on Easter Day, the C3 crew was invited to participate.



Figure 9 Seba and cousins during grog session on Easter Day (Stalio, 2012)

3.5 The constraints of working on Kia

Research in remote locations like Kia present several problems (i.e. social, technical, and practical) that need to be considered as part of my methodology.

- Lack of a reliable source of electricity on the island, meant the electric appliances were recharged through a generator that runs in the evening for few hours (not every day, and depending on the fuel availability). The work that needed to be conducted using a computer (i.e. reading reviews, methodology, scientific papers, etc.) was often delayed.
- Weather conditions limited mobility. Due to rain/strong wind (rainy season is between January and April) I was not able to reach Ligau and Daku for the whole month of January and February, causing the interviews to be conducted mainly in Yaro.
- Kians attitude towards time proved to be a great obstacle. In fact, people on the island have no awareness of time, nor need to be (apart from church functions). Fishermen would go out fishing, come back, eat, sell their fish, eat again, and start grog sessions. Initially, interviews were delayed, or needed to be re-arranged simply because the “*I will see you when I am back from fishing*” meant long hours of wait for the fisherman that would never show up.
- The quality of the translations depended on a number of factors, some of them beyond my control. Although carrying out pilot interviews in order to deal with translation-related problems, direct translation quotations was not always achievable, as comparability of meaning was not possible.

- Maleli plays an important role within the community. He has helped many villagers to obtain benefits such as (for example) a bank account, and study certificates, and he is therefore respected by everyone on the island. For this reason, I suspected that participants may have been indirectly influenced by Maleli's role as C3 representative, and may have not been entirely honest during the interviews (e.g. not saying they go fishing in the MPA, or expressing only positive thoughts on the benefit of the MPA).

The qualitative data obtained through the semi-structure interviews will be presented in the following Results chapter, and further discussed in chapter 5 (Discussions).

CHAPTER 4: Results

In this chapter the data has been divided into six sections: demographic, financial, changes in fishing routines, ecological changes, perception of the MPA, and future generations.

4.1 Demographic data

Household numbers change from villages in Kia (table 1). The average size of a household varies but ranges from 4 to 10 or more. Household structure also varies greatly, as sometimes children live with their uncles/aunties, or other relatives. Throughout the year, the population of Kia fluctuates depending on the festive season (*i.e.* Christmas, Easter), and events such as bazaars, weddings, and funerals, when people travel to and from the mainland. Consequently, the population on Kia is at its peak during the Christmas and Easter holidays, when residents are joined by relatives living on the mainland or other islands, to celebrate the most important days in the Christian calendar (*i.e.* Palm Sunday, Maundy Thursday, Good Friday, Easter, Pentecost, Advent, and Christmas). This also corresponds to the school holidays, when teenagers schooled on the mainland return to Kia. For Fijians, who were converted to Christianity at the end of the 19th Century when Great Britain took possession of the island, holidays like Christmas and Easter are not only significant for religious purposes but also because families are reunited. Fijians give great importance to the family unit, the village, and the vanua (land). Traditional Fijian society is based on communal principles derived from village life. People in villages share the obligations and rewards of community life; they fish together, work together in the preparation of bazaars or other events, and they all help in communal activities such as the building of homes and maintenance of the village communal spaces such as the community hall, gardens, and church. The advantage of this system is an extended family unit that allows no-one to go hungry, be uncared for, or unloved. Ideally it is an all-encompassing security net that works effectively not only as a caretaking system but also by giving each person a sense of belonging and identity (Veitayaki *et al.*, 2011).

Table 1 Population distribution across Kia

Village	Population	No. of households	No. of males	No. of females
<i>Daku</i>	40	6	18	22
<i>Ligau</i>	80	17	44	36
<i>Yaro</i>	142	27	82	60
<i>total</i>	262	50	144	118

(Source C3, 2011)

Seventeen percent of the people approached agreed to take part in the research, fourteen percent of which were women.

Eighty percent of respondents were from Yaro, five of them women. Eight percent were from Daku, one of them was a woman, and twelve percent were from Ligau (no women from Ligau participated in the research).

4.1.1 Age

Age in Fijian society is significant. Societal respect is based on three main concepts; age, sex and social distance. However, it is not the age in number which is important, but seniority. The older a person is the more respect they command, regardless of sex or social rank (Thomson *et al.*, 2009).

For this study, participants were divided in five age groups (Table 2). In Yaro participants belonged to all age categories. In Ligau only participants from age groups c and d (ages 40-49, and 50-59 respectively) took part in the research, while in Daku participants' were from age groups b and c (30-39 and 40-49 respectively).

In relation to gender, males (representing 86% of the total participants) had 21% belonging to group a, 32% of respondents belonging to b group, group c accounted for 21% of the participants, group d comprises of 24% respondents, and group e had 3%. Four male participants did not know their exact age, so categorisation fell as a 'best guess'.

Of female participants (6 in total), 33% of women belonged to group b, 50% fell within the c group, and 17% of participants were in the d group. No women were recorded in the a group.

Table 2 Age groups of the participants

Group	a	b	c	d	e
Age	19-29	30-39	40-49	50-59	60-69
Males	8	12	8	9	1
Females		2	3	1	
Totals	8	14	11	10	1

4.2 Financial data

Like other rural communities in developing countries, Kians still lead a traditional subsistence-based livelihood, the *Kaivit'* way (the subsistence village lifestyle), communally drawing on local marine resources for their income (Aalbersberg *et al.*, 2005).

4.2.1 Primary income

Fishing is the primary source of household income for all participants. All 44 participants (17% of the entire population of Kia) are breadwinners; 17 respondents are the single breadwinner in their family, while the remaining 27 are part of an 'effort combined' group of breadwinners, working alongside parents, siblings, children, and spouses. One woman from Yaro is the only breadwinner in her family; her children are too young to go out fishing, and she has decided not to receive any benefit from government, unlike other women on the island. However, the importance of family and relationships in Fijian society means her brother and nephews occasionally assist her financially, sharing with her and her children part of their income and catch.

Participants were asked if the frequency of their fishing trips and the size of the catch have changed after the establishment of the MPA. Ninety percent of the participants responded "*It depends on the weather, not on the MPA (directly)*". Weather (*i.e.* rain, wind, roughness of the sea) has a direct impact on everyday Kian life, influencing the frequency of fishing trips, daily catch, trips to mainland, location of fishing, fish species, etc. Sixty percent of participants stated that, because of the MPA, the fish catch is more abundant, although they spend the same amount of time at sea as they used to prior to the taboo area being established. This means they are now in a position where they can decide how often and for how long they will go out fishing; a 'luxury' that they could not afford before the establishment of the MPA. As a result, income can vary greatly, depending on the daily catch. Seventy seven percent of the respondents believe their finances have increased after the MPA, and eleven percent believe they are earning less money now (Fig. 10).

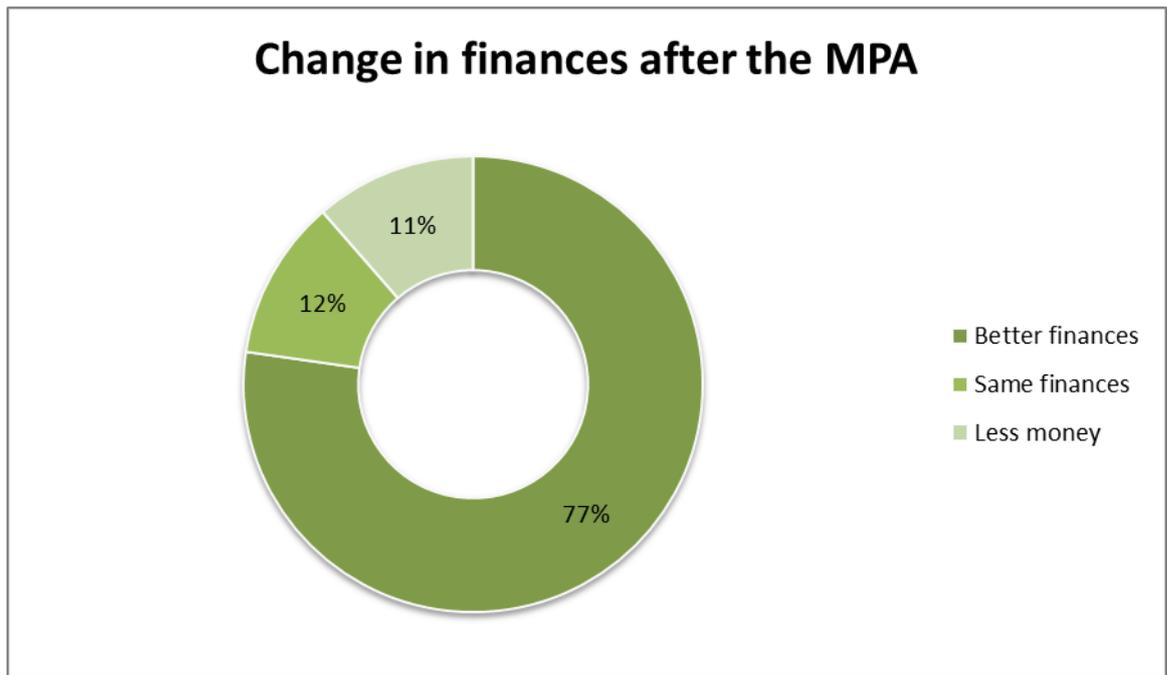


Figure 10 Change in finances after the MPA

Twelve percent of the respondents believed that there has not been an increase in income after the establishment of the MPA, and respondent 14 mentioned that *“There was an increase in the money we make when we first opened the MPA (2/3 years after its establishment). But now, the money we make is the same”*.

Fifty percent of respondents that believe their income is lower now also stated that the cost of living (e.g. petrol, staple foods) has lately increased, in addition to the ‘financial commitments’ they have with their church, towards the island’s chief, and their children’s education.

Eighty seven percent of the respondents agreed that when the taboo is lifted, is the time they make more money. During this time, people go out fishing several times per day, and for longer periods, therefore fish catches are greater, fish size is larger, and number of fish species more numerous. This is possible because fishermen, being at sea for longer time, can select their catch. As respondent 17 mentioned, *“Because there are more big fish after the establishment of the MPA, and we can get more money. So, for the same amount of time I spend fishing, I get more money. Also because the size of the fish I can catch is bigger”*.

4.2.2 Secondary income

Only few families on the island have a secondary source of income. Selling goods is the second source of income for 9 families (7 from Yaro, and 2 from Ligau). Three of these families have 'canteens', 1 in Yaro and 2 in Ligau. A canteen is the local shop, where basic goods like household products, staple food such flour, rice, crackers, canned meat, and tuna are sold. The goods are purchased with the fishing generated income, and usually bought in Labasa at wholesale price, and re-sold in Kia at higher price. The remaining 6 families sell cigarettes, suki (a Fijian term for tobacco leaf, generally rolled in newspaper or, more traditionally, dried pandanus leaves rolled into cigars and smoked), and kava (*Piper methysticum*). One family sells pigs (a pig can cost 250 Fijian dollars, which can be the equivalent of 2/3 days spent fishing out in the sea). Four of the participants have other sources of income: pension, rent from properties on mainland, or taking passengers on boat trips (for both fishing and travelling to mainland). Weaving was mentioned as secondary income by 3 of the women participants (all over 40). For weaving, pandanus leaves are traditionally used to produce mats, fans, etc., to be sold on Kia and in Labasa.

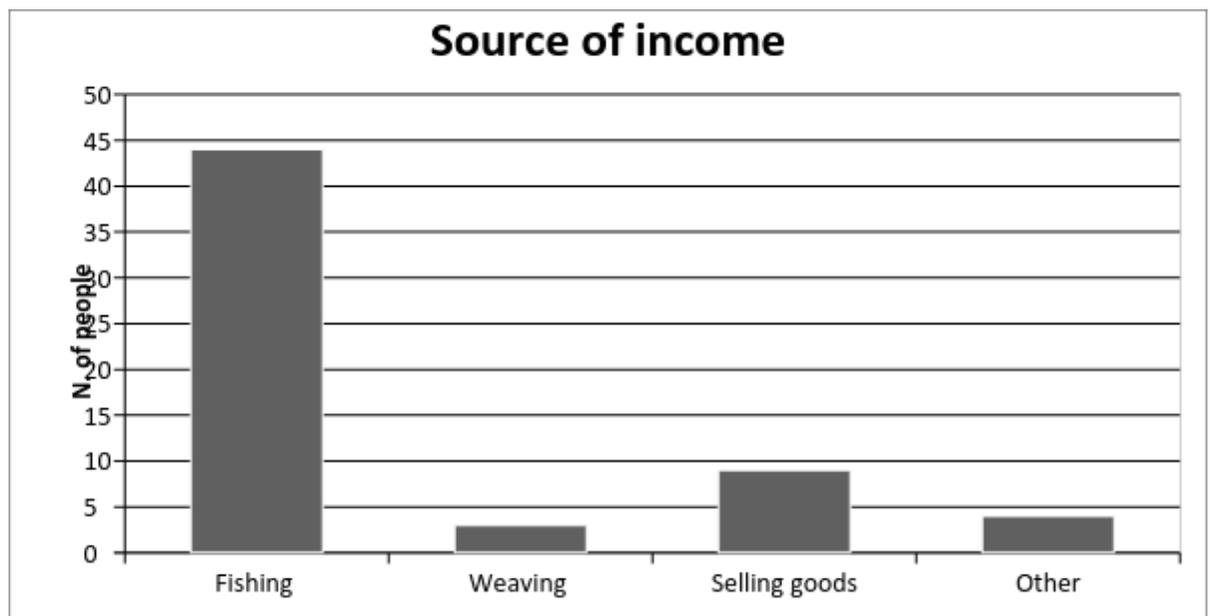


Figure 11 Source of income

Within recent decades, the introduction to Kia Island of middlemen (more commonly referred to as 'fish agents', the middleman between the Chinese company that export the fish from Kia to the Asian market, and the fishermen on Kia) who buy fish directly from the local fishermen to sell to the markets on the mainland and/or to fishing

companies, has seen the provisions which are collected from the Great Sea Reef that surrounds Kia become a major income-provider for Kians, influencing a shift from a community deriving their livelihoods from the land and fishing for sustenance purposes, to a community engaging in fishing to secure primary income generation. Now approximately 80-90% of the catch is sold to the fish agent, while the remaining catch is sold at the Labasa market on Saturdays. Fish sold includes protected species like the Humphead wrasse (HHW), which is illegally fished and sold via the local agent in Kia who is also the fishing warden and WWF representative.

Opportunities to earn extra money or other sources of income are scarce on Kia, as in other islands in the Pacific (Turner *et al.*, 2007), but it is important to analyse and undertake these scarce opportunities as they may be replacing fishing in the near future. The series of focus groups conducted on alternative livelihoods on Kia, to which I opportunistically participated, revealed that Kians are aware that fish stocks, although partially protected by the MPA, may not last long enough for future generations to benefit from, and that feasible alternatives to income must be created and initiated in the nearer future.

Women involved in the focus groups recognised that handicrafts (*i.e.* home decoration, mats, jewellery, kava bowls) was the most feasible source of income for them, followed by farming (both poultry and vegetables), and bakery. Poultry and vegetable farming are already happening on Kia island, but they are not considered as a source of income. In fact, both poultry and vegetables are for personal use. Activities such as poultry farming, seaweed farming and vegetable farming were elected among the top three feasible activities decided upon by both male and female focus groups, which demonstrated that these activities would be successful in involving a broad range of community members.

Discussions involving the instalment of a village bakery took place in both male and female focus groups conducted in Yaro, the female focus group held in Ligau, and the male focus group held in Daku. It was prioritised as one of the most favourable business ventures by the women of Yaro, and one of the third most favourable business ventures by women of Ligau, men of Yaro and the men of Daku. Its favourability among a variety of participants, both male and female, demonstrated that if implemented this activity would most likely be successful in involving many different members of the community.

Beekeeping as an alternative activity was one of the most discussed ventures in four of the focus group sessions held. It was selected as one of the most feasible ventures by one focus group.

Although alternative source of income are not strictly necessary at the present moment, fish stock availability is not something easily predictable, and if amount of people fishing (and moving to Kia to fish) keep on increasing, soon there will be need for some sort of substantial secondary income to ensure Kians can sustain their lifestyle.

4.3 Changes in fishing routines

The establishment of the MPA means that some of the reefs Kians once used to fish are now protected. This has forced the fishermen to select different reefs, sometimes in more remote locations.

4.3.1 Locations

It emerged from the focus groups I conducted that after the establishment of the MPA fishing locations changed. There are two main reasons for which people now fish in other areas:

1. The MPA is now protecting the most bountiful reefs that once suffered from overfishing
2. Fishermen now use different locations, where *“We never used to fish before, because there was not fish. But now, after the MPA, the fish is abundant in these spots”*(respondent 3) .

According to 13 participants, this is due to spillover from the MPA. Other participants argued that they do not choose in which locations to go out fishing, but it depends mainly on the weather conditions and the sea. For example, if the sea is agitated, fishermen may decide upon reefs where fish is very abundant and fishing requires less time spent in inhospitable waters. As fishing locations have changed, the majority of participants go out fishing farther than they used to do before the establishment of the MPA, facing an increased cost of petrol for the travel. This has had an indirect impact on fishing techniques (see following ‘Techniques’ section) because stakeholders have to maximise the profit, and need more effective techniques like, for example, the spear gun, and the ‘bomb’ (explained in the next chapter).

4.3.2 Techniques

Fishing methods can be grouped in three categories: (i) when the individual fish is caught by methods like spearing; (ii) where fish are caught in pre-set traps or lines; and (iii) where fish are sought and caught in great quantities such as purse-seine nets (Veitayaki, 1995).

In Kia, artisanal fishers employ the first and the second techniques. Spearfishing is practiced as free diving and without the aid of diving equipment (*i.e.* oxygen tanks, wetsuit), the only exception being the use of a snorkel and fins.

The male respondents do not exclusively use one fishing method but combine and alternate them, although they do have a preference. Forty-seven percent (18 participants) of the male respondents use line fishing as main fishing technique, and occasionally combined it with spear fishing (weather dependent). The remaining thirty seven percent (14 respondents) use spearfishing, sporadically combined with line fishing, and also practice sea cucumber diving.

Six participants (16%) practiced sea cucumber (*beche-de-mer*) diving. All of them are under 40 years old, with five respondents belonging to the group aged between 19 and 29, and one respondent in the group aged between 30 and 39. These participants combine sea cucumber diving with spear fishing, and one participant exclusively dove for sea cucumber. In the last few years, Indian fishermen have introduced a new technique to catch sea cucumber: the 'bomb', a small spear below a lead weight tethered to a line and float (Fig. 12). This new technique has increased catches across Fiji as it allows harvesting from greater depths. Before the introduction of the bomb, fishermen would have to dive in deeper waters (many species of sea cucumber can only be found at depths greater than 9 m where conditions are more challenging for free divers) and therefore catches would be quite scarce (Li, 2004).

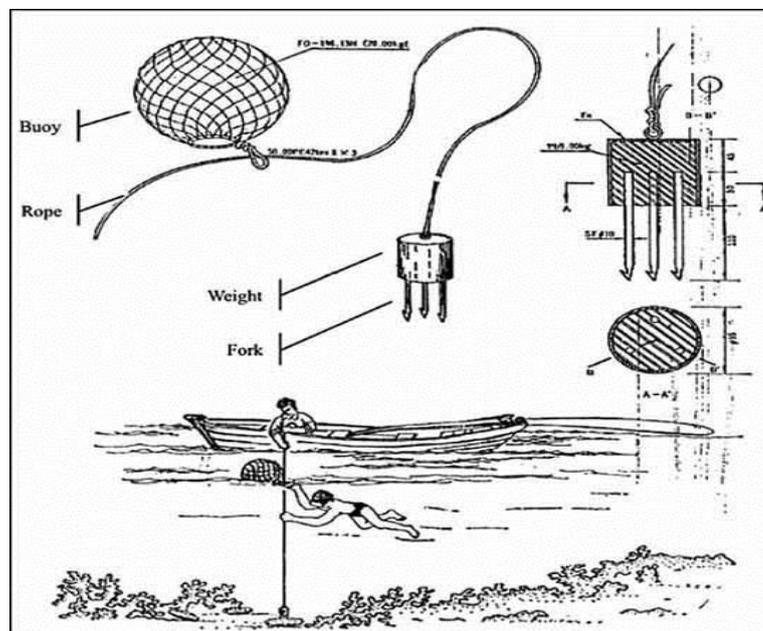


Figure 12 The bomb

(Source Li, 2004)

The bomb is not the only improvement in fishing techniques that have been recently introduced, along with other techniques that were replaced by more effective ones like, for example, the spear gun replacing the *tukidodo* (Fig. 13)



Figure 13 A modern spear gun (left) and the traditional Tukidodo (right) (Source C3, 2010)

According to the people of Kia, a spear gun requires less physical effort than the tukidodo, and fishermen can catch more fish. Just before the spear gun became more popular, fishermen adopted the use of diving masks and fins that allowed them to go in deeper water, providing access to different species. The transition from tukidodo to the kilivati was initiated before the establishment of the MPA, but after the MPA more and more people decided to adopt the use of the spear gun instead of the tukidodo to increase their catches, and income (Veitayaki, 2011).

4.4 Ecological changes

Participants were asked if they have noticed any change in species, size, and population density since the establishment of the MPA. Following SEM-Pacific guidance, and for a better understanding of people’s perception, the questions related to fish species were separated from questions on coral reefs and sea grass.

Respondents were divided in 3 groups (Table 3): *spear gun*; *line fishing* (all the women participating to the research practice line fishing); and *other* which includes sea cucumber fishermen and the MPA expert (occasionally practicing line fishing).

Participants were asked about the changes in species, size, and population density. Their answers were divided in three groups: *increase* (positive change *i.e.* more species and bigger population, bigger size), *same* (where no changes have been perceived), and *decrease* (negative change *i.e.* less species are found, some of which have disappeared, populations are smaller and so are the size of fish).

Table 3 Ecological changes after the MPA

	Species Diversity	Population density	Size
<i>Spear gun</i>			
Increase	10	12	11
Same	4	1	1
Decrease		1	2
<i>Line fishing</i>			
Increase	10	8	7
Same	4	10	13
Decrease	7	3	1
<i>Other (sea cucumber, MPA expert)</i>			
Increase	5	4	3
Same	1	1	
Decrease		2	2

During the interviews, the opinion on the health of the marine environment changed greatly, mainly between fishermen practicing line fishing and the group using spear guns. Seventy two percent of the spear gun fishermen found that number of species, fish abundance, and size of fish have increased since the establishment of the MPA. Participants believe that there are more species because the environment in the MPA is “healthy” or “healthier”, “and this is demonstrated by healthy coral reefs and the sea

grass is growing back" (respondents 4, 9 and 11). In particular, the biggest improvement was noticed in population density and fish size. Some species have also made a comeback; including sea cucumber and fish such as tuna, grouper, snapper, sweetlips, and the Humphead wrasse, which is classified as endangered on the IUCN Red List (Sadovy, 2003). Seventeen percent believe no changes or improvement have occurred, in particular to species abundance. The remaining eleven percent believe the marine environment has deteriorated, 48% of whom claim that more people (including outsiders), are now fishing in Kia's waters, and consequently exploiting its resources. Fishermen practicing line fishing have a more mixed opinion on the changes the MPA has brought to the marine environment. Fifty percent of the women could not give satisfactory answers on the ecological changes (both marine species, and coral reefs and seagrass) because they do not go out fishing very often and they have only started recently going out fishing.

Fifty percent of the participants believe that the MPA is improving the status of the marine environment, especially in terms of population density. Twenty four percent have not noticed any changes after the MPA was established, and only one respondent believed that population density has remained the same. Twenty six percent of respondents stated that species, size, and population density are decreasing after the MPA. An expert line fisherman (respondent 23) stated *"The difference with now is that you can only catch 5 to 10 fish with the line. Before the MPA, we used to catch even 50. But it will be different for the spear gun. You can catch as many fish as you want. With the spear gun you can get many more fish now"*.

Of the sea cucumber divers and the MPA expert (referred to as 'other'), 67% think the environment has improved after the MPA, 22%, have not noticed any change, and 11% think that population density has decreased but have not noticed any deterioration in species richness or size. Stakeholders also named which fish species are found and their locations, showing that the reefs protected by the MPA host a greater variety of species in contrast with other reefs. Stakeholder's perception was grouped as 'positive changes', 'no changes' (same) and 'negative changes' (Fig. 14).

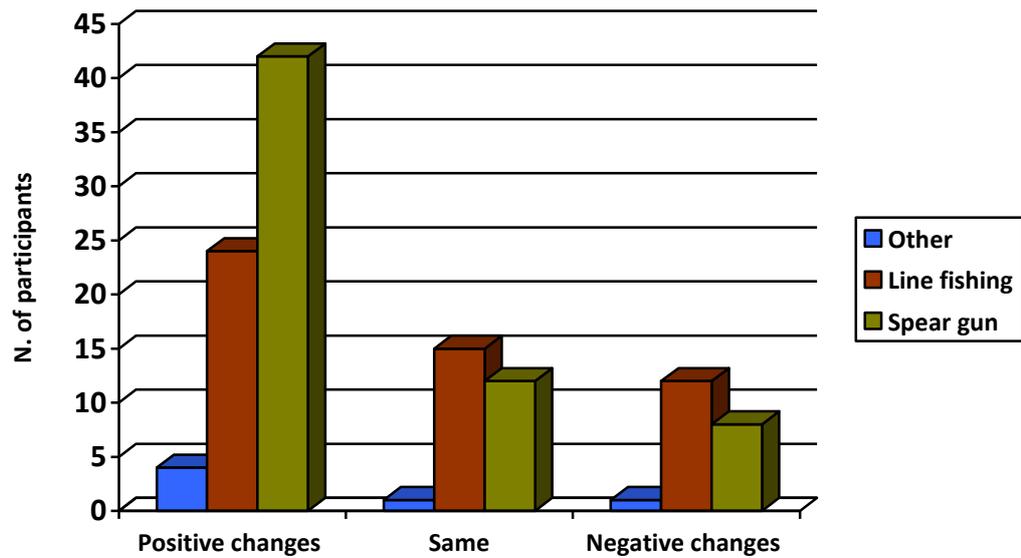


Figure 14 Fishermen's perception of the MPA

Regarding other ecological changes referring to sea grass and coral reefs (*i.e.* healthier, greater extent, more species), (Fig. 15) 65% of the participants have witnessed an improvement in sea grass and coral reefs and all attributed the improvement to the MPA. The general opinion is that because of the MPA, coral reefs, sea grass and other marine species have been undisturbed for few years now, and they are now recovering. Coral reefs, for example, are not being damaged by destructive fishing techniques, and some fish species have made a comeback. In general, the whole area is healthier than it used to be before the MPA. Thirty five percent of the participants think that the damage the marine environment has suffered in the last decades is beyond recovery, and there is little the MPA can do to reverse this.

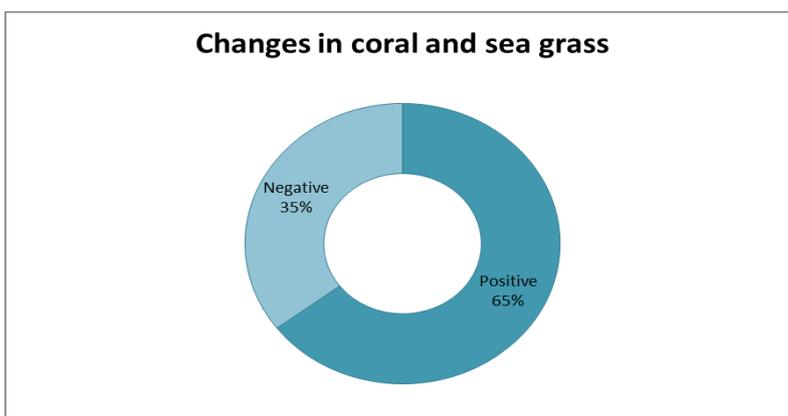


Figure 15 Ecological changes of sea grass and coral reef

4.5 Perception of the MPA

Participants were asked to outline and explain the importance of the MPA for both Kians and the environment. Thirty nine percent of participants believe the MPA is essential for the protection and functioning of the marine ecosystem. However, the remaining 61% does not share this view, and essentially think of the MPA as a money generating resource as everybody can go out fishing as many times as they want. They see the ecological benefits provided by the MPA to be of secondary importance, and although they noticed improvements in the ecosystem, they do not entirely relate the good health of the environment to the MPA.

More than 80% of the participants consider the MPA weak in terms of regulations, and they would like it to be policed, with the government and fishery department patrolling the area. When asked if they ever fished in the MPA when it was taboo, 40% of the male respondents admitted to have fished in the MPA when it was prohibited. When asked the reasons why they fished in the MPA when it was not allowed, 5% of the respondents said they did not realise they were doing so, while the remaining admitted they wanted to see *“See how bountiful the MPA really is”*. Eight percent of the respondents that fished in the MPA when it was taboo it is included in the groups aged between 19 and 39, meaning that younger generations of fisherman may have a different concept of respect towards the Vanua, and may feel connected to the environment at a different level compared with the elders that, on the contrary, never fished in the taboo area when it was prohibited. None of the women have ever fished in the MPA, with some of them declaring that are too scared of the consequences of it.

4.5.1 Changes related to the MPA

Participants were asked if they would change anything about the MPA and why. Fifty percent of the respondents said they would keep it *“As it is now”*, but when asked *“If the MPA stays the way it is now, do you think that there will be enough fish for future generations?”*, they identified that the MPA needs improvements in order to guarantee fish stocks for the future generations . Eight of these respondents (all males) think the MPA was very effective when it was opened for the first time *“The big change was in the first period of the MPA, when it was open for the first time. That was when we got the biggest amount of money”*(respondent 29) and *“The catches we made when the MPA was open for the first time were the biggest we ever seen”*(respondent 32).

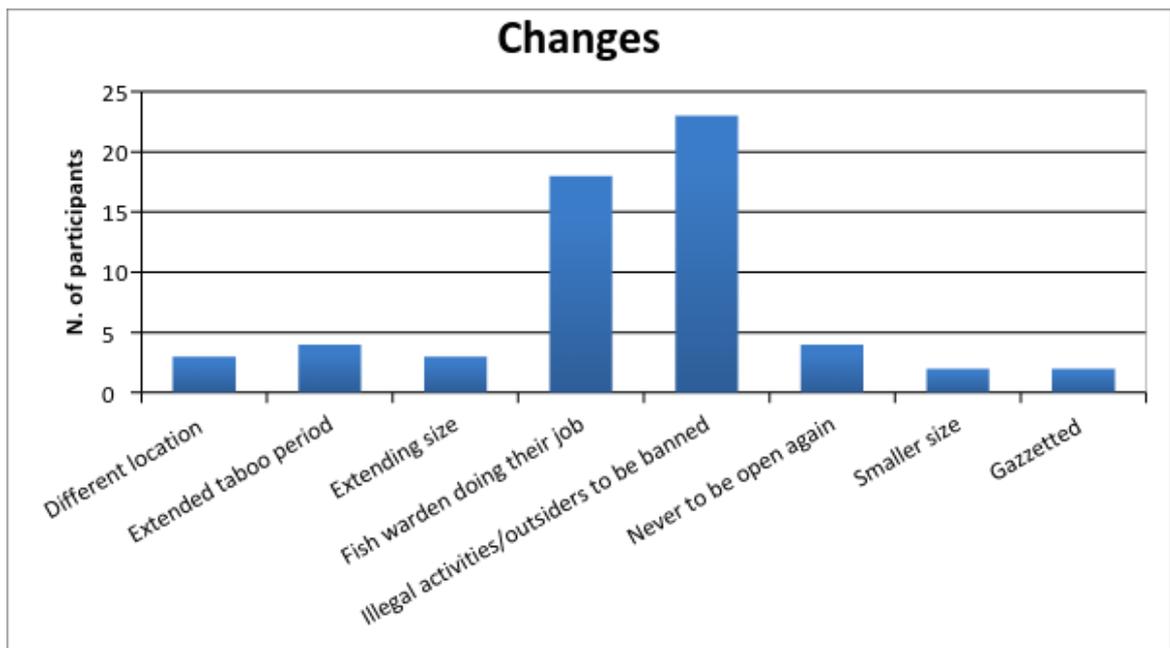


Figure 16 Changes people would like to see in the MPA

Several topics emerged during the interviews which were recurrent (fig. 16). The two central points are fish wardens and illegal activities carried on by both outsiders and Kians. Fish wardens (5 in total: 2 in Yaro, 2 in Ligau, and 1 in Daku) are seen by 41% of participants as not committed to the protection and patrolling of the MPA, partly due to lack of funding and training which were supposed to be provided by the government and WWF, and partly due to their lack of interest. One of fish wardens in Yaro is also the fish agent, which is clearly a conflict of interest. Fishermen want the fish wardens to be involved with the protection of the MPA, *‘as they were meant to be when they were chosen for the role, this is why we chose them, because they are the most trustworthy and experienced fishermen’*(respondent 37). Some of the youngest participants proposed themselves to take on the role of fish warden, as some think *‘I will be better at it, and I will punish everyone stealing from our MPA’*(respondents 16 and 20).

Fifty-two percent of participants want all the illegal activities (*i.e.* night divers, fishing when area is taboo) to be policed and penalties to be enforced, and also access to the MPA by outsiders (people coming from Vanua Levu, from Suva, and rarely from small islands around Kia) to be restricted or prohibited. Respondents had the tendency to blame outsiders for taking from the taboo area when fishing is banned but when asked if they ever fished in the MPA when it was taboo, forty percent of the respondents admitted to have fished the area.

With regard to outsiders, 76% of male participants dislike outsiders because they *“Steal from our resources”* (respondent 16) and, as has happened in the past, they are

prepared to physically confront them if necessary. The women respondents would not mind 'sharing' their resources with outsiders, if *"When they come, they should take into consideration us and our needs first. They should just ask permission if they want to fish in our area"*(respondent 5).

Ten percent of the people would like to keep the MPA taboo forever (at the moment, people on Kia decide when to lift the ban, and for how long) as they believe the spillover would suffice for everyone's needs. Ten percent of the respondents would like to see the taboo period to be extended to 3 or 5 years, instead of lifting the ban in several occasions every year, because they believe an extended no-fishing period will help the ecosystem to further recover from exploitation.

Seven percent of the participants would like to extend the MPA to the other unprotected reefs; another 7% want to have the MPA relocated somewhere not so close to Kia island, as they think that the restrictions brought about by the taboo area are having a detrimental impact on their income. Six percent would like to decrease the area of the MPA, because they feel patrolling would be easier *"If the MPA is smaller"* (respondent 41).

Another 6% would like to see the MPA to be legalized (gazetted in fig. 16). At the moment the MPA has not been officially sanctioned by the government, which means the government (nor the fishing department) is not involved with the management. If it is to be gazetted, the fishery department will be solely responsible for patrolling, dealing with illegal activities, deciding when to lift the ban, for how long, etc.

Respondents were asked if as a community they felt adequately consulted and informed (by both WWF and the fishery department) prior to the establishment of the MPA on objectives, regulations, and management. Thirty percent believed they did not receive enough information *"What WWF did when they came to establish the MPA was not enough"* (respondent 40). Sixteen percent think they received enough information prior to establishment. However, 41% of these respondents would like to receive more information about the progress of the MPA (in the form of workshops, meetings, and educational training).

4.5.2 Regulations

Forty percent of the participants know about the regulation of the fishing ground *"The fishing ground around the island of Kia is within a bigger fishing ground of the whole tikina of Macuata. The tikina of Macuata is led by the Tui (king) of Macuata. He is also the leader of the whole province. Kia is included in the tikina (district) of Macuata. So Kia's resources are part of a combined fishing ground, called Qoliqoli Cokovata. The*

fishing ground surrounding Kia (the Ikanakana: a place where to eat from) was given by the tui of Macuata to them”(respondent 20).

Four districts comprise the Qoliqoli Macuata: Macuata, Sasa, Mali and Dreketi. *“The village’s elders of the island are the ones that decide when to make it (the MPA) taboo’ or not”(respondent 2).* Kian people were given (by the tui Macuata) 5 miles from the shore for fishing grounds to help them with their subsistence.

Although Kians are possessive of their own resources, specifically their fishing grounds, and they do not like outsiders fishing in their waters, some participants have admitted (and it also emerged during casual conversations with fishermen) that they fish in other provinces’ waters.

At regulatory level, nothing has changed since the introduction of the MPA. The Qoliqoli Cokovata was in place before the area was designated taboo. Only 8 participants believe that there is a lack of respect for the MPA (from both outsiders and people from Kia), and 35 people said that they fully respect the MPA (although some of them have fished in the area when prohibited).

4.5.3 Social changes

The income generated by the MPA means the way of living on Kia is rapidly changing. Seventy percent of the participants believe that there are more women going out fishing now than ever before. This has been confirmed by previous research conducted by C3, highlighting the increased number of women going out fishing since the establishment of the MPA. The social changes participants mentioned referred mainly to the village of Yaro (the most populated village), where the greatest number of women are going out fishing. In both Daku and Ligau these problems are not as accentuated as in Yaro.

The perceived social changes Kia is facing due to both women and men dedicating more time to fishing rather than traditional duties is summarised in figure 17.

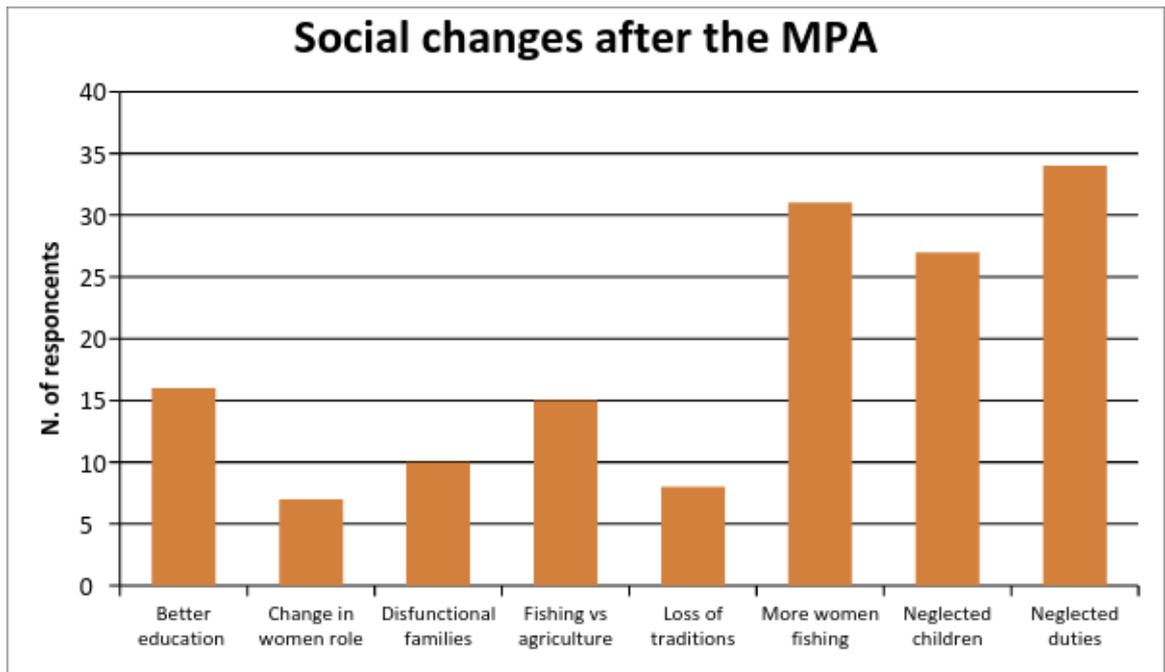


Figure 17 Social changes after the MPA

Child-neglect: 62% of the respondents (both with children and not) agreed that because women are now going out fishing (and for long periods), their children are looked after by neighbours, relatives, the older siblings (very often still children themselves, or just in the transition between childhood and teenage years), or not looked after anyone at all.

Disfunctional families: 23% of participants pointed out that, although couples spend more time together out at sea, they do not actually spend any “*quality time*” anymore, because by the time they are back from fishing, they are too tired to actually enjoy the family.

Duties neglected/loss of traditions: 19% participants claimed that women (those going out fishing) are no longer ‘attending’ their duties (e.g. cooking, cleaning, looking after the children, weaving).

Change in women role: 16% of the participants viewed women going out fishing as a positive change, because they now contribute to the family finances.

The establishment of the MPA has had an impact on men’s duties also. Using secondary data on perception of natural resources (Appendix Ib), participants were asked what their opinion was on the condition of terrestrial resources such as gardens (small patches of vegetables), agricultural land (plantations), beaches, coastal plants and trees. It emerged that agricultural land and gardens were been neglected in favour of fishing. In fact, since the establishment of the MPA, men have been “*Spending less time looking*

after their land" (respondent 17). In Fijian tradition, it is men's duty to cultivate the land, while women undertake the fruit harvest. Although this may not be a problem in Daku and Ligau, where men spend enough time cultivating, this is becoming an issue in Yaro. Thirty-four percent of the participants think that because people spend too much time, and energy, fishing, they neglect the land. It is the younger generation of men (mainly between 19 and 30 years) that are neglecting their vegetable gardens, or not planting anything at all.

4.6 Future generations

One of the last questions I asked was *"if the MPA stays the way it is now, do you think there will be enough fish for future generations?"*. Seventy-five percent of participants think that future generations will not benefit from the MPA because fish stocks will decrease rapidly *"If we carry on fishing like we are doing now there will be nothing left for our children"* (respondent 18). The remaining twenty five percent (all respondents belonged to group age 19 to 29) of stakeholders had a more positive vision of the future of the MPA. They see the ocean as an infinite resource that will provide food and income for many generations to come.

The results, divided in 5 groups, are discussed in Chapter 5.

CHAPTER 5: Discussions

5.1 Social data

A sample representative of the age groups on the island was obtained, with the exception of women in the age group 19 to 29. The lack of women participants to the research was likely due to one or more factors; many women may have been undertaking childcare; they were unavailable as a result of having moved to the mainland for studying; they did not wish to participate; or simply because not all of them go out fishing. Women on Kia have recently started going out fishing, and their traditional ecological knowledge in this area is limited, and not comparable to that of the men. While in the past women would collect seaweeds, shells, trochus shells, and sea salt to be used for handcrafts and in the kitchen, and possess a unique knowledge of each, they are now simply going out fishing for financial purposes, losing interest and knowledge on inshore marine resources (Aalbersberg *et al.*, 2005).

Within the patriarchal Fijian society, the role of women has always been secondary, as the 'good wife', and in the past they have never contributed to support the family financially. The disempowerment of women that results from their domestic status and economic dependence, and the heavy burdens they bear as food producers, caregivers, nurturers and teachers within the family are expressions of fundamental inequalities in the lives of women (Nilan, 2009). These inequalities limited their independence, freedom and life choices. Things are now slowly changing, and women are becoming active members within rural societies, although they may still not be recognised for their new roles within the community (Aalbersberg *et al.*, 2005).

On Kia, the role of women may not be changing at community level yet, but it is certainly changing within the family unit. Women are becoming increasingly active in terms of financial contributions to the family, gaining some sort of financial independence from their husbands. However, current literature lacks research on the topic that could be used to compare and examine in depth this phenomenon.

Women are yet to earn an income that matches the men's, mainly due to the fact that (a) they do not go out fishing every day (like men do), and (b) they only use line fishing, meaning that the fish catch is smaller than it would be for spear fishing. Furthermore, it is not possible to quantify women's income because most of the time they go out fishing with their husband, and their catch is combined for the household. It is definitively too early to draw conclusions on what the consequences of this newly acquired financial status and economic empowerment of the women of Kia may be. It is also important to mention that women, contrary to men, hardly ever travel to mainland. From informal conversations it emerged that the reasons why men rather

than women usually travel to mainland are based on jealousy and trust; men are quite possessive of their wives, and they do not trust them in the presence of other men from the mainland. This attitude towards women may slow down the process of their empowerment through financial independence as, although they have now access to money, they may not have the opportunity to use it outside Kia, and to be exposed to modern life, and different opportunities, on the mainland.

In terms of population distribution, Yaro is the most populated village, although the last one to be established. It is likely, as suggested by some of the elders living in Yaro, that people migrating, or returning to live on Kia, had decided to settle down in Yaro because when travelling from mainland or other surrounding islands it is the nearest first village to be encountered.

Yaro also has the highest number of motor boats per household, while Daku has the lowest. The boats on the island are owned by the family unit, with only one exception of a young fisherman in Yaro that owns his boat. The abundance of boats in Yaro is likely due to it being the most highly populated village. With boat prices ranging from 4000 to 11000 Fijian dollars (as informed by a local boat vendor), it becomes easier for fishermen to buy a boat together with members of the family instead of individually. In the whole island, with the exception of the young fishermen already mentioned, only older people (35 years or older) own boats. Younger fishermen do not have the need to buy a boat for themselves as they can either use the family's one, or go out fishing with other fishermen. It could be argued that, if owning their own boat, younger fishermen could decide when and how often going out fishing, and therefore their income could increase greatly. However, younger fishermen do not seem interested in nor capable of saving money, making them dependent on their families when it comes to shelter and transportation. From informal conversations with stakeholders, it seemed that the younger generations of fishermen do not consider buying their own boat as a priority or an investment for their future. Priorities are changing for the people on Kia; *"While older generations would invest their income, for example, for buying a fishing boat, fixing their house, or saving money for their children's education, younger generations do not seem concerned about their future, and the majority of their income is spent on grog"*(respondent 6).

In communities like Kia, not only the sense of community is strong but the concept of 'family' is far stronger than in the west, where there is a general trend towards the breakdown of extended family forms, and family values have been lost (Nainoca, 2011). The whole community works together to ensure everyone has food, shelter, comfort and friendship, meaning that less fortunate members of the community are cared for by what they call 'adoptive' families. This attitude can definitively have an impact on a

family income, especially with regard to how many times people are able to go out fishing on a weekly basis, and influencing women's choice in undertaking fishing activities (Sienkiewicz, 2000).

5.2 Financial data

A comprehensive analysis of financial data was difficult to carry out. From previous research on illegal fishing (Appendix II) we know the price the fish agent pays to fishermen on Kia. For example, sea cucumbers are paid per individual and per kilo (ranging from \$0.70 to \$3, and \$2 to \$25 per kg respectively) while other catch, such as crustaceans, fish, bivalves, and cephalopods are only sold by the kilo. We also know the frequency of the catches (daily, weekly, seldom), and what species is rarely or commonly found (an inferred indication of abundance). The income generated by fishing depends on fish abundance (which is directly related to spawning period, weather, MPA opening and closing period, etc.). The fish agent decides the price of the fish, using a grading system: A+ are the most expensive fish, followed by B, C, D, etc. A fish like the Humphead wrasse is not very expensive, but because of its size (it can grow to 2 meters), people make good profit when they catch one.

The size of the catch depends on abundance and species ecology (e.g. migration, spawning period, interaction with abiotic environment) and also the fishing method. The majority of species listed in Appendix II are caught using spear guns. The species caught using this method are generally more expensive and receive a higher price paid by the fish agent than species caught by line fishing; this could explain the different outcome of the interviews conducted with line fishermen and spear fishermen on their perceptions on catches and finances. Spear fishermen have the advantage of choosing what fish (and what size) they will catch, while line fishermen do not.

All the species listed in Appendix II are directly associated with coral reefs. In their research, Cinner *et al.* (2007) explained that size, species, and density of coral fish depends on many factors. These species live in close relation with their environment, depending mainly on the health of the reefs. Therefore, where the coral is healthier more species can be found than elsewhere. Species may also cluster in given areas, as many coral reef fish have evolved in symbiosis with other species and/or the coral. These relationships can be either mutualistic, commensalistic, or parasitic (Bell *et al.*, 2011). Understanding the complexity of species interaction in the coral reef system, knowing the locations where fish can be found, and monitoring the health of corals is all part of the traditional ecological knowledge (TEK) Kians still maintain. With all the challenges (*i.e.* ocean acidification, sea level rising, etc.) complex ecosystems like coral reefs are facing, it is of crucial importance that TEK is preserved and passed down to

subsequent generations, to enable local people to exploit their resources in a sustainable manner (WMO, 2010).

What is unknown and unclear is the amount of a daily or weekly income each stakeholder earns. Income mainly depends on daily catch (species and quantity), if it is generated from a combined effort of more family members, how long the fishing trip is, and the weather conditions that may have influenced the catch. None of the stakeholders is keeping a record of their income, so they know neither how much money they earn, or how much they used to earn before the establishment of the MPA.

Eighty seven percent of the stakeholders stated the '*biggest money*' comes from when the taboo area is lifted, not only because fishing within the MPA boundaries means bigger fish and catches, but because the lift can last from few days to several weeks, depending on the occasion. The bountiful catches from the MPA, derived from increase effort and yield, can enhance people finances greatly. The MPA also provides the money for education. Thirty six percent of the participants are now able to provide a better education for their children due to the increased finances after establishment of the MPA. Better education means that the Kians children may have better prospects for their future, and not necessarily had to undertake fishing as source of income.

When asked if their income (from fishing) has changed after the MPA was established, many had difficulties in answering the question. Money was not an easy topic to discuss with stakeholders. During the research, many participants came across as unconcerned about their finances. Younger people especially could not define at all what their average daily/weekly income is, while older people (over 40) were more aware of the amount of money they earn on a daily basis. As C3 coordinator Maleli Qera explained, *"The problem is that they get money every day, easy money. They go out fishing, they sell their fish, and they have money until the next day. They do not know how much they earn, especially the youngest, because they have no responsibilities or commitments. And they go on. They do not think of tomorrow, because God will provide"*.

Maleli's view describes perfectly the situation on Kia. Older stakeholders not only have a better idea of what their income may be, but because they also have the responsibilities Maleli mentioned (e.g. dependent children, house and boats maintenance) they are also more careful where their money is spent.

The financial analysis is purely related to the income of the stakeholder. Data on the costs stakeholders encounter (to buy goods, for a fishing trip, to repair the boats, to help the church and the vanua, for the community) in their everyday life was not collected.

In recent decades the presence of fishing agents on the island has seen a shift from people fishing for subsistence purposes, to fishing heavily for income generation. While in the past fishing was conducted alongside agricultural pursuits, in recent times the fishing effort has shifted to serve the community as a primary source of income. With fish populations and other marine resources already under evident pressure, exploring the opportunities available to the community to generate income is one way that could avoid over-exploitation of these resources in the long term.

The way people sell their fish has changed too, but *“It has nothing to do with the MPA”* (respondent 25). In the past they used to sell their fish at the markets in Labasa, but now it is more convenient for them to sell their catch to the fish agent present on the island. One of the participants explained that the fish company was established long before the MPA, around 40 years ago, but it was not until the 1990’s that the agent started to buy fish from the locals. Initially, he would only buy sea cucumbers. However, over the years, the demand for fish species has differentiated and diversified, depending on the demands of the market. The current fish agent, is the 5th or 6th (participants could not remember exactly how many fish agents there had been previously) they have had on Kia. The participant continues *“Is the people from Kia, especially the elders that used to look for buyers. They looked in Suva too, just to find the best buyer. And they asked them to come over to Kia. The company, at that point, went to the government to ask for the licence, in order to come to Kia. But it is the people that initiated the fish company. Every year the company needs to renew the licence. And if people of Kia are not happy with the fishing company, we can get rid of the fish agent”* (respondent 3).

As modernisation (and an increasing cost of living) is having an impact on Fijian society, which originally relied on a subsistence economy based on marine and terrestrial resources (Mascia and Claus, 2008), the way of life is rapidly changing, especially in rural communities like Kia. The role played by money within these societies is changing; the transition to a monetary economy increases pressure to supply large urban markets changing the proportion of fresh fish used for subsistence and those that are sold (Zann and Zann, 2008). Financial hardship in rural areas coupled with the lack of alternative livelihoods, increases fishing effort and therefore the risk of over-fishing. With a growing population across Melanesia the real issue is whether there can be an increase in sustainable fisheries yield. Furthermore, with little disposable income the shortcomings are unlikely to be met with tinned fish, and the poor national distribution system renders it difficult to transport fresh fish (Sobrevila, 2008).

Older generations may feel more connected to the natural environment because their livelihood was a resources-based economy, and the accumulation of wealth was a

foreign concept. Their way of life was not individualistic, and people depended on each other for survival. Land and the sea were the economic means and the source of their well-being (Zann & Zann, 2008). With modernisation slowly eroding values like communalism and subsistence, commercialism and individualism are taking place. It is open to debate whether a monetary based economy can benefit Kian community, and what the consequences may be for the future generations. As the transition is already taking place, it is advisable to keep monitor the changes, especially social ones, that modernisation is bringing to Kia.

Secondary income (weaving, selling of goods, passenger's fees for boat trips, etc.) only accounts, at the present moment, for a small percentage of the total income of the stakeholders (C3, 2010).

Fishing takes up the majority of the day (at least for fishermen), with fishing boats leaving Kia island at 7 am and coming back after 4 pm, often 5 or 6 days per week. Selling goods does not require significant time investment, as it can be conducted as and when required, but it requires financial investment to purchase goods for trade; money derived from fishing efforts. Conversely, weaving does not require any financial investment, as the material used is found on the island, but instead requires a great deal of time to produce the goods. Women on Kia, for example, are known for their traditional way of weaving that cannot be found anywhere else in Fiji. Occasionally they are commissioned to weave mats for special occasions by people across Fiji, and the money generated is shared by all the participant women. However, this is not happening often enough to provide a consistent income for women. In fact, often women are employed to weave mats for the community hall, funerals or weddings of relatives, and they do not receive compensation for their work, as it is considered part of their tradition (C3, 2010).

Weaving could potentially become a more remunerative source of income if the products could be sold to tourists in big markets like, for example, Labasa, or Suva. Gross earnings from tourism continue to be Fiji's major source of foreign currency, and there is definitively demand for traditional handicrafts (CIA, 2012). Also, if the demands for woven products from Kia could increase, it could result in more revenue streams for women, precluding the need for them to go out fishing. Tendentially, the women that are currently neglecting weaving in favour of fishing, or because they are not interested in something they regard as '*difficult and tedious*' are the youngest. Weaving is not only considered a way for helping address the economic needs of the community on Kia, it is also a cultural expression of who and what Kians are and their identity (C3, 2010). One mechanism to secure that the practice is passed across generations could be to

guarantee a revenue for the hard work, but this could only happen if there is a high demand for the products (Vunisea, 2002).

From the focus groups conducted on alternative livelihoods, it emerged that all 3 groups of women have mentioned weaving and handicrafts as the most feasible. This shows the desire and enthusiasm of women to continue their weaving and crafting traditions, but also the optimism that this practice could, one day, become an important source of income.

Alternative sources of income, like, for example, beekeeping, and animal farming, are feasible on Kia, but there is need for financial and logistic planning, whichever activity has to be taken on. There is potential to involve everyone on the island: women for weaving, and vegetable and animal farming, baking, and bee keeping; men for animal farming, and also bee keeping. Short term, these activities may not provide enough income to allow stakeholders to decrease the fishing but, if planning and organisation are maintained there is the possibility of alternative income, and to reduce the pressure on fisheries. The obstacle is whether Kians wish to be involved with these activities or not. Fishing is not only part of Fijian traditional way of living, but it is also an 'easy money' generator, and it could be difficult for Kians to transit to a different economy.

5.3 Fishing techniques

All the changes brought in by the MPA have had a direct impact on the choices of fishing technique, pushing fishermen to opt for the most effective (e.g. spear guns, the 'bomb') in order to maximise their catch, and their income. Younger fishermen tend to favour spearfishing to line fishing, while fishermen aged over 40 (and women of all ages) mainly practice line fishing. Although there is not an age limit for free diving, it is known that divers can face health and physical risks when they adventure underwater. As Lindholm *et al.* (2006) argued, there are some ill effects of breath-holding in terms of cardiac function, and older divers become more prone to cardiac problems (e.g. arrhythmias) than younger ones. Although all males on Kia are experienced divers, as fishing is part of their heritage (and they have been familiar with the aquatic environment since a very young age) the choice to switch to line fishing over a certain age could be dictated by health problems, or risks to health, or because the physical demands of diving (ability to undertake frequent diving trips decrease with age, diving depths becoming shallower, apnea times become shorter) mixed with the difficulties of swimming while carrying the spear gun increase.

During the research, many fishermen in their late 20s and early 30s would speak openly about their health problems linked to frequent diving. For example, one of the most experienced divers (aged 29 years), had lung and hearing problems, and he was advised

by a doctor to decrease his diving trips to 1 or 2 per week. Unfortunately this is not possible, as his income (as for all Kians) depends on his fishing trips. Also, with spearfishing, the fisherman decides what species to catch, while once he swapped to line fishing, the catch is not predictable.

In regard to women's choice of fishing techniques, they are quite limited as they lack expertise in both fishing and diving. Line fishing does not require expertise in fishing, physical strength, nor fitness to dive. Also, diving would require women to swim in their underwear or wearing shorts, as it is clearly restrictive while wearing the sulu (a length of fabric wrapped around the body as a sarong) (Fig. 18) and not all women are keen to wear swimsuit, especially in front of other men, due to cultural reasons. Like many rural communities cross Fiji, women are not allowed to bare their shoulders or legs, wear short shorts, halter tops, and bathing costumes in public, as this shows a lack of respect, and in the context of a Fijian village it is considered offensive.



Figure 18 Traditional sulu women from Daku, Kia

(Source Stalio, 2012)

5.4 Ecological data

With regard to ecological changes after the establishment of the MPA, opinions varied in relation to the fishing techniques. When asked about changes in species diversity, body size and population density, the participants were divided into groups, depending on which fishing techniques they use.

Although the division in groups was primarily dictated by the choice of fishing technique, the age of the participants played an important role, as it influences the

choice of fishing technique, which consequently dictates the time of the day for the fishing trips. We now know that line fishing is practiced mainly by older villagers, and women. Sometimes, younger fishermen (especially the irregular ones, or those without their own fishing gear) would join the line fishermen, mainly as it is an opportunity to earn some money, but also to help with the anchor and with the fish catch. Once again, the strong sense of community existing in Kia is perceptible even in everyday life. Not only do older villagers have more experience and knowledge in marine species than those younger, but they also go out fishing at a different time of the day to the spear gun fisherman. Spear gun fishermen begin their fishing trips around 7 or 8 am, and come back to the island around 3 or 4 pm. They spend the whole day out in the sea, including the hottest hours of the day whereas line fishermen usually undertake their fishing trips after 2 or 3pm.

Spending long hours under the hot Fijian sun is challenging, and because line fishing requires fishermen to sit for hours exposed to the elements in a boat, they prefer to adventure in the ocean when the sun is less warm.

The time of day for fishing influences the fish catch, as it greatly depends on fish behaviour. For example, coral reef fish may feed either diurnally or nocturnally, depending on their diet (*i.e.* herbivore, carnivore, or planktivorous). Herbivores species (e.g. parrotfish, surgeonfish) feed diurnally, and tend to have a large population size (Heaps, 2005). They are commonly found in shallow waters, where algal growth is more abundant due to high level of sunlight. Herbivorous fish are the most common species found at 30ft below sea level, while carnivorous fish are generally found deeper than 30ft. (Wainwright and Bellwood, 2002). Predatory fish that feed on more active animals often do so at dusk or later, in order to hunt prey in their night shelters, or to catch invertebrates emerging from holes in the reef. Some species feed solitarily, while others prefer to be in a group, depending on their body size. Small planktivors, for example, in order to protect themselves from predation, are often found in schools (Pitkin, 2013). Fish behaviour is unquestionably a factor that determines stakeholders catch, and it clearly influences their perception on the health of the marine ecosystem, in both negative and positive way (Heaps, 2005). Spear gun fishermen, have access to more marine species (both in shallow and in deeper waters) because they can choose their target catch. As they tend to catch bigger fish, and in greater numbers, in order to maximise their profit, they may perceive that all fish species are more abundant, and larger than they used to be before the MPA. However, this view is in contrast with line fishermen's. Although their view is mixed, line fishermen tend to think that the MPA has not actually brought much improvement in regard to marine species. The knowledge of line fishermen is an advantage for them, as they used to be spear gun fishers and have seen changes in the ecosystem at different depths. However, due to

their age, they have switched to line fishing (most probably after the MPA was established), and the fact they no longer fish underwater, and their target catch is therefore less specific, their catches may have shaped their opinion toward the benefits of the MPA. Not least because they are now unable to observe any difference or changes over time in respect of species richness, abundance, or fish size, in the way they did when spear fishing.

With regard to sea cucumber fishing, not many negative changes were observed. In fact an improvement, especially in species diversity and population density, was perceived. This could be due to the fact that on Kia, sea cucumber exploitation is not yet being observed. Sea cucumbers are never consumed by islanders, and rarely fished. This could be because both fishermen and exporters have failed to realize the maximum value of it as an export as the price for certain species of sea cucumber is high (Vunisea, 2002). Sea cucumbers are in demand on international markets, especially in Asia, where they are used in traditional cuisine and medicine (Anderson *et al.*, 2011). On Kia, some species (e.g. White teatfish, and Black teatfish) reach \$25 and \$15 per kilo. If Kians would diversify their catches, adding sea cucumber to their targets, the harvesting of these species could potentially increase their income, and reduce pressure on more popular marine species. Furthermore, sea cucumbers could be integrated in Kians' diet, as they have high protein value (per 100g = 26% recommended daily intake) (Vunisea, 2002), meaning that demands on tinned fish and meat could decrease, and so the needs of money to purchase it. As Lovatelli *et al.* (2004) argued, sea cucumber fishing is very important to the livelihoods of many artisanal fishers in developing countries, as long as resources are not exploited, as sea cucumbers play an important role in maintaining the health of the marine ecosystem by recycling nutrients.

When respondents were asked about changes in coral reefs and sea grass health, they only noticed improvements or worsening, no one thought that they were the same as before the establishment of the MPA. The health of the coral reefs is partly dependent on its inhabitants. If the coral is healthy, or recovering from damage, as it appears to be in Kia for 65% of the respondents, more marine species will *"Move in, and fill up the empty niches"* (respondent 17) and *"The corals is healthier now. You can see it from the beach; you can see the colours are coming back"* (respondent 34). The MPA is now protecting these reefs where species diversity has always been greater, helping species like the HHW, to make a comeback. If more species return, and population density grows, this could support beneficial interactions between species, meaning that the reefs could recover even further. Damselfishes and surgeonfish, for example, feed on algae growing on or near the corals. As coral reefs, in order to grow, need high light exposure, herbivorous fish feeding on algae help maintain the reefs exposed to sun light. Also, algae provides oxygen and help the coral to remove waste, while the corals

provide algae with the compound for photosynthesis (Levinton, 1995). Although it is not possible to determine whether any of these factors already have had an impact on Kia, the 35% of the respondents that believe the health of the coral reefs is worsening think that this is due to inland pollution, coastal erosion and overfishing. Pollutant discharges such as boat fuel and sewage can considerably modify the water chemistry in coastal areas, causing an outburst of nutrients encouraging the growth of organisms that outcompete corals for space. The discharge of domestic waste into the sea, such as plastic bags, and bottles, can cause near-shore pollution, killing the corals already affected by trampling, and anchoring (Vunisea, 2002).

There is a need for a waste management plan on Kia, because at the present moment there are no routines to remove domestic or agricultural waste. Not far from Yaro village there is a small pig farm. Effluent from the pigs is directly discharged into the sea. This has already caused water turbidity depriving coral of sunlight for photosynthesis (C3, 2010). In terms of domestic waste, food waste is not a problem as it is usually used to feed pigs. However problems stem from plastic, paper, cans, tins, and napkins. Every village has several waste pits, where the trash is stored. As these pits have a certain capacity, once they are full the villagers dig a new one, and so on. This is just a temporary solution as it is not environmentally friendly; there will soon be no convenient places left to dump the garbage (the pits are usually nearby the villages, but far enough from the houses), and during the rainy season flooding can and has caused the garbage to be washed away into the sea, exacerbating the problem. Regardless of the protection the MPA may be providing to the reefs surrounding Kia, anthropogenic factors like the ones discussed above must be monitored, because in the long term, they could cause a threat to the health of the marine environment.

For either ecological or financial reason, Kian people believe the MPA is important. All respondents respect the MPA because *"it is part of the Vanua"*. The word Vanua has two meanings; (1) an extension of the concept of the 'self', and includes the people and their traditions, beliefs and values, and the various other institutions established to achieve harmony, prosperity and solidarity, providing a sense of identity and belonging; and (2) it is associated with the ownership of an area of vanua in the sense of "land" (Sienkiewicz, 2000), and in most of the interviews the two meanings were interrelated. Respect is one of the reasons why people do not, or have stopped fishing in the MPA when it is taboo; *"But I do not do it anymore because it is illegal"* (respondent 6), or *"I will be punished, or my children will pay the consequences"* (respondent 10), or *"I respect the Vanua"* (respondent 13). When participants spoke freely about the MPA, the main point that emerged was that although the reefs are now under legal protection, nothing was being done to stop and prevent illegal fishing and exploitation of the resources, whether it originated from Kians or outsiders.

At the present time, Kians are responsible for patrolling the MPA but this is not possible because neither the government nor WWF provide fuel or boat transport. Neither are Kians able to issue penalties for illegal fishing (*i.e.* night divers, fishing during taboo period). Kian people blame the government (in particular the fishing department) and WWF for their lack of interest in the MPA, and also consider the “*Fishing department underfunded and corrupted*” (respondent 16). People think that WWF and the fishery department should deal with the problem of illegal fishing by patrolling and issuing punishments for those caught fishing in the MPA. Furthermore, according to the participants, WWF never monitored the progress of the MPA. Since its opening, only WCS-Fiji (Wildlife Conservation Society) has conducted a survey of the marine species. I believe that a dialogue between Kians, WWF, and the fishery department must be established in order to discuss, and plan the management of the MPA. The cooperation by all stakeholders is necessary for the success of the MPA. The lack of real and effective involvement of local people in the management of the MPA can create a negative perception of the local people towards the MPA, and the risk of conflict between the parties involved (*i.e.* NGO, stakeholders, government, fishery department) may arise (Turner *et al.*, 2007). Previous research on the effectiveness of MPAs has mainly focused only on fisheries management and habitat protection, especially on exploited species, neglecting elements such as changes in species, community structure, and legal enforcement (Breckwoldt, 2012). Boersma and Parrish (1999) argued that the benefits MPAs can provide are ecological, economic, ethical, scientific, and social. As many participants pointed out, surveillance of the MPA is important, as intruders who violate the reserve can seriously damage the recovery process of fish populations and coral reefs. The Government, or fishing department, should provide support to the MPA. In particular, the financial aspect is important to initiate an effective protection effort. An honorary to the fish wardens could incentivise protection of the MPA, because they would be compensated for their time and effort. But also the government should implement the laws pertaining to marine resources protection and fisheries management, and legalise, respect and fulfil the agreement (Pita *et al.*, 2011).

From the interviews it also emerged that more information on the MPA is sought, regardless of if stakeholders felt the amount of information given before the establishment of the MPA was enough or not. It is believed that regular workshops, and updates on the state of the MPA should be provided by both WWF and the fisheries department. This is not happening at the moment because as discussed previously, there is no monitoring of the MPA in place and a subsequent lack of ecological data to present. From informal conversations, it emerged that now that Kia’s waters are protected, many people from the mainland have moved to the island in order to boost their finances with fishing. Unfortunately, as one of the elders explained, there is no

way to control this migration, and Kians just have to accept these newcomers. The problems, aside from the risk of over-exploiting fish stocks, is that new people do not know the layout of the MPA, the rules and regulations, etc., which could lead to conflicts with Kians. Also, newcomers may not share the same sense of respect for marine resources that locals have, and therefore may fish regardless of other people and the needs of future generations of Kian people. More than 50% of the participants felt the need for more information to be delivered to the whole community of Kia, especially for the 'newcomers'.

5.5 Social changes

In terms of social changes, previous research conducted by C3 highlighted the fact that women on Kia are now going out fishing. This is not a problem in itself. On the contrary, it could be a benefit as women will contribute directly to the household income. However, the problems that arise are several. As women spend more and more time out at sea, they are less present in their children's lives. Not only are children not being looked after as they were before women fished, and therefore may suffer negative consequences (lack of education, poor behaviour) in the future, but also those looking after them may neglect their own children to dedicate time to other's; *"The main responsibility is the kids. If the women go out fishing too often, other people will look after their kids, and they will take advice from other people, instead that from their parents"* (respondent 33). Another problem that concerns people on Kia is that older children are looking after their younger siblings. They are simply too young to be fully responsible for children, and they may have to sacrifice their own time (e.g. homework, interacting with other children) in order to help their mother. The worst situation is when children are not looked after at all. According to several participants (all from Yaro), last year there were 'near-drowning' incidents with small children involved. This is a direct consequence of not having someone looking after the children. A further factor specific to Yaro, is that houses are much closer to the beach, and it is very easy for unsupervised children to wander to the sea.

Women are also neglecting their traditional duties. Duties include attending to the men of the household (when returning from fishing), cleaning the house, cooking and weaving of mats, fans, baskets using the pandanus palm. The exchanging of woven mats has been common practice in all forms of Fijian ceremony from ancient times, from weddings and funerals to adorning village halls, welcoming visitors, etc. Weaving is such a long and meticulous process, that it takes a number of years to learn (Nainoca, 2011). With women spending more time at sea, it is of no surprise there is a lack of mats in the village of Yaro. Not only people's houses and the village hall are without new mats, the main problem is that whenever there is a funeral there were no mats to be presented

as gifts; “Some of the women do not do the traditional things that are very important in our culture, like weaving mats, for example”(respondent 23) and “people look down to these women”(respondent 15 and 19). People eventually buy mats at the market in Labasa, and this is worrying for them as only the oldest generation of women practice weaving.

Duties are also being neglected by men. As already indicated, livelihoods on Kia are becoming increasingly monetary-based, meaning that people are (intentionally or not) abandoning their subsistence-based livelihood, and therefore their relationship with nature is changing too. As a result, cultivating of the land is neglected. However, the lack of interest in agriculture is not entirely caused by the amount of time the men spend at sea; it is also linked to the amount of money people earn on a daily basis. As they now earn more money, or at least have the opportunity to do so, they prefer to buy food instead of growing it, especially younger generations of fishermen.

The last important point that emerged during this research is related to future generations. Resources are not infinite, and people on Kia, especially the older generations, appear fully aware of this. Regardless of the establishment of the MPA and any perceived benefits, Kians are genuinely concerned with ability of fish stocks to remain resilient against exploitation. They are worried that, because the MPA is seen as a “*bountiful source of fish*”, and an infinite resource by many (both Kian and non-Kian), the number of people going out fishing will continue to increase. This, combined with the overfishing of certain species of ecological importance like the HHW, and for many families, the necessity of increasing the fishing trips and catch to meet their financial needs, will eventually lead to a collapse of the marine environment in the nearer future, within and outside the MPA. As at the moment there are no means of regulating fishing, the only way Kians can guarantee an income for future generations is, in combination with fishing, to embrace the idea of alternative livelihoods.

CHAPTER 6: Conclusions and Recommendations

6.1 Conclusions

This research attempts to uncover and understand the social, economic, and financial elements affecting the community on the island of Kia as a result of the establishment of the MPA, and to evaluate if the MPA has been effective by way of its management objectives. This has not been an easy task for many reasons. Conservationists have only recently started investigating the social aspect of conservation projects, meaning reviews of the subject are still quite scarce, and especially so in Fiji. This leaves very few references to support ideas, and deepen discussions. Kia island is one of many remote islands in Fiji and, if it was not for C3 and the social research they have been previously conducting, no background information or secondary data, vital for this study, would have been available.

This study may just be ‘the tip of the iceberg’. Further research is definitely required on ecological, social, financial, and legal changes, in order to better understand whether the MPA is effective or not. When the local community is directly involved with the MPA at many levels, it is important to equally consider what social and financial changes are occurring, and what the consequences of these changes are, as they have the potential to influence the whole dynamic of the rural community. For this reason I believe more anthropological research, alongside the ecological, is needed, as this could help to understand the dynamics of other rural communities relying on fisheries, not only in Fiji but around the world. Not having recorded data (financial, ecological, demographic) previous to the establishment of the MPA makes comparative analysis of interviews difficult. However, the importance of this research is pivotal for whichever future studies may be conducted not only on Kia, but potentially for other small, isolated island-communities around the world (Duncan and Nakagawa, 2006).

Although conservationists put an emphasis of research on the ecological importance of projects like, for example, protected areas, species reintroduction, or habitat restoration, it should also be considered the various other facets of our research. Social elements must be considered for two main reasons: first, the consequences the initiative is having on people directly and immediately involved with it (e.g. researchers, and stakeholders) not only in the present or immediate future, but also for the generations to come; second, the role people involved with the initiative (especially underrepresented groups such as women) could play to increase the chances of success of the initiative itself.

Different opinions have emerged in relation to the choice of fishing techniques, and most probably due to the age of the participants.

- Spear gun fishermen (generally fishermen of 40 years of age and younger) have a more positive view of the ecological changes. They believe that the MPA is contributing through spillover and larval dispersal to the increase of population density, body size and species abundance.
- Line fishermen (fishermen over 40 years) have a more neutral and negative view. The majority believe that there has not been many changes in population density, body size and species abundance, and that they are the same as before the establishment of the MPA.

However, when participants were asked about the changes in coral reefs and sea grass, 65% of the respondents agreed that after the establishment of the MPA, the corals are healthier and the sea grass is more abundant. It is known that healthy corals/corals in recovery favour both species abundance and population density. This could explain the positive view of spear gun fishermen that fish deep into the ocean, and have the choice of targeting particular species of a specific body size. They also are able to observe the marine environment as a whole. Line fishermen are less able to target their catch, meaning that their perception of marine species could be influenced by what species they capture, and they may be less aware of the health of the marine environment. In addition, 6 line fishermen were women. Women have only recently began fishing, and their knowledge of the marine ecosystem is limited to those species that they observe at landing sites. However, their knowledge is not to be underestimated as it may become beneficial if landing site survey are to be undertaken.

In terms of regulation, and enforcement, Kians' see the MPA as a failure. They feel abandoned by WWF and the government, the bodies that should have provided tools for support of the MPA, such as patrolling. The main change they would like to see is an end to illegal activities, namely outsiders 'stealing' from the MPA. This can only be possible if patrolling is put in place.

Even though the establishment of the MPA has forced fishermen to fish in more distant locations, with the implications of higher cost for the fuel, there is the opportunity to increase the daily income, due to more frequent catches of larger fish in greater numbers. As 77% of the fishermen have underlined, their finances have now increased because of the abundance of fish around the MPA.

Line fishermen may argue that population density, and species abundance have not changed greatly after the MPA, but they are aware that the spillover due to the MPA is actually helping increase their finance. Fishermen have now the option of going out more often, and for longer hours, without incurring the risk of small catches. Before the

establishment of the MPA, many niches on the reefs were empty, meaning that fishermen would return with small catches, and they had to search further afield for fish to catch. Now, although the more bountiful reefs are protected by the MPA, they can go out fishing with the certainty that their catches will be abundant.

This abundance, however, although at the present time seems to be endless, may not last forever. In fact, when participants were asked if there will be enough fish for future generations to benefit from, 75% answered that if the rate of fish exploitation continues as now, and patrolling and enforcement are not put into place, they fear the marine resources will be depleted very rapidly. As they have already witnessed in the past, Kians are aware that their marine resources are limited, and that there is the need to find alternative income that could relieve decreasing pressure on fisheries. Ideas have been discussed during focus groups, where participants of both genders and different ages took part. Weaving, animals and vegetable farming seemed to be the most appropriate and feasible, as they are already part of everyday Kian life. However, the biggest challenge is whether Kians are prepared to decrease their fishing effort, and their '*easy money*' in favour of other activities.

The biggest transformation the community of Kia is facing is the change in the role of women within the community. At this stage it is unclear whether women are fishing solely to contribute to the family income, or because they are seeking financial independence. The fact they are spending more time out at sea, and less time attending their traditional duties, whether it is child care, housekeeping, or weaving, is at the moment a great concern to the community. Neglected children and family are seen as a negative aspect of the establishment of the MPA. Many participants argue that children are suffering in terms of education, and behaviour, from the fact that their mothers are not spending enough time with them. Children are frequently looked after by older siblings, or other members of the community that not necessarily are suitable guardians. Furthermore, women are abandoning the tradition of weaving, which on Kia, likewise around Fiji, is part of their heritage and traditions. Not only women are slowly detaching themselves from their cultural identity, but also from their role of care taker, food provider and guardian. Their role within the community is changing, but where it will shift to, and the effects this development may have within the patriarchal Fijian society is unclear.

To conclude, the establishment of the MPA has, without doubt brought changes within the small community of Kia. At an ecological level, there have been some improvements as more species have now populated the waters surrounding the MPA. In regard to finances, people have now access to better finances, whether a positive or negative outcome it is too early to say. On a social level, the fact that women are now

contributing to the family income can be seen as positive, although it is not known where this will lead.

6.2 Recommendations

It would be of considerable benefit to carry out a series of interviews targeting the older members of the community (60 years and above) on Kia, as only 1 took part in this research. Insight from this age group and their experience of the ecological changes are fundamental to generating background information that could be used for monitoring of important species. Also, their knowledge could be used to evaluate the impact of neglecting agricultural land in favour of fishing, and the possible extent of coastal erosion. Although not related to the MPA, it is important to understand the environmental changes happening on Kia. According to people in Yaro, the village coastlines have been receding in the past few years, but it is unknown what the driving factors may be. Some have argued that removal of trees to create space for new houses could be one of the reasons. If terrestrial changes are recorded, together with weather patterns, and infrequent but significant events like, for example, hurricanes, cyclones, coral bleaching events, it may be possible to understand the causes of coastal erosion, and put in place a plan to avoid further degradation.

Detailed data on living costs and expenditure is required. This is important to assess the community wealth and to evaluate what alternative livelihoods can be considered to integrate with the income generated by fishing. Daily and weekly income should be recorded, together with expenses (*i.e.* fuel, church contribution, goods, school-fees). Also, it could be important to record the financial revenue of women. In terms of alternative income, there are other factors aside from finances that should be taken into account. For example, the location of the villages: Ligau and Daku are closer to the MPA, therefore they may be more suitable for venturing toward tourism-related activities. The outline of the villages is also important. With fewer houses, and more vegetation and communal spaces than Yaro, Ligau could be suitable for silviculture, and sandalwood farming. Daku, the smallest of the three villages, could be suitable for beekeeping or a bakery, while Yaro could be used for livestock farming.

Ecological monitoring must be put in place, in order to assess the real benefits of the MPA. It is only through such observations that the health of the environment can be truly evaluated, and decision-making undertaken. The new locations where Kians go fishing must be monitored to assess its impact, and to evaluate the effective benefits of the MPA. It is not known if spear gun fishermen and line fishermen share the same locations or not. Monitoring of the coral reefs is also fundamental, as coral reefs are subjected and susceptible to both anthropogenic and environmental hazards.

Monitoring and surveying could be conducted by C3 volunteers. However, it should be taken into account that to determine fish abundance and species diversity the data has to rely on visual sampling, requiring advanced skills in identification. Visual sampling has a margin of imprecision, and it can be challenging to quantify the benefits of the MPA, although catch per unit effort could be used to compliment this method. To keep the MPA taboo in perpetuity would certainly benefit the ecosystem, and it would provide protection to fish residing in its boundaries (Leleu *et al.*,2012). If monitoring and patrolling are put in place, and become effective, this could help to guarantee fish resources for future generations. Clarity on the role of fish warden, WWF and government fisheries department should be made, with the community actively involved in order to take full ownership of the MPA.

Recording environmental changes are also important. A seasonal calendar could be useful when asking about environmental changes, to understand how these events have influenced the community's development and relationship to the environment.

Participants, fish wardens included, believed that a salary should be given to fish wardens. Either from WWF or the fisheries department. If fish wardens are not given an incentive, as is the case on Kia, they may eventually abandon the job, leaving the MPA unpatrolled and open to exploitation. Their time and efforts must be compensated as the time they spend patrolling the MPA is less time they can spend out fishing, meaning their income may decrease (Cabigas, 2012). If fish wardens were involved with monitoring and patrolling the MPA, all the community could benefit and be involved. Information sharing during community meetings, and TEK could be shared and used to improve the managing of the MPA. It is simply not known how and if passing of TEK is happening on Kia. Young generations of fishermen know about the species they usually fish, but it is not clear whether their knowledge is extended to non-target species.

With this research I wanted to contribute to the (at the time) scarce literature on the interaction between an MPA and the local communities relying on the marine environment (protected and non) for both income and nutrition. I chose Fiji not only because C3 gave me the opportunity to do so, but also because the country was not a priority for conservationists like, for example, South America or Asia are, and there was not much research on Fiji. I wanted to tell the story of this community, the bond Kians have with their environment, and how are they preparing themselves for something that looks almost inevitable: fish stock decline.

With this research I aimed to discovered how effective the MPA really is, how the life of Kians is changing after the establishment of the MPA, but I wanted to talk to people not only as a scientist, but also like someone interested in how they feel about their

environment that is so rapidly changing. I wanted to help them in any way I could, and I am hoping that C3 will continue with the work it is doing with the community.

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Appendix I

a) Semi-structured interview template

 <p>Community Centred Conservation 17 Northcliffe Drive, London N20 8JX info@c-3.org.uk</p> <p><small>www.c-3.org.uk Registered as a non-profit company in England & Wales #5569524</small></p>	<p>SEM PASIFIKA KEY INFORMANT SURVEY Kia Island, Fiji</p>			
<p><i>Notes in italics are to assist the interviewer only.</i> <u>Text in underlined bold refers to SEM-Pasifika Indicators</u> Bold text for emphasis</p>			<p>Interview #:</p>	
			<p>Date:</p>	
<p>Interviewer:</p>		<p>House No: House name: Village:</p>		
<p>Interviewee: Age: Area of expertise:</p>				

<p><u>INTRODUCTORY STATEMENT</u></p>
<p>Hello, my name is Monica and I would like to take about 45 minutes of your time to ask you about the changes that the MPA has brought to Kia Island and its people. You have been selected as an expert on these issues on Kia. Please be aware that the results of this interview will be kept completely confidential from any authorities and the results of this survey will be discussed in detail with the whole community with the hope of providing an assessment of the MPA, in order to identify possible strategies for future management of the MPA and its resources, for the benefit of local people and the environment.</p>
<p>Can I ask your permission to record the interview with a dictaphone?</p>
<p>The list of marine species was provided by C3</p>
<p><i>The KI survey aims to gather rich detailed qualitative information, ensure that you allow and encourage the KI to provide as much detail as possible, but keep the discussion relevant. Take extensive notes to ensure that all detail is recorded, use a Dictaphone if the interviewee is comfortable with it.</i></p>
<p><u>DEMOGRAPHIC</u></p>
<p>How long have you been living on Kia?</p>
<p><u>D1 Household Size</u></p>
<p>a) How many people live in your household?</p>
<p>b) Do you have any children? If yes, how many?</p>
<p><u>D12 Sources of Household Income</u></p>

a) What is your household's primary source of income?
b) What is your household's secondary source of income?
c) Are you the breadwinner in your family?
d) How often do you go out fishing?
e) Has the frequency with which you go out fishing changed since the establishment of the MPA?
<u>COASTAL AND MARINE RESOURCES</u>
From Lui's survey (and personal observations) has emerged that:
<u>C1 Coastal and Marine Resources</u>
Some of the species fished in Kia's waters (only family names are indicated, as the individual species depends on seasonality):
Barracudas (<i>Sphyraenidae</i>), Boxfish (<i>Ostraciidae</i>), Emperor (<i>Lethrinidae</i>), Groupers (<i>Serranidae</i>), Parrotfishes (<i>Scaridae</i>), Porcupinefish (<i>Diodontidae</i>), Rabbitfishes (<i>Siganidae</i>), Sea Cucumber (<i>Cucumariidae</i>), Snappers (<i>Lutjanidae</i>), Spadefish (<i>Ephippidae</i>), Surgeonfish (<i>Acanthuridae</i>), Sweetlips (<i>Haemulidae</i>), Trevally (<i>Caranidae</i>), Triggerfishes (<i>Balistidae</i>), Wrasses (<i>Labridae</i>),
a) Have you noticed any change in species, size, and population density since the establishment of the MPA?
<u>C2 Coastal and Marine Activities</u>
Harvesting methods: diving with spear guns (younger men), net fishing and sea cucumber diving (women, children and older men)
Fishing locations: there are different grounds, but they are all close to the reefs. When the MPA is open, they fish in the MPA.
Fish price (grade A (and minor), B (and minor), C (and minor), D (and minor): Depend on species availability, and the fish agent
Market (local, national, international): Fish is primarily sold on Kia to the fish agent. Occasionally fish is sold in Labasa (usually at the market or directly from the boat on Saturdays).
a) Have you noticed any change in the harvesting methods, locations, price or the market since the establishment of the MPA?
b) Has your income changed since the establishment of the MPA?
c) If I ask you to draw a map of the waters surrounding Kia, indicating the locations where you used to go fishing (before the MPA) and where you going now, will you be able to? The reason for asking is because we will be doing a mapping focus group with the fishermen.
<u>C6 Types and levels of use by outsiders</u>
From Lui's research has emerged that outsiders do use Kia's marine resources.

Activities: fishing, crabbing, reef gleaning, sea cucumber collection
Harvesting methods: line fishing, long line, night diving (illegal), scuba diving (illegal)
a) Do you know where these outsiders are from?
b) Why do you think they come here instead of fishing in their own fishing grounds?
c) What do you think about outsiders using Kia's resources?
d) Should the people responsible for the MPA find way to stop people from abusing it?
<u>C9 Gender roles and responsibilities</u>
From the data collected by Lui, my personal observations, and conversations with locals, it emerged that women have more traditional duties than men (e.g. looking after the children, cooking), and also go out fishing (more often than before the MPA was established).
a) Has anything changed in the role women used to play in the community since the establishment of the MPA?
b) If yes, what are the consequences? And which ones may be in the future?
<u>THREATS</u>
<u>T2 Perceived resource conditions</u> From Lui's research, it emerged that people in.....perceive the condition of their resources (agricultural land, beaches, coastal plant and trees, coral reef, and seagrass beds) as follow:
a) Have you noticed any change in the terrestrial resources since the MPA was established?
b) How much time do you spend in your garden?
c) Have you noticed any change in the marine resources since the MPA was established?
<u>MANAGEMENT</u>
<u>M9 Formal tenure and resource rights</u>
a) Do you know of ownership rights existing on Kia and the Great Sea Reef?
b) Do you know if anything has changed since the establishment of the MPA?
<u>M14 Management Successes and Failure</u>
a) How important do you think is the MPA for the marine ecosystem, and the people of Kia?
b) If you could, would you change anything about the MPA, and why?
c) If the MPA stays the way it is now, do you think that there will be enough fish for future generations?

<u>M18 Compatibility of management with local values and beliefs</u>
a) Have you ever fished in the MPA when it was tabu'?
b) Why have you fished? Why do not you fish anymore?
c) Do you think that the community was adequately consulted and informed before the establishment of the MPA?
d) What do you think is the current level of involvement of the community with the MPA?
e) Do you know of any future plan for the MPA?
Anything else you would like to say?

B) Resources perceptions

Resources (Yaro)	Good	Neither	Bad
Agricultural land			
Beaches			
Coastal plant and trees			
Coral reefs			
Seagrass beds			

Resources (Daku)	Good	Neither	Bad
Agricultural land			
Beaches			
Coastal plant and trees			
Coral reefs			
Seagrass beds			

Resources (Ligau)	Good	Neither	Bad
Agricultural land			
Beaches			
Coastal plant and trees			
Coral reefs			
Seagrass beds			

C) Coastal and marine activities

Coastal and Marine Activities (people in Kia)	Coastal and marine goods and services (data collected by Lui and during my research) (Dependent on season)	Harvesting methods and means of service	Location of coastal and marine activities	Value (High /medium /low) or price	Market % (local (Kia)/ national / international)
Fishing	Octopus, shellfish, turtles (endangered), coral, Beche-du-mer, lobster, boxfish, porcupine fish, parrot fish, wrasse, crabs, trigger fish, snapper, sweetlips, groupers, emperor, surgeonfish, spadefish, barracuda, trevally	Diving with spear gun, net fishing	There are different grounds, but all closed to the reefs. Occasionally, when the MPA is open, they fish in the MPA.	Depend on species	Fish is mainly sold in Kia to the fish agent, and in Labasa (directly from their boat)
Non-fishing					
Collecting shells	Shells	By hands.	Beach. Some in sea.	n/a	n/a
Cooking	Salt/salt water	Pot/bucket.	From beach.	n/a	n/a
Extraction	Live coral – house decorations	Break by hand. If caught on fishing line, take it. Used to be a company that bought live coral. Kia community stopped them coming here but they did it with other communities.	Deep sea	Souvenirs are not sold on Kia	(Previous Company) 0/0/100 All overseas
Extraction building materials	Sand	Spades and sacks	Beach	n/a	
	Gravel	Spades and sacks	Shorefront of beach	n/a	
	Dead coral	Spades and sacks	Shorefront of beach	n/a	
Hunting	Seabirds	They don't fly during hurricane. Hit them with a stick.	End of bay. They shelter in the bushes.	n/a	n/a
Medicine	Seawater	Gallon/bucket.	Far out. Deep sea.	n/a	n/a
Medicine	Trigger fish and shark liver.	Catch it and cut it.	Sea.	n/a	n/a
	Exercise	Walk up and down. Sometimes while doing cultivation, weeding etc (if not too much grog)	Beach. Plantations.	n/a	n/a
	Relaxation	Just sit, watch, meditate	Beach under trees	n/a	n/a
	Rugby training	Run, exercise on sand	Beach/playing ground	n/a	n/a

	Swimming	Swim	Sea, beach, when fishing in fishing grounds	n/a	n/a
Rubbish disposal	Rubbish disposal	Just throw it	Everywhere. Sea and everywhere, bushes, outside kitchen, on floor.	n/a	n/a
Transport	Transport	Boats	Sea	Depends on owner. High, low or free	n/a