Marine Protected Area: A Case Study in North-Eastern Iloilo, Philippines

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Cheryl Joy Jardiolin Fernandez
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ABSTRACT

Marine Protected Area (MPA), as a fisheries management tool has been promoted by both national and local conservationists and has provided de facto illustrations of integrated coastal management (ICM) in the Philippines. However, conflict is inevitable in the implementation of public policy such as the MPA because of contrasting objectives and expectations from various stakeholders. Coupled with non-human (e.g. MPA size) and human (e.g. mismanagement) threats, conflict becomes a hindrance to MPA effectivity. In the Philippines alone, only 10-20% of the 500 MPAs are attaining their objectives. This study presents an overview of MPA management and examines the interaction between the civil society and market forces of institutional arrangements in the case of North-Eastern Iloilo (NI) in the Philippines. It discusses overall scenarios that resemble conflict between various national, local and international sectors, assessing MPA success factors and the expected implications from such implementation.

Results from key informant, focus-group discussion and social survey show that there are problems on MPA management in the region. Using data and strategic analyses, it presents that minimisation of conflicts amongst actors should be the primary goal of the NI municipalities. In addition, MPA size and membership to organisations are also significant factors of success. Moreover, the analysis from a simple correlation to complex Principal Component Analysis (PCA) and Canonical Correlation Analysis (CCA) conclude that information on MPA regulation does not directly contribute to the improvement in MPA management. It implies that a focus on informing stakeholders about the benefits of having an MPA and its regulations is ineffective. The focus should be on the reduction of conflict between economic actors - for free riding problems are currently occurring, thus minimising conflict by conflict resolution and

proper incentives. However, there are still remaining challenges on MPA management, for not all factors are incorporated on this study. The challenge now is on how to identify the remaining factors and integrate them into policies and implementations to improve the overall condition of coastal communities.

DEDICATION and ACKNOWLEDGMENT

I dedicate this piece of work to my family: Mama, Papa, and Perry - for whom I owe my achievements.

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BFAR – Bureau of Fisheries and Aquatic Resources

CDA – Canonical Discriminant Analysis

CCA – Canonical Correlation Analysis

CRMP – Coastal Resource Management Programme

DENR – Department of Environment and Natural Resources

DILG – Department of Interior and Local Government

FARMC – Fisheries and Aquatic Resources Management Council

FGD – Focus Group Discussion

GDP/GNP – Gross Domestic Product/Gross National Product

ICM – Integrated Coastal Management

IUCN – International Union for the Conservation of Nature

JICA – Japan International Cooperation Agency

KI Interview – Key Informant Interview

LCG 1991 – Local Government Code 1991

LGU – Local Government Unit

LOGIT function – logistic function

MAO – Municipal Agriculture Officer

MPA – Marine Protected Area

NEDA – National Economic and Development Authority

NSCB – National Statistics Coordination Board

NGO – Non-government Organisation

NI – North-Eastern Iloilo

NIACDEV - Northern Iloilo Alliance for Coastal Development

NIPAS Act 1992 – National Integrated Protected Areas Act 1992

NSO – National Statistics Office

NZD – New Zealand Dollar

PCA – Principal Component Analysis

PCG – Philippine Coast Guard

PHP – Philippine Peso

PNP – Philippine National Police

PO – People‘s Organisation

PAMB – Protected Area Management Board

CHAPTER ONE ~ Introduction

> *„Despite its government‟s good intentions, rapid population growth, urbanisation and industrialisation have far outstripped urban environment services and weak natural resource management systems have led to rapid degradation of those environments, too‟.*
> *- World Bank (2008)*

As an archipelago, the Philippines is endowed with diverse fisheries resources a lengthy 17,460 km of coastline and a wide 2,200,000 km^2 of marine area. With this comes the government‘s responsibility for sustainably maintaining fish catch, promoting tourism and preserving biodiversity.[1] The country‘s marine resources are highly valued, both economically and socially, with fisheries contributing approximately 4.3% of the country‘s Gross Domestic Product (GDP), or around 22% of the country‘s total agricultural sector (BFAR, 2008). Throughout time, fishery resources, particularly mangroves, corals and fish, have been continuously threatened and upon the implementation of the Presidential Decree (PD) 704 in 1975, fishery problems have intensified. This law encouraged utilisation of resources and excessive production, which have eventually led to „ineffective promotion of sustainable management and development‘ of the Philippine fisheries (Pomeroy & Carlos, 1997). In addition, there have been expansions of coastal communities; proliferation of destructive fishing methods; and a high demand for natural resources in local and international markets all of which has continued to increase over the years.

Since the beginning of Spanish colonisation, the Philippine‘s fisheries and coastal management has been managed through a central authority, i.e. bureaucratic, until the fall of the dictatorship regime in the mid-1980s (Pomeroy & Carlos, 1997). The country‘s history recognises that the allocation of coastal resources has occurred through traditional property

[1] Fisheries refer to all activities relating to the act of, or business in fishing, culturing, preserving, processing, marketing, developing, conserving, and managing aquatic resources areas and the right to fish or take aquatic resources thereof (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004).

rights. Its management has evolved, which can now be categorised into three management schemes– bureaucratic, community-based, and co-management. [2] Philippine laws, such as the Fisheries Code of 1998; the National Integrated Protected Area Systems (NIPAS) Act of 1992; and the Local Government Code of 1991[3] make the devolution of authority possible, wherein there are active participations between different sectors of society, such as the Local Government Units (LGUs); Non-Government Organisations (NGOs)[4]; municipal and provincial sectors; community stakeholders; and market forces (business enterprises) (Fernandez, 2006; Webb, Maliao, & Siar, 2004). The sole responsibility of the national government in managing fisheries was scrapped, stakeholders, managers and politicians are expected to participate in MPA management processes. As a result, conflicts have been inevitable due to varying objectives and different actors involved in implementing and managing marine policies.

A Marine Protected Area (MPA) is one of many fishery coastal management strategies in the country, put in place to address future problems related to coastal and livelihood sustainability. Usually, MPAs prohibit or regulate fish catch in marine areas to achieve conservation objectives. In the Philippines, were they had been introduced as early as 1940s, they became more popular as a pioneering tool in fisheries management during the 1970s, following prominent successes such as the Apo Island Reserve, where coral cover increased extensively. From then on there has been a rapid increase in the number of MPAs in the country, reaching 500 in the late 1990s (Gjertsen, 2005; University of the Philippines – Marine Science Institute (UP-MSI), ABC, ARCBC, DENR, & ASEAN, 2002). The MPA became an important policy that involves a dynamic and participatory process, in which an integrated strategy is employed for the conservation and sustained multiple use of the coastal zone, whilst taking into account traditional,

[2] For details, see Fernandez (2006) and later chapters.
[3] Details of these laws are discussed in later chapters.
[4] Non-Government Organisation (NGO) is any agency, institution, foundation or group whose purpose is to assist people's organisations or associations in various ways including, but not limited to, organizing, educating, training, researching, and/or resources accessing (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004)

cultural, and historical perspectives (Webb et. al, 2004, p. 138). Thus, it is regarded as a tool to improve fish catch and preserve biodiversity (Alder *et al.*, 2002; Hannesson, 2002; Roberts *et al*., 2001 as cited in Christie, White & Deguit, 2002; Sumaila, 1998).

Coastal and fisheries resources are deemed important since they play major roles in ecological and economic functions. However, due to the complexity and dynamics of social and biological entities in MPA, two main problems may arise – (1) threats and mismanagement, and (2) conflict amongst actors and sectors. Although there are expectations that an MPA yields positive effects, an assessment of its management is essential, because fishing communities and other target groups cannot fully reap these benefits, if the MPA is not working properly. The International Union for Conservation of Nature (IUCN) relates that the success and failure of MPA relies on the attainment of specific objectives for the people concerned (Pomeroy, Parks, & Watson, 2004). Given the different changes in the country such as (1) environmental degradation; (2) pollution; (3) rapid population growth; (4) natural resource depletion; (5) high demand for marine products; (6) lack of employment other than marine resource extraction; (7) law enforcement constraints; (8) poorly managed shoreline development (e.g. ports); (9) low success rates; and (10) conflicts in MPA, it is important to analyse the effectiveness of MPAs for success or failure has sequential effects on coastal communities. Since human activities are responsible for damage to the MPA, it is logical that an effective MPA should be free from these threats (or at least the danger should be minimal).

1.1 Objectives of the Study

This study addresses MPAs in North-Eastern Iloilo (NI) in the Philippines, a poor fishing area that is a good example of various management regimes and conflict associated with various types of MPA. The objectives of the study include the following questions:

1. **What is the current MPA management regime and scenario in NI?** There are many types of strategies that have been implemented for the management of fishery resources. As mentioned earlier, they fall into three broad categories: bureaucratic, community-based, and co-management. However in reality, coastal management commonly used in the Philippines is a combination of these categories. It is therefore, essential to discuss the structures and practices of MPA management regimes, since they have the utmost influence on the success of its implementation and on the behaviours of economic actors. Through this, problems are understood and resolutions are possible.

2. **Do conflicts exist between different management entities (fishermen, public, and private sectors) and management regimes?** The NI fishing region has had persistent conflicts and continuing problems with its management. During the implementation of various development programs and projects, there has been _conflicts over management plans and strategies between and among subsistence fishers, commercial fishing operators, politicians and their pressure groups, fish processing plants, barangays with MPAs, and NGOs' (Fernandez, 2006).[5] Furthermore, due to a lack of _common interpretation of the law', there is also conflict between the local government and the Northern Iloilo Alliance for Coastal Development (NIACDEV) and, in addition a conflict between municipal and commercial fishers.[6] This study is an in-depth study of these conflict, making use of a social survey technique.

3. **Are MPAs successful in NI and do the levels of success differ between management regimes?**[7] Most studies of MPAs in the

[5] *Barangay,* or village, is the smallest unit of administration or government in the Philippines.
[6] NIACDEV is a registered non-profit decision making and management council composed of ten municipalities (seven have coastal areas) and led by two volunteers (i.e. a municipal councillor and a Community Resource Management (CRMP) officer (Fernandez, 2006, p. 20).
[7] A successful MPA is one in which objectives are achieved; otherwise it is considered a failure.

Philippines do not include those of NI, but rather focus on national parks and certain fishing regions. Since there are different management regimes, conflicts may arise due to misunderstanding of authority and mandates. This study will determine whether MPA's effectivity depends on the type of regime, through assessing conflict in every regimes.

4. **What are the factors affecting MPA success?** This study determines factors relevant to the success or failure of MPA management in NI. Literature suggests both biological and social factors that affect the success of MPA. This study identifies whether the same conclusion is reached in the case of NI MPAs.

5. **What are the roles of economic players and how do they behave towards MPA implementation?** Based on the assumption that conflict arises due to differences in objectives and overlapping mandates, it implies that minimisation of conflict leads to more successful MPA. There are also some implications relating to individual and group behaviours. It is then imperative to look at what and how these roles are played out and how each behaviour changes, due to complying and not complying with MPA regulations. The study should also consider the benefits and costs that individuals incur, when complying with the regulations.

6. **What are the implications for policy making of the success or failure in the management of MPA, in addition to changes in behaviours?** Given the problems of MPAs and conflict in the management of MPA, there are policy implications. If MPAs are successful then what are the policy structures. However, if MPAs are not successful, governments should reconsider revising the provisions of MPA, or opt to other coastal management strategies.

Research on the successes and failures of MPAs in the world and in the Philippines, has been widely documented. It has often been general in

nature and it has focussed on large marine parks and specific regions. For example, most studies assess the scientific factors that affect MPA implementation and some assess social factors. In addition, some studies have illustrated an integration of these factors in order to achieve comprehensive results. However, success factors used have not been previously studied in terms of different management regimes and conflict issues, which enables comparison. Although there are many studies on the factors of success of MPAs, literature on the conflicts between economic actors and their roles is limited. There are some studies which analyse the tradeoffs between sectors such as fishing and tourism, but little is known about the economic tradeoffs that entities face when complying and not complying with MPA regulations; hence this study will fill these gaps.

Although part of the Visayas fishing area, NI MPAs have been the least studied amongst their counterparts. This study aids in the comprehensive assessment of MPA management, conflict and interaction. It helps to determine what factors are critical to an improved performance of various sectors, as well as to identify problem areas for immediate solutions. For instance, an overall assessment on the conflict as a failure indicator can be used when modifying and improving strategies for MPA managers and policy makers.

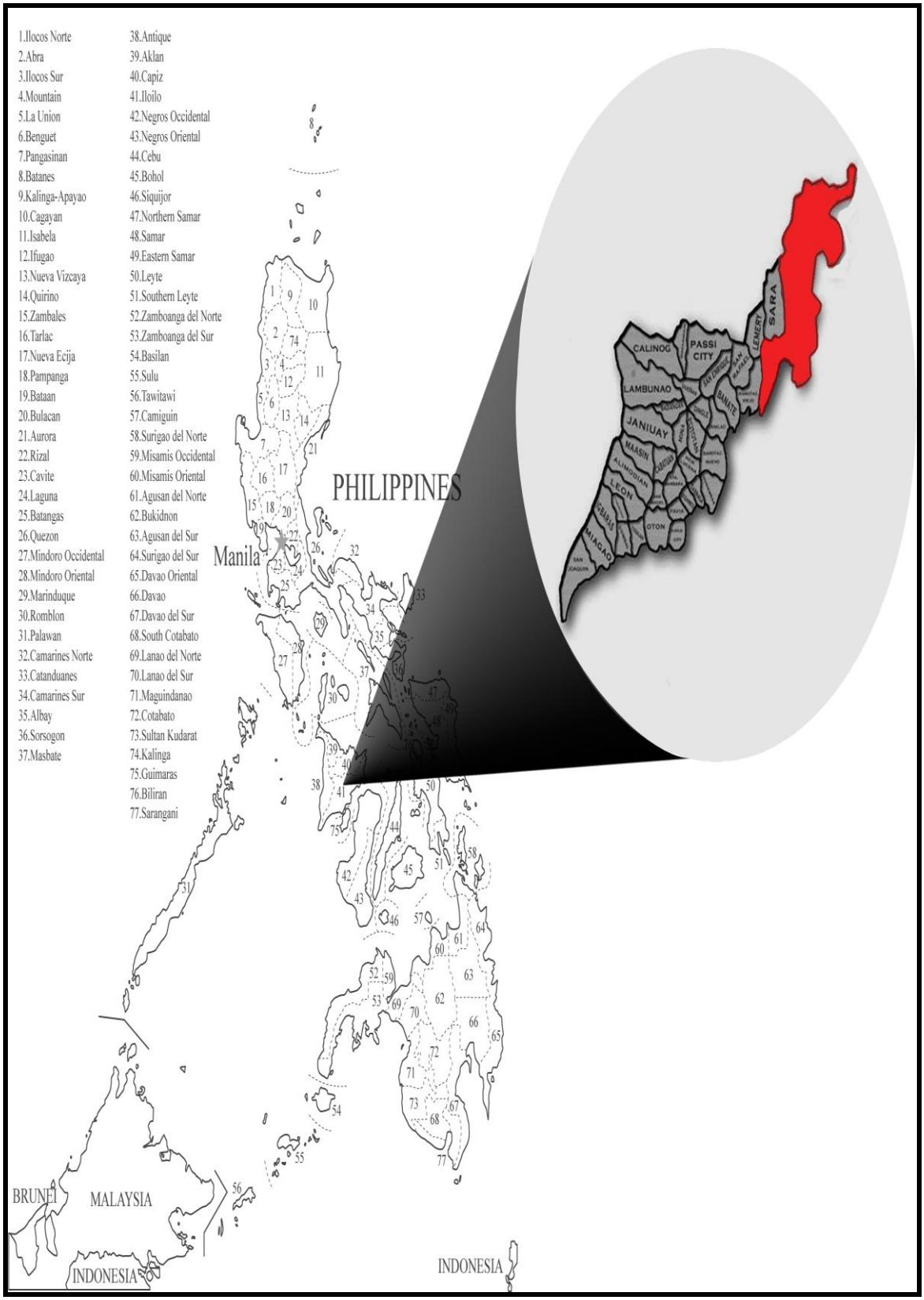


Figure 1: *Map of North-Eastern Iloilo, Philippines, Illustrated by Perry Neil Fernandez (2008)*

1.2 Outline of the Study

This study consists of seven chapters. Chapter Two presents a profile of the Philippines and an overview of fisheries management and the roles of MPAs, with an emphasis on the Coastal Resource Management Programme (CRMP). It discusses the composition of the Philippine macroeconomy and environment and puts emphasis on the Philippines dependence of fisheries and coastal communities in marine resources. Chapter Three discusses MPA related literature, focusing on the effectiveness of MPAs, i.e. whether they are successful or not, considering their link to both human well-being and natural resources management. In addition, the MPA‘s biological and social factors; definitions and roles; and conflicts, are also discussed in this chapter. The discussion highlights the roles of institutional and community capacities; information; and conflict reduction, as MPA success factors. The concluding remarks from this chapter and information from Chapter Two, provide the framework and methodology that are covered in Chapter Four. This chapter includes the data collection process used to answer the specific objectives identified in the first chapter. Chapters Five and Six discuss the results both from the data and strategic analyses while Chapter Seven summarises the study by describing the key findings and offering suggestions for further study.

CHAPTER TWO ~ Fisheries Management and the Case Study of North-Eastern Iloilo, Philippines

> *„As fishery policy moves from recommendations to implementation, there will be an ever increasing set of questions about how MPAs will affect local, regional, and national stakeholders that have come to depend on the oceans for their livelihood, recreation, and overall well-being". – James Sanchirico et al. (2003)*

The Philippines is a host of one of the world's most diverse biodiversity but is also confronted with serious threats to its ecosystem. This chapter describes the country's economic and environmental profiles as well as the government's fisheries management, with a given emphasis on the Marine Protected Area (MPA).

Statistics provide sufficient evidences that despite of its developing economy, the country faces mismanagement and overexploitation of its natural resources. These are all discussed in the first section, where the discussion starts with the Philippine's output, employment and prices and then discusses its environment, particularly its fisheries and marine resources. One of the core problems is the degradation of natural resources which poses imminent threats to food security of coastal communities. The next section describes the fisheries management processes through an integrated system and highlights the interdependence of scientific and social factors as well as the involvement of different actors. The country's coastal management is generally bureaucratic in nature, but over the years, marine resource management evolved into a participatory process. It also shows the laws governing MPAs in the country and the need for integration of different dimensions in MPA processes. The last section describes NI's demographic profile and its coastal environment.

2.1 The Philippine Macroeconomy, Environment and Natural resources

The Philippines is an archipelago bounded by the Pacific Ocean in the east, the South China Sea in the west, the Luzon Strait in the north and the

Celebes Sea in the south. According to the 2007 World Bank classification, the country belongs to a lower middle income (US$936 - $3,705) bracket with a Gross National Income per capita per year (GNI per capita per year) of US$1,620 (World Bank, 2008). Filipino is a mixed nationality with many different cultures, such as Indo-Malay, Spanish, Chinese, Arab, American and other European heritages, contributing to Filipino heritage. This diversity is due to the country‘s having experienced several different colonial masters since the discovery of the Philippines in the year 1565.

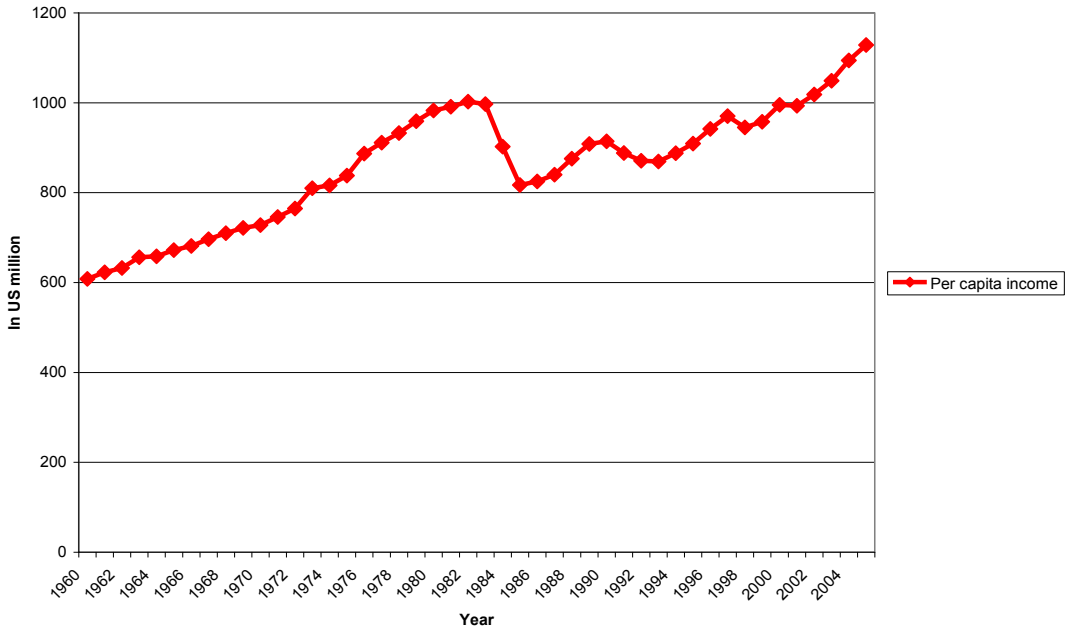
2.1.1. The Philippine Macroeconomy

In the past, the Philippine economy was viewed as one of the leading economies in Asia, second only to Japan. Output had been increasing by approximately 5-6% annually. Figure 2 illustrates the rising trend of per capita income (US$ constant) in the Philippines from 1960 to 2005. However, for the past 50 years the Philippines has experienced crises and adjustments that have led to the more recent pattern of slowed economic growth. During the 1970s, the country‘s long term external debt built up,due to steep increases in world interest rates and the oil shock (Vos & Yap, 1996). Between 1983 and 1985, as a consequence of the international financial crisis, the country‘s growth lagged behind, dragged down by debt repayments, and there was a decline in the manufacturing industry as well as collapse of the political regime.

Despite a negative growth rate in 2001, the country‘s economy has grown steadily from 2001 to 2006 with average annual growth rate in Gross Domestic Product (GDP, 1985 constant prices) of 5.4% (National Statistics Coordination Board (NSCB), 2009; National Statistics Office (NSO), 2007). However, during the third quarter of 2008, output fell from 7.1% to 4.6% due to rising oil prices and the world recession (NSCB, 2009). The country‘s growth rate is affected by corruption, political issues and environmental degradation (Freedom House, 2007).

Up to the present time, there have been ongoing political issues such as corruption and human rights violations along with a continuing decline in the level of democracy. Looking at other indicators, the gross national savings and the current account deficit have been decreasing due to effective implementation of a consumption tax called the Value Added Tax Reform (VAT). Business credibility has also risen during the past 6 years, thus increasing investment from abroad. Further, debt as a percentage of GDP declined from 67.5% in 2000 to 46.2% in 2006. In addition, inflation in the Philippines was approximately 4.3% at the end of 2006, and was down to 2.6% by February 2007 (Philippine Development Forum, 2007).

Figure 2: *Per capita income from 1960-2005 (US$, constant)*



Source: World Bank (2007)

The economy is generally composed of three major sectors: agriculture (fisheries, forestry and livestock), industrial and service sectors. Table 1 introduces the structure of the GDP in the Philippines from 1950 to 2008. It shows an increasing trend in the output of the manufacturing sector and a decreasing trend in agriculture industry output. The service sector (until the present time) has held the largest share of GDP, followed by the industrial and agriculture sectors, respectively (National Statistics Coordination Board

(NSCB), 2009). The growth of the economy is due to high export growth and private consumption. Particularly in 2006, the service sector grew at approximately 6.3%. This service sector includes transportation and tourism, whilst the agriculture sector comprises forestry, fishery, crops and livestocks.

Table 1: *Percentage Distribution of Gross Domestic Product (GDP) of the Philippines*

Year	Agriculture	Industry (manufacture in brackets)	Services
1950	42	14 (8)	44
1960	26	28 (20)	46
1970	28	30 (23)	42
1980	23	37 (25)	40
1990	22	35 (25)	43
1998	17	32 (22)	51
2008	15	32 (21)	54

Sources: Hutchinson (2001); Jayasuriya (1987:85); NSCB (2009); World Bank (1999)

During the eighteenth century, the Philippines began to commercialise its agriculture and open up international ports (Hutchinson, 2001). This allowed the Philippines to grow crops such as sugar and abaca for overseas markets. However, the country experienced a ‗colonial' pattern of trade, wherein most of the imports and exports came to and from the United Kingdom (UK) and the United States of America (USA).

In late 1990s, several business opportunities begin to rise particularly in the business outsourcing industry. There is currently a strong growth in this industry, which in turn provides additional employment. However, the unemployment rate has consistently held at around 9-10% since 1998. It is estimated that 1.1 million Filipinos left the country in 2006, a number that starkly reflects the lack of domestic employment in the country. Higher wages abroad are still the pull factor for these skilled workers.

Relative to other Asian economies such as Indonesia, Malaysia, and China , the country‘s growth rate is catching up. Most recently, the output decline due to world‘s oil crisis in 2008, is to 4.5% from the previous year‘s 6.4% (NSCB, 2009). This is much lower than its Asian counterparts. During this time, the economy is cushioned by demand side forces, which includes increased household spending and government consumption.

During the Philippine Development Forum in 2007, experts concluded that in order for the country to sustain its growth, specific areas of reform must be targeted, such as investment and employment. For example, the government should promote growth to ensure stability and prevent social unrest.

The Philippines follows a democratic type of government and has been popular for its democratic movements. Corruption is a major factor that disrupts the Philippine economy (World Bank, 2007). For instance, corruption has been revealed by various anomalies during the times of former presidents of the country, e.g., Marcos and Estrada. This can be understood by the fact that corruption can sap resources which could be used for development and social services. However, improvements in minimising corruption are observable. President Estrada was convicted of perjury in September 2007 and was sentenced of life imprisonment. He was later pardoned by President Gloria Macapagal Arroyo.

As concluded from previous paragraphs, the Philippines must address macroeconomic and social stability issues in order to maintain its economic growth. Moreover, corruption must also be properly addressed in order to sustain foreign and domestic investment and thus increase the country‘s competitive position (World Bank, 2007).

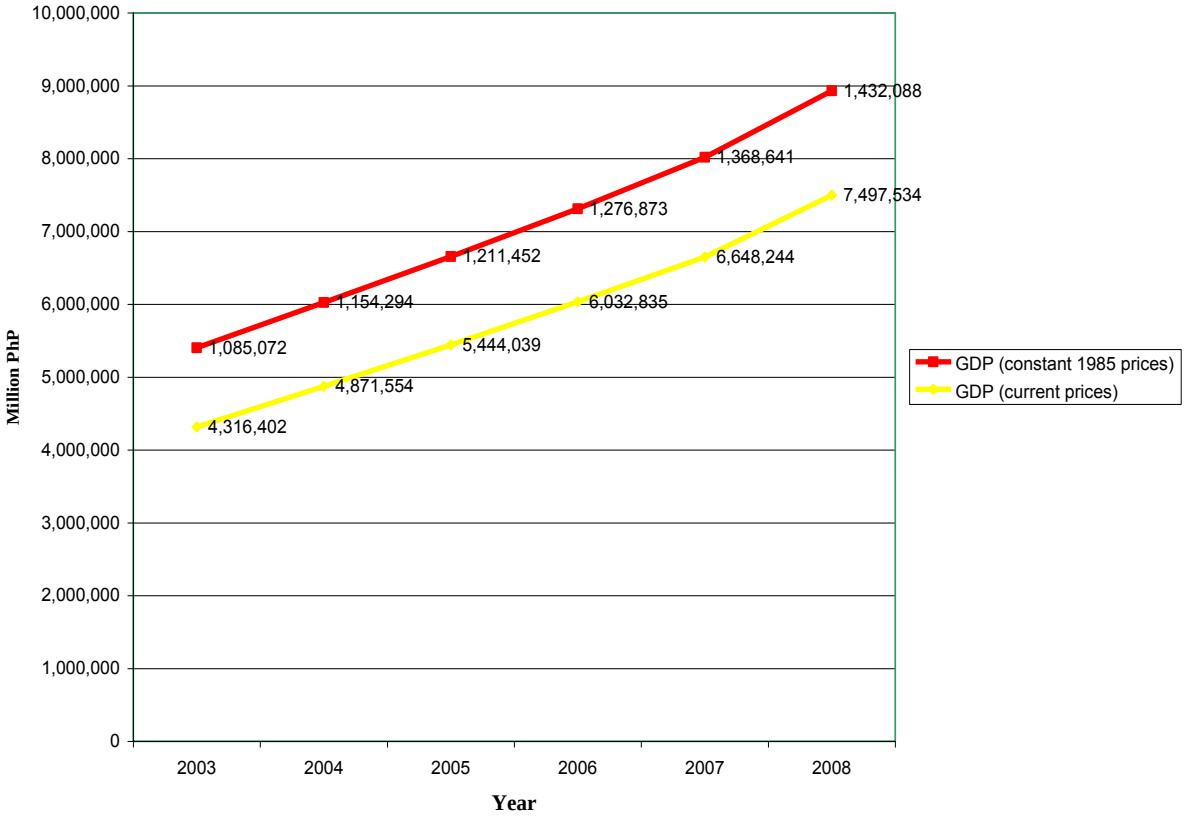
2.1.2 The Philippine environment and natural resources

The country is an archipelago comprised of 7,100 islands with a total area of 300,000 km^2 (an area 1.3 times that of the main island of Japan). As such, the Philippines experiences natural disasters annually, including typhoons, damage from flooding, storms, in addition to regular volcanic eruptions. It has a number of cities and a ratio of urban to rural population sits at approximately 58.9% or 44.87 million (Japan International Cooperation Agency (JICA), 2002). The major natural resources range from gold, copper, chromite, iron, nickel, cobalt, limestone, coal, petroleum and geothermal energy to sugarcane, bananas, coconut, corn, rubber, abaca, and more (Department of Environment and Natural Resources (DENR), 2008). In terms of biodiversity, the country is recognised by the Asian Regional Centre for Biodiversity Conservation (ARCBC) as a country with many distinctive bio-geographical units (JICA). The Philippines is, therefore, a biodiversity hotspot, comprised of fifteen bio-geographic regions. It is ranked second in the world for butterfly endemism (352 species), sixth for overall vertebrate endemism, and ninth for endemism and species diversity (vertebrates) (JICA, 2007; Mittermeier & Mittermeier, 1997). There are 430 species of hard or stony corals, compared to the Caribbean‘s 70 species. There are fourteen species of seagrasess, which makes it the highest number in the Indo-Pacific region and second worldwide (compared to Australia‘s 17 species) (DENR *et al.*, 2001). These rankings highlight that the Philippines is the only host to a number of particularly unique species. If these species start to become extinct, there may be no other place in the world to see them, except in the Philippines.

Figure 3 illustrates the growth of the agriculture sector from 2003 to 2008, both in Gross Domestic Product (GDP at current and constant prices). As shown, the country‘s growth has been increasing through the years, with a substantial increase from 2005 to 2008.

There is also positive growth in the Manufacturing, Agriculture and Fishery, Construction and Private Services sectors. Further, the Agriculture, Fishery and Forestry sector increased this year by around 1% mainly due to the performance of the Fishery subsector, which accelerated to a growth of 11.1 percent in the fourth quarter of 2008 from 3.6 percent in 2007 (NSCB, 2009).

Figure 3: *Philippine Gross Domestic Product (GDP), 2003-2008 in Million PhP*



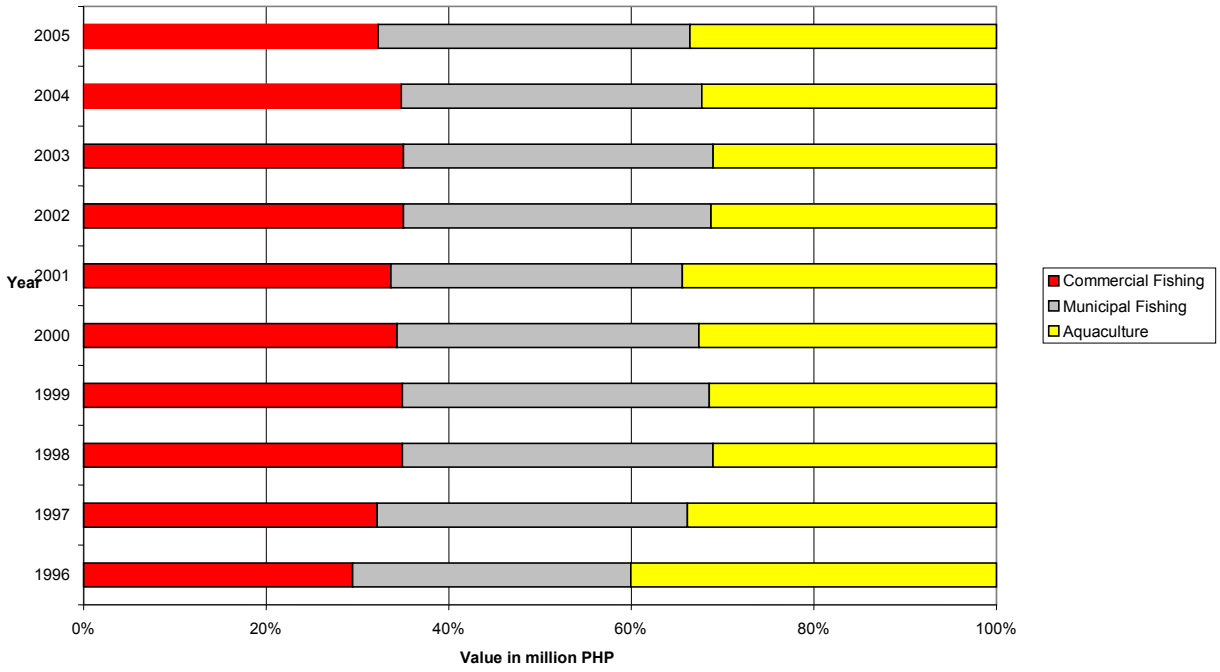
Source: NSCB (2009)

Figure 4 shows the three categories of total fish production in the country, specifically, the commercial[8], municipal[9] and aquaculture fisheries.[10] As

[8] Commercial fishing is the taking of fishery species by passive or active gear within the municipal waters for trade, business or profit (3.1 gross tons (GT) to 150 GT) areas (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004).
[9] Municipal fishing refers to fishing within municipal waters using fishing vessels of three GT or less, or fishing with gear that is passive in nature, fishing that does not require the use of fishing vessels (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004).

indicated, production shares are almost equal amongst the three types. Commercial fish production has edged past the other two other categories since 1996, but in 2005 municipal fish and aquaculture production dominated over commercial production. As early as 1890s, the country‘s fishing has been regulated in milkfish-fry collection areas (Burke *et al.*, 2002).

Figure 4: *Philippine Fish Production from 1996-2005, by Fishing Operations*



Source: NSCB (2009)

Fishing is an essential sector of the Philippine economy and is vital for most Filipinos. It contributes approximately 22.4% of the total output of the Agriculture, Fishery and Forestry industry group. In 2007, there were approximately 1.4 million people employed in fishing, and fishing activities accounted for 40-60% of the total fish catch (Balgos, 2005; NSCB, 2009). In the Philippines there are approximately 500 people per km^2 in some coastal rural areas (DENR *et al.*, 2001). Reefs are an important resource, since they

[10] Aquaculture describes fishery operations involving all forms of raising and culturing fish and other fishery species in fresh, brackish and marine water areas (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004).

can support approximately 70% of the total fish catch, in addition to providing a protein source for most residents (Savina & White, 1986; White, Aliño, & Meneses, 2006). Approximately 70% of the total animal protein intake and 30% of the total food intake comes from fish and other marine products. The Philippines has the highest per capita seafood consumption rate in Southeast Asia (33.8 kg/year) and a high ratio of people to coastline (3,000/km^2). The number of coastal inhabitants dependent on coral reef resources may reach several tens of thousands per square kilometre of coral reef (Burke *et al.*, 2002, p. 80). In 2007, total fish production was valued at approximately PhP 180,545.2 million (6,944 million NZD) and Philippines was ranked twelfth in the world in terms of fish production (Fernandez, Matsuda, & Subade, 2000; NSCB, 2009). Furthermore, tourism in coastal areas—where 70% of the 1,500 municipalities (towns) are located—is a booming business.

The Philippines is undoubtedly endowed with rich natural resources. However, there has been growing concern on the quality of its environment extending from pollution to the depletion of natural resources. The Philippine government has responded to these problems by passing decrees and creating institutional bodies. These actions, however, have not effectively addressed these problems. For instance, government institutions, especially local government units (LGUs), lack the capacity to manage the natural resources (World Bank, 2007).

According to JICA (2007), the loss of biodiversity in this country is caused by five factors: (a) habitat destruction, (b) overexploitation, (c) chemical or environmental pollution (d) biological pollution, and (e) weak institutional and legal capabilities. The current government agenda is to build strong relationships with local communities and NGOs, in addition to disseminating information on biodiversity awareness.

However, despite high growth rates over the past years, poverty is still rising. The Philippines, overall, had a poverty threshold of PhP 14,866 (571 NZD) in 2007, with PhP 16,936 (650 NZD) and PhP 14,103 (542 NZD) in the urban and rural areas, respectively.[11] The poverty threshold (per capita per year) refers to the cost of basic food and non-food requirements (NSCB, 2009).

Basic non-food requirements cover the non-food expenditure items of the Total Basic Expenditure. This amount is the minimum income that a person would need to buy food and non-food items to cover their basic needs. This implies that people earning below this level of income can be considered as living in poverty, i.e. classified as poor.

Philippine marine resources have been continuously under threat, but at the same time they are considered to be economically, socially and biologically valuable. These resources include fish, corals, seaweeds, mangroves and other marine flora and fauna. They serve as sources of income, food and many other forms of livelihood for the coastal communities. At the same time, less than 5% of the Philippines' coral reefs are in excellent condition (White, Courtney, & Salamanca, 2002). These corals extend to approximately 27,000 km^2 and they were valued at approximately US$1.35 billion (White & Cruz-Trinidad, 1998). However, it is estimated that only 70-80% of the original seagrass beds still exist (Fortes, 1994; White, Courtney, & Salamanca, 2002). Furthermore, mangrove areas are currently at 120,000 hectares, a decrease from 450,000 hectares in the early 1900s (White, Courtney, & Salamanca, 2002). Only 30% of coral reefs, 50% of mangrove forests and roughly 10% (or 1 million hectares) of old growth forest are intact (Fernandez, Matsuda, & Subade, 2000; CRMP, 2004). Since fisheries are an open access resource, the municipal sector is experiencing a decline in the fish catch, largely due to the eminent characteristics of inland and coastal waters, a lack of sustained livelihood opportunities and a large domestic and

[11] 1New Zealand Dollar (NZD) = 26 Philippine Peso (PhP)

international market for fishery products (Fernandez, Matsuda, & Subade, 2000, p. 347).

2.2 The Philippine Fisheries Management and the Community Resource Management Programme (CRMP)

Through the years, the Philippines has been attempting to improve its economic and coastal management. Fisheries management, for example, evolved from bureaucratic to participatory regimes to address imminent problems. The Coastal Management Programme (1996-2004) is an initiative of the Philippine government and the United States Aid and Development (USAID) to address imminent treats of overfishing and drastic marine resource use. Primary aim of the program was to address the gap of policy and action. Marine Protected Area (MPA) is one of the popular practices in CRMP. This section discusses the dynamic and participatory nature of MPAs.

2.2.1 MPA as a powerful tool in fishery management

There is a consensus that fisheries management is multidisciplinary since it involves not only biological but also economic, social and cultural perspectives. There are varying definitions and terms used for MPAs internationally; for example, in New Zealand as well as in the Philippines. MPAs have different objectives, which include different levels of human access or restrictions. There are several terms associated with MPAs all over the world, including ‗marine reserves', ‗sanctuaries', ‗parks', etc (Oracion, Miller, & Christie, 2005).

In economics and public policy, MPA is seen as a fishery management tool for integrated ocean management, which is defined by scientists to be ―a protected area in the ocean" (Sumaila & Charles, 2002, p.262). In an international context, the International Union for the Conservation of Nature (IUCN) consolidated these varying terms and consensually stated that an MPA is:

> *Any area of the intertidal or sub tidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by the law or other effective means to protect part or all of the enclosed environment (Boersma & Parrish, 1999, p. 288).* [12]

It is, therefore, an assigned ocean space, mainly for conservation purposes, wherein human activities are regulated more strictly than in other areas. This definition implies that an MPA does not only cover bodies of water near the shore, but also the waters of the high seas. However, some MPAs are established mainly in order to provide sustained livelihoods to poor communities or to halt fishery degradation. Fisheries improvement is the main priority, with rules issued on the prohibition and restriction of fishing activities. Improvement can occur through habitat protection and the creation of environments that allow the natural breeding and reproduction of fish and invertebrates that might otherwise be captured as juveniles (White *et al.*, 2006). Protection can be set at a variety of levels—from total prohibition of activities to regulation of them at different intensities. It can also be ‗no-take', which means that human access is totally prohibited in the area, or it can be zoned so that different levels of access and use are implemented. If human access is restricted, the protected area will recover from degradation. Therefore, MPA establishment is not restricted to only specific organisms, extends from cultural heritage to social concerns.

In the course of time MPA usage has been extended in relation to regulatory activities to impact sea-bed exploitation, land-based pollution and dumping. The extension of MPA usage is embodied in the IUCN workbook which states that an MPA can be designated for a variety of reasons, including the following (Salm, Clark, & Siirila, 2000, p. 14):

1. it is the best example of an important ecosystem or habitat type;

[12] This definition will be used on the entire study

2. the area is needed for the sustainability of fisheries and it will be a ‗no-take' zone ;
3. it contains high species diversity;
4. the location is one of intense biological activity;
5. it is a ‗natural wonder' or tourist attraction;
6. the area provides a critical habitat for particular species or groups of species;
7. it has special cultural value (such as being an historic, religious, or recreational site) ;
8. the area protects the coastline from storms ;
9. it facilitates necessary research or determination of ‗natural' baseline conditions.

In this way, use of the area can be prohibited to some degree and limitations put on specific purposes such as seabed mining, specific activities such as fishing, or specific technologies such as trawling or shipping (Sumaila & Charles, 2002). An MPA is also established in order to allow natural activities to proceed without intrusive interventions such as being used for bombing practice, mining, oil exploration or hunting down navigational wrecks. Further, MPAs can prevent ships from anchoring in places where there are already cable ways and/or international shipping lanes. For example, in New Zealand there are *de facto* marine reserves or areas in the sea that have been protected for many years. Their establishment is not only based on environmental concerns or fisheries but also on economic and social interests. Roughly half of these 3,000 km^2 areas are protected because of undersea cable ways, and the other half because of ammunition dumps (Anthoni, 2008). *De facto* reserves have also been implemented for shipping lanes, oil drilling platforms and other activities. In terms of polluting the sea, an MPA is used to regulate those commercial uses that can create pollution, such as fish harvest, waste disposal and mining development. Furthermore, the government usually collects fees from visitors who wish to use (e.g., swim or scuba dive) in an MPA area. An MPA can also bring pride and empowerment to the communities contributing to its management.

Philippine history recognises that the allocation of coastal resources has occurred through traditional property rights. Moreover, since the beginning of Spanish colonisation, the country's coastal management was handled through a central authority, i.e. bureaucratic institution, until the fall of the dictatorship regime in the mid 1980s (Pomeroy & Carlos, 1997). Fisheries resources such as mangroves, corals and fish have been heavily and continuously exploited under the Presidential Decree (PD) 704 of 1975.[13] This law encouraged excessive utilisation and production of resources, which eventually led to the *"ineffective…promotion of sustainable management and development"* of Philippine fisheries (Pomeroy & Carlos, 2007).

The government recognises the need for marine conservation, as evidenced by its efforts to establish a nationwide project relating to Integrated Coastal Resource Management Programme (ICRMP). This project gained much popularity in the early 1990s through its conservation efforts. Technically, the ICRMP follows the CRMP, in which the MPA strategy is incorporated. The following are the factors that helped in the promotion (or constraint) of MPAs and ICRMP (Balgos, 2005, p. 976):

1. an archipelagic country rich in natural resources that need to be preserved or rehabilitated for socio-economic and other purposes;
2. strong scientific and technical support from the marine science and fisheries research and academic institutions;
3. influx of donor-assisted development and conservation initiatives;
4. Decentralisation of governance with the implementation of the Local Government Code (LGC); and
5. active grassroots movement and proliferation of environmental NGOs, following the deposing of the martial law regime.

This is a national strategy, primarily aimed at improving the coastal environment. Unlike the bureaucratic regime, the ICM is a dynamic and

[13] Fisheries refer to all activities relating to the act or business of fishing, culturing, preserving, processing, marketing, developing, conserving, and managing aquatic resources, the areas and the right to fish or take aquatic resources thereof (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004).

participatory process in which an integrated strategy is employed for the conservation and sustained multiple use of the coastal zone, whilst taking into account traditional, cultural, and historical perspectives in addition to conflicting interests (Webb *et al.*, 2004, p. 138). It seeks to balance issues of conservation and development through the people's participation. Additionally, it requires empowerment and participation of community stakeholders and the promotion of equity, ecological soundness and sustainable development, respect for traditional/indigenous knowledge and gender fairness. The main approach is through education and community organisations. In this way, marginalised or disadvantaged groups—mostly small-scaled fishermen—are given priority, because they are directly affected by the programme. It must be noted, however, that MPA is not the sole end-goal of the CRMP project, but rather a typical entry point for the programme.

In 1974, the first fish sanctuary was established by the Silliman University Marine Laboratory in Cebu, Philippines. This pioneering project led to phenomenal results—improving coral reef substrate, increasing individual fish abundance, and increasing fish catch per year. It influenced coastal managers and scientists, who had to acknowledge that an MPA could improve reef fisheries. Due to the positive effects of this MPA, comparable fish sanctuaries have been established to extend its great success. Some of these sanctuaries are well documented and have become successful in managing fisheries and tourism in their respective territories: Apo Island in Negros, Balicasag and Pamilican Islands in Bohol, Mabini in Batangas and San Salvador Island in Zambales (White, Courtney, & Salamanca, 2002).

Currently, in the Philippines, the term MPA is employed in a variety of ways which are used inconsistently within national and local government laws. [14] MPA is a well-known term in the country, but it is generally understood to be a fish sanctuary, marine reserve, marine park or other similar established area (White, Courtney, & Salamanca, 2002). These latter terms are still

[14] National laws refer to legislation that are passed by the Congress, Senate, or President's Office while local government laws refer to those passed at a municipal or town level.

used in community-based and local government units. [15] At the national level, the context of MPA is being used as a broader coastal management regime or programme associated with the wider programmes of the Department of Environment and Natural Resources (DENR). However, the term ‗MPA' can also be used in a more popularly recognised national context, wherein it denotes a collective area in a marine region (coastal or offshore) which has been saved for management or conservation purposes. It can also refer to an area that has some degree or aspect of fortification being implemented, in either a legal or illegal way.

Simultaneously with the decentralisation of authority and a considerable increase in the amount of foreign-assisted projects, the number of MPAs in the Philippines increased to 500 by early 2000. There are currently many MPAs in every region of the country, but the majority of these areas are small in size–a minimum of 50 hectares. All MPAs have a common goal of attaining food security for the coastal communities, in terms of increasing fish catch and sustaining fisheries (Balgos, 2005).[16] Specifically, they aim at halting the destruction of coastal resources (e.g., corals) and improving the condition of marine ecosystems and biodiversity.

Furthermore, the MPA programme in the Philippines is considered as issue-based for most of the marine protected areas have been established especially in North-Eastern Iloilo (NI), in order to address the problem of food security there (Balgos, 2005; Fernandez, 2006).[17] Thus, in the Philippines the term differs slightly from the international major objective of conservation. Two of the important issues stated in the Philippines' MPA programme are: (a) serious depletion problems, generally in fishery resources and particularly felt in the decrease in catch per unit of fishing by subsistence fishers; and (b)

[15] Refers to those on a micro-level, i.e. from the local government and not from the national government (e.g. Department, Congress, etc.)
[16] Food security refers to any plan, policy, or strategy aimed at ensuring adequate supplies of appropriate food at affordable prices. It may be achieved through self-sufficiency, self reliance and pure importation.
[17] Pertains to programmes established due to existing problems such as food security, poverty, etc.

loss of, or damage to, productive coastal ecosystems (e.g. mangroves, sea grasses, beds, and coral reefs).

2.2.2 Laws governing MPA in the Philippines

There are three essential policies that govern MPA in the Philippines. First, the *National Integrated Protected Areas Act of 1992 (NIPAS Act of 1992)* deals with the management of protected areas and is national in scope. It is recognised as the primary national legal framework, which covers not only MPAs but all other protected areas (e.g. inland) in the country. Under Philippine law, an Act ranks higher compared to other legislation, such as a decree or code. The NIPAS Act gives the Philippine Congress the power to declare a protected area. In the establishment of an MPA, the Act imposes a general planning and decision making body, in the form of a Protected Area Management Board (PAMB) (White, Courtney, & Salamanca, 2002). This body is composed of various stakeholders, which include people‘s organisations (POs), tribal communities, local government, non-government organisations (NGOs), and government line agencies. It is headed by the Regional Executive Director of the Department of Environment and Natural Resources (DENR). The DENR is mandated through NIPAS to classify and administer,

> *~~a~~ll designated protected areas in order to maintain through essential ecological processes and life support systems, to preserve genetic diversity, to ensure sustainable use of resources found therein, and to maintain their natural conditions to the extent possible”* (White, *et al.*, 2006).

This implies that the PAMB is responsible for overseeing the management of different protected areas, including MPA. Furthermore, the law requires the preparation of a site-specific ‗general management planning strategy‘ (GMPS) as part of a larger national strategy for the management of protected areas (White, *et. al*, 2006, p. 13). Preparing each GMPS requires inputs from different sectors, such as local communities and non-government organisations (NGOs). The local government unit (LGU) plays an important role in resource management, even if the NIPAS Act has a national scope

(White *et al.*, 2006). The authors argue that the local PAMB is usually dominated by local community representatives from the municipality or community/*barangay* levels.[18] Due to this structure, most of the time, the local government unit has implemented what has been decided by the majority vote in PAMB decisions. However, MPAs that are established through municipal ordinances are more „realistic and sufficient", since they have a terrestrial bias and need specific guidelines (White, Courtney, & Salamanca, 2002, details see Luna, 1997). Since the majority of the NI MPAs are established thru LGUs' initiatives, the NIPAS Act is less relevant because the focus is not on national conservation.

Second, *the Local Government Code of 1991 (LGC of 1991)* recognises the role of local government entities. The decentralisation of authority has led to decisions being made on coastal management at the local level, without the approval of the national government through the NIPAS Act. The code enhances the authority of the local government to be involved in the management of MPAs. The devolution of authority from the central government to the local governments, especially in planning and management aspects, is one of the key successes of MPAs (White, Courtney, & Salamanca, 2002). This is the case in the Philippines, because it is comprised of many different islands and is archipelagic in nature. This undermines the central government's capacity to efficiently provide resources and manage MPAs. Furthermore, the local government then has the capacity to mobilise and generate economic and political resources, through taxes, fees, and legislation.

Last, the *Fisheries Code of 1998* reaffirms the jurisdiction of the LGU in the involvement of MPA management. This code links the acts and laws, for the management of MPA. It further reaffirms the power of the local government over the municipal waters (i.e. <15km from the shoreline) and specifies their authority to regulate fishery-related activities in overfished areas. One of the

[18] Municipality is a term used to refer to a town.

major outcomes of this code is to implement the constitutional and statutory mandates, in favour of LGUs and the subsistence fisher folk, by limiting open access to fishery resources and thus giving priority to municipal fisher folk. This results in the empowerment of community members in the management process, through the formation of a local council (White, *et al.*, 2006, p. 15). It also offers support and assistance to the fisher folk associations and non-government organisations, with the preparation of a development plan. Balgos (2005) states that the code gives LGU the authority to specify that „*at least 15% of bays, foreshore lands, continental shelf, or any fishing ground or habitat area may be declared as a sanctuary where no fishing is allowed*".

However, the power of the LGUs is limited and municipal ordinances must not contradict with national laws. The majority of MPAs in the Philippines have been established through community involvement at the *barangay*, municipal or city level and not usually through the NIPAS Act of 1992 (White, Courtney, & Salamanca, 2002). The laws mentioned have overlapping mandates. The Fisheries Code of 1998, for instance, encourages food security by utilising fisheries, but at the same time, it specifically states that MPAs „*achieve food security as the overriding consideration in the utilisation, management, development, conservation, and protection of the fishery resources in order to provide the food needs of the population.*" Contrary to this, the DENR, which has the power to govern the fishery sector, has been given the power to encourage „development, exploration, and utilisation of marine, freshwater, brakishwater and overall aquatic resources'. Furthermore, under the NIPAS Act of 1992, it also has the power to declare protected areas.

In summary, the country has conflicts in the national and local laws and mandates. It follows that the implementation of these laws can cause problems, especially when the communities and other stakeholders are not well informed about the mandates. In addition, there have been no clear revisions from the government on how to address such issues.

Thus, these issues should not be taken for granted.There is a connection between the people‘s awareness and their interpretation of existing laws and how their behaviour may change.

2.3 The case study in North-Eastern Iloilo (NI), Philippines

The Philippines is composed of three major island groups: Luzon, Visayas, and Mindanao, with each region having rich fishing grounds. Panay in the Visayas is one of its largest and most economically important islands, and that is where the province of Iloilo is strategically located. The province is part of the Western Visayas Region (Region VI), which occupies the southern and north-eastern part of Panay Island. It is bounded by the Province of Capiz in the north, Antique on the west, Panay Gulf and Iloilo Strait on the south, and the Visayan Sea on the east. In its rich fishing grounds, grouper (*lapu-lapu*), tuna and blue marlin can be found. The Iloilo province is the country‘s fourth largest fish producer and the second, in terms of fish value (NSCB, 2008).

The NI province has 42 municipalities, 2 cities and 1,721 *barangays*, garnering the status of a first-class province with a total voting population of 1.1 million (NSCB, 2009). Ajuy, Balasan, Batad, Carles, Concepcion, Estancia and San Dionisio are coastal municipalities in NI (see Figure 1 from Chapter One). According to Fernandez (2006), sixty percent of NI municipalities are in the top 10% of the poorest in the province with high incidence of child malnutrition (Fernandez, 2006).

Table 2 provides a socio-economic profile of these municipalities. The municipalities belong from 3rd to 5th classifications, denoting low income and relatively weak facilities and infrastructure. In Western Visayas (Region VI) where the province of Iloilo is located, the poverty threshold is PhP 14,381 (552 NZD), which is lower than the national average. However, in Iloilo Province the poverty threshold is at PhP 14,157 (543 NZD).

In the Iloilo urban area, the income breakpoint is at PhP 13,772 (529 NZD), whilst in the rural area it is higher, at PhP 14,470 (555 NZD) (NSCB, 2009). All of the NI municipalities have fishing as a main source of income. However, Balasan also has farming as a major source of income because it has the smallest surface area of municipal waters (0.6 km^2) compared to the other municipalities. In addition, Balasan and Batad have a lower percentage of coastal *barangays* to the total number of communities. Based on this, Carles, Concepcion, Estancia and Ajuy are mainly dependent on coastal resources because the majority of the population are into fishing activities and are residing along the coast. Eventhough Balasan and Batad have smaller coastal area and lower coastal population, fishing is still a primary livelihood of the people.

Since all the marine protected areas in the NI region have been established through local government units and incorporated under the Integrated Coastal Resource Management (ICM) programme of the national government, sources of funds for the ICM projects are shouldered by the municipal government and some non-government organisations (NGOs). All local government's ICM budget is approximately PhP 50,000 – 100,000 (1,923- 3,846 NZD) a year.

The main proponents of marine fishery management are *barangays*, together with some technical assistance from local and national governments in addition to NGOs and people's organisations (POs).

The MPAs in NI are combinations of "no-take' zones and "regulated' zones. Regulations can require an area be "no-take', which means that human access is totally prohibited in the area, or "zoned', where different levels of uses are implemented. The main reasons for the establishment of MPAs are to secure food for coastal communities and to restore depleted fishing grounds. The majority of MPAs, including the NI, have been established; designed and located (e.g., size has been determined) based on socio-

economic and political issues, which are focused more on food security than on conservation.

Table 2: *Study Area: Demographic Profile (NI Municipalities, Philippines)*

	Ajuy	Balasan	Batad	Carles	Concepcion	Estancia
Income classification	3rd	4th	5th	3rd	4th	3rd
Total population (2007)	47113	27384	18298	57673	36881	39479
Number of *barangays*	34	23	24	33	25	25
Land area (km^2)	175.52	57.3	52.61	103.52	97.2	30.55
# coastal brgy (% of total)	18 (53%)	2 (8.6%)	6 (25%)	32 (97%)	18 (72%)	16 (64%)
Main source of income	Fishing	Farming, Fishing	Fishing	Fishing	Fishing	Fishing
Malnutrition	-	-	1%:34 (2004)	1.128% (200)	-	1%:34 (2007)
Surface area of municipal waters (km^2)	250	0.6	8	368	320	10
Length of shoreline (km^2)	74.83	3.5	8.2	94.7	120	28.51
# of islands	0	0	2	30	17	3
Registered municipal fishermen	3185	120	142	4500	3211	1296
Wardens, patrol boats	65, 2	0	60, 3	100, 3	160,6	45, 1
No. of MPA	1	0	1	1	1	1

Sources: Fernandez (2006); Iloilo Provincial Capital Development Plan (2001); NSCB (2009)

Hence, management is considered as a process whereby policies are put in place and then long-term maintenance of those policies begins.

Further, there are different phases and activities for MPA establishment and management within local government jurisdiction. There are five distinct

phases of coastal environment and these steps are shown in Table 3. These are the phases, in which NI municipalities adopt on their MPA management.

Table 3: *Phases and activities for MPA establishment and management within local government jurisdiction*

Phases of coastal management*	**Stages and activities for MPA establishment and management ****
1. Issue identification and baseline management	Recognition of a need and programme preparation Integration with the community and assessment issues 1. Community organisation and mobilisation 2. Conduct of baseline studies 3. Information, education, and communication
2. Plan preparation and adoption	Definition of goals and objectives: Formation of the core group and development of the management plan 1. Formation of the core group 2. Definition of goals and objectives 3. Preparation of management strategy and action plan 4. Determination of reserve boundaries and zones
3. Action plan and project implementation	Implementation: Formalisation of the reserve, implementing management strategies, enforcement, and community strengthening 1. Formalisation of the reserve through local ordinance 2. Implementation of strategies for managing the reserve 3. Enforcement 4. Permits and user fees 5. Strengthening of community involvement
4. Monitoring and evaluation	Monitoring and evaluation Refinement of the management plan
5. Information management, education, and outreach	Review of status of MPA and its benefits Refinement of education programme from experience Development of outreach programme appropriate

Notes: * Described in details in Guidebook 1 and 3 of this series as the overall phases for coastal resource management planning and implementation
** These stages and activities are different from those prescribed under the NIPAS Act because of the focus on MPA within local government jurisdiction.
Source: DENR, *et al.* (2001, p. 69)

2.4 Concluding Remarks

The Philippines and the NI region are vital areas for fisheries. Marine resources are valuable to the country‘s output and at the same time, are vital to most poor coastal communities. MPA as a front-line programme of the CRMP, has been very popular and has been implemented in NI region. The focus is on restoring fish abundance to the region to assure livelihood of communities, which for many years have depended on the sea and its products to earn their day to day living. MPA involves a participatory process wherein it aims at empowering different sectors and groups. Due to unclear definition and implementation of MPA, marine resources in the Philippines have been continuously and adversely affected by human and economic threats. There is therefore a need to recognise and to clarify the definitions and mandates of MPA at the macro (national level) and micro (town or *barangay*) levels. Managers should aim in balancing these dimensions in order to fully gain the benefits of MPA.

Thus, MPA objectives should not only concentrate merely on the improvement of fisheries and coral covers but on their scientific, cultural and tourism significance as well. Even though, fisheries management in the country encourages participation amongst people involved, it faces a strong dilemma in fully attaining its objectives. The next chapter discusses related literatures on MPA, highlighting different factors that determine the success or failure of its management.

CHAPTER THREE ~ Marine Protected Area: Related Literatures

> *Only 0.6% of the world"s oceans are protected, and the vast majority of existing marine parks and reserves suffer from little or no effective management. – World Wildlife Fund (2008)*

This chapter outlines significant indicators and factors (biological and social) that are essential for MPA success. The first section introduces the different dimensions and significance of MPA which involve both tangible and intangible benefits. It further discusses how the adjacent areas reap the benefits from MPAs. The next section describes MPA failure in the world and in the Philippines and stresses that management factors are more important than scientific (e.g. size, location). The sections following this, highlight institutional and community capacities along with adequate information and minimised conflict as key indicators for the success of an MPA management. The last section shows stakeholders' perceptions and social surveys as methods in determining the real condition of MPAs in NI, Philippines.

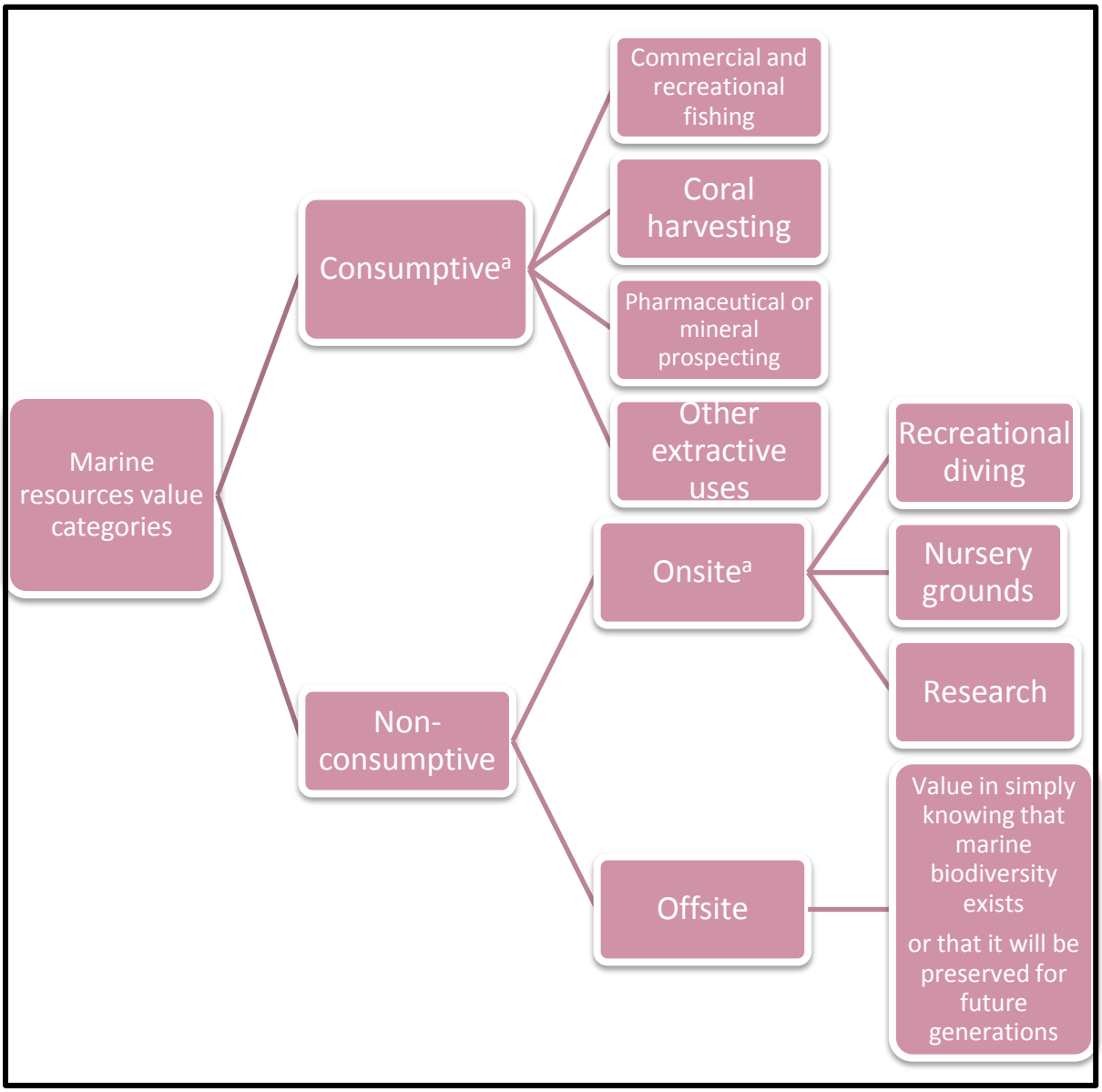
3.1 MPAs Involve Human and Ecological Dimensions

MPAs are considered to be economic capital, which can be utilised and invested in by any individual who owns it (Carter, 2003).[19] This capital may include consumptive and non-consumptive values. The former deals with values which can be derived from activities, such as the consumption (i.e., extraction or removal) of resources from their natural environment. Examples of these values are commercial, recreational, and coral fishing. Non-consumptive values, on the other hand, relate to a direct experience within the MPA, from simply knowing that the resources exist or that they will be preserved for future generations to enjoy. These values include activities such as recreational diving and marine research. For example, the Willingness to Pay (WTP) value of the Bonaire Marine Park in Netherlands Antilles is 13.70 NZD/diver per year (Dixon & Scura, 1994). In this study,

[19] Economic capital refers to resources with value.

researchers attempted to measure the benefits and costs of park protection and diving tourism.

Figure 5: *Consumptive and Non-consumptive Values of Marine Resource, Adapted from Carter (2003, p. 441)*



Notes: [a] Consumptive and onsite values are „use" values and, as such, consist of the value of current use and the value assigned to the option of use in the future

MPA outcomes can either be benefits and costs. In order to assess the incentive framework for each stakeholder of an MPA, there are existing

studies that identify its outcomes.[20] There are also known positive and negative impacts of MPAs. For example, in the short-run, fishermen with high dependency on fisheries will experience losses in terms of revenue losses. On the other hand, one positive impact is MPA's capacity to improve reef fisheries and tourism (White, Courtney, & Salamanca, 2002).

Through the improvement of reefs, fish stocks are revived and fish catch is increased. However, outcomes depends on the spill-over effect, i.e. fish that are born in the protected area will spill over into the surrounding waters, increasing the fish catch for nearby fishermen.

However, there is growing concern about this claim. Changes in the density of fish in an MPA depend on the migration of fish and how much they are attracted to the fishing boats (Hannesson, 2002). Hence, if the density of fish in an area increases and spills over, the results will be an increase in the number of fishing boats. However, if the migration rate is high and the MPA size is also large, the effect on the stock and the total yield will be relatively small. Thus, marine reserves alone are not economically successful and in order to become so a change in structure is needed, so that incentives can be offered to the fishing industry. This theory is not applicable to many mobile species and therefore the positive effects are not clear (Hilborn *et al.*, 2004).

However, even though there are recorded benefits, there are also some associated costs. There was no evidence that the benefits from increases in fish yield is sustantially bigger to cover loss in restricted fishery access and specified area (Fabinyi, 2008; Sale, 2002).

[20] See http://www.fao.org/fishery/topic/16201/en and http://mpa.gov/helpful_resources/archives/benefits.html#benefits for both fisheries, ecological, economic and social benefits of MPAs (Food and Agriculture Organisation of the United Nations (FAO-UN, 2008).

Generally, the following are real and potential on- and off-site benefits of MPAs in the Philippines: (a) improved fishery yields (large- and small-scale), (b) tourism revenues, (c) recreation, (d) scientific research and education, (e) biodiversity improvement, (f) flood and erosion reduction, (g) spiritual, cultural, and aesthetic values, and (h) future value (Padilla & Rosales, 1997).

In establishing MPAs, many sectors, such as tourism, fishery, government, etc., are involved. Because of their different objectives and goals, conflicts usually arises (Davos *et al.*, 2007). Tourism gives additional income to community members in the form of user fees and tourism services. However, anyone who participates in the management efforts of the project can also benefit, possibly in terms of food or cash income from tourism, as well as _pride' for their role in protecting valuable resources.

There are human dimensions to establishing an MPA, and experts say that certain groups of people and individuals can be adversely affected by it (Wahle *et al.*, 2003). [21] However, there is a trade-off between the costs and benefits of having imposed restrictions. The relative costs are often measured in socio-economic terms, while benefits are often measured in ecological terms, and these are made clear through specific site-based proposals for MPAs. Generally, stakeholders play essential roles in MPA management and they also use fishery resources direct or indirectly – thus, if these are successfully enforced they can significantly contribute to the coastal ecosystem's sustainability (White, Courtney, & Salamanca, 2002). In Jamaica's Portland Bight, the estimated net present value (NPV) of incremental costs of management for 25 years are at NZD 13.2 million (Cesar, 2000). On the other hand, the incremental benefits are at NZD 36 million (optimistic tourism scenario) and NZD 28 million (pessimistic tourism case). In the Philippines, all endeavours related to the benefits are the focus of the participating MPA stakeholders, especially people in the communities. Philippine MPAs cover 12 large-sized MPAs in the Philippines that covers approximately 45, 8000 hectares and another 44 MPAs can enclose

[21] Human dimensions reflect the social aspects of MPA, pertaining to management and governance. Conflicts between sectors and entities will be discussed in detail in the latter part of this chapter.

approximately 26,500 hectares (Pajaro, Olano, & San Juan, 1999; White, Courtney, & Salamanca, 2002). Protection of coral reefs in Olango Islands in the Philippines provides a net value of NZD 19,000 to 31,500 per km^2 (NZD 0.756 to 1.27 million for the whole area) (White, *et al.* 1999).

In order to create changes to MPA management, different actions (such as implementation of incentive structures) should involve human decision making processes. In other words, MPAs involve both ecological and human aspects and is an example of an ecosystem-based approach (Pomeroy, Mascia, & Pollnac, 2006). It is an approach to fisheries management that includes the interaction of human with natural resources. For example, fish, as part of the marine ecosystem, is linked to resource users, who are part of the socio-economic environment. It involves parts of nature but it also has social dimensions embedded in it. Furthermore, MPA is also a product of social institutions, and as a management tool, it is expected to manage the way people behave in their use of the country‘s coastal and marine resources.

Ecosystem-based management has emerged as an approach to maintaining ecosystem health and integrity. There is an emphasis on protecting the productive potential and biological diversity of the system that produces goods and services from the ecosystem, as opposed to protecting an individual species or stock as a resource (Pomeroy *et al.*, 2006, p. 150). [22] One major objective of this approach is sustainable development, in which the capacity of the aquatic ecosystem health is sustained for current and future uses (Pomeroy *et al.*, 2006). Furthermore, MPA is considered a tool that is (1) geographically specific; and (2) knowledge-based and uncertain about and amongst living marine resources. It has habitat and human components but strives to balance its diverse societal objectives (Pomeroy *et al.*, 2006; Sissenwine & Mace, 2001). Based on the complexity of the MPA context, it follows that its management is not an easy task. Hence, in all MPA

[22] For details see Costanza *et. al*, 1998; Gislason *et al.* (2000)

management-related activities, there should be formation of a core group that can serve as leader in all processes. Success is dependent on the creation of an appropriate legal framework and a well-supported management system. According to the Wahle *et al.* (2003), MPA processes are complicated and dynamic in nature.

3.2 MPAs in the Philippines: Are they achieving their objectives?

Management effectiveness is a level at which management actions are achieving the goals and objectives of the protected area (Pomeroy *et al.*, 2004, p. 486). Throughout the world and in the Philippines, there are overwhelming MPA failure statistics, with a number of studies focusing on the factors behind this phenomenon.

MPA statistics, at world level, show that approximately 80-90% have not successfully met their objectives. One of the first studies of the effectiveness of MPAs is the Great Barrier Reef Marine Park Authority, in which scientists started using the term, ‗paper parks' or area where rules and regulations are not enforced and proper resources are lacking (Javier, 2003). In Southeast Asia, only 14% of the 332 MPAs are considered effectively managed for which, some studies recorded around 48% and 38% of the total MPAs are inadequately managed (Burke *et al.*, 2002; Pomeroy *et al.*, 2004). Specifically in other Asian countries such as in South Asia, studies found out that mismanagement is a continuing problem. MPAs are oftentimes characterised with weak management system, inadequate resources (e.g. funding) and training (Javier, 2003; Rajasuriya *et. al*, 1998). The same scenario is observed in the Philippines, in which around 10% of all MPAs are reported to be not working effectively (Alcala, 2001; Gjertsen, 2005). Of note, most of the 249 MPAs surveyed in the country only exist on paper (Baling, 1995; White, Courtney, & Salamanca, 2002). In addition, merely 44 of the 439 MPAs (10% of the total MPA distribution) surveyed by the Haribon Foundation are classified as ‗fully implemented'. These projects by the

Haribon Foundation are situated in areas that are environmentally critical and they have been declared by law to be marine recreation and seashore parks.

There are various indicators used all over the world to measure whether MPAs are achieving their objectives, specifically biophysical, socio-economic and governance indicators.[23] Based on the IUCN guidebook for evaluating MPAs, if the MPA goal is to enhance or maintain food security, the appropriate indicators are S1 (local marine resource patterns) and S2 (local values and beliefs regarding the marine resources). S1 is the ways people use and affect coastal and marine resources (Pomeroy *et. al*, 2004, p. 135). It determines if the MPA management startegies being implemented have impacts on income, livelihood patterns, and cultural traditions. It may also show who are affected by MPA implementation as well as the activities involved in MPA management. On the other hand, the S2 indicator measures how people make choices and understand actions related to marine resource use and management based on their values of what is good, just, and desirable and their beliefs of how the world works, (Pomeroy *et al.*, 2004, p. 138). In case of MPAs, it is people‘s values and beliefs to marine resources as well as their usage and management practices. Decision makers should incorporate these values to effectively manage coastal resources.

Further, if the objective is to enhance and improve livelihoods, then indicators S3 (level of understanding of human impacts on resources) and S4 (perceptions on seafood availability) are used. The former is a measure of the degree to which local stakeholders understand basic ecological relationships and the impacts that human activities have on the environment; while the latter is a measure of what the primary food purchaser/preparer in the household thinks about the local availability of the seafood for the household (Pomeroy *et al.*, 2004, p. 141 & 143).These indicators are in fact the most appropriate for the declining fish catch in NI , because they are focused on stakeholders‘ perceptions influencing the status of marine

[23] To see the full descriptions of each cluster, see Pomeroy *et al.* (2004) at http://data.iucn.org/dbtw-wpd/edocs/PAPS-012.pdf.

resources. The IUCN suggest the use of FGDs and social interview to capture these success indicators.

However, there are studies, such as those of the Apo Marine Reserves and Sumilon Islands in the Philippines that have used coral reef improvement as a success indicator. In addition, a combination of coral reef and child nutrition conditions has also been used as measures of human well-being in the Philippines (Gjertsen, 2005).

3.3 MPA and the Role of its Location

There are two dimensions to consider when evaluating MPA success internationally: (a) how MPAs are located and (b) how MPAs are managed (Jameson, Tupper, & Ridley, 2002). The effectiveness of an MPA is dependent on its location, since they are placed in areas subject to many irrepressible and external stressors. These stressors can generate conflict with protection mechanisms and degrade the environment**.** There are three categories of stressors: atmospheric, terrestrial and oceanic (Jameson *et al.*, 2002). The first category, *atmospheric* stressors, refers to African dust that has herbicides, pesticides, bacteria, viruses, carcinogens, etc.; advective and atmospheric disposition; and global climate change factors, such as higher sea level, more severe weather resulting in increased sediments, etc. The second stressor category is *terrestrial*, which may include storm water runoff (organic debris, silt); mosquito control programmes (pesticide); residential wastewater (fecal coliform bacteria, fungus spores, septic tanks, etc); marina operations (boat scraping, paints, engine fuel lubricants); and natural sources (animal wastes, runoff from natural environments and weed wrack). Lastly, *oceanic* stressors include tidal exchange (such as Florida Bay and Biscayne Bay, nutrients and turbid water) and oceanic upwelling (nutrient loading via oceanic upwelling has not been quantified).

Size is a characteristic of MPAs that may be closely associated with its success or failure. Scientists claim that the smaller the MPA relative to the

home range of species within, the more time those species will spend outside the MPA–and therefore, unprotected (Jameson *et al.*, 2002, p. 1180; Kramer & Chapman, 1999). However, a common problem in the process of establishing an MPA involves risk from nearby unsafe areas that prohibit the spawning and feeding of fish (Anthoni, 2008). This is based on the rationale that an MPA does not have a physical boundary and is bounded naturally. There is a tendency for the fish to ‗leak' and the area becomes unsustainable. Based on biological arguments, there are few studies, except those of Agardy *et al.* (2003) and Brechin *et al.* (2002) which promote the park model that is associated with larger MPAs, over the community-based approach involving smaller areas.[24] The Philippine MPAs are characterised by small MPAs, in which approximately 400 MPAs have been established ranging from less than a hectare to hundreds of thousands of hectares (Gjertsen, 2005; Pajaro *et al*., 1999). In addition, most of the marine reserves are in municipal waters (<15 km^2 from the shore).

3.4 MPA and the Role of Social Factors

Researchers have found that social factors affecting MPAs are difficult to manage compared to biological and primary factors such as size. Generally, there are three key determinants for MPA success: community capacity; institutional capacity, and information.

Community capacity is defined as the rules, procedures and values people hold which incline them to work together to achieve a common benefit. This is necessary in order to provide support to NGOs and government institutions in MPA processes such as financing, monitoring, enforcement and technical capabilities.

Community involvement is a key determinant in the success of an MPA, as evidenced in most case studies in the Philippines (White, Courtney, &

[24] MPA management regimes will be discussed in details in Chapter 5: Theoretical and Conceptual Frameworks.

Salamanca, 2002). People can build their confidence and generate outcomes when they commit themselves to the management of marine resources. The Apo Island reserve‘s success is due to the level of the community‘s capacity that later led to the prevention of poaching, improvement of reef fish populations and an increase in tourism revenues (Jameson *et al.*, 2002; Russ & Alcala, 1996, 1999). In contrast, low community capacity, in the case of the Turks and Caicos Islands in the Caribbean, has led to illegal fishing.

Even at the beginning of the planning and implementation phase, community participation and cooperation amongst actors is essential (Balgos, 2005). These collaborative skills reaffirm the establishment of an MPA as a ‗best practice‘ under the nationwide conservation scheme of Coastal Resource Management (CRMP). Even though San Salvador Island and the Tubbataha Reef have gone through different MPA experiences, community participation that draws on the various sectors of society involved in the MPA process was a key success factor for both (White, Courtney, & Salamanca, 2002). In the case of San Salvador, the key sectors were the fishing community and the fishermen, while Tubbataha Reef key participants included different entities from different levels, specifically participants from the province of Palawan, the DENR, the Philippine Navy, several NGOs, dive boat operators who visit the area, the fishing community and the Local Government Unit (LGU) of the Cagayancillo Islands (White, Courtney, & Salamanca, 2002, p. 21).

Another important determinant of success is *institutional capacity*, which is defined as the ability of government agencies to provide public goods and services and to ensure that laws and regulations will be enforced (Jameson *et al.*, 2002). In all MPA management-related activities, establishment and management involve the formation of a core group that can serve as a leader. As early as the establishment stage, the group may serve as a ‗spearhead‘ (White, Courtney, & Salamanca, 2002). MPAs do not instantly succeed just because community capacity is high; rather it must be complemented by a significant level of institutional capacity (Cooke *et al.*,

2000; Jameson *et al.*, 2002). For example, in Fiji, communities were not able to control others (outsiders) from poaching in MPA sites – thus an appropriate level of institutional support was necessary. Many discontinued initiatives are the result of low levels of institutional support for community-based programmes such as MPAs. The flow of resources must be ongoing, and, monitoring and evaluation expertise must be provided (Balgos, 2005).

However, territorial conflicts and prohibited fishing gears are still existing in NI due to weak community and institutional participation on pursuing suspects and perpetrators. For example, commercial vessels in municipal waters has been a continuing threat to municipal fishermen. It is claimed that offshore areas appear to be underexploited, since there has been slower growth (only 2.65% from 1993 to 1997) in commercial fishing (Fernandez, Matsuda, & Subade, 2000). Moreover, illegal fishing is rampant in Philippine waters and the penalties for fishing in fishery reserves, refuges, or sanctuaries are stated in the Fisheries Code of 1998. Those people who are proven guilty can be imprisoned for two to six years and/or have to pay a fine in the range of PhP 2,000 to 20,000 (NZD 74-740). In addition, the perpetrator would also forfeit their catch and their fishing permit[25], or have their licence[26] cancelled (DENR, 2007).

MPAs will not succeed if there is a lack of long term dedication, cooperation and endorsement from LGUs and the government built into the MPA management (White, Courtney, & Salamanca, 2002). Community education, which involves activities that bridge the MPA‘s objectives and which are significant to the local stakeholders, must be present as well. Differences in quality of management arise, due to lack of skills and interest from the local government. Strategies for community capacity may include the following tasks: core group formation; feedback from surveys for validation and

[25] A fishing permit is a document through which the municipality allows the licensee to conduct fishing operations in municipal waters (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004).

[26] A fishing license is a document that qualifies a person/corporation/cooperative/association to operate fishing activities for a specific duration within municipal waters (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004).

planning; formation of sub-committees based on identified needs and tasks; ongoing education; formulation of management schemes; implementation of plans or projects; training and seminars on leadership; formation of the group; and updates and additions to the baseline data (Buhat, 1994; White, Courtney, & Salamanca, 2002).

Poor *information* can hinder economic efficiency, as it reflects fundamental scientific uncertainty and limits individuals‘ knowledge of the situation (Perman *et al.*, 1999). Since the potential costs of educating stakeholders are usually high, government intervention is necessary to achieve efficiency, and there is no guarantee that once achieved, the economic gains from efficiency will be greater than the costs.

Even though the institutional role of local government units must be properly implemented, through building up their capacity to fulfil these roles; it is not enough to guarantee the success of the MPA. One appropriate example is the pioneering collaborations between the government and the private sector, namely the Central Visayas Regional Project (1984-1992), which included the implementation of an MPA. The project was financed through a World Bank loan which enabled the government to place interventions in such areas as mangrove reforestation, coral reef protection, marine sanctuary establishment, artificial reef and fish-aggregating device installation and mariculture (White, Courtney, & Salamanca, 2002). Even though there is institutional support through DENR participation and the NIPAS Act , it did not make much impact. In addition, there were significant problems associated with this intervention; for example, the baseline information was inadequate for assessing the results (Calumpong, 1996; Silliman University Marine Laboratory, 1996). Community participation was very low, since there was ineffective community organisation and reduced participation on the part of the municipal government. Further, some managers focused more on the success of the MPA and disregarded other threats to the coastal environment such as poaching, corruption, inadequate policing , and subsistence fishing. In contrast, the results based on the

perceptions of fishermen in San Salvador Island, Philippines, showed that significant improvement in coastal resources was due to the education programmes and successful community organisation (White, Courtney, & Salamanca, 2002). Thus institutional capacity is not the sole contributing factor in the success of MPAs (White, Courtney, & Salamanca, 2002).

The key issue to MPA success is to identify the factors that may affect both community and institutional capacities. Community capacity is a function of the community's social and cultural history (Jameson *et al.*, 2002). While institutional capacity is dependent on governance of territorial resource management agencies.

The following are factors that contribute to the success of coastal area governance systems in the Philippines (Fernandez, Matsuda, & Subade, 2000, p. 350):

1. Clearly defined fisheries or households with rights to fish within the fishing boundaries, and clear definitions of who can participate in the management of the resources;
2. Presence of homogeneity and group cohesion among fishers and their organisations;
3. Presence of fisher experience in community-based systems and organisations;
4. Participation of affected groups in the decision-making process of managing resource;
5. Benefits of participation in and compliance with community-based management outweighing the costs of investments in such activities;
6. Enforcement of management rules shared by the stakeholders;
7. Existence of legal rights for fishers and their groups to organise for their needs;
8. Presence of incentives and cooperative spirit and leadership in the management process; and

9. Decentralisation and delegation of national government authority to local government and local group organisation level.

In the management of coastal resources, these factors highlight both institutional and community initiatives, as well as the roles of information, appropriate legal frameworks, and well-supported management systems. Improving the condition of the coastal environment as a whole, then, should involve integrated programmes (Anthoni, 2008). Thus, the solution is to combine biological, political, economic and other social aspects, in order to achieve greater results. There are different reasons why MPAs fail, including (a) lack of enforcement or community-support, (b) lack of political will, (c) insufficient funding and training, (d) lack of alternative fishing grounds or opportunities for fishermen, and (e) poor location (Gjertsen, 2005, p. 200-201). There is, then, a need to integrate community participation, environmental awareness, economic incentives and legal provisions, with the support of all entities in the MPA process.

3.5 Conflict as a Disadvantage of MPA Implementation

Because of the existence of different management regimes in MPAs, there is *a priori* expectation that there will be overlapping and conflicting combinations of property rights (McKean, 2000). Hanna and Munasinghe (1995) recognise the association of property rights and property rights regime. They say that:

> *… „the knowledge of how property right regimes, as for particular types of institutions, function in relation to humans and their use of the environment is critical to the design and implementation of effective environmental protection".*

It is clear that conflict situations may arise during MPA implementation and the effectiveness of an MPA‘s coastal resource management is dependent on having in place the appropriate mix of property rights (common, private and state). Most of the MPAs in NI are under a co-management regime however, there are some scenarios in which other types of institutional

arrangements have been made (Fernandez, 2006).[27] Public policy, such as that governing the implementation and management of an MPA, can generate natural resource conflicts. Thus, in some ways, specific policies and the implementation of government programmes such as MPA can induce conflict, rather than solve it (Tyler, 1999).

The NI municipalities are no exceptions to this situation. According to Fernandez (2006), there are persistent conflicts in NI. He mentions that during the implementation process of various coastal development programmes and projects, there were —conflicts over management plans and strategies between and among subsistence fishers, commercial fishing operators, politicians and their pressure groups, fish processing plants, *barangays* with MPAs, and the non-government organisation (NGOs)." Furthermore, he observes that due to a lack of common interpretation of the law, there was conflict between the local government and the Northern Alliance for Coastal Development (NIACDEV), in addition to conflict between municipal (small-scale) and commercial (large-scale) fishers.

Stakeholders could sometime reconcile conflict amongst themselves, without help from the government (Tyler, 1999). However, there are also instances wherein policy frameworks are working and are fair, but they are also negatively influenced by elites and other pressure groups. Situations such as these arise out of traditional cultural differences, obscure government bureaucracy, uncoordinated planning and investment or asymmetric information.

Conflict that arise because of conflicting views, for example, can be both productive and hostile (Lewis, 1996). The outcome depends on how the managers and institutions address the issues. If problems are identified and resolved, improvement can be achieved and can be considered productive.

[27] A detailed discussion of the co-management regime is on Chapter 7: Results and Discussions.

On the other hand, hostility will surface if conflicts are not properly resolved. Conflict resolution can be achieved if there is communication between stakeholders in which formal legal or legislative actions can be agreed upon (Tyler, 1999). One principle which can be applied in solving conflicts concerning protected areas such as MPAs is to focus on underlying interests. This principle states that conflict can be resolved if all parties and their interests (i.e., people's needs and concerns) are satisfied. This is a win-win situation, wherein all parties believe that they have gained something, resulting in a mutually agreeable outcome (Lewis, 1996). However, further conflict may take place if there is inadequate funding, training and capacity building. The regeneration of corals and sea grasses and the promotion of breeding areas for fish and enhancement of fishery stocks are not the priorities; food security and sustained coastal livelihoods are.

3.6 Social Survey, Stakeholders' Perception, and Success Proxies

In areas where no baseline information is available, stakeholders' perceptions and social surveying are oftentimes implemented. After the San Salvador Island's MPA was carried out, fishermen assigned high scores to measures concerning fisheries, information exchange, satisfaction with fishery arrangements, benefits from the marine reserve, and quickness of resolving community conflicts (Katon *et al.*, 1999; White, Courtney, & Salamanca, 2002). The stakeholders' perceptions were divided into two categories: members and non-members of a fisherfolk association (Samahang Pangkaunlaran ng San Salvador or SPSS).[28] There is no statistically significant difference between the two sets of perceptions held by these two groups. There were also significant biological changes in the island, such that coral cover and fish per hectares had significantly improved. The authors used income and coral reef conditions as proxies for a successful MPA. It is believed that sanctuaries can promote long term

[28] Fisherfolk are people who are directly or personally and physically engaged in taking and/or culturing and processing fishery and/or aquatic resources. For this study, fisherfolk are also called fishermen (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004).

productivity in shallow water fisheries such as the Philippines, where 10-15% of marine fish production is supplied from the coral reefs (DENR *et al.*, 2001).

Social science surveys and key informant interviews (KI) were used to assess the impact of MPAs on the fishery and tourism industries of Mabini, located in the Calumpan Peninsula (Luzon, Philippines) (Oracion *et al.*, 2005). A structured questionnaire with open-ended questions was developed to assess the views of different stakeholders–fishermen, boat operators, resort owners and operators, managers from the local area and the *barangay* (village) government, NGO workers, and sea wardens. These stakeholders represented three key sectors: fishery, tourism, and management. Furthermore, the questions were asked through non-purposive sampling using a snowball technique, wherein respondent identification is through personal reference from the previously identified respondent. A Likert five-point scale was used to gather data on perceptions relating to the assessment of biological conditions within MPAs, as well as the level of engagement. Interpretation of the data was through general statistical processes, such as percentage distribution, mean, t-test, and one-way analysis of variance (ANOVA). Results from the survey were analysed together with information from key informant interviews to determine respondents‘ perceptions towards conflict and other MPA issues. In a different study, Webb *et al.* (2004) applied perceptions of local stakeholders in evaluating the outcomes of MPAs, which showed social factors affecting MPAs. They also used the Likert scale and proportionate random sampling of registered fishermen. People‘s perceptions, stakeholders‘ perceptions, and survey interviews (one-to-one) have also been carried out in order to analyse preferences and perspectives concerning community-based MPAs in the country (Himes, 2007; Pollnac, 2001).

3.7 Concluding Remarks

This chapter summarises the importance of MPAs, their mismanagement in many places, and factors for their success. Natural resource management

literature accepts the integration of MPA factors and objectives of success – ranging from high community participation, institutional capacity and information. However, with many conflicting objectives and behaviours, MPAs tend to generate conflict amongst management actors – and that the reduction in those conflicts is essential for MPA success. In analysing case studies without baseline information, stakeholders‘ perception through a social survey is usually done. Further, studies in fisheries management use a five-point Likert scale in order to capture the perceptions of fishermen and different sectors in the society. Given this, the next chapter discusses methodologies and analyses appropriate to the study area. It describes economic theory behind the fisheries management and highlights preconditions in pursuing these methodologies to answer the objectives of the study.

CHAPTER FOUR ~ Methodology and Data Collection

> *"A marine reserve is the government's most comprehensive tool in the provision of area-based biodiversity protection in the marine environment. However, it is important to remember that marine reserves are not a panacea for all threats to the marine environment, integrated land and sea management is essential". – Department of Conservation, Te Papa Atawhai (2008)*

Marine Protected Areas (MPAs) have both human and biological elements that interact in a dynamic environment. With this, different frameworks based on theories and applications can be derived. This chapter discusses related concepts behind the relationships of biological, economic and social factors in the management of MPAs. The first section focuses on indicators used for specific MPA objectives and their relation to the study area. The next section emphasises the roles of the national governments to correct market failure and restore efficiency to the markets. However, in the management of MPA, different roles must be fulfilled and must have conflicting objectives and behaviours – for this, different management regimes evolved in the Philippines and in NI. This section discusses these regimes, particularly on how they work and on how their styles of management differ from each other.

This chapter also introduces the data collection process, highlighting the survey design and methods. It further describes the combination of data and strategic analyses in order to answer study questions.

4.1 MPA and Human Well-being

As mentioned in the previous chapter, various studies illustrate that in order to determine whether or not MPAs are successful, various relevant indicators must be analysed. The International Union for the Conservation of Nature (IUCN) enumerated these indicators: biological, social and governance

indicators, for which there are specific identification and measurement methods (Pomeroy *et al.*, 2004).

Figure 6: *Relationships between marine protected areas, coral reef health and human well-being, Adapted from Gjertsen (2005, p.202)*

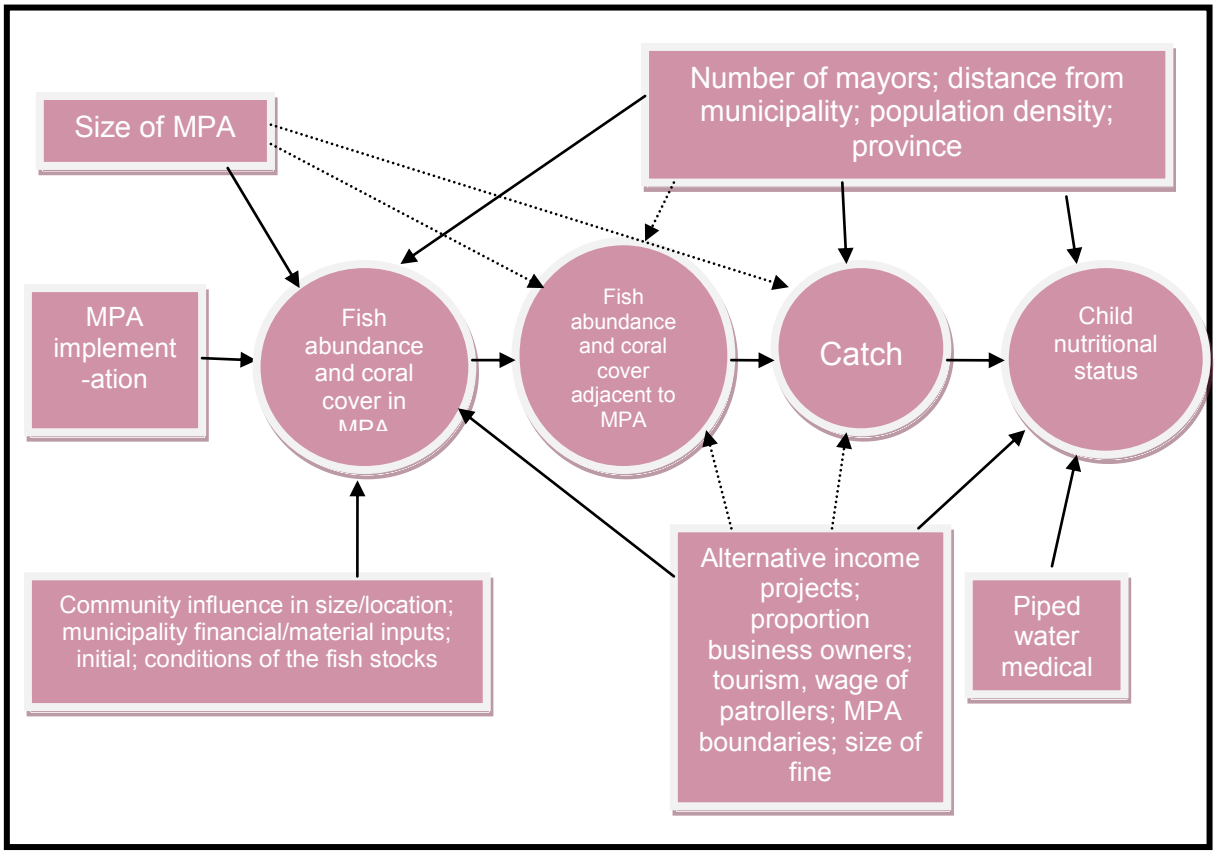


Figure 6 above, represents the relationships between MPAs, coral reef health, and human well-being. MPAs are seen both as a habitat protection and fishery management tool, their implementation can cause coral reefs (and fish within the area) to be maintained and increased through time. The human dimensions of MPA as stated in the ecosystem-based approach are reflected in its association with controlling the size of catches and ultimately, the condition of the fishermen‘s children. Moreover, increases in the fish catch will give additional income to the fishermen, since raw fish and fish products can be sold at the markets. Because it is capable of recognising spill-over effects, MPA implementation can also lead to fish abundance and coral cover in those areas adjacent to an MPA. This is also an associated effect on the nutritional status of fishermen‘s children. It is apparent that a

rise in the fishermen‘s income will improve the quality and quantity of food available to their children (Gjertsen, 2005). When adopting the ecosystem‘s improvement and the children‘s conditional status as factors in the assessment of livelihood success of MPAs, Gjertsen showed that habitat protection can lead to positive effects in human well-being. However, some livelihood schemes in the Philippines do not work effectively because they are weighed down by constraints of administrative loans as well as ineffective and inadequate planning and marketing infrastructures (Balgos, 2005). Therefore, success indicators are dependent on exogenous variables (biological, social, political, economic conditions) and MPA-related activities (including paying patrollers, financial inputs and the availability of other income projects).

Most MPAs are established, designed and located (e.g. their size is determined), based on socio-economic and political issues (Jameson *et al.*, 2002). This is frequently true, particularly in the case of NI Iloilo, where the focus is on food security, rather than on environmental conservation. There were extensive studies which explored social surveys and stakeholders‘ perceptions such as Himes (2007); Oracion *et al.*, (2005); Pollnac (2001, as cited in Christie, 2002); Pomeroy *et al.* (2004); and Webb *et al.* (2004). These studies assess whether or not NI MPAs are successful by using people‘s perceptions on the changes in the quality and quantity of coral reefs. Since the main objective of MPA establishment in NI is enhancing and maintaining food security, the S1 and S2 indicators of IUCN are appropriate variables. For this study, these indicators will be measured in terms of change in local marine patterns, local values, and beliefs regarding the marine resources. In addition, indicators S3 and S4 which focus on improvement of fishers livelihoods in the area‘s communities are also used because they are based on the importance of understanding the degree of human impact on resources and perceptions of seafood security.

The indicators mentioned above selected because there has been no extensive study of coral reef cover before the implementation of MPAs. In

line with this, the current study further identified significant success factors and investigated whether or not conflict surrounding the MPA still exists in different management regimes, as identified in Fernandez's (2006) study. In addition, factors such as information about and membership in any coastal organisation as well as the primary and secondary incomes, were included. Knowledge indicators of MPA regulation, MPA size and MPA as a priority coastal project were also included on the study.

Decision making actions should also involve consideration of integrating community participation, environmental awareness, economic incentives and legal provisions, along with the support of entities.

4.2 Theoretical and Empirical Analysis of MPA

Fishery is often characterised by its problems of efficiency and allocation. This section outlines why markets may fail in their fishery management and MPA implementation. It also describes property rights and institutional arrangements in Philippine MPA management.

4.2.1 Market failure and government intervention

With regard to the allocation of natural resources, resource economists seek to answer the "economic efficiency question'. As fishery can be either common property or open access, how does failure occur? Take, for instance, a fishery that is owned by a group and not by an individual. In the end, complete freedom for everyone to pursue their interests and thereby utilise the common resource will eventually lead to resource depletion (Hardin, 1968). For example community member or fisherman uses the quantity (e.g. fish catch) that maximises his/her income (e.g. fishing cost) in producing the greatest possible benefit (e.g. fishing profit) for himself/herself. Therefore, an unregulated situation will lead to overexploitation.

The government, as a body that promotes the welfare of society, should intervene in order to correct this failure and improve market efficiency and allocation. There are many ways this can be achieved, such as conservation appeals, public action, and property rights. The first solution is to issue actions in order to motivate people to stop exploiting the common resource. The government, for example, can place a notice that restricts fishing in a particular area, due to conservation objectives. It can also provide information and fund research in order to reduce uncertainty and increase people‘s awareness. These actions could send mixed messages, since they ask individuals to place themselves in the position of practising moral behaviour but at the same time act against their own self interest (Ward, 2006). It appears that these actions also have little effect on people‘s behaviour. It is therefore suggested that such appeals be accompanied by public actions such as rules, regulations and taxation. Rules and regulations are referred to by Hardin (1968) as *„mutual coercion mutually agreed upon*”. The government nowadays, for example, sets and implements limits for catches and use of the fishing area, in order to achieve certain objectives.

Information, on the other hand, also plays an important part in achieving economic efficiency. Non-asymmetrical information or imperfect information can give rise to externality-like effects. For example, individuals (e.g. fishermen and the public sector) will make a decision, for compliance of policy, based on his/her personal costs and benefits. If there are any doubts about the information, individuals will not accept the terms of the transaction, therefore the market will break down along with its consequences. Therefore, in order to create a decision, information must be adequate. Literature shows that if people are informed about conservation, they will more likely comply with the policy.

Assigning property rights is another solution to common resource exploitation. These rights are defined as the right to claim a resource or a service that the resource can provide. The government needs to define property rights clearly and create and maintain appropriate institutional

arrangements for property rights establishment and support (Perman *et al.*, 1999). Institutions are the rules of societies or organisations that facilitate coordination amongst people by helping them form expectations which each person can reasonably hold when dealing with others (Hayami & Vernon, 1985, p.101). It is claimed that an institution works well, i.e., efficiently, if it permits each member to reap the full benefits of his/her own actions and if it offers symmetric information concerning his/her actual costs. An MPA can be seen as a policy implemented by the government that is governed through different management schemes. It can be linked to the provision of rights, ownership and control, but this may result in the degradation of local coastal conditions.

In this regard, property rights are embedded in institutions, and thus can be seen the rise of different property rights regimes. An efficient functioning legal system takes an important role in imposing property rights. It allows the violation of property rights to be settled in an efficient way, i.e., maintaining lowered costs for such enforcement in terms of time and money. Therefore, settlements are exercised through an institution and not among individuals.

Moreover, government interventions in the form of economic instruments (e.g. property rights) are not guarantee to achieve efficiency gains. Since the intervention itself—i.e. regulatons, is not in itself efficient and thus, may create other distortions in the market (Perman *et al.*, 1999). Institutions formed through the establishment of an MPA may end up inefficient because of corruption and improper implementation as well as a lack of infrastructure.

Hardin (1968) suggested that privatisation of property rights is the correct way of achieving regulatory efficiency. However, there is copious literature supporting the fact that common property institutions can also achieve and promote economic efficiency in resource use.[29]

[29] Agrawal, 2001; Ostrom, 1990, 1998

MPAs are an example of government intervention for the purpose of correcting market failure. Institutions are rules set by a given society in order to alter the behaviour of that society's members, and improve their overall welfare (Ward, 2006). They control the quantity of the fish catch (or direct regulation); for example, they can induce adjustments in behaviours. The problem with this solution is the inconsistent capacity of government to create and design institutions that are enforceable yet do not _abuse' the people. Therefore local governments should enforce a relevant MPA framework with consideration of the unique structure of their coastal environments.

4.2.2 Three MPA management regimes

The management of marine protected areas in the Philippines has been characterised by three institutional arrangements which are bureaucracy-based, community-based and co-management based. Frequently, coastal management is a combination of all these management regimes; however, a dominant type does exist. This section discusses these three regimes in the context of NI.

In a *bureaucratic type* of management, a central authority such as national or local units is responsible for the management of MPAs. Property rights to fish and exploit coastal resources are held by the government on behalf of the public. Usually, its focus is on developing regulations that maintain stocks of resources at sustainable levels and oftentimes, members of the community share the costs of extraction (Fernandez 2006, p. 24). In addition, this regime assumes that the government is responsible for solving the _Tragedy of the Commons', as it is described in Hardin's (1968) article. The central authority handles the management and implementation of coastal protection, in addition to controls related to the resources. Thus, the government is the representative of the people and it has the ownership with which to utilise the fishery resource. If the rules are clear and well-defined, it can achieve its objectives and at the same time reduce transaction costs through lower

administrative costs and the promotion of equity. However, if there are conflicts amongst stakeholders, changes in the bureaucratic laws and regulations can become expensive. If policies are changing frequently due to political pressure, it creates appending costs of adjustment on the part on the fishermen. At this point, policy-making process becomes costly and time consuming, as well as information costs. In addition, inefficiency and cheating behaviours are likely to be present in this type of regime (Fernandez, 2006). Since there is a fixed limit to the fish catch, those operations expending high levels of effort resulting in large catches will end up with wasted fish and stock loss. Cheating behaviour, along side with bribery and corruption, are likely to occur as results and may imply high enforcement costs for the implementing organisations.

In the Philippines, an example of a bureaucratic regime is the regulation of the maximum sustainable yield (MSY) and restriction of use over some fishery instruments in a given area as mandated by the national and local government units. Municipal water delineations and MSY are not properly implemented in the NI region (Fernandez, 2006). In addition, coastal management and conservation has become a growing concern in response to a recent decline in the crab harvest. Most of the common conflicts noted in NI surrounds in the implementation of national laws relating to regulation of the fish catch. Therefore, there should be a need for close collaboration between the national and local governments (Javier, 2003). There are ongoing conflicts between different sectors in the NI region particularly between commercial and municipal fishermen and politicians and other pressure groups. There are cases of violations, however case processes are usually unsuccessful, due to the lengthy and costly proceedings involved and due to lack of support from the local government (Fernandez, 2006).

A *community-based framework* for MPA management, or common property resources management, is a framework wherein coastal management in the Philippines is a collective effort by usually poor and under-privileged people. In this case, the community owns the property and has the right to utilise the

resource. Rules are incorporated and they are based on local knowledge or tradition. Typically these rules come from social norms, rules and sanctions, and are put in place to control use of the resource. This framework is necessary for regular protection of sensitive and marginal ecosystems, cost-efficiency, and the inclusion of objectives to uplift people‘s quality of life‘ (Cohen & Uphoff, 1980; Dasgupta & Maler, 1994; Fernandez, 2006, p. 26). Concerns about this type of arrangement include how to develop rules and regulations that successfully sustain fishery resources. One of the pitfalls of this community-based framework is the free-ride problem wherein some fishermen, even though they are outside the community, can still access benefits from the positive effects, i.e. benefits from the fishery. The community does not have the legal power to enforce penalties, but can only apply social sanctions to those who violate the law, thus the local communities do not hold enough power or authority to actually control their coastline. In the case of Fiji and Papua New Guinean marine parks, community-based management system is oftentimes implemented in order to enforce rights and follow traditional systems to local owners. However, in NI, MPA poaching is one of the most common conflicts in this management regime, where municipal fishermen from the same area or town or fishermen from other towns are the usual players (Fernandez, 2006).

Lastly, a *co-management framework* of MPA management involves the users and the government in the management of MPAs. It also involves private sectors, such as research institutions, which give donations or technical support to the planning, implementation and monitoring of MPAs. The rights to use the area are distributed amongst the users and the government and the benefits are allocated to different sectors of the society. The distribution of benefits continues as long as the actors persist in engaging in the long term management of the MPA. In this regime, NGOs and the public sector create a partnership in terms of sharing visions, resources, expertise and network systems, to manage MPAs (Fernandez, 2006). In order to reduce government costs and to improve decision making process, the co-

management framework recognises the role of both local and private sectors in the management process.

Co-management regime is effective in a community such North-Eastern part of Poland, where there are diverse interests of the local communities and stakeholders (Zylicz, 1995). In addition, when central government do not have the capacity to effectively manage comprehensive fisheries such as in New Zealand Maori and other Asia-Pacific regions, co-management may be an effective option (Dasgupta & Maler, 1994). The structure of most MPAs in the NI region is a co-managed common pool resource, which means that it is a combination of co-management and common resource management. Thus, it is a combination of policy instruments that have been tailored to fit the local conditions (Fernandez, 2006). The same author related that the everyday management of the MPAs in NI is community-based (*barangay*-based), but is partially financed by public and private sectors. In addition, since MPAs in the area were established because of food security, the no-take or core zones are not implemented.

The distinct differences between the regimes can be seen clearly in terms of property rights. In the bureaucratic regime, property rights are owned by the government on behalf of the public, an example being the provision of laws pertaining to a sustainable fish catch.

4.3 Data Collection

This section describes the data collection process, firstly discussing survey interview (SI) and the survey questionnaire; followed by key informant (KI) interviews and focus-group discussions (FGDs).

4.3.1 Survey interview (SI) and social survey questionnaire

A total of 213 survey questionnaires were implemented in six municipalities of NI, disregarding the municipality of San Dionisio due to logistics and safety

considerations. Questionnaires were presented in face to face interview to 200 fishermen; 6 Municipal Agriculture Officers (MAO) as the representatives of the public sector; and 7 fisher folk association officers and NGO officers as representative of the private sector. They were presented by two hired enumerators to fishermen at their households, to public sector officer at the municipal town halls, to the private sector representative in their offices or residents. The first section is composed of classification section and is one of the two demographic sections. It includes the respondent‘s position and number of years involved with fishing, in addition to factual information (MPA size, municipality and economic actor classification) relating to MPA. [30]

The second part follows the Likert scale.[31] In total, eight questions are asked. Two are questions about perceptions on changes after implementation of MPAs and another one about knowledge on MPA regulations. Since the main objective of MPA establishment in NI is to enhance and maintain food security, S1 and S2 indicators of IUCN are appropriate. These indicators are local marine patterns and local values and beliefs, regarding the marine resources. In addition they are also related to S3 and S4 indicators, which focus on improvement of fishing livelihoods in communities, based on a level of understanding of human impacts on resources and people‘s perceptions regarding seafood security.

The last five statements ask whether conflicts amongst fishermen, public and private sectors exist, in which respondents have the opportunity to describe and assess whether conflicts are still prevalent in the region. Table 4 below shows the existing conflict in NI as per management regime. These are statements used in order to know which amongst the conflicts are highly prevalent in NI.

[30] Refers to MPA size, municipality, economic actor classification
[31] See next section for full description of the Likert-scale used in this study.

The third section, includes open-ended question on perceived and actual costs and benefits of the respondents on MPA establishment. In addition, demographic information such as membership and activities in coastal management organisation or group belong to this section. It also includes primary and secondary income information. The last section is composed of open ended questions on the reasons why MPA should be established. Along with this, conflict scenarios are asked and where adapted from previous work of Fernandez (2006).[32] Table 5 summarises all the variables used in this study.

Table 4: *Conflict in different Management Regimes in North-Eastern Iloilo, Philippines*

Management regime	**Economic Actors**	**Conflict Scenario***
Bureaucratic	Fishermen, Public sector	Conflict on implementation of the maximum sustainable yield (MSY) through fisher folk identification and boat licensing of vessels (below 3 gross tons)
Community-based	Fishermen, Public sector	Poaching on MPA sites and territorial conflict
Co-management	Fishermen, Public and Private sectors	Participation/cooperation conflict

Note: Fishermen – municipal and/or commercial; Public Sector– national and/or local government; Private Sector– non-government organisations, business sector, people's organisation, research institutions, etc.; * as results from Fernandez' study (2006)

All data collection took place in June and July 2008. Due to inconsistencies and lack of exact list and numbers of fishing population per *barangay*, proportionate sampling is done. In the municipality of Ajuy 38 people were interviewed, 25 in Balasan, 40 in Batad, 26 in Carles, 40 in Concepcion, and 31 in Estancia. The snowball approach is used in determining the respondents.

[32] Adapted from the results of Fernandez' (2006) study. Results show that there are conflicts amongst different economic actors in coastal resource management in NI, Philippines.

Table 5: *Summary and description of variables for LOGIT regression*

Variable Name	Type of variable	Description
S1 (SUCCESS1)*	dependent variable (binary)	referring to whether there is a improvement in the quantity or quality of corals
S2	independent variable (binary)	whether respondents has knowledge with MPA regulations
S3 (SUCCESS2)*	dependent variable (binary)	referring to whether there is an improvement in the overall coastal environment
S4 (Conflict4)*	independent variable (binary)	whether there is conflict between municipal and commercial fishermen
S5 (Conflict5)*	independent variable (binary)	whether there is conflict between the government and commercial fishermen
S6 (Conflict6)*	independent variable (binary)	whether there is conflict between the government and municipal fishermen
S7 (Conflict7)*	independent variable (binary)	whether there is conflict between NGO and fishermen
S8 (Conflict8)*	independent variable (binary)	whether there is conflict between NGOs and POs
mpa	independent variable (continuous)	size of MPA in hectares
priority	independent variable (binary)	whether MPA is a priority coastal project
MemOrg	independent variable (binary)	whether respondent is member of any environmental/natural resource group
PrValue	independent variable (continuous)	weekly primary income value, referring to fishing income, in PhP
SecValue	independent variable (continuous)	weekly secondary income value, in PhP
Rnum	continuous	respondents number
YrsSer	continuous	number of years in service
EcType	continuous	economic type i.e. fisherman, public or private sector

Note: *variable names in parenthesis are the names after they are recoded into binary numbers from a Likert scale.

This approach is a type of purposive sampling that relies on the people in the community to direct the enumerators to particular sources of information. It is oftentimes used if the budget of the study is small but it captures stakeholders very well. It is appropriate to use this method since the target group of this study is the fishing and management entities.

4.3.2 Key informant (KI) interview and focus-group discussion (FGD)

Along with the questionnaires, KI and FGD are also used to determine the current coastal management activities and situation in the region. Face-to-face KIs are conducted to address qualitative gaps. Its main objective is to gather information from different sources in the community, in this case, in MPA management. The key informants have first hand knowledge of the subject matter and can provide valuable insights regarding the nature of the problems as thus can provide recommendations as well. According to the International Development Research Centre (IDRC) (2009), FGD method involves group discussion of approximately 6 - 12 persons guided by a facilitator, during which group members talk freely and spontaneously about a certain topic. The main objective is to obtain in-depth information on concepts, perceptions and ideas of a group as well as to clarify some issues related to the survey proper. This gives a level of consistency between the data yielded by individual interview and by a group. Discussions are done in Barangay Nipa in the town of Concepcion, where fishermen and other members of fisher folk associations are present.

4.4 Data Analysis

4.4.1 Likert Scale and the evaluation criteria

A five-point Likert scale was adapted to analyse conflict scenarios and determine whether respondents have a thorough understanding of the regulations of MPA. The scale is a type of psychometric response scale used in a questionnaire in order for respondents to specify their level of agreement to a particular statement.[33] The scale adopted in the study is (1) less disagree; (2) strongly disagree; (3) neither; (4) less agree; and (5) strongly agree. It aims in measuring the knowledge and attitudes of respondents. In relation to the study, this is the most convenient way of capturing the respondents‘ attitudes and knowledge on the status of MPA. Oftentimes, Likert scales are treated as summative scales using the analysis of variance and are treated as ordinal data using non-parametic tests.

[33] Field of study concerned with theory and technique of educational and psychological, to measure knowledge and attitudes.

To comprehensively assess the MPA situation in the region, descriptive statistics and correlation are used. Results are presented in tabular form, showing descriptive statistics such as mean, mode, standard deviation and maximum and minimum values. Oftentimes, these are used in order to have an initial feel of the data as well as to identify errors in the data sets. Likert-scale results and other quantitative variables are initially analysed based on (1) central tendency, (2) dispersion, (3) shape of distribution, and (4) correlation. The central tendency can infer information about the population. The statistics on central tendency used on this study are the mean and the mode and described in Likert results. The mean ($\bar{x}$) is depicted by the Equation 1 below.

$$\bar{x} = \frac{\sum x}{n} \qquad (1)$$

Where: n = total number of data points; x = data points

In measuring the dispersion and variability of variables, variance, standard deviation and the standard error are used. The standard deviation is used in order to assess how varied or dispersed the sample is by averaging how spread out the score are from the mean. It seeks to find out if the data sets vary a lot or they tend to be the same or near each other in terms of value. The variance of a sample (var) is defined as in Equation 2:

$$\text{var} = \frac{\sum (X - \bar{X})^2}{N - 1} \qquad (2)$$

Where X= data points, $\bar{X}$ = mean, N = population

and the standard deviation (s) is defined as,

$$s = \sqrt{\text{var}} = \sqrt{\frac{\sum (X - \bar{X})^2}{N - 1}} \qquad (3)$$

Where X= data points, $\bar{X}$ = mean, N = population

Equation 3 shows the average amount by which scores in a distribution differ from the mean, ignoring the sign of the difference. Furthermore, it is also the average distance between any score in a distribution and the mean of the distribution.

The last measure of dispersion is the standard error, also called the Standard Error of the Mean ($SE_{\bar{x}}$). It is an estimate of the standard deviation of the sampling distribution of means, based on the data from one or more random samples. Numerically, it is defined as in Equation 4 below:

$$SE_{\bar{x}} = \frac{s}{\sqrt{n}} \quad (4)$$

Where s = standard deviation of the mean, n = sample size

In order to show how closely related the sample is to the population, the standard error (SE) is used. It is a measure of the precision of an estimate and by increasing the desired confidence level, widens the confidence interval and the reliability of the survey results. Thus, results with small intervals is more reliable, which in return is dependent on the size of the sample.

Correlation, in broadest term, is a measure of the relation between two or more variables. The correlation coefficient ranges for +1.00 to -1.00. The former connotes a perfect positive correlation and the latter, a negative correlation. In addition, a 0 value presents an absence of correlation amongst variables. The study employs the Pearson R correlation, which shows the magnitude and direction of the association between two variables. It further describes the extent to which the values of two variables are proportional to each other. Proportional in this sense refers to the fact that they are linearly related i.e. the correlation tends to be high if it can be summarised by a straight line. The coefficient is squared, the value is called the coefficient of determination that represents the proportion in common variation in the two variables. The interpretation of correlation is also

important for it describes the degree of relationship between variables. The test of significance is based on the assumption that the distribution of the residual values i.e. the deviations from the regression line, for the dependent variable y follows the normal distribution, and that the variability of the residual values is the same for all values of the independent variable x.

According to Monte Carlo studies, the rule of thumb is that if the sample size is 50 or more, then serious biases are unlikely (Statsoft, 2008). In addition, if the sample size is over 100, then there is no concern on the normality assumption. The study has 213 respondents in the actual social survey. This does not include eight KI interviews, which includes the Municipal Agriculture Officer (MAO) of six municipalities and coastal managers in the region.

4.4.2 Principal component analysis (PCA)

The Principal Component Analysis (PCA) is a technique for reducing the complexity of the data. Its purposes are the following: (1) to understand the variation in the data; (2) to form predictive models; and (3) to model response variable in terms of principal components (PCs) and to reduce the number of variables in the model (SAS, 2008). The PCA provides an objective way of ‗aggregating' indicators so that variation in the data can be accounted for as concisely as possible (Jollands, Lermit, & Patterson, 2004, p. 295). It approximates the data into fewer dimensions where each dimension, called the principal component, is representative of a linear combinations of the original variables.

Technically, PCA takes p variables $\varepsilon_1, \varepsilon_2, ..., \varepsilon_p$ and finds linear combinations of these to produce PCs Z_1, Z_2,…, Z_p (Jollands *et al.*, 2004, p. 295). The first principal component accounts for as much variation of the data as possible while the subsequent principal components accounts for as much of the remaining variation as possible and is orthogonal i.e. unrelated, to all of the previous principal components. Therefore, the indices are measuring

different ‗dimensions' in the data for the first and the second PCs (third, fourth, fifth, …) which are not correlated with each other.

Since, the study explores the sources of variation of MPA success in NI, PCA captures the most variance of these data in low-dimensional subspace – in preferably two or three dimensions. Moreover, the subspace will be formed by the span of the first few principal components, wherein a span of a set of vectors is the vector space consisting of all linear combinations of the vectors (SAS, 2008, p. 1). Results are shown through an eigenvalue matrix table, a correlation matrix and score plot figures.

4.4.3 Logit regressions

The statement variables (S1 to S8) are recoded into binary numbers (1 and 0) in order to interpret success and knowledge indicators quantitatively. Hereby, S1 is SUCCESS1, S3 is SUCCESS2, and S4-S8 are conflict variables (assigning 1 for success and 0 otherwise). Logit regression is appropriate to use on this study compared to the ordinary least squares regression (OLS) because the assumptions of OLS are violated when using a binary response variable.[34] The model is technically composed of a dependent variable that is binary (0, 1) and a set of independent variables. Two logit models are adopted, given each success indicators: improvement of the coastal environment (SUCCESS1) and improvement of the coral reef (SUCCESS2). Using the non-linear likelihood estimation, the probability P_i, is defined as follows.

$$\text{Prob}(Z_i = 1) = \frac{\exp(\alpha + \beta X_i}{1 + \exp(\alpha + \beta X_i)} \qquad (5)$$

where Z_i=1 if MPA is successful and Z_i=0 if otherwise.

[34] OLS estimator is unbiased and has the minimum variance of all unbiased estimators. The residuals have constant variance and the errors are normally distributed

The vector of X, X=(X_1, X_2, X_3…, X_n), is the set of independent variables for determining the success of MPA. In this study, there are two regressions. The first one determines which among the five conflict variables (Conflict4 (derived from S4); Conflict5 (derived from S5); Conflict6 (derived from S6); Conflict7 (derived from S7); Conflict8 (derived from S8), are significant. Insignificant conflict variables are dropped from the analysis. The second regression is composed of the significant conflict variables and a set of independent variables.

Specifically, the first regressions have the following general form for all conflict variables.[35]

$$\text{logit}[\widehat{\theta}(\text{SUCCESS1})] = \log\left[\frac{\widehat{\theta}(\text{SUCCESS1})}{1-\widehat{\theta}(\text{SUCCESS1})}\right] = \alpha + \beta_1 \text{conflictvariable} \quad (5.1)$$

Equation 5.1 is for the first success indicator, SUCCESS1.

$$\text{logit}[\widehat{\theta}(\text{SUCCESS3})] = \log\left[\frac{\widehat{\theta}(\text{SUCCESS3})}{1-\widehat{\theta}(\text{SUCCESS3})}\right] = \alpha + \beta_1 \text{conflictvariable} \quad (5.2)$$

Equation 5.2 is for the second success indicator, SUCCESS3.

On the other hand, the second logit regression will have the following forms:

$$\begin{aligned}\text{logit}[\widehat{\theta}(\text{SUCCESS1})] &= \log\left[\frac{\widehat{\theta}(\text{SUCCESS1})}{1-\widehat{\theta}(\text{SUCCESS1})}\right] \\ &= \alpha + \beta_1 \text{Conflict4} + \beta_2 \text{Conflict5} \\ &\quad + \beta_3 \text{Conflict6} + \beta_4 \text{Conflict7} + \beta_5 \text{Conflict8} + \beta_6 \text{S2} \\ &\quad + \beta_7 \text{mpa} + \beta_8 \text{priority} \\ &\quad + \beta_9 \text{PrValue} + \beta_{10} \text{SecValue}\end{aligned} \quad (5.3)^{36}$$

Equation 5.3 is for the first success indicator, SUCCESS1.

[35] Equations 5.1 and 5.2: conflictvariable = (Conflict4, Conflict5, Conflict6, Conflict7, Conflict8)

[36] Equations 5.3 and 5.4 can be altered, depending on the previous logit regressions with conflict variables. Only conflict variable which are found to be significant are included on these equations.

$$\begin{aligned}\text{logit}[\hat{\theta}(\text{SUCCESS3})] &= \log\left[\frac{\hat{\theta}(\text{SUCCESS3})}{1-\hat{\theta}(\text{SUCCESS3})}\right] \\ &= \alpha + \beta_1 \text{Conflict4} + \beta_2 \text{Conflict5} + \beta_3 \text{Conflict6} \\ &\quad + \beta_4 \text{Conflict7} + \beta_5 \text{Conflict8} + \beta_6 \text{s2} + \beta_7 \text{mpa} + \beta_8 \text{priority} \\ &\quad + \beta_9 \text{PrValue} + \beta_{10} \text{SecValue}\end{aligned} \tag{5.4}$$

Equation 5.4 is for the second success indicator, SUCCESS3.

The above equations show that regressions have two dependent variables (*S1*, *S3*), which are run separately. On the other hand, the independent variables are the following: conflict between municipal and commercial fishermen (Conflict4): conflict between government and commercial fishermen (Conflict5); conflict between government and municipal fishermen (Conflict6); conflict between NGO and fishermen (Conflict7); conflict between NGOs and POS (Conflict8); knowledge (S2); size of MPA (mpa); whether MPAs are priority coastal project (priority); membership to organisations (MemOrg); fishing income (PrValue); and secondary income (SecValue).

The aim of the regression is to accurately predict the category of outcome for individual cases by calculating the probability of success over the probability of failure. The probability of success is expressed in odd ratios. The regression provides knowledge on the relationships and strengths among the variables. It also shows significance, wherein coefficients are statistically tested.

4.4.4 Canonical correlation analysis

The Canonical Correlation Analysis (CCA) is a dimension-reduction technique related to PCA.[37] It derives canonical variables or the linear combinations of the interval variables that summarise between class variations in much the same way that principal components summarise total variation (SAS, 2008). It also derives the highest possible multiple correlation

[37] Canonical discriminant analysis (CDA) is equivalent to canonical correlation analysis (CCA) between the quantitative variables and a set of dummy variables coded from the classification variable.

with the groups. For example, the first canonical variable is the maximum multiple regression and the second canonical correlation is derived by finding the linear combination uncorrelated with the first canonical variable.

The canonical correlation analysis (CCA) seeks to find out whether there are independent statistical relationships that exist between two variables. It is the correlation of two canonical variables, one representing a set of independe varoables, while the other is representing a set of dependent variables. This is done by studying the sets simultaneously and identifying and quantifying the elements of one variable set most highly related to the elements of the other variable set (Chatzipanagiotou, Vassilikopoulou, & Siomkos, 2008). It, therefore, seeks to find potential relationships. The complexity of data is regarded in this type of multivariate regression analysis, wherein multiregression is used for ‗many-to-one' relationships, CCA is used for ‗many-to-many' relationships (Chatzipanagiotou, *et al.*, 2008, p. 290).

4.5 Strategic Analysis

Strategic analysis studies the complex interactions of different management actors and the specific benefits and costs (e.g. changes in revenues and fishing income they are facing.[38] Its primary aim is to verify the results from the data analysis.

Entries such as perceived and actual costs and benefits of MPA (as well as cost and benefit from complying and not complying) are analysed using frequencies. As identified by the respondents, results include details of their expected losses and gains. In measuring these values, the concept of opportunity cost is used. It says that an opportunity cost is whatever one has given up in order to get something. In the case of fishermen, the time and income they lost for complying to the MPA are their loss while the

[38]Strategic analysis follows the game theory notation, which analyses interactive situations (decision situations) in which there are two or more decision makers (players or actors) and to formulate hypotheses about their behaviour as well as the final outcomes of the game.

preservation of the coastal environment and expected rise in their incomes is their gain. Further, in the case of the public sector, the revenue derived from fishing licences and permits to fish are basis for these gains. On the other hand, private sector‘s benefits and costs lie in the preservation of fishing grounds and secure income for the fishing communities. These costs and benefits are beyond the coverage of this study, and are not quantified. However, there are many recent methods that can measure willingness to pay (WTP), in order to capture non-use values such as biodiversity and bequest values, but were not adapted in this study (Hanley & Spash, 1993).

4.6 Concluding Remarks

MPAs are considered to be a form of government intervention to correct the coastal problem of open access. The three management regimes of MPA developed in the country and their differences in terms of property rights create some unavoidable conflicts in NI. The choice of what indicator to use for measurement of success of the MPA, depends on the primary objectives of MPA and the type of community where it is implemented. The choice of success indicator enables the identification of the relevant factors to be considered in analysing different dimensions of MPA. This chapter explained a framework that includes factors of MPA success such as community, institutional and information capacities.

The study applies data analysis and strategic analysis. Data are gathered through social surveys, FGD, and KI. Principal Component Analysis (PCA); Logit regressions; and Canonical Correlation Analysis (CCA) are used to analyse the data. The PCA and logit regressions are used to assess whether MPA is successful or not, in addition to capturing factors associated with MPAs‘ success. Statistical analysis software such as STATA and SAS are employed in estimating these associations. On the other hand, strategic analysis aims to support the results from the data analysis and add more information about the behaviour of economic actors. It shows, for example, different incomes (primary, secondary and total income) for different

characteristics of fishermen (membership and knowledge on regulations) in order to analyse the behaviours of groups (i.e. members who have knowledge relating to regulations) that have the highest value in each income type. The next chapter presents the results from the all the analyses presented in this chapter.

CHAPTER FIVE ~ Results and Discussion

"Whether an MPA is effective is a function of the initial objectives, the level of enforcement, and its design". - Boersma & Parrish (1999)

The results and relevant discussions from the analyses are presented in this chapter. It begins with information on the current MPA management scenario and describes the respondents' characteristics. It then offers general evaluation criteria, through univariate analysis and Likert-scale results. The behaviour of fishermen with different characteristics (i.e. with membership and with MPA regulation knowledge) is also investigated, in relation to the current MPA situation. This is followed by an assessment of the success/failure of MPA in NI and conflicts between actors and management regimes, through the use of general logit, Principal Component Analysis (PCA), and Canonical Correlation Analysis (CCA). An explanation is given concerning the association of variables (including different conflicts) to MPA success, in addition to the relationships of variables, per municipality. Different economics actors in MPA management, such as fishermen and public and private sectors are also discussed. Lastly, complying (and not complying) benefits and costs and policy implications are presented and discussed.

5.1 The Current MPA Management Scenario and General Evaluation Criteria

Descriptive statistics are used, in order to understand the characteristics of the data gathered, through surveys and interviews. This section presents these results in order to understand the association of these characteristics with MPA management.

5.1.1 MPA management regimes, income, knowledge and membership

Secondary data show that the management of coastal resources and that of MPA in NI is a combination of three management regimes in MPA management namely: bureaucratic, community-based, and co-management.

For example, in island *barangays*, most MPAs are managed through community-based frameworks. The management system of an MPA follows jurisdictions of the three governing laws of MPA mentioned in the previous chapters, particularly the Local Government Code of 1991. All MPAs in NI are established and managed under this authority. There are, however, other coastal projects which are associated with coastal conservation, such as mangrove reforestation, which have the same objectives as that of an MPA. The NI municipalities are one of the marginal communities in the Philippines with a high incidence of malnutrition and poverty – this is the reason why conserving and sustaining fishing livelihoods, in addition to marine conservation, are the priorities of most NI municipalities. This reflects that MPA management in NI communities is government-led with participation of the people‘s organizations oftentime called Fisheries and Aquatic Resources Management Council (FARMC).

Table 6: *Correlation Matrix of Selected Variables*

	MemOrg	**MemYrs**	**Fishing Income (PrValue)**	**Secondary Income (SecValue)**	**S2**
MemOrg	1	0.69	-0.04	-0.02	0.12
MemYrs	0.69	1	0.01	-0.03	0.14
Fishing Income (PrValue)	-0.04	0.01	1	0.19	-0.04
Secondary Income (SecValue)	-0.02	-0.03	0.40	1	-0.01
S2	0.12	0.14	-0.40	-0.01	1

MPAs involves human dimensions and their management reflects economic actors‘ characteristics. This study has assumed that knowledge of MPA regulations makes for a successful MPA. This is based on the expectations

that fishermen will comply with the MPA provisions, because they perceived a higher income for themselves in the future. Thus it is imperative to look at respondent‘s knowledge, membership of environmental organisations and incomes. Results in Table 6 shows that those who joined a group stayed for a longer period of time, as denoted by a high correlation coefficient (0.69) of membership (MemOrg) with years of service (MemYrs). There is no significant (or very week) relationship between membership and income (-0.04). On the other hand, knowledge indicator S2 is not highly correlated with any of membership and income variables shown on the table. In addition, the knowledge indicator is shown to have high positive correlation with conflict variables (Conflict4-Conflict8), with values ranging from 0.82 to 0.60. Interestingly, correlation results suggest that the more knowledge on regulation respondents have, the more conflict occurs. These findings will be further analysed in the succeeding sections.

Using the same factors, Table 7 presents how incomes change with certain characteristics of fishermen – whether it is being a member of an organisation and/or whether they have knowledge relating to MPA regulations.

Fishermen who do not have MPA knowledge have higher fishing incomes than those who have no MPA knowledge. It could be that these individuals do not comply with MPA regulations, because they are not familiar with them and as a consequence, they fish in restricted areas and increase their incomes. On the other hand, secondary incomes are low for those fishermen who have no knowledge, but are members of organisations. Fishermen are not constrained if they have no knowledge or membership, for they can be rational and maximise their resources. As members, they are oblige to strictly follow rules and restrictions in order to avoid penalties. However, non-members are not boundby these obligations , therefore may violated existing rules. The situation can be explained by the ‗free rider‘ problem, which exists when people (e.g. non-members) enjoy the benefits (e.g. fish catch improvement due to MPAs), independent of whether or not they comply with

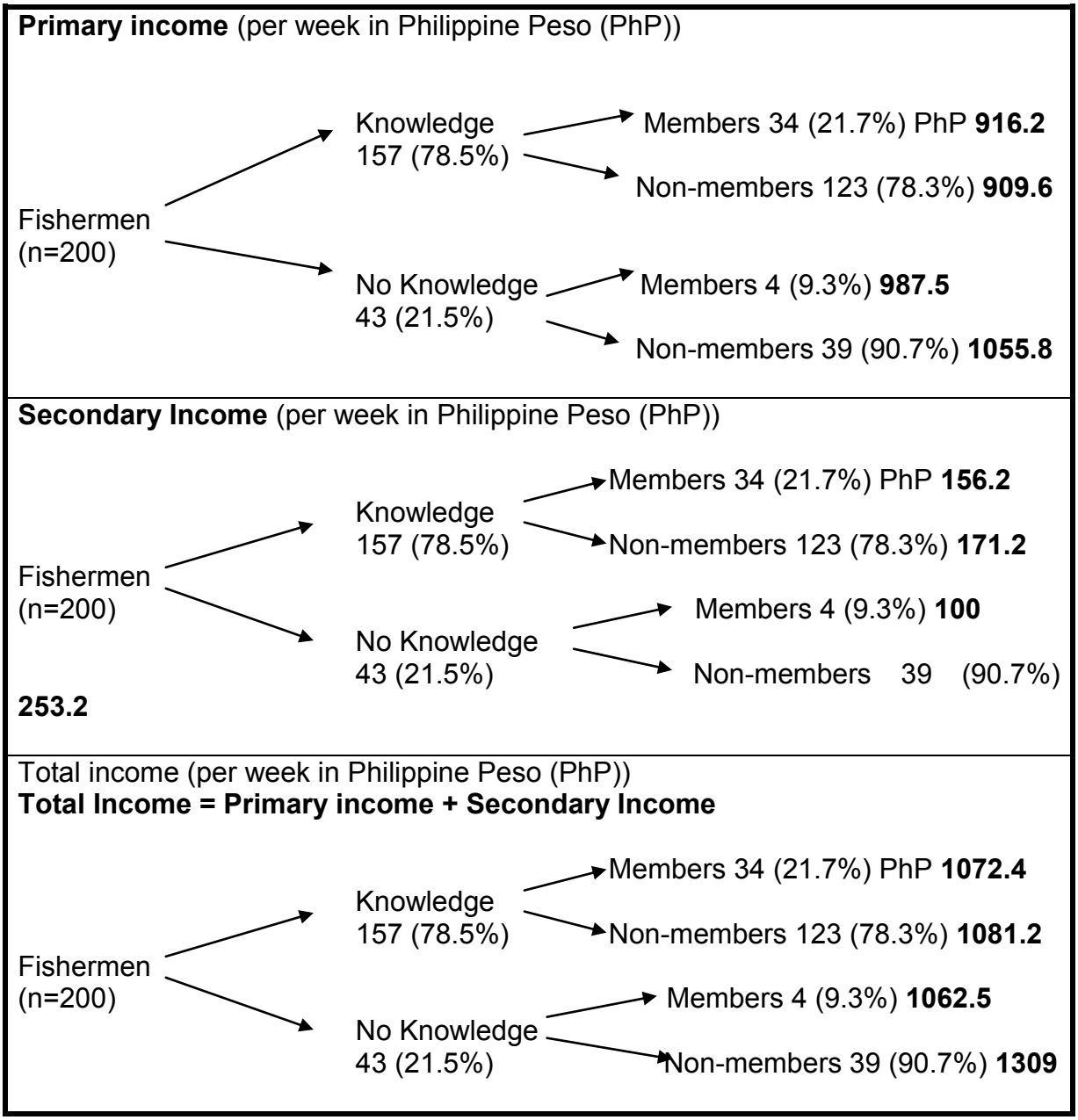
the MPA policy. These people do not shoulder their fair share of cost for the use of the resource. In other words, there will be non-member stakeholders (e.g. fishermen) who are benefiting from MPA but are violators of MPA rules and regulations. Therefore, if the free rider problem is not minimised, it could defeat the objective of MPAs and eventually lead to excessive loss of fisheries resources.

The findings in Table 7 reaffirms results in Table 6 and imply that stakeholder awareness and technical assistance are significant for MPA management. Moreover, results show that membership does not make any difference to income because correlation values are weak. It can easily be seen that those fishermen, who do not have any knowledge about MPA regulations and are non-members of any environmental or coastal group, have higher fishing and secondary incomes.

It may also imply that those member fishermen have access, not only to information but also to the infrastructure and support of the organisation. However, there are other factors which have an influence on income, aside from membership, such as resources, skills, education level, household expenses , etc.

This study, however, does not look into the details of why some fishermen choose or not choose to become a member of an organisation but rather analyses conflicts in every management regimes that could affect the distribution of benefits amongst stakeholders. Conflict variables are tested using multivariate analysis and are discussed in later sections.

Table 7: *Behaviour of Fishermen in NI, Philippines*



Notes: *(1)* Primary income is the income from fishing*; (2)* Secondary income is from other source(s) of income, aside from fishing)*; (3)* Knowledge indicator is based on Likert test results, wherein respondents have knowledge of MPA regulations; and *(4)* Membership of any coastal or any environmental organisation.

5.1.2 The general evaluation criteria

The general evaluation criteria describe the characteristics of the respondents through univariate and general statistics. As mentioned in the previous chapter, respondents are fishermen and representatives from local government offices (public sector) and NGOs (private sector). Table 8 below summarises the statistics of selected variables.

Table 8: *Descriptive statistics of selected variables (n=213)*

Statements	Mean	Mode	Standard Deviation	Low value-High value
Likert Variables				
S1 – Improvement of coastal resources as a whole	3.86	5	1.71	2.15-5.57
S2 – MPA regulation knowledge	4.03	5	1.71	2.32-5.74
S3 – Improvement in quantity and quality of corals	3.54	5	1.66	1.88-5.2
S4 – There is conflict between the municipal and the commercial fishermen.	3.79	5	1.75	2.04-5.54
S5 – There is conflict between the government and the commercial fishermen.	3.32	5	1.8	1.52-5.12
S6 – There is conflict between the government and the municipal fishermen.	3.54	5	1.73	1.81-5.27
S7 – There is conflict between the NGO and fishermen.	2.69	3	1.44	1.25-4.13
S8- There is an active participation between NGOs and Pos (fisherfolk association).	3.14	3	1.56	1.58-4.7
Non-Likert Variables				
MPA - size of MPA *(km^2)*	1.09	1.00	0.37	0.72 - 1.46
PrValue - fishing income value *(per week)*	1017.28	1000.00	902.01	115.27 - 1919.28
SecValue - secondary income value *(per week)*	302.05	0.00	1009.34	-707.29 - 1311.39
MemOrg - membership	0.19	0.00	0.39	-0.20 - 0.58
MemYrs - years of membership	0.64	0.00	1.92	-1.28 - 2.56
Priority - whether MPA is a priority project	0.55	1.00	0.50	0.06 – 1.05

Note: All Likert-scale variables are measured on 1 to 5 scales (1 - highly disagree, 2 - disagree, 3- neither, 4-agree, 5-highly agree)

From the Likert datasets, it is more appropriate to use the mode, compared to mean and median, when capturing central tendency. The mean does not effectively denote distribution, as reflected by the wide spread of the data shown by large standard deviations. Table 8 shows that there is intense conflict between (1) fishermen (municipal and commercial), and (2) fishermen and the government. With mode equal to 3, the conflicts between the private sector and the fishermen (and within the sector) are less than other conflicts. On the other hand, success indicators, S1 and S3, have mode equal to 5, which implies that the conditions of coastal environments, within MPAs are perceived to have improved. Moreover, knowledge indicator S2 has a mode equal to 5, showing that most respondents have knowledge of the rules and regulations regarding MPA.

NI fishermen, on average, have been fishing for over 19 years. Their weekly income from fishing ranges from PhP 100 to 5,000 (NZD 4-192). On the other hand, those respondents from the public and private sectors have been working in their respective organisations for approximately 16 years, with an average income of approximately PhP 10,000 (NZD 384). In addition, these respondents do not have incomes from fishing. Average secondary income, as expected, is lower than primary income, at approximately PhP 302 per week (NZD 12). Furthermore, most of the respondents are not members of any coastal or environmental organisation, with 0.19 and 0.00 as mean and mode, respectively. The MPAs tend to be a priority amongst the municipal and town projects with a mean of 0.55 and mode of 1.0.

Descriptive statistics analyse variables independently and therefore, insufficient in illustrating a full picture of the situation of MPA management in NI. On the other hand a multivariate analysis captures variable dependence. The next section shows significant MPA success factors using multivariate analysis.

5.1.3 The four principal components

A principal component (PC) can be defined as a linear combination of optimally-weighted observed variables (SAS, 2008). The analysis presents eigenvalues which correspond to the PCs and represent a partitioning of the total variation in the sample. Thus, the eigenvalues shows relative usefulness of the principal components. Table 9 presents: (1) the eigenvalues of the correlation matrix and contains all the eigenvalues of the correlation matrix (2nd column); (2) the differences between successive eigenvalue (3rd column); (3) the proportion of variance explained by each eigenvalue (4th column); and (4) the cumulative proportion of the variance explained (last column). Specifically, proportion shows the proportion of the variance accounted for by the principle component, while cumulative the cumulative proportion of the principle components. Since correlation is used, the sum of all the eigenvalues is equal to the number of variables — in this case 15. From the table, the first row of the table corresponds to the first principal component (PC1), the second row to the second principal component (PC2), and so on.

Table 9: *Eigenvalues of Correlation Matrix*

Principal Components	Eigenvalue	Difference	Proportion	Cumulative
1	6.19	4.29	0.41	0.41
2	1.90	0.69	0.13	0.54
3	1.21	0.10	0.08	0.62
4	1.11	0.21	0.07	0.69
5	0.90	0.11	0.06	0.75
6	0.80	0.23	0.05	0.80
7	0.56	0.04	0.04	0.85
8	0.52	0.13	0.03	0.88
9	0.39	0.10	0.03	0.90
10	0.29	0.01	0.02	0.93
11	0.28	0.02	0.02	0.94
12	0.26	0.02	0.02	0.96
13	0.24	0.05	0.02	0.97
14	0.19	0.06	0.01	0.99
15	0.13	-	0.00	1.00

Table 10 reflects the order in which the PCs are derived from the PCA. The results show that the PC1 explains over two-fifths of total variation (41%) and on the other hand, PC2 accounts for 13%, PC3 for 8% and PC4 for 7%, amongst the fifteen variables of five towns sampled. For example, algebraically, PC1 is shown as:

$$\begin{aligned} PC1 = {} & 0.202Rnum - 0.039YrsServ + 0.916Mpa - 0.18PrValue \\ & - 0.008ScValue + 0.118MemOrg + 0.082MemYrs + 0.3571S1 \\ & + 0.357S2 + 0.345S3 + 0.352S4 + 0.307S5 + 0.336S6 + 0.288S7 + 0.330S8 \end{aligned}$$

The variables on the right side are the original indicators used in the analysis. The remaining eigenvalues are much smaller than 10 and they contribute only a small amount towards explaining the total variation - PC3 and PC4 accounting 8-7%, whilst the remainder accounts little towards the total variation (5^{th} and 6^{th} are less than 7%). It is therefore reasonable to say that the data can be summarised by fewer dimensions (i.e. 4) than fifteen, which accounts for about 70% of the total variations of the variables.

Table 10: *Correlation (Structure) for Principal Components*

	PC1	**PC2**	**PC3**	**PC4**	**PC5**	**PC6**
Rnum	0.202	0.241	-0.197	0.541	0.055	0.004
YrsServ	-0.039	0.302	0.028	-0.551	0.577	0.390
Mpa	0.196	0.180	-0.165	0.461	0.511	0.161
PrValue	-0.018	-0.050	0.660	0.266	-0.236	0.634
SecValue	-0.009	-0.062	0.674	0.090	0.442	-0.555
MemOrg	0.118	0.588	0.086	0.014	-0.251	-0.209
MemYrs	0.082	0.605	0.158	-0.181	-0.240	-0.068
S1	0.357	-0.062	-0.016	-0.065	0.032	0.082
S2	0.357	-0.066	0.015	-0.097	0.014	0.015
S3	0.345	-0.034	0.057	-0.076	-0.029	0.082
S4	0.352	-0.104	0.024	0.016	0.069	-0.049
S5	0.307	-0.151	0.012	-0.146	-0.131	-0.137
S6	0.337	-0.028	0.056	-0.115	-0.057	-0.112
S7	0.288	-0.227	-0.007	-0.156	-0.064	0.062
S8	0.330	0.067	0.057	0.012	0.021	0.108

As derived from PCA, Table 11 gives the factor analysis, wherein PC1 is extracted from the PCA and accounts for a maximal amount of variance in the observed variables. Eight variables are loaded onto PC1 that account for approximately 41% of the total variance.

The variables under PC1 can be interpreted as those statements on the Likert scale that include the two success variables: the knowledge and conflict variables. Thus, under typical conditions, this means that the first component will be correlated with at least some of the observed variables and it may also be correlated with many variables. Scores are dominated by conflict variables in PC1, which is interesting, since the issue of effectiveness of the MPA relies on whether actors are in conflict with each other — and that conflict is one of the major concerns of this study.

Table 11: *Principal Component Analysis (PCA) Summary Statistics*

Principal Component Number	Principal Component	Decision Variables (Eigen values)	Percent of Variance (%)
PC1	Likert Statements	S1 (0.357)	41%
		S2 (0.357)	
		S3 (0.345)	
		S4 (0.352)	
		S5 (0.307)	
		S6 (0.336)	
		S7 (0.288)	
		S8 (0.330)	
PC2	Membership Characteristics	MemOrg (0.588)	13%
		MemYrs. (0.605)	
PC3	Income	PrValue (0.660)	8%
		SecValue (0.674)	
PC4	Other Factors	YrsServ (-0.55)	7%
		mpa (0.461)	

For PC2, two variables play important roles and comprise approximately 13% of the total variance. They are interpreted as characteristics of membership i.e. (1) whether a person is a member of any environmental or

coastal group or (2) the number of years in that group. Higher scores mean membership and longer years of being members. This component accounts for a maximal amount of variance in the data set, which was not accounted for in the PC1. Again, under typical conditions, this means that PC2 is correlated with some of the observed variables that display strong correlations with PC1. The second characteristic is that PC2 will be uncorrelated with the PC1. Literally, the correlation between components 1 and 2 is zero. This highlights the importance of membership and years of service as channels, which can be related to channels of information. However, information on regulations does not explain a great deal of the total variation and it is not included in this component.

The principal component results confirm with the correlation analysis from the first section, which concludes that the information does not explain the changes in fishing (brought about by a successful MPA) and secondary incomes. This could be explained by the free riding problem, where fishermen do not have any incentives to account for the collective benefits of their decision. Furthermore, there are two variables loaded onto PC3 which is loaded with the income variables of fishing and secondary incomes. While PC4 is loaded with MPA size and years in service or fishing.

Although, these last two PCs explain a small portion of the variation and they are deemed not as important as the first two PCs, they still show a picture of the data. The third component has the same characteristics as the PC1 and the PC2. There are other external factors, which connote the flow of funds and enthusiasm of the public sector to the MPA. All variables in PC1 to PC4 mentioned above comprise approximately 70% of the total variance.

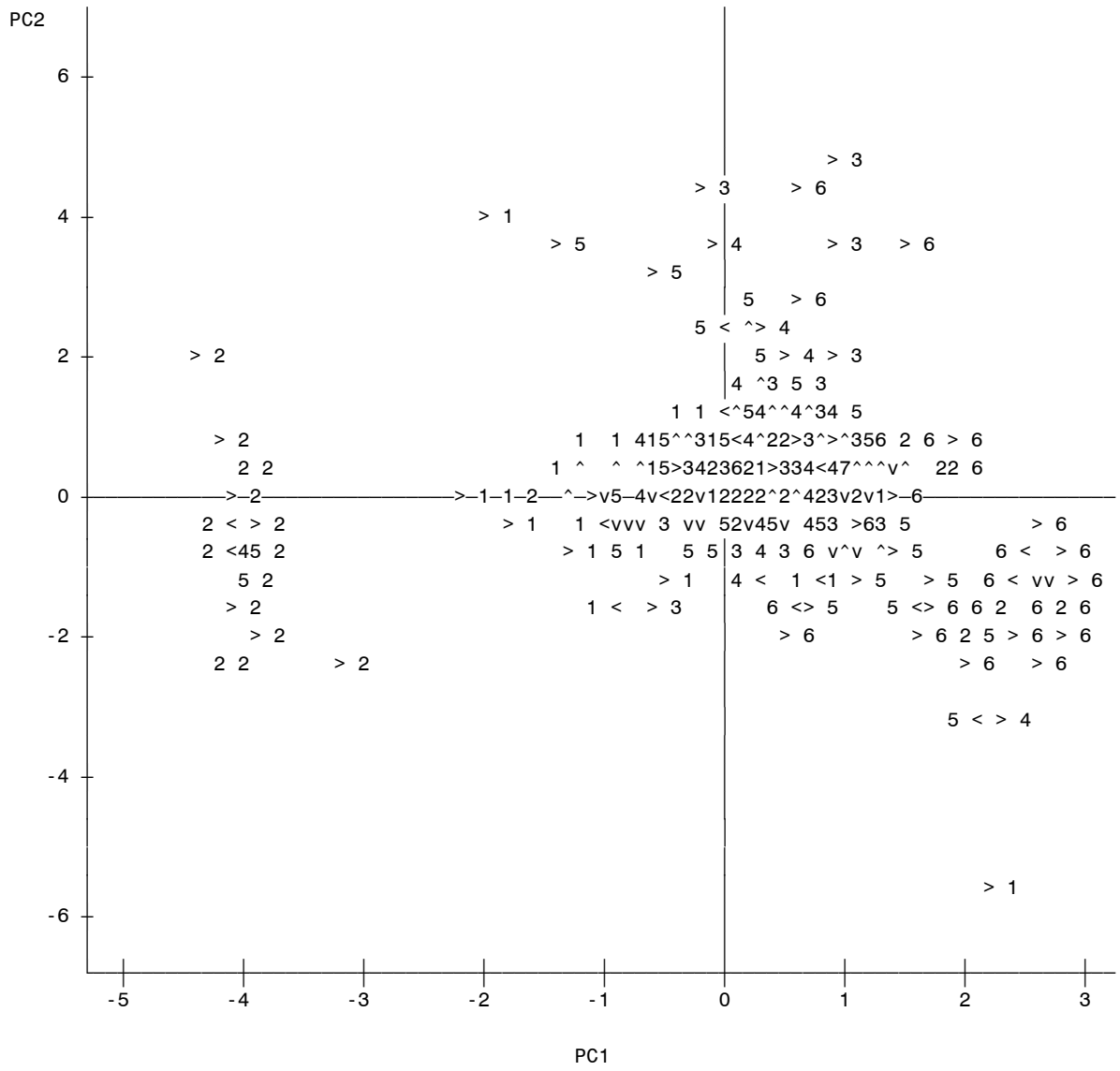
Figures 7 and 8 are called score plots, in which the plots of the observations in the coordinate system are defined by PCs. This is a method of ordination, or the ordering of units within multidimensional space in order to simplify and code the diversity of information so that the patterns of variability can be

observed. The score plots reveal relationships between principal components.

In Figure 7, the horizontal axis represents PC1 while the vertical axis represents PC2. It shows the ordination of the first and second PC and involves the projection of the data onto the PCs in two dimensions. Positive values on the axis (>0) represents higher values for the principal component while negative values (<0) represent lower values. The PC1 primarily measures the statement variables for each municipality, while PC2 primarily measures the membership characteristics for each municipality. The first quadrant (+,+) is the upper right section of the figure while the second quadrant (-,+) is the upper left section. Moreover, the third (-,-) and the fourth (+,-) quadrants are on the lower left and lower right, respectively. Each dot represents the municipality: 1- Estancia; 2- Balasan; 3-Batad; 4-Carles; 5-Ajuy; and 6-Concepcion.

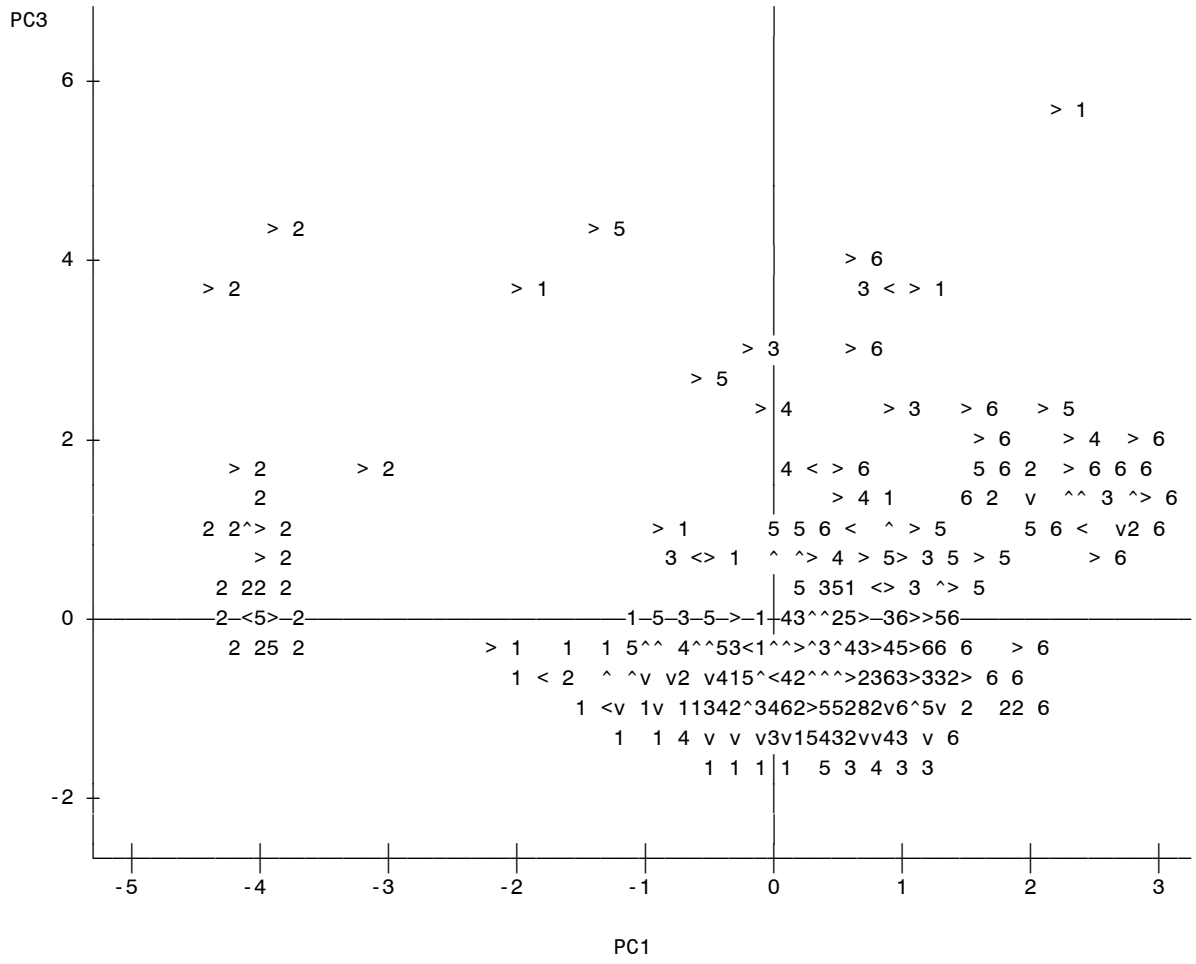
There are few data on the 2nd and 3rd quadrants, whilst the observations primarily lie on the 1st and 4th quadrants. Specifically on the 1st quadrant, most of the observations come from the municipality of Carles (4) and Concepcion (6). This means that most respondents from both municipalities strongly agreed on the Likert statements (e.g. they believe that there are conflicts within MPA management) and at the same time they are members and have served a long time in coastal or environmental organisations. On the other hand, data from Balasan (2) are concentrated in the 2nd and 3rd quadrants. This implies that people in this municipality have low Likert scores and neither have skills and knowledge about MPA regulations. It is observed that there are more data point from Balasan in the 3rd quadrant, meaning, there are more uninformed and unskilled economic actors. The majority of the observations from the 4th quadrant are from Batad (3) and Carles (4). The table shows that respondents from these municipalities are generally not members of any coastal organisation, but they strongly agree on the Likert statements.

Figure 7: *Score Plots for Principal Component 1 (PC1) and Principal Component 2 (PC2)*



Notes: 1- Estancia; 2- Balasan; 3-Batad; 4-Carles; 5-Ajuy; 6-Concepcion

Figure 8: *Score Plots for Principal Component 1 (PC1) and Principal Component 3 (PC3)*



Notes: 1- Estancia; 2- Balasan; 3-Batad; 4-Carles; 5-Ajuy; 6-Concepcion

These observations reflect on the profile of these municipalities (recall Table 3 in Chapter 3). For instance, 72% of Concepcion communities are coastal communities where fishing is a primary livelihood with a large area of municipal waters (320 km^2). In addition, the MPA is a priority project with the highest number of patrol boats and wardens (sea/coastal police) amongst the NI municipalities. Conflicts are rampant in this municipality since it is located far from other municipalities that led to various fishermen from nearby provinces and areas to poach on its municipal waters. In the case of Batad, not many fishermen are members of organisations because they have small surface area of municipal waters and fewer numbers of coastal *barangays*. As shown in Table 2, Balasan has no MPA and prefers aquaculture and mangrove reforestation for its coastal management policies rather than MPA. This may also connote that because there are other coastal management options and small surface water area, people are not familiar with MPA activities and regulations.

In Figure 8, the relationship between the 1st and the 3rd components is shown. The 3rd PC is composed of other factors, such as whether MPA is a priority project and the size of the MPA. Most of the observations are in the 1st, 3rd and 4th quadrant, whilst only a few are on the 2nd quadrant. On the first quadrant, it is clear that a majority of observations come from the municipality of Concepcion (6) and Batad (3). In these municipalities, where MPA is a priority project and the MPA size is large, respondents strongly agree on the Likert statements. As mentioned, Concepcion has the largest coastline, the largest number of fishing areas and registered fishermen (all 2nd to Carles) and it is logical that a great deal of attention from the public sector is concentrated on the protection of fishing areas, thus, the MPA policy. Interestingly, Batad has a small fishing area but it prioritises the MPA. This is possible because fishing is still the town‘s major source of livelihood, with two island *barangays* and a reasonable number of coastal *barangays*. Looking at the number of wardens and patrol boats, Batad has relatively more of these per fishing area (60 wardens in 0.6 km^2 of surface water). This reflects on the issue that conflict is intense in these areas (PC1), and that is

the reason why (even though there is less territory to guard) more wardens are deployed. This explains why there are restrictions on fishing grounds — i.e. the MPA — a priority.

A majority of the observations from the municipality of Ajuy (5) strongly agree on the Likert statements. In this municipality, where there is a significant area of fishing and large number of fishermen, the MPA size is small and it is not a priority. This reflects the current political situation in this municipality, where top political leaders are murdered and a political coup is imminent. Although, there is only small population in the coastal communities, large numbers of wardens and patrol boats are present. This explains why conflict statements scores are high.

The score plots show that conflict and other factors for success depend on the characteristics of the municipalities. It also shows that areas with long coastline and large number of fishermen tend to prioritise the MPA but that those areas are also exposed to a high possibility of conflict amongst actors.

5.2 MPA Success and Conflict in NI, Philippines

This section shows the results of MPA effectiveness and comprises three subsections. The first subsection presents the results from logit regression, in which the significance of five conflict variables is tested. The second subsection shows results of the regressions, given two success indicators. It also presents the significant factors affecting MPA success in NI. The third subsection shows the results of the Canonical Correlation Analysis (CCA) in order to determine the nature of the links between two sets of variables.

5.2.1 MPA conflicts between actors and regimes

Actors play essential roles in MPA implementation but they also generate conflicts. Implementation of an MPA can generate conflict, as shown in

previous chapters. Particularly in NI, there are existing conflicts between actors and regimes which hinders the implementation process.

The statement conflicts (S4-S8) are recoded as binary entries and renamed as Conflict4, Conflict5, and so on. Their significance was tested, using logit regressions. Conflict between NGOs and fishermen (Conflict7) is dropped because it is not significant and all the significant variables are used in logit regressions of two success indicators. Table 12 shows the logit regression results.

Table 12: *Goodness of Fit Tests - General Logit for Conflict Variables*

Conflict Variables	**Likelihood Ratio**		**Pearson Chi-Square**	
	Value	**Significant**	**Value**	**Significant**
Conflict4 - There is conflict between the municipal and the commercial fishermen.	51.340	.000	56.233***	.000
Conflict5 - There is conflict between the government and the commercial fishermen.	21.623	.000	21.921***	.000
Conflict6 - There is conflict between the government and the municipal fishermen.	42.455	.000	43.615***	.000
Conflict7 - There is conflict between the NGO and fishermen.	2.070	.150	1.965	.161
Conflict8- There is active participation between NGOs and POs (fisherfolk association).	15.372	.000	13.818***	.000

Significance: * (0.025) p>5.02, (0.01) p>6.64* (0.001) p>10.83

The results conform to the univariate analysis results (see Table 8) that there are conflicts between economic actors. For example, Conflict4, Conflict5, and Conflict6 have modes equal to 5 – suggesting intense conflicts. In line with this, logit regression results show that these variables are highly significant at p>0.001. In the case of Conflict7, it previously had a mode equal to 3, suggesting a middle ground of not having a conflict and a conflict

and this shows it is a non-significant value in the logit regression. Conflict8 has a mode equal to 3 and it is significant in the regression. This implies that indeed, there is an active participation between members and NGOs in NI and therefore less conflict.

By looking at conflicts between coastal management regimes in NI, the most common in *bureaucratic regime* is on the implementation of national laws concerning the regulation of fish catch, in addition to the imposition of municipal water boundaries, where MPA provisions are complementary. However, there is evidence of lack of institutional capacity in terms of proper implementation both national and municipal regulations. Fisheries management plans of municipalities include zoning, MPA area, seasonal fishing, and restriction of specific gears. For example, coastal waters are divided into municipal and commercial waters and most of the time, MPAs are implemented in both of these areas. Under the current national law, municipal waters are defined as being fifteen kilometres from the seashore. However, in some towns in NI, where there are there many island *barangays*, an extension of the municipal waters is being implemented. Thus, municipal waters can be more than the 15-kilometer mark. Based on FGD and KI, even though there have been concrete institutional provisions on fishing areas, territorial conflict is the most prevalent and intense conflict amongst other coastal conflicts. The common problems in this regime are infrastructures and equipment such as patrol boat‘s lack of municipal personnel; MPA being a non-priority project; and inadequate funds.

Community-based frameworks or common property resource management is a framework wherein coastal management is a collective effort of usually poor and underprivileged people in the country. Results show that poaching in MPA sites and municipal waters is the second intense conflict in MPA management. Interviews reveal that fishermen, coming from different provinces, poach in some NI designated waters. Most community-based MPAs are implemented in island *barangays*, which is closer to the commercial waters mark and is therefore, vulnerable from big commercial

vessels and other adjacent town fishermen. Respondents strongly agree that there are conflicts between different economic actors. There is also conflict amongst commercial and municipal fishermen; government and commercial fishermen; and government and municipal fishermen. Discussions show that most of the violators are not from NI municipalities but instead they are fishermen from other neighbouring provinces, such as from Negros and Guimaras. In Barangay Nipa in Concepcion, fishermen believe this conflict is of existence until today , but compared to previous years, they said that conflict incidences have been reduced. Problems relating to implementation, particularly of monitoring their coastal territories are common and communities face other problems relating to lack of facilities to monitor, buoyancy markers, search lights, etc.

Meanwhile, the *co-management framework* involves the users and the government in the management of MPAs. It oftentimes involves private sectors such as research institutions that give donations or technical support to planning, implementation and monitoring of MPAs. Generally, respondents are indifferent that there is an active participation amongst members of NGOs and other associations. However, answers vary with municipalities, in Concepcion and Estancia, respondents perceived that NGOs are active and community participation is widespread. In constrast, in Balasan and Ajuy, participation is minimal and is concentrated on few people.

In this type of management, there is usually the presence of pressure groups such as the landowners or the head of the community or group. Problems such as lack of technology in monitoring, changes in politics and lack of funds are most common. The dominant players in NI are usually the municipal or *barangay* officials. More than 20% of the respondents do not trust the government for coastal management. Table 13 shows the benefits to both fishermen and the public sector, i.e. the municipal government, for complying and not complying with regulations under the three management regimes. Benefits for complying shows potential gains of fishermen when

they comply with MPA regulations and of the public sectors when they effectively implement MPAs.

Results shows that the public sector, particularly the municipal governments gain the most from collecting revenues from taxes and fees from the fishermen, whether the fishermen comply with MPA regulations or not. In the case of fishermen, the level of benefit (in terms of fish catch) will alter, whether they comply or not. Fishermen will incur an estimated benefit of not less than PhP 5,000 (NZD 192) a week, if they will comply; otherwise, benefits in terms of fish catch will reduce to approximately PhP 1,500-1,950 (NZD 58-75) per week. This does not include the penalty they will pay if caught, which is around PhP 2,500 (NZD 96) per offense. In the case of the public sector, the total revenue for the six municipalities, derived from licensing, is approximately PhP 2 million (NZD 76, 923) per year.

When establishing an MPA, additional costs such as training and organisation are also incurred. In addition, these costs are direct and do not include non-use values, such as future use, which may be more than the benefits incurred.

The distinct difference between these regimes is in terms of the provision of property rights. In the bureaucratic regime, property rights are owned by the government on behalf of the public, such as the provision of laws pertaining to sustainable fish catches. In the community-based regime, the community owns the property rights. On the other hand, the rights to use, within a co-management scheme are distributed amongst the users and the government. There is evidence that communities have started some conflict resolutions in their areas, especially relating to some instances when there have been misunderstandings on the part of municipal fishermen and the NGO officer. Thus, a dialogue is oftentimes initiated to resolve the problem. This agrees with studies from Lewis (1996) and Tyler (1999) concerning reconciliation of conflict without government intervention. However, plans

and solutions can also be mandated by a single individual, in most cases, a powerful political figure.

Table 13: *Benefits for Fishermen and Public Sectors in NI, Philippines (PhP, per year)*

FISHERMEN ***(Average Benefit, per week per fishermen)***							
Benefits for complying	Estancia	Balasan	Carles	Batad	Ajuy	Concepcion	*Total*
Bureaucratic	862	869	998	775	764	814	*5,082*
Cooperation	888	1119	1066	816	1068	807	*5,763*
Co-management	850	1025	1170	740	1100	847	*5,732*
Total	*2600*	*3013*	*3234*	*2331*	*2932*	*2468*	*16577*
Benefits for not complying	Estancia	Balasan	Carles	Batad	Ajuy	Concepcion	*Total*
Bureaucratic	750	1200	0	0	0	0	*1,950*
Cooperation	300	1200	0	0	0	0	*1,500*
Co-management	0	1775	0	0	0	0	*1,775*
Total	*1050*	*4175*	*0*	*0*	*0*	*0*	*5225*
PUBLIC SECTOR ***(Benefit per week per municipality)***							
Benefits either comply or not comply	Estancia	Balasan	Carles	Batad	Ajuy	Concepcion	*Total*
Bureaucratic	51300	1200	2187000	1420	31850	32110	*44,324.6 (2,304,880)*
Cooperation	51300	1200	2187000	1420	31850	32110	*44,324.6 (2,304,880)*
Co-management	51300	1200	2187000	1420	31850	32110	*44,324.6 (2,304,880)*
Total	*153,900 (2,960)*	*69 (3600)*	*126,173 (6561000)*	*82 (4260)*	*1,838 (95550)*	*1,853 (96330)*	*132,974 (6914640)*
Fees							
Fishing License Fee	150 (100)[a]	10	486	10	10	10	
Registered Fishermen	232 (165)[a]	120	4500	142	3185	3211	

Notes: [a] In the municipality of Estancia, fishing fees and registration amounts depend on the capacity of the boat.
[b] Entries in parenthesis are yearly values

5.2.2 Factors affecting implementation of Marine Protected Area (MPA)

MPA literature summarises institutional, community and information as key indicators of success. This study combines these factors with conflict to determine whether which amongst them are significant, in the case of NI. Two logit models are analysed and each given success indicators: improvement of the coastal environment (SUCCESS1) and improvement of the coral reef (SUCCESS2). Using the non-linear likelihood estimation, the probability P_i, is defined as follows.

$$\text{Prob}_R(Z_i = 1) = \frac{\exp(\alpha + \beta X_i}{1 + \exp(\alpha + \beta X_i)}$$

where Z_i=1 if MPA is successful and Z_i=0 if otherwise. The vector of X_i is the set of independent variables for determining the success of MPA.

Table 14 shows the analysis of fishermen‘s behaviour towards MPA success. There is a total of 200 respondents, for which the chi-square distribution is 102.15 and p-value is nearly zero. The model, therefore, fits significantly better than an empty model. The second success indicator – improvement of the condition of the coral reefs — is also analysed. The significant variables are Conflict4 (commercial and municipal fishermen) and S2 (knowledge indicator).

The second regression shown in Table 15 fits the data relatively well, with a chi-square distribution of 45.06 and a p-value of nearly zero. This implies that the model, as a whole, fits significantly better than an empty model. Both tables show the corresponding independent variables i.e. predictions with their respective coefficients; odd ratio; z statistics or the Wald test and p-value.

The first success indicator – improvement in the condition of the coastal environment — is analysed first. The significant variables in this model are Conflict6 (municipal authority and the government), S2 (knowledge indicator), and mpa (MPA size). The coefficient and odd ratio do not have meaning or they are awkward for some variables.[39] It says, for example, that with one unit increase in conflict, the log odds of being successful in improving the condition of the coastal environment increases by 1.4.

Table 14: *Logit model to determine factors associated with MPA SUCCESS1*

Dependent Variable: SUCCESS1
Log likelihood = -60.278665
Number of obs = 200
LR chi2(10) = 102.15
Prob > chi2 = 0.0000

Variables	**Coefficient**	**Odd Ratio**	**z**	**p value**
Conflict4 *(municipal and commercial fishermen)*	0.9255	2.52	1.62	0.106
Conflict5 *(public sector and commercial fishermen)*	-0.0946	0.91	-0.17	0.868
Conflict6 *(public sector and municipal fishermen)*	1.4208	4.14	2.71	0.007***
Conflict8 *(Non-government organisations and People's Organisation)*[40]	0.7110	2.04	1.19	0.233
PrValue	-0.0004	1.00	-1.3	0.194
SecValue	-0.0017	1.00	-0.88	0.377
MemOrg	-0.6791	0.51	-1.00	0.315
S2	0.6473	1.91	3.5	0.000***
mpa	0.1538	1.17	2.38	0.017*
priority	-0.7424	0.48	-1.26	0.209
_cons	-2.7138		-3.32	0.001***

Notes: The dependent variable is a binary choice of 1 and 0: 1 = success; 0 = not successful. *p<0.10, **p<0.05, ***p<0.01

In the first logit model, the MPA size variable is useful but not very significant. [41] However, the interpretation of coefficient is useful. It shows

[39] Variables' (conflict variables, priority, etc.) interpretations do not fit the concept of conflict variable and knowledge.

[40] The People's Organization (PO) is a bonafide association of citizens with a demonstrated capacity to promote the public interest and it has an identifiable leadership, membership, and structure. Its members belong to sector/s who voluntarily bands themselves together, in order to work for their own upliftment, development, and the greater good (Ajuy Development Office, 2006; Estancia Provincial Legal Office, 2004).

that, for one unit increase in the size of MPA (i.e. 1 hectare), the log odds of improving the condition of the coastal environment increases by 0.1538. The odd ratio, on the other hand, refers to the exponentiation of the coefficients. In this case, with one unit increase in MPA size, the odds of improving the coastal environment increase by the factor of 1.17. It means that the bigger the MPA size, the more likely the MPA implementation to be sucessful.

Table 15: *Logit model to determine factors associated to MPA SUCCESS2*

Log likelihood = -113.1969
Number of obs = 200
LR chi2(9) = 45.06
Prob > chi2 = 0.0000

Variables	Coefficient	Odd Ratio	z	p value
Conflict4 *(municipal and commercial fishermen)*	0.8549	2.35	1.78	0.075*
Conflict5 *(public sector and commercial fishermen)*	0.2289	1.26	0.60	0.550
Conflict6 *(public sector and municipal fishermen)*	-0.3154	0.73	-0.78	0.437
Conflict8 *(Non-government organisations and People's Organisation)*	0.3443	1.41	0.92	0.358
PrValue	0.0004	1.00	1.59	0.111
SecValue	-0.0001	1.00	-0.41	0.680
MemOrg	0.1379	1.15	0.31	0.755
S2	0.4928	1.64	3.40	0.001***
mpa	0.0156	1.02	0.39	0.700
priority	-0.4438	0.64	-0.94	0.346
_cons	-2.5781		-4.00	0.000***

Notes: The dependent variable is a binary choice of 1 and 0: 1 = success; 0 = not successful. *p<0.10, **p<0.05, ***p<0.01

Based on the results from both regressions, knowledge (S2) appears to be a key factor in the success of an MPA. Perceptions of fishermen in San Salvador Island are consistent with our findings — a significant improvement in coastal resources is due to education programmes held in the area. Another key factor for success is absence of conflict.

[41] PrValue and SecValue variables can be interpreted, but these results show that they are not significant and therefore they are not reported.

5.2.3 Canonical correlation analysis results

The Canonical Correlation Analysis (CCA) predicts the number of statistically significant links between two sets of variables. The set of predictors are the factors of success, whilst the dependent variables are the success indicators. Table 16 provides alternative sets of significance. It presents several multivariate statistics and F test approximations for the null hypothesis — that is all canonical correlations are zero in the population. Wilks' lambda, for instance, is a direct measure of the proportion of variance in the combination of dependent variables that is unaccounted for by the independent variable (the grouping variable or factor). The small p-values (<.0001) rejects the null hypothes, suggesting significance of the analysis.

Table 16: *Multivariate tests of significance and approximates F-tests*

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.00000000	Infty	40	874.57	<.0001
Pillai's Trace	2.10404076	18.53	40	1020	<.0001
Hotelling-Lawley Trace	-	-	40	586.15	<.0001
Roy's Greatest Root	-	-	8	204	<.0001

Note: F Statistic for Roy's Greatest Root is an upper bound.

Table 17 presents the ratio of the eigenvalues which is the ratio of the explanatory importance of the five canonical correlations (labelled as ‗pots') that are extracted for these data. The *eigenvalues* in the 2nd column are interpreted as the proportion of variance accounted for by the correlation between the respective canonical variates. They do not connote variability in either set of the variables for the *proportion* (3rd column), which is computed relative to the variance of the canonical variates of the weighted sum scores of the two sets of variables (StatSoft, 2008). The *canonical correlation* (4th column) is the square root of the eigenvalues. As a rule of thumb, the larger the correlation the better and in the case of the first canonical correlation, the correlation is very high at 1.0.

Table 17: *Eigenvalues and canonical correlations*

Root No.	Eigenvalue	Proportion	Cumulative	Canonical Correlation	Sq. Correlation
1	Infty	-	-	1.000000	1.000000
2	24.8489	0.9938	0.9938	0.980466	0.961314
3	0.1120	0.0045	0.9983	0.317371	0.100724
4	0.0345	0.0014	0.9997	0.182661	0.033365
5	0.0087	0.0003	1.0000	0.092940	0.008638

On the other hand, the second canonical correlation, the ‗covariate' canonical variable explains about 96% of the variance of the dependent canonical variable. Further, the 3rd and the 4th canonical correlations, the 3rd and the 4th ‗covariate' canonical variable explain only approximately about 10% and 3%, respectively.

Table 18: *Canonical Likelihood Ratio and F Values*

Root No.	Likelihood Ratio	Approximate F Value	Num DF	Den DF	Pr > F
1	0.00000000	Infty	40	874.57	<.0001
2	0.03333849	40.67	28	726.14	<.0001
3	0.86176273	1.72	18	571.83	0.0329
4	0.95828538	0.87	10	406	0.5575
5	0.99136225	0.44	4	204	0.7764

Table 18 shows the test significance of all the roots in order to determine which of the roots possess a strong correlation — for only those roots that are statistically significant are then retained for subsequent interpretation. Results show that the first and the second canonical correlations are significant ($p<0.0001$), but the remaining three are not. Therefore, the variation can be summarised into two dimensions, i.e. Can1 and Can2.

Each of these roots represents two weighted sums, one for each set of variables. One way of interpreting the two significant roots (1st and the 2nd

roots) is through canonical weights (standardised coefficients). [42] Table 19 presents these weights. As a rule of thumb, variables with larger weights contribute more to the variates and vice versa.

Table 19: *Total-Sample Standardised Canonical Coefficients*

Variable	Can1	Can2
Rnum *(Respondent"s number)*	0.000	5.783
YrsSer *(No. of years in service)*	0.000	-0.204
Mpa *(Size of MPA, in hectare)*	2965596.957	-2.909
EcType *(Economic Actor Type)*	0.000	0.082
PrValue *(Fishing income value, per week)*	0.000	0.024
SecValue *(Secondary income value, per week)*	0.000	0.064
MemOrg *(Membership to organization)*	0.000	-0.041
MemYrs *(Number of years as member)*	0.000	0.056

5.3 The Roles of Economic Actors

MPA success in development, management and performance is dependent on how different sectors in the society interact with each other.Hence ,the key players need to prepare adequately (e.g. with technical skills) to ensure long-term effectiveness (Balgos, 2005; Pomeroy *et al.*, 2006). As mentioned in previous chapters, these entities may include the following: resource users (e.g. fishermen, tourists); resource stakeholders; the community; local government; national government; and international agencies. This section discusses their varied interests roles and their interdependence in management processes.

Fishermen and their households, in addition to fishing communities worldwide are considered to be heterogeneous and thus each MPA is unique for each of these entities (Pomeroy *et al.*, 2006). The fishermen are the primary MPA stakeholders since they directly use fishery resources. They

[42] To facilitate comparisons between weights, the canonical weights are usually reported for the standardized variables, that is, for the *z* transformed variables with a mean of *0* and a standard deviation of *1* (StatSoft Inc., 2008).

use marine resources as food and livelihood sources as well as recreation activities. Moreover, their every day and fishing activities have brought about marine life damages and fish decline. Thus, NI MPAs are established locally to restore the marine econsystem to secure food and livelihood for coastal communities in NI. Moreover, fishermen usually bear additional harvesting cost due to fishing restrictions via MPAs (Carter, 2003).

The *public sector* comprises the national government and local governments (provincial or city/municipal governments). Initially, it is responsible for the provision of initial policy structures and enactment and enforcement of rules and regulations. In all three management regimes, its role is crucial because there is a big gap between national and local levels. During a conflict resolution in the El Nido Marine Reserve in the Philippines, the willingness of top government officials to come and talk with the reserve stakeholders brought about positive changes and successful consultative dialogues (Peñafiel, 1998). Conflict may arise when different resource users receive different signals from different government agencies (Tyler, 1999). This situation stresses that uncoordinated planning, on the part of the public sector, can generate or heighten conflicts. The sector is a broad category divided into several groups, such as the national government, provincial government and the municipal or the city governments. Each of these sub-categories play different institutional roles.

The national government is composed of the Department of Environment and Natural Resources (DENR), the Bureau of Fisheries and Aquatic Resources (BFAR), the Department of Interior and Local Government (DILG), the Philippine Coast guard (PCG) and the Philippine National Police (PNP). The DENR is the country‘s primary agency responsible for conservation, management, development and the proper use of the country‘s environment and natural resources (DENR, 2008). As a special department of DENR, the BFAR specifically ensures the management, development and conservation of the Philippine fisheries and other aquatic resources (BFAR,

2008). Furthermore, in terms of implementation and encouragement of local units and people alike, the DILG is the governing body. Its aim is to:

> *"promote peace and order, ensure public safety, strengthen capability of local government units through active people participation and a professionalized corps of civil servants"* (Department of Interior and Local Government (DILG), 2008).

Lastly, in the implementation and enforcement of laws, the PCG and PNP play vital roles. They are responsible for ensuring public safety and internal security, with the active support of the community which includes coastal and sea territories (Philippine National Police (PNP), 2008).

In summary, the national government is in charge of policy direction, legislation, planning, technical assistance, training, monitoring and evaluation and enforcement activities related to MPAs (White, Courtney, & Salamanca, 2002). The provincial government, similar to the national government, deals with planning, technical assistance, training, monitoring and evaluation. It is also in charge of harmonising policies and managing information. The municipal or city government has authority to plan, regulate, legislate, train, monitor and evaluate, through the LCG of 1991 (White, Courtney, & Salamanca, 2002). It is also responsible for enforcement and revenue regeneration. [43]

The *private sector* has an essential responsibility in MPA management. A case study in Palawan revealed that, as a third party, the NGOs can ensure effective dialogues by building trust between local people and the government (Peñafiel, 1996). Most of which, put MPA as one of the prototype instruments for rejuvenating the degraded marine environment (White, Courtney, & Salamanca, 2002). In developing countries, inadequate information and consultation are a common problem (Tyler, 1999).

[43] Refer to Figure 2 in Fernandez *et al.* (2000) study for a detailed description of the power and responsibilities of national and local fisheries and aquatic institutions, under the Philippine Fisheries Code, 1998.

Particularly in the Philippines, there are a number of NGOs and other donors that support MPA-related projects, such as the Asian Development Bank (ADB), the United States Agency for International Development (USAID), and the European Union (EU). Other donor countries, are Australia, Japan, Canada, Denmark, Germany, Netherlands, and the UK. For instance, in 1984 and 1994, there were approximately 25 private entities and eight donor countries which provided assistance to community-based resource management projects in the Philippines (White, Courtney, & Salamanca, 2002). This includes the establishment of fish sanctuaries and marine reserves.

The academe (universities and other research institutions) are private entities, similar to NGOs which can be categorised as assisting organisations. Together with NGOs, they are accountable for organising communities; research and data (management and analysis); technical assistance; training; and funding (White, Courtney, & Salamanca, 2002). In the Philippines, other groups have arisen due to the establishment of MPAs and other coastal resource projects. These are local resource management organisations at municipal and *barangay* levels which are in charge of policy advice, planning and planning implementations (White, Courtney, & Salamanca, 2002). Examples of these organisations are the Fisheries and Aquatic Resources Management Council (FARMC); the local law enforcement; and MPA management groups. They are oftentimes composed of fisherfolk associations, NGOs, LGUs, and other government agencies, in which the following roles are expected:

1. providing assistance in the preparation of municipal fishery development plans;
2. recommending the enactment of municipal fishery ordinances ;
3. providing assistance in the enforcement of fishery laws, rules, regulations ;
4. advising the LGUs on fishery issues ;

5. empowering people, in order to recommend the creation of MPAs in the municipal waters (White, Courtney, & Salamanca, 2002).

One notable collaboration between the government and the private sector is the Fisheries Resource Management Project (FRMP), where a loan was received from the Asian Development Bank (ADB) between 1998 and 2003 (White, Courtney, & Salamanca, 2002). This is a continuation of the Fisheries Sector Programme of the Philippines, which is implemented from 1991 to 1997 in twelve bays but communities are poor and inefficient coastal management.

5.4 MPA Perceived Benefits and Costs for Regulation Compliance

Perceived benefits and costs of MPA reflect actors‘ decisions, when complying or not complying with MPA regulations were determined. Around 48% of the respondents noted that the MPA would increase the fish catch. This garnered the highest frequency and coincided with the actual benefits derived from the MPA. On the other hand, around 10% perceived that the MPA can also protect other marine resources, such as mangroves and corals. Furthermore, around the same percentage believe that there are no perceived benefits from the MPA. In support to this, more than half of the respondents noted that there are no disbenefits with MPAs. However, there are associated costs and some people believe that implementing MPAs would decrease the fishing grounds for fishermen. Approximately, 8% say that MPAs are waste of money because they seen them as ineffective projects; and 4% believe that MPAs would entail additional cost for the government. These results prove that MPAs hold natural capital (fish, coral, etc.) that has associated costs in the short run, such as boat patrol for extra-mile fishing. Thus, MPAs are viewed as an investment. People are willing to trade these extra costs in order to reap MPA‘s benefits in the future in order to sustain their livelihood and biodiversity conservation. Table 20 presents reasons why economic actors are complying and not complying with MPA regulations.

Table 20: *Frequencies of benefits and disbenefits of MPA when complying or not complying*

Benefits/Reasons of Complying	**Frequency**	**% (n=658)**
Increase fish catch	195	29.64%
Protect other marine life eg. corals, mangroves, seagrass	52	7.90%
Municipal grounds is safe, free from poaching	34	5.17%
Cheaper to fish in the sea (spend more time with their families)	13	1.98%
To comply to the objectives of MPAs	12	1.82%
Increase income	167	25.38%
Increase employment opportunities	28	4.26%
Lower cost for fishermen (fuel, less time)	2	0.30%
Good management	77	11.70%
No knowledge	2	0.30%
Reduce illegal fishing	6	0.91%
Persuasion (no choice)	5	0.76%
Peace of mind no conflict with others	18	2.74%
Ecotourism	12	1.82%
Taxes from the govt	10	1.52%
Pride of the community	5	0.76%
Help future generation	20	3.04%
Benefits/reasons for NOT complying	**Frequency**	**% (n=476)**
Increase income (catch)	192	40.34%
Do not trust the government	82	17.23%
Increase fishing cost	9	1.89%
No proper monitoring(weak)	14	2.94%
MPA mismanagement	9	1.89%
Conflict and lack of cooperation	1	0.21%
Lack of freedom, violation of human rights	10	2.10%
MPA is not applicable/not effective	15	3.15%
Lack of information or education regarding the matter	49	10.29%
No food supply	32	6.72%
No alternative livelihood offered	10	2.10%
Values	50	10.50%
Poverty	3	0.63%

More than 50% of the respondents are complying because they believe that the fish catch has increased, thus, their incomes havel also increased. However, around 11% did not comply because the government was not managing the MPA well. In addition, 17% of respondents did not trust this government project and thus, in return, they did not comply. This revealed

that there are still areas where the government is not actively managing the MPA – thus mismanagement is proven to be a factor to MPA success. Compliance is low: approximately 10% do not have enough knowledge relating to the regulations and information regarding benefits from the project. Fernandez (2006) observed that there are oftentimes misinterpretations of the law.

Furthermore, it is observed that most of the commercial fishermen are relatives or close friends of political leaders in Iloilo Province. Several leaders and advocates of coastal resource management, particularly in Batad and Concepcion, relate that the imposition of penalties is not often exercised. If there is a reported MPA violation, witnesses must bear extra costs. Normally, these cases are not pushed through due to these unavoidable costs on the part of the witnesses who are normally poor fishers from the far island *barangays*. Witnesses bears the costs of going to and from the the main island. This conforms to literature that government‘s institutional roles must be properly implemented in order to effectively address problems.

The FGD in Barangay Nipa, in the municipality of Concepcion determines and verifies the requirements of an effective MPA. Key informant interviews reveal (as supported by Fernandez (2006) study) that the MPA project is one of the success stories of implementation in NI. It is found out that the fisherfolk associations in the area are active and with many of its members having voices of their own. It is observed that a dominant actor amongst this group is not present, i.e. everyone has a say in discussions, with no single dominant individual. This finding is true for the specific MPA in Concepcion, but not as a generalisation. However, it reflects the results of Fernandez (2006) that a strong participation of fishermen in the implementation of a MPA is a success factor. The public sector in the municipality appointed a separate employee, specifically to manage their fisheries sector, which is unique amongst the NI.

Last May 2008, a fisheries technician was appointed to the municipality of Batad. However, interviews confirmed that this employee‘s main task is in the abalone industry, rather than the MPA. In addition, in the municipality of Balasan, for example, people perceive that the MPA is not a good project since they only have small coastal area. What they want is to support other projects such as mudcrab or other aquaculture projects. This highlights the fact that MPA‘s effectiveness is dependent on the area where it is established, in addition to the existing socio-economic profile of the area.

5.5 Key Findings and Policy Implications

This thesis examines the relationship between socioeconomic variables and the success of the management of MPAs in NI. Results show that the success of managing MPAs depends on the success of managing social conflicts. The four PCs from the Principal Component Analysis (PCA) summarised all points of data and represented conflict as the most important dimensions of MPA success in NI. Moreover, the logit regressions show that MPA success is dependent on absence of conflict; knowledge of MPA regulations; and MPA size. MPAs will not be successful if there are pending constraints on these variables.

As a decision maker, considering these significant areas of concern, i.e. both technical (MPA size) and social (knowledge and conflict), can improve MPA effectiveness through identifying threats, needs, and considerations relating to MPA planning and awareness. For example, there should be a focus on the appropriate MPA size – which can be implemented in collaboration with local universities, NGOs and the national government. Moreover, implementing bodies should not focus just on awareness and information dissemination but rather prioritise programmes for reducing conflict between economic actors. Together with these recommendations, clear legal mandates on territorial boundaries should be properly addressed in order to avoid confusion. In addition, the NIACDEV as an alliance between NI municipalities, should be continued and it should focus on resolving MPA

boundaries. However, this study does not totally disregard this information, but it implies that national (DENR) and local (LGU) resources should be channelled more to reduction of conflict. MPAs are under coastal conservation therefore , its budget should be maximised.

As shown by both the Likert-scale and descriptive and correlation analysis, having knowledge and membership of coastal and environmental groups do not make any difference to income. There are noted differences but the margin is approximately 100 PhP or a fraction over 4 NZD. Correlation results also show that membership is highly correlated with membership years but not with fishing and secondary incomes. These findings do not conform to priori expectations that information brought about by channels, such as ‗being a member', makes the income of fishermen increase (due to a successful MPA). This may imply that the MPA is not successful and that is the reason why fishermen (although they know about the regulations and are members) say that their fish catch has not increased considerably.

5.6 Concluding Remarks

The results from univariate and multivariate analysis show that there should be an integration of institutional and community participation, in order for MPAs to be successful. This conforms to MPA literature provided in previous chapters. The key finding in this study is that MPAs in NI are not successful and that different conflicts are still present in the area. It shows that there is no association between fishing and secondary incomes with the level of information fishermen receive (through membership to certain organisations).

The management of MPAs in NI is not achieving its objectives because it failed to sustainably increase coral reef cover and overall conditions of the coastal environment. In poor fishing communities of the studied areas in NI, MPAs are not effective coastal management strategy; fishemen have very poor knowledge on MPA. In three different management regimes, there are different problems and levels of conflict, when it comes to the benefits from

MPA implementation. However, there is always the presence of a dominant actor, i.e. the public sector, but there is no proof of how each of these actors behaves with the implementation of an MPA and of how their benefits, in terms of income, change with their compliance to MPA regulations.

It is also concluded that without taking into account the human dimension in the management of MPAs, *ceteris paribus*, the goal of establishing the MPAs cannot be met. Fishermen who are not members of a social economics organisation and lack of knowledge on MPA could earn more income than those who are members because of free riding problems. In NI, fishermen seem to believe that the right to fish on the fishing areas (MPA zone) is violated, where fishing in a non-MPA zone could have to pay more (e.g. fuel and time).

Results from this study indicated that bureaucratic-based regimes have more conflicts than the community-based and co-management regimes, especially MPAs‘ solely operated by local government, for which the tangible benefits are concentrated. The public sector has the bulk of the total budgets of coastal management and its influence cannot be disregarded. In addition, human (e.g. conflict) and non-human (e.g. size) threat to MPAs are not controlled, though there have had attempts on negotiation and dialogues in order to solve conflicts. The success of MPAs management therefore could be very limited unless there is educational measures to increase fishermen‘s awareness on MPA.

CHAPTER SIX ~ Summary, Conclusions and Recommendations

This chapter is devoted the summary of the results presented in the previous chapter, as well as the conclusions that can be derived from the gathered and collated data. Recommendations for actions as well as further studies are also included in this chapter.

6.1 Summary and Conclusions

As the problems of environmental effect, natural resource degradation, and economic development face Philippine coastal communities, different management programmes like the Marine Protected Area (MPA) have been initiated. MPAs are a frontline strategy of the Coastal Resource Management Programme (CRMP) that yields benefits for sustaining livelihoods of coastal communities and conservation of biodiversity. It is also an ecological-based management approach that evolves from bureaucratic to participatory processes where its establishment and management is made possible by three legislations, namely the Local Government Code of 1991, Fisheries Code of 1998, and the Nipas Act of 2001, which govern and give power to the local government authorities. Despite of the decentralisation of coastal management, there have been numerous studies about the successes and the failures of MPA in the world and in the Philippines, for which not a handful have succeeded in achieving their objectives.

In the rich fishing areas of the Province of Iloilo in the Philippines, MPAs are implemented to address food security and biodiversity. One relevant study has revealed that MPA management in North-Eastern Iloilo (NI) has been problematic and that conflicts have arisen because of different objectives. The majority of the country‘s MPAs and those of NI, are established because of rapidly declining fish catches, which eventually threatens the primary livelihoods of coastal communities. All MPAs in NI are established and controlled by the local public sector, but management is also designated to other entities – i.e. involving fishermen and the private sector as well.

Currently, the management of MPAs in NI consists of bureaucratic, community-based, and co-management regimes or schemes.

The study conducted has yielded some conclusions based on the findings that were summarised in the previous chapter. It is now possible to derive several conclusions based on the objectives presented in the first chapter. These conclusions are the following:

1. MPAs in NI are not seen to be achieving their objectives in that they have failed to sustainably increase coral reef cover and overall conditions of the coastal environment. Results have concluded that in poor fishing communities such as in NI, MPAs are not an effective coastal management strategy. Human (e.g. conflict) and non-human (e.g. size) threats to MPAs are not minimised, particularly the conflicts amongst economic entities and management regimes. However, although there have been attempts to solve these conflict of interests, the survey results consistently show that conflicts still exist in the management of MPAs today.

2. Quantity and qualitative analyses show that the important determinants of success are a reduction of conflict and an expansion of information. Logit regressions, using two success proxies, conclude that MPA success depends on community (membership) and institutional capacities (MPA as a priority project). However, based on other analysis such as correlation and multivariate (Principal Component Analysis (PCA) and Cananonical Correlation Analysis (CCA)) ,membership, and knowledge affect MPA success but not as much as reduction of conflict. Thus, conflict minimisation should remain the primary goal of the government. In fact, bureaucratic-based regime seems to have most of the conflicts compared to the other two schemes. Intense conflict is also seen in community-based regime and but less in the co-management regime. These findings conform with the apriori expectation that in a management scenario, in

which there is high participation by stakeholders, the MPA will be successful. However, these results cannot be generalised, thus, there is no single best regime, but is subjective on the area in question.

3. Membership to natural resource/environmental group is found to be associated with MPA success, as shown by their large contribution to the total variation of data in the PCA. However, fishing and secondary incomes are not significant in the logit regression. This is supported by there not being a significant relationship between knowledge and membership on the changes in different incomes. It shows that fishermen who are not knowledgeable and are non-members have more income than those who are not. This situation is explained by the free riding problem and the presence of other factors that are not incorporated in this study. It can be concluded that because non-members do not have obligations to follow the rules exerted by the group, they are therefore less constrained in following MPA regulations. Therefore, they will ‗free ride', reap benefits, and increase their incomes.

4. There are direct benefits to both the fishermen and public sector expressed as revenues to the local government and to the fishing incomes of fishermen from different municipalities. In the case of the fishermen, in the short-run, fishing income declines if they follow MPA regulations. Fishermen believed that their rights to fish on a fishing area (MPA zone) is violated and that they have to pay extra costs (e.g. fuel and time) to fish in non-MPA zone. However, the long term benefits are not realised, which explains why most fishermen do not comply with MPA regulations. Therefore, it is crucial that fishermen know the long run benefits of MPA such as sustained marine resources, to avoid these violations.

5. On the other hand, it shows that there are public sector benefits from the MPA even if fishermen will comply or not to these regulations.

Given that the public sector has the bulk of the total budget of coastal management, its influence can not be disregarded. Particularly in NI, management is mainly operated by local government, for which tangible benefits are concentrated – explaining the economies of scale of the government.

6.2 Recommendations

Since the management of MPAs in NI is not attaining its objectives; the policy makers should reconsider the strategies of establishing MPAs.

The study concluded important key areas and recommendations for improvement are shown below:

1) There are other factors that are important in MPA management but are not analysed on this study namely: (1) community capacity in terms of frequency of consultations; (2) ongoing and follow-up trainings; (3) community contribution and compliance; (4) institutional capacity in terms of ‗visits on MPA sites' and availability of technical and human resources; and (5) other monitoring and evaluation indicators. This study does not assess the benefits of the society that requires data on non-use values such as willingness to pay (WTP) for biodiversity conservation and bequest value. In order for these values to be measured, non-market valuations should be used and these are beyond the scope of this study. To comprehensively assess MPA management, future research may focus on how economic gains and losses (both use and non-use values) and on how they are distributed amongst the members of the society.

2) It is necessary to adopt a strategy wherein the government will decide for a collaborative process - suggesting an integration of institutional and community capacities as factors for which long-term sustainability. Importantly, conflicts should be minimised and should be given priority. After this, it is then imperative to look at formal and

informal trainings and continuous activities/consultations, in order to encourage participation and empowerment and assure long-term sustainability of the MPA project. If there is no sufficient participation from coastal communities and the public sectors, provisions of the programme will not be materialised. It is possible that the programme has a good start, but if participation declines through time, it will not sustain and achieve its objectives. This study shows how important these factors are in MPA management though it has not shown the processes that connect each of these factors. For instance, tradeoffs between tourism industries and other relevant industries in the implementation of MPA are also not included here.

3) Future studies should focus on the links and effects on MPAs in alleviation of poverty within most of Philippine coastal communities. The study includes incomes and fishermen's expectations, but the community's overall well-being is not considered. Although there is an attempt to include "well-being' that is expressed on the overall assessment on total benefits and costs of MPA implementation, total "well being' must also include other social concepts such as malnutrition and poverty. The NI region case needs immediate actions for malnutrition is very high amongst children and at the same time, MPAs are not effective in improving the conditions of coastal hosueholds. Moreover, malnutrition as a proxy to poverty - there is no clear information and policy support to "trickle down' MPA positive effects (i.e. increases in incomes) to improve children's conditions. MPAs may also fail because of insufficient infrastructure (e.g. farm to market roads) and other income opportunities to these fishermen. If this important nexus is disregarded, coastal policies to, such as MPAs are insufficient to improve coastal conditions and secure coastal livelihoods. In addition, coastal families are marginalised in terms of unfavourable socio-economic conditions. These people are usually those who are poor; who do not have the access to livelihood opportunities; and who are highly dependent on the marine resource.

With the information on how these factors are linked and interlinked, policy makers can identify target areas and develop types and focus of management strategies. Effectiveness of coastal policies is maximised through an improved understanding of community‘s well being. Furthermore, the local governments can efficaciously apply limited coastal budget by considering projects complementary to local conditions.

4) There should be an improvement in the enforcement and guided implementation of existing laws on the management of MPA and other coastal resources. Most Philippine laws have overlapping mandates and unclear designations and provisions. Consequently, the public sector, particularly the local government should correct this ambiguity in terms of clarifying rules and regulations to the stakeholders. There should also be strengthened coordination between sectors and agencies to allow more effective management decisions. Currently in NI, there is a collaboration between municipalities through NIACDEV where there are opportunities to share resources and information across municipalities. If this group can not be sustained for long (maybe because of conflicting objectives and priorities) or is replaced with ineffective network groups, decisions by different municipalities could affect each other‘s coastal regulations and programmes.

5) Even though MPAs are recognised as a popular project amongst municipalities, policy-makers should properly assess other relevant coastal management programs in order to comprehensively establish and implement plans for the marine environment. For instance in NI, there are other coastal management programmes, namely mangrove reforestation; nursery establishment; closed and open seasons; preferential use rights establishment; coastal waters zoning; and the Information, Education and Communication (IEC) establishment. These projects should be integrated and prioritisation should be based on which programme is most effective.

6) This study is limited to MPA as a tool for coastal management. However, to fully explain the role of income to MPA compliance, it is recommended to study incomes in marine tourism industry. Currently, NI municipalities' marine tourism industry is beginning to gain popularity amongst fishermen. Tourism services such as boating and tour guiding, provide additional livelihoods and income to communities. Since there are no previous studies on the trade-offs between tourism industry and MPA implementation in NI, marine ecotourism and tourism feasibility can be areas of future studies. For this, policy makers can tailor coastal management policies such as MPAs with livelihood and tourism initiatives.

7) To encourage and improve community participation, especially in the island *barangays* where most MPAs are managed through community-based frameworks, a consideration of traditional uses and knowledge must be provided. This study did not consider traditional knowledge as an indicator of empowerment and rights, thus further study should assess these important indicators. Inclusion will encourage participation of stakeholders on the MPA compliance and management. This is an extension of socio-economic to cultural orientations.

8) The provision of baseline information on communities that are highly dependent on coastal resources should be encouraged within municipalities. There should be an up-to-date regional database network on marine resources. Currently in NI, most databases and results of studies are found in NGOs and universities, but little is kept in the municipal hall or library. If this is not met or improved, there would be no opportunities for information exchange, monitoring and further studies.

APPENDICES

APPENDIX A: *Categories and Number Estimates of MPAs in the Philippines*

Appendix A.1: *A Summary of the total number of MPAs of different categories*

Code	MPA Designation Status/Category	Total Number
ECA	Environmentally Critical Area	1
FS	Fish Sanctuary	31
MCRP	Municipal Coral Reef Park/Marine Park	7
MR	Marine Reserve	1
MTS	Marine Turtle Sanctuary	7
MSFR	Mangrove Swamp Forest Reserve	83
NMP	National Marine Park	1
NMR	National Marine Reserve	1
PLS	Protected Landscape and Sea	2
SP	Seashore Park	1
TZMR	Tourist Zone Marine Reserve	65
WA	Wilderness Area	52

Source: UP-MSI *et al.*, 2002 p. 69

Appendix A.2: *A Summary of Philippine MPAs Recorded 1995, 1997 and 2000 (from Aliño et. al, 2000)*

Political Region	Indicative No. of Existing MPAs (Cheung 1995)	Indicative No. of MPAs (Pajaro *et al.*, 1999)		Indicative No. of MPAs (UP-MSI et.al, 2002)	
		Existing	Proposed	Existing	Proposed
I	3	6	4	4	0
II	4	4	0	5	0
III	2	6	9	7	1
IV	60	77	10	106	11
V	36	41	13	34	9
VI	3	18	11	88	10
VII	68	106	27	33	25
VIII	14	77	21	98	21
IX	7	23	15	29	13
X	4	16	6	20	5
X	7	14	12	19	11
XI	1	3	5	5	4
CARAGA	38	44	3	46	3
NCR	0	2	0	1	0
ARMM	0	2	3	3	3

Source: UP-MSI *et al.*, 2002 p. 70

APPENDIX B: *Environmental Legislations in the Philippines*

Year	Legislation
1964	National Water and Air Pollution Control Commission Act
1974	Revised Coastal Guard Law
1976	Marine Pollution Decree
1976	National Pollution Control Commission
1978	The Water Code of the Philippines
1979	Environmental Impact Statement System
1980	Regulations for the Conservation of Marine Turtles
1981	The Coral Resources Development and Conservation Decree
1984	Environmental Impact Statement System – Areas/Types of Projects
1988	Small Scale Mining Law
1990	Philippine Environment Code
1992	National Integrated Protected Areas System
1992	Toxic Substances and Hazardous and Nuclear Wastes Control Act
1992	Strategic Environment Plan for Palawan Act
1995	Guidelines on Biological and Genetic Resources
1995	Philippine Mining Act
1995	The Water Crisis Act
1996	Preferential Treatment of Small Fisherfolks
1997	Agriculture and Fisheries Modernisation Act
1997	Philippine Environment Policy
1998	Philippine Fisheries Code
1999	Philippine Clean Air Act
2001	Wildlife Resources Conservation and Protection Act

Source: UP-MSI *et al.*, 2002 p. 68

APPENDIX C: *Key Informant and Social Survey Questionnaires*

Appendix C.1: *Marine Protected Area (MPA) and Coastal Management Activities (Key Informant Questionnaire)*

Municipalities: Ajuy, Batad, Carles, Concepcion, Estancia (Balasan has no MPA)

Management Stage	**Activities**	**Sectors involved**	**Notes**
1. Planning			
2. Design			
3. Implementation			
4. Evaluation			
5. Monitoring			
6. Communication			
7. Adaption			

Appendix C.2: *Social Survey Questionnaire*

(English version of the questionnaire)
Good day! This is a survey conducted by a Master's student of Massey University in New Zealand. The purpose of this survey is to find out the interactions of different people in conserving their costal resources through marine protected areas (MPA) in North-Eastern, Iloilo Philippines. As a person directly involved in costal resources in this community, this questionnaire is designed to know your perceptions towards coastal resources and MPA. It will probably take 15-20 in answering this questionnaire. If anything is unclear, do not hesitate to ask the assistant. If this questionnaire is fully accomplished, you will be qualified for a raffle draw, and a chance to win one of the two memorabilia from New Zealand. If you win, we will contact you directly.
There is no right or wrong answer to the questions, what really matters to us is your own honest opinions. You have the right to choose whether you will participate in this survey or not. We however, ask for your help trough your participation. All information you will provide shall be dealt with confidentiality.

Section A: Personal Details
Respondent's Name (optional): _____ Position (if applicable): _____
Years in the service/fishing: _____ Barangay/Municipality: _____
Number of MPAs (year established, size in ha.):_____

Section B: Assesment on the success of MPA. Please rate the following statements from 1 to 5.

Statements (S)	**1 = Less disagree**	**2 = Higly disagree**	**3 = Neither**	**4 = Less agree**	**5 = Higly agree**
1. Do you think that MPA will improve the condition of coastal resources (e.g. mangroves, fish, seagrasses etc.)					
2. Fishing outside the MPA is legal. (or other MPA regulation to capture the unersatding of stakeholders on the legal defintion of MPA: to be found ou after initial contact with towns)					
3. There is an improvement in the quantity and quality of corals.					
4. There is a conflict between the municipal and the commercial fishermen.					
5. There is a conflict between the government and the municipal fishermen.					
6. There is a conflict between the government and the commercial fishermen.					
7. There is a conflict between the NGO and fishermen.					
8. There is an active participation of NGOs and POs (fisherfolk association).					

Section C: Type of economic player and their perceived benefits and costs (please specify)

Economic Player	Code (Encoding)	Perceived Benefits from MPA establishment	Perceived Disbenefits from MPA establishment
1. Fisherman	1		
□ Municipal	M		
□ Commercial	C		
2. Public Sector	2		
□ Local Government Unit	L		
□ National Government	N		
3. Private Sector	3		
□ Research Institution	R		
□ Academe	A		
□ Fisherfolk association (PO)	F		
□ Business groups	B		
□ Non-government organisations (i.e. donor and non-donor)	N		

If fisherman

□ What is your primary source of income? _____ How much per week: _____

□ Other sources income (if applicable)? _____ How much per week: _____

□ Member of any organisation (y/n)/: _____Name of organisation: _____ How many years: _____

□ What are your activities/roles in the organisation?
_____

If public sector

□ Is there any recorded possible income from fisheries on MPA? or coast? (y/n): _____ How much? (cite source): _____ _____

Section D: Strategic Interaction (Rank answers)

Objective	Offer	Comply (y/n)	Comply Benefit	Not comply (y/n)	Not comply benefit	Reason(s) why not comply
□ Sustainable fish catch (1)	Alternative Livelihood (M), persuasion (C)					
□ Preserve biodiversity (2)	More information regarding the importance of coastal resources					
□ Tourism (3)	Involvement in the tourism community					
□ Reduce commercial fishers coming into municipal waters (4)	Persuasion from the government					
□ Reduce fishermen from poaching in other coastal communities (5)	Persuasion from the government					
□ Enhance cooperation between people who are involve in the mgt of MPA	Support from other entities					

(Hiligaynon version of the questionnaire)

Maayong adlaw! Ini isa sa surbey sang isa ka estudyante sang Massey University sa New Zealand. Ang tinutuyo sang sini nga surbey amo mabal-an ang inun anaon sang mga tawo sa ila pagkonserbar sang dunang manggad paagi sa pagpundar sang Marine Protected Area (MPA) sa North-Eastern, Iloilo, Philippines. Kay kamo malapit at direkta sa dagat ga dungang manggad, ang ini nga palamunkutanon ginobra para mabal an ang inyo nga opinion nahanungod sa dunang manggad kag sa MPA. Matapos ang ini nga surbey sa banta-banta nga 15-20 ka minuto. Kun may indi kamo naintindihan, pahilog indi mahuya nga mamangkot sa nagainterbyu sa inyo. Kun ang ini ng surbey inyo makompleto, may tsansa kamo nga malakip sa raffle draw para madaog sang isa sa duha nga sobenir halin sa New Zealand. Kung kamo, magadaog, directa ka namon ikontakon.
Sa pagsabat sang mga palamungkutanon, palihog paminsar nga wala sang sala o sakto ga Rabat, ang amon lang tani makuha ang inyo nga tuod nga opinyon. May katungganan kamo nga magsabat sang sin inga surbey o indi. Pero ginapangayo namon nga kung tani maghatag kam sang gamay ng tinion para sa ikamaayo sang sin inga surbey. Ginapromisa namon nga ang Rabat niñillo, gamiton lang sa amon nag eswelahan kag ini konpidensiyal.

Sekta A: Persona nga Detalye

Ngalan (optional): _____ Posisyon (kun may ara): _____
Tuig nga nagapangisda: _____ Barangay/Munisipyo: _____
Pila ka bilog ang MPA (tuig nga gintukod, ektarya):_____

Sekta B: Paglantaw sang ila nga opinyon nahanungod sa MPA

Paghambal (S)	**1 = Wala Gapati gamay**	**2 = Wala gapati guid**	**3 = duha2x**	**4 =Gapati gamay**	**5 = Gapati guid**
1. Nagpati ka bala nga ang MPA makaimprobar sang kondisyon sang aton nga dunang manggad sa dagat? (e.g. mangroves, fish, seagrasses etc.)					
2. Legal ang pagpangisda sa sagwa sang MPA.					
3. May pagimprobar sa kalagayan kag kadamuon sang corals.					
4. May indi pagintindihanay ang magamay kag dalagko nga mangingisda.					
5. May indi pagintindihanay ang gobyerno kag ang gagmay nga mangingisda.					
6. May indi pagintindihanay ang gobyerno kag ang dalagko nga mangingisda.					
7. May indi pagintindihanay ang NGO ka gang mga mangingisda.					
8. May aktibo nga pagupod ang NGos ka gang mga Pos (fisherfolk association).					

Sekta C: Ang masunod nga mga pamangkot nahanungod sa mga benepisyo kag sa inyo nga karakter sa pangisda

Aktor	**Code (Encode)**	**Ano ang pamatyagan ninyo ang mga *benepisyo* nga makuha niyo sa MPA**	**Ano ang pamatyagan ninyo ang mga *disbenepisyo* nga makuha niyo sa MPA**
1. Fisherman	1		
□ Gamay	M		
□ Dalagku	C		
2. Gobyerno	2		
□ Lokal	L		
□ Nasyonal	N		
3. Praybeyt	3		
□ Research Institution	R		
□ Eswelahan	A		
□ Grupo sang mangingida (PO)	F		
□ Negosyante	B		
□ Indi-gobyerno nga grupo (i.e. donor and non-donor)	N		

Kun mangingisda

□ Primero nga pangabuy an? _____ Kita taga semana: _____

□ Iban pa guid nga pangabuy an (kun may ara) _____Kita taga semana: _____

□ Miembro sang isa ka organisation sa dagat o sa dunang manggad/: _____Ngaland sang org: _____ Tuig: _____

□ Mga aktibidades _____

Kun taga-gobyerno

□ May ara bala sang nakarecord nga halit/benepisyo/nagasto sa MPA (y/n): _____ Pila? (iphambal ang naghambal): _____ _____

Sekta D: Strategic Interaction (Rank answers)
Ang masunod nga mga pamangkutanon nahanungod sa inyo opinyon parti sa pagpundar sang MPA. Palihog pili sang inyo nga mga rason kun ngaa dapat ipundar ang MPA. (pwede damo ang isabat, irank)

Tinutuyo	**Hatag**	**Pagsunod (y/n)**	**Benepisyo sa pagsunod**	**Indi magsunod (y/n)**	**Benepisyo sa indi pagsunod**	**Rason(es) kun ngaa indi magsunod**
□ Para may isda nga mahuli subong kag sa mga masunod nga tuig (1)	Alternatibo nga pangabuy-an (M), Pagpilit (C)					
□ Pagpreserbar sang mga nakalain2x nga mga pananum kag kasapatan sa dagat (2)	Damo nga impormasyon nahanungod sa imporatnsya ka dunang mangad sa kilid baybay					
□ Turismo (3)	Pag-intra sang komunidad sa turismo					
□ Pag ibitar sang mga dalagku nga mga mangingisda nga mangisda malapit sa baybay (municipal waters)(4)	Pagpilit sang gobyerno					
□ Pag ibitar sang mga iban nga maningisda sa pangisda sa iban nga baybay (other coastal communities) (5)	Pagpilit sang gobyerno					
□ Maayo kag pagkaooperar sang mga tawo nga nagadumala kag naga atipoan sa MPA (gobyerno, mangingisda, NGO, etc)	Suporta sa iban pa guid nga mga tawo or organisasyon					

APPENDIX D: *Coastal Maps of North-Eastern Iloilo Municipalities*

Appendix D.1: *Municipality of Carles, Iloilo, Philippines*
Source: *National Mapping and Resource Information Authority (NAMRIA-Region VI)*

Appendix D.2: *Municipalities of Concepcion and San Dionisio, Iloilo, Philippines*
Source: *National Mapping and Resource Information Authority (NAMRIA-Region VI)*

Appendix D.3: *Municipalities of Batad, Balasan and Estancia, Iloilo, Philippines*
Source: *National Mapping and Resource Information Authority (NAMRIA-Region VI)*

Appendix D.4: *Municipality of Ajuy, Iloilo, Philippines*
Source: *National Mapping and Resource Information Authority (NAMRIA-Region VI)*

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