universität wien

DIPLOMARBEIT

Titel der Diplomarbeit

"Analyzing Institutional Change.
The Establishment of a sustainable Fishery
at Apo Island."

Verfasser

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angestrebter akademischer Grad

Magister (Mag.)

Wien, 2014

Studienkennzahl lt. Studienblatt	A 057 390
Studienrichtung lt. Studienblatt:	Internationale Entwicklung
Betreuer:	Univ.-Prof. Alejandro Cuñat

Acknowledgements

I would like to thank my supervisor, Dr. Alejandro Cuñat, for fruitful insights and guidance. Special thanks to Ben Goodspeed, Martin Königsstetter, Julian Lenk, Mag. Stremming, and Sinan Ersek (T.D.) for reading parts or all of this work and for the helpful discussions, comments and feedback.

Finally, I am eternally grateful to my parents and Kati, for their patience, love and support. Thank you.

Abbreviations

BFAR	Bureau of Fisheries and Aquatic Resources
CPR	Common Pool Resource
CPUE	Catch Per Unit Effort
GT	Gross Tons
LGC	Local Government Code
LGU	Local Government Unit
MCDP	Marine Conservation and Development Program
MMC	Marine Management Committee
MPA	Marine Protected Area
MT	Metric Tons
NGO	Non Government Organization
NIPAS	National Integrated Protected Areas Systems
PAMB	Protected Area Management Board
PC	Philippine Constabulary
PD	Prisoner's Dilemma
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

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1. Introduction

1.1 Changing perceptions of the commons

Growing populations and economies confronted with depletion and degradation of available natural resources represent a fundamental challenge to a viable future of humanity. The quest for sustainable patterns of production and consumption is therefore of great importance. Resources shared by communities, such as fish or wildlife, are vulnerable to overuse if not properly regulated. These Common Pool Resources[1] (CPRs) are, however, by nature difficult to protect, in high demand among local populations and especially vulnerable to unsustainable exploitation. Policy recommendations for CPRs promoted either strict government control or privatization to avoid the "Tragedy of the Commons" (Hardin, 1968), as when rainforest deforestation leads to degradation of the ecosystem as a whole. Recent CPR literature has called these management policies into question. Today, a growing number of scholars have compared and contrasted various forms of successful CPR governance around the world. These scholars have successfully shifted the scientific focus towards the institutions[2] that govern human behavior. It has been proven that people do not necessarily behave like rational egoists, but, to the contrary, often engage in mutually beneficial collective action (Ostrom, 1990). Moreover, the recent literature offers a rich pool of case studies that provide information about sustainable ways to manage natural resources. As Arun Agrawal (2003, p.43) puts it,

> [t]his achievement cannot and should not be underrated. Scholars of common property, by shifting the focus of their investigations toward the analytical and structural elements that comprise successful management of the commons, have been in the vanguard of the bearers of the message that the commons and the community are an integral and indispensable part of contemporary efforts to conserve environmental resources. They have rewritten the text on how the environment should be governed.

[1] Common pool resources describe resource systems that usually don't belong to anyone in particular. At the same time, the resources one can appropriate from such systems are often scarce. Politics often argue in favor of either privatization or strict government regulation of such resource systems in order to avoid overexploitation. For example, common grazing land has been largely privatized in Europe and fisheries are often under government regulations. Common pool resources will be further highlighted in section 2.2.

[2] Institutions must not be confused with organizations. North (1993, p.5) distinguishes between institutions as "the rules of the game of a society" on the one hand and organizations as "groups of individuals bound by a common purpose to achieve objectives" (Ibid., p.6) on the other hand. The meaning of institutions will be further outlined in section 2.4.

We need to further enhance our knowledge about sustainable ways of dealing with natural resources. The sustainable management of natural resources is imperative to the survival of communities at large and of humanity as a whole.

1.2 Thesis

In a world where the Tragedy of the Commons is all too common, it is especially important to understand the origins of sustainable resource management. Self-organized CPR utilization has been proven to be feasible. However, this study postulates that there are cases in which external actors are *indispensable* for the stimulation of institutional change and long-term maintenance of sustainable CPR governance. In such cases, cooperation between local and external actors is required in order to properly implement the management techniques necessary to ensure a resource's viability for all and for generations to come.

This study aims to contribute to the pool of knowledge on reproducible sustainable practices by providing an in-depth case study of a fishery in the Philippines. Case in point is the fishery management system of Apo Island, located in Central Visayas. The next section will describe why the island provides such an interesting case and outline research goals.

1.3 Research

Fisheries are a classic example of CPRs, as they are usually difficult to regulate and fish are a rival good. Fishermen, especially in small-scale fisheries, have a collective incentive for sustainable management of their resource system, as negative effects of overuse directly affect them[3]. Fisheries are facing increasing problems on a global scale. Overfishing and depleting fish stocks are common in many parts of the world and in the Philippines the problem is particularly apparent. The country's fishery sector faces serious threats due to overfishing, use of destructive fishing methods, destruction of critical coastal habitats, and pollution (Green et al., 2003; Luna et al., 2004; Nañola et al., 2004).

At Apo Island, a small island in Central Visayas at the center of the Philippine archipelago, the local community was able to alter its fishery management in a way that stopped the vicious cycle of declining fish stocks and increasing fishing activity. Beginning in the early 1980s, the islanders put an end to a *de facto* open access regime and crafted rules that sustained the marina habitat surrounding Apo Island. The marine protected area (MPA) of Apo Island rendered possible continuous fish yields and alternative income sources for the

[3] This is not the case in all CPR settings. Clean air can be considered a common good but the negative effects of pollution have to be beard by everyone. A factory owner that pollutes clean air might not be as interested as a fisherman to find solutions to environmental problems caused by his actions.

community (Russ & Alcala, 1999). Management of the MPA was community-centered until 1994, when the Island was declared a protected landscape and seascape under the National Integrated Protected Areas Systems (NIPAS) Act (DENR et al., 2011). The community-centered comanagement model was subsequently altered into a more centralized system, thus making Apo Island an optimal case study.

1.4 Goals

This work strives to answer to the following questions:

What lessons can be learned from the fishery regulatory system implemented on Apo Island in the early eighties?

What were the main factors stimulating institutional change at Apo Island?

To what extent can the fishery of Apo Island be regarded as sustainable?

The goal of this study is threefold: to provide an in-depth analysis of the set of rules adopted in 1982, which introduced sustainable fishing to Apo Island; second, to investigate the circumstances that led to the implementation of the island's fishery governance system; and thirdly, to evaluate the sustainability of the system as a whole.

The conclusions of this study should contribute to the growing pool of knowledge on sustainable development, providing a best practice analysis for other researchers and fisheries.

1.5 Methodology

To understand the social, political and environmental issues surrounding the implementation of special management techniques on Apo Island, this study relies primarily on available literature. It utilizes the design principles of Elinor Ostrom, the world renowned political economist best known for her work on CPRs, to analyze the governance system of Apo Island's fishery. Her principles provide the primary methodology for analyzing enduring self-organized CPR institutions in the academic world, and, although the fishery management of Apo Island was not entirely self-organized, her methodology still applies. On Apo Island, it was in fact a hybrid form between state, and self-organized CPR governance with additional support by Silliman University. Therefore, the concept of comanagement will be used to

complement Ostrom's design principles in order to better describe the elements particular to Apo Island's fishery.

Apo Island's history shows that the distinction between three possible forms of CPR management (privatization, state governance, and self-organized governance) can be misleading. In fact, in different cases these elements work together in a wide variety of ways. One of the great achievements of recent Commons literature was to prove, by focusing on self-organizing resource users, that the theory that CPRs must be either privatized or managed by the government was inaccurate. A communal approach can also be viable. The history of Apo Island provides, in contrast, an example of a community-based comanagement system, in which fishery management was established and enhanced with the facilitation of actors external to the local community.

While the design principles of Ostrom and the concept of comanagment work well to assess governance systems in place, they do not reveal how institutional arrangements develop. Ostrom also advocated a framework for analyzing self-organized institutional change. In the case of Apo Island, however, establishing a system of resource governance took place with actors outside the local community. Consequently, in this case, the impact of external actors on local institutions must be included in the analysis of institutional change. In this context, the concepts of sustainable development, ownership and capacity building are of particular interest. The main factors that stimulated institutional change at Apo Island will be evaluated by making use of the framework advocated by Ostrom, complemented by these concepts.

The assessment of the sustainability of Apo Island's fishery will be based on the description of sustainability outlined in the section about sustainable development.

1.6 Structure

Following the introduction, chapter two will delve into the theoretical context of CPRs. Special focus will be placed on Ostrom's design principles. Chapter three will focus on the framework to analyze institutional change. In order to combine the impact of external actors with the analysis of institutional change, chapter four will deal with typical problems arising in development cooperation with particular attention to the concepts of ownership and capacity building. The chapter will also serve to provide a description of sustainable development in the context of CPRs. The detailed case study of Apo Island will constitute the fifth chapter.

Furthermore, this study will cover governance structure, management arrangements and relevant actors with special focus on consistency with Ostrom's design principles and the circumstances of institutional change. Moreover, to what extent the fishery of Apo Island has remained sustainable in the light of considerable changes will be assessed by looking at the fundamental factors of influence and determining their role in on-going resource management. The conclusion will cover lessons learned and offer recommendations for future efforts toward sustainability.

2. Theoretical Context

2.1 Types of Goods

When economists think about types of goods, one way to structure them is a classification according to two characteristics: rivalry and excludability. For goods (and services) to be supplied by the market, they need to be excludable. Suppliers must be able to prevent the use and consumption of their products by people that don't agree to their terms and conditions (Ostrom & Ostrom, 1999, p.2f.). If both sides agree, the goods can be supplied at a price. The second characteristic of goods is termed rivalry or jointness of consumption. A good is rival when its use by somebody diminishes its use for others. If a person can use a good without diminishing its quantity and quality for others, instead, it is non-rival (Mankiw & Taylor, 2011, p.222). Goods that are not rival can be consumed jointly (Ostrom & Ostrom, 1999, p.3f.). As illustrated in figure 1, this distinction allows for four categories of goods: private goods, public goods, CPRs and toll goods[4].

Figure 1. Types of goods

Excludability	Rivalry: High	Rivalry: Low
High	**Private Good** Bread Shoes Automobiles Haircuts Books	**Toll Good** Night club Telephone Service Cable TV Electric Power
Low	**Common Pool Resouce** Fish taken from an ocean Water pumped from a ground water basin The environment	**Public Good** National defense Fire protection Weather forecast

Source: Adopted from Ostrom and Ostrom (1999, p.4) and Mankiw & Taylor (2011, p.222)

[4] Toll goods are also known as natural monopolies or club goods.

Private goods are both excludable and rival. In order to gain access to bread, for example, it has to be bought. Once a loaf of bread has been eaten, other people cannot eat the same loaf. Toll goods are excludable but not rival. It is possible to exclude people from access to cable TV, but one person watching cable TV does not subtract its consumption for others. Public goods are neither excludable nor rival. A person residing in Austria, for example, cannot be excluded from consuming the security of the country's national defense system. Yet, consuming this public good does not diminish its use for others within the country. In other words, "each individual's consumption of such a good leads to no subtraction from any other individual's consumption of that good" (Samuelson, 1954, p.387).

The distinction of goods according to figure 1 is to some extent stereotyped. Many goods are not pure in the sense of the definition. Most joint consumption goods (non-rival goods), for example, can become subject to degradation or erosion in quality when there is no adjustment in supply to meet demand. Fire protection can become increasingly rival when there's high demand for it, considering that fire fighters are a finite force. It is also possible to exclude some people from consuming public goods through jurisdictional boundaries. Some public goods provided by a city can be reserved primarily for residents, for example (Ostrom & Ostrom, 1999). Exclusion of some goods can also be technically possible but economically infeasible, if the costs of excluding people are too high. In reality, thus, both excludability and rivalry of goods often vary in degree.

After this first classification, CPRs will now be further analyzed.

2.2 Common Pool Resource

A common pool resource can be described as "a natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use." (Ostrom, 1990, p.30)

To understand the specific characteristics of CPRs it is essential to distinguish between the *resource system* itself and the flow of *resource units* it produces. CPRs bear similarities to public goods with respect to the resource system. In both cases the provision of the system benefits all users, while every individual faces temptations to free ride[5] it (Ostrom, 1990, p.30f.). The provision of both public goods and CPRs can thus be problematic. It is also difficult to exclude people from both types of goods. With regard to the resource units, however, one can observe the difference between common pool resources and public goods.

[5] "A free rider is a person who receives the benefit of a good but avoids paying for it." (Mankiw & Taylor, 2011, p.224)

As figure 1 demonstrates, CPRs have a higher degree of rivalry than public goods. The individual use of a public good, does not limit its use for others. The individual appropriation of resource units of a CPR, on the other hand, can very well lead to a limited possibility for others to appropriate resource units (Ostrom, 1990, p.32). Once a fish is caught, other fishermen cannot catch it anymore. Therefore, CPRs are similar to public goods with respect to provision, while they are different with regard to appropriation. Because of the rivalry of its resource units, CPRs are subject to problems like crowding effects and overuse. Overuse can even threaten the capability of a resource system to produce resource units. In other words, overuse can diminish a CPR until it is exhausted and not longer usable (Ostrom, 1990, p.32).

Furthermore, CPRs face uncertain and complex environments. Uncertainty stems from both external and internal sources. Variations in nature and market prizes as well as varying actions of the diverse actors in CPRs lead to incomplete knowledge about the functioning of CPR settings. Nonetheless, appropriators are usually motivated to find solutions to CPR problems, not least because their livelihoods often depend on the ability of the CPR to continuously produce resource units (Ostrom, 1990, p.33f.).

2.3 Rational Behaviour, Collective Action and the Importance of Insitutions

Until the 1980s, scholarly work predicted failure of CPR systems. In the 1950s, H. Scott Gordon and Anthony Scott argued that open access situations in fisheries would lead to overfishing and an eventual destruction of the CPR. Gordon (1954) suggested that the government should limit fishery efforts. Scott (1955) argued in favor a 'sole owner' in order to sustain fisheries. Such owner, be that the government, a cooperation, an association or a private entrepreneur, would be interested in maximizing long term benefits of the fishery, and therefore sustain it.

In addition, game theory was gaining importance in economics at that time, and the prisoner's dilemma (PD) emerged (Schlager, 2004, p. 147). PD games are usually non-cooperative games, in which all players possess complete information about the rules and outcomes of the game. Hence, players know the payoffs of every possible action. Communication, as long as not stated otherwise, does not take place. By always choosing the most advantageous tactic for him- or herself, each player in a PD game pursues a dominant strategy[6]. PD games show that, under certain assumptions, individuals choose their personal

[6] In game theory, a strategy can be termed dominant, "if it is the best strategy for a player to follow regardless of the strategies pursued by other players." (Mankiw & Taylor, 2011, p.365)

strategies in a way that result in suboptimal outcomes. Strategies that are individually rational can therefore result in collectively irrational outcomes (Ostrom, 1990, p.5; Kollock, 1998, p.184).

In "The Logic of Collective Action", Mancur Olson (1965) contested the view that rational individuals who are able to gain collective benefits from cooperating, would naturally do so. He argued that

> unless the number of individuals is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, *rational, self-interested individuals will not act to achieve their common or group interests.* (Olson, 1965, p.2 emphasis in original)

Shortly afterwards, 'The Tragedy of the Commons' by Garrett Hardin (1968) further exemplified the problem that rival resources can be overexploited when there is free access to and unrestricted demand for them. Referring to Smith's (1776) 'invisible hand', Hardin (1968, p.1244) pointed out that individual self-maximizing behavior does not always imply a positive impact on society as a whole and can even lead to socially undesired outcomes. While Smith portrayed a situation of positive externalities[7], Hardin's example (which will be discussed in more detail in section 4.1) describes a collective action situation that produces negative ones (Dawes, 1980, p.173).

These views share the assumption that individuals are self interested and rational. Each individual that can benefit from joint efforts without being excluded from positive outcomes would try to do so by free riding on the efforts of the others. Such behavior possibly results in situations where no one is willing to invest in collective efforts in the first place. Even if some invest in joint efforts while others free ride, optimal outcomes would not occur (Ostrom, 1990, p.6). Hence, the free rider problem complicates the achievement of collective benefits. This perception of collective behavior provokes a certain image. It indicates that individuals using a shared resource, if left on their own, are trapped in a social dilemma that leads to an eventual destruction of their resource system. Dawes (1980, p.169) offers the following definition for social dilemmas:

> Such dilemmas are defined by two simple properties: (a) each individual receives a higher payoff for a socially defecting choice (e.g. having additional children, using all the energy available, polluting his or her neighbors) than for a socially cooperative choice, no matter what the other individuals in society do, but (b) all individuals are better off if all cooperate than if all defect.

[7] An externality is "present whenever the behavior of a person affects the situation of other persons without the explicit agreement of that person or persons." (Buchanan, 1971, p.7)

To sum up, prevailing scholarly work of that time presumed failure of CPRs unless they were turned into private property, in order to internalize the negative externalities, or managed by the government, which forces people to avoid their dilemma (Rose, 2003, p.233).

Countries that had just gained independence from colonialism focused on modern state building. Strong central states were thought to be the appropriate actors to address problems of natural resource degradation. Natural resources were to be regulated and enforced on a national base. Countries nationalized resources that had been common goods previously (Schlager, 2004, p.148).

Outcomes of state centered policies were often disappointing, however. In some cases, national regulation even worsened environmental problems. In the 1980s, policies based on the Tragedy of the Commons and likewise models were increasingly put into question. Numerous case studies on CPRs revealed that individuals were not always deemed to destroy their resources, when left on their own. It was recognized that people could achieve sustainable CPR systems by regulating their behavior through various institutional arrangements (Schlager, 2004, p.148f.).

2.4 New Institutional Economics

A relatively new branch of research supported these findings. New institutional economics combines neo-classical economic theory with insights about institutions. While acknowledging the assumptions of scarcity and competition, it rejects instrumental rationality (North, 1993, p.1). Economists following this school of thought maintain that "individuals try to solve problems as effectively as they can." (Ostrom, 1990, p.25) Institutions structure human behavior and exchange, because of their ability to reduce uncertainty. According to North (1993, p.5f.),

> [i]nstitutions are the rules of the game of a society or more formally are the humanly-devised constraints that structure human interaction. They are composed of formal rules (statute law, common law, regulations), informal constraints (conventions, norms of behavior, and self imposed codes of conduct), and the enforcement characteristics of both.

In order to understand how interaction within societies takes place, therefore, the 'rules of the game' have to be examined. They are the rules in use in particular settings: the ones that are understood, followed and enforced (Gibson et al., 2005, p.8). It would be, however, shortsighted to consider only the formal rules in place, as they may not be important in reality. Traffic rules, for example, are similar in many parts of the world, while real practices vary fundamentally.

Institutions increase the predictability of human interaction by providing incentives that influence people's actions. Incentives are connected to external stimuli and internal

motivation. Individuals perceive their actions and the actions of others to be correlated with rewards and punishments. Internal - or intrinsic - motivation stems from inside a person, i.e. hobbies, interest, volunteer work, etc. Payments received, costs paid, and acquisitions of skills are examples for external stimuli that stimulate certain behavior (Gibson et al., 2005, p.9). Incentives can motivate people to act in ways that are productive for everyone involved. On the other hand they can also lead individuals to avoid engaging in mutually beneficial actions or to even take actions that harm others (Gibson et al., 2005, p.8f.).

Being an institutional economist, Elinor Ostrom (1990) challenged the belief that either privatization or state-centered governance control would be the only valid approaches to prevent social dilemmas. By highlighting the various ways of self-governance that social groups developed around the world use, she explored alternative ways to solve the dilemma. In addition to private property and state ownership Ostrom (1990) introduced community property as a third possibility to govern CPRs. Solutions to CPR governance can be found in the institutional settings that regulate CPRs. The comparison of different functioning institutional settings led her to identify 8 design principles that outline essential elements of sustainable and stable CPR governance.

2.5 Design Principles for Successful CPR Governance

Ostroms (1990) 'Governing the Commons: The Evolution of Institutions for Collective Action' has profoundly influenced the development of CPR studies. In a review of the design principles Cox et al. (2010) analyzed 91 studies that used them explicitly or implicitly. They found that the design principles are well supported empirically and added slight reformulations. The next sections are based on these 8 design principles.

2.5.1 Design Principle 1: Clearly defined boundaries

"Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself." (Ostrom, 1990, p.91)

Those who invest in sustaining the CPR must be able to reap the benefits of their efforts. Consequently it must be possible to exclude others from access and appropriation. In addition, the resource system must be defined geographically (Ostrom, 1990, p.91f.). Once the CPR boundaries are clear, appropriation and provision patterns must be clarified.

2.5.2 Design Principle 2: Congruence between appropriation and provision rules and local conditions

"Appropriation rules restricting time, place, technology, and/or quantity of resource units are related to local conditions and to provision rules requiring labour, material and/or money." (Ostrom, 1990, p.92)

Rules governing appropriation and provision must be in accordance with the specific CPR settings in place. CPR rules differ a great deal around the world, depending on the local conditions that are different everywhere. Cox et al. (2010) point to the importance of recognizing the two conditions implied in this principle. First, provision and appropriation rules must conform to the local conditions, and second, appropriation and provision rules must be congruent. Concerning the latter, individuals must perceive that the benefits they obtain from participating and complying with the rules exceed the costs of providing them.

2.5.3 Design Principle 3: Collective-choice arrangements

"Most individuals affected by the operational rules can participate in modifying the operational rules." (Ostrom, 1990, p.93)

The individuals involved in appropriation and provision patterns can participate in changing the rules. According to Ostrom (2012), the resource users themselves are often the ones most knowledgeable about the rules and the conditions of their CPR. Therefore, those affected by the rules are likely to be best suited to adjust them according to the particular characteristics of the respective situations. The fact alone that people are able to craft and modify their own rules does not ensure compliance, however. In all long enduring CPR settings, monitoring and sanctioning takes place (Ostrom, 1990, p.92ff.).

2.5.4 Design Principle 4: Monitoring

"Monitors, who actively audit CPR conditions and appropriator behaviour, are accountable to the appropriators or are the appropriators." (Ostrom, 1990, p.94)

Behavior must be monitored in order to ensure compliance. Monitoring activities are usually compensated with personal rewards such as increased prestige, portions of fines or other forms of monetary payment. In order for monitoring to work smoothly, monitors have to be accountable to the community. If they fail to deliver on their monitoring task they can be exchanged (Ostrom, 1990, p.95f.). Cox et al. (2010) found that environmental monitoring is

an additional critical factor for functioning CPR governance. With adequate information about the conditions of the CPR, community members can adapt rules, if the environmental situation changes. They suggest a division of the principle into social monitoring and environmental monitoring.

2.5.5 Design Principle 5: Graduated sanctions

"Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and context of the offense) by other appropriators, by officials accountable to these appropriators, or both." (Ostrom, 1990, p.94)

In addition to monitoring, rule compliance often also depends on sanctioning. In repeated settings, individuals comply if they feel that the rules in place (1) serve the collective objective, and (2) are followed by others as well. Ostrom (1990, p.94) calls this "quasi-voluntary compliance", following Levi (1988), who uses the term to explain the behavior of taxpayers in systems with high rates of compliance.

While enforcement is provided externally in the cases described by Levi, CPR governance can also be characterized by internal enforcement. Appropriators are interested in rule compliance of other appropriators, because of their own interest in using the resource to their highest benefit. Mutual monitoring will (1) deter appropriators from breaking the rules and (2) reassure them that others also comply (Ostrom, 1990, p.94f.).

Moreover, effective rules often need sanctioning procedures that provide a credible threat to appropriators considering a violation of the rules. These are usually graduated, from modest sanctions for offenders that normally follow the rules to stronger ones for offenders that repeatedly break rules. Sanctions also depend on the severity of the violation and the circumstances (Ostrom, 1990, p.97ff.).

2.5.6 Design Principle 6: Conflict-resolution mechanisms

"Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials." (Ostrom, 1990, p.100)

The rules governing CPRs are usually not without ambiguity. Temptations to free ride provision duties and/or interpret appropriation rules will always exist. Therefore, an arena for discussing and resolving current conflicts is important. Conflict-resolution mechanisms can vary from simple and informal arrangements to well-developed and more complex court systems (Ostrom, 1990, p.100f.).

2.5.7 Design Principle 7: Minimal recognition of rights to organize

"The rights of appropriators to devise their own institutions are not challenged by external governmental authorities." (Ostrom, 1990, p.101)

Local CPR governance systems can turn out to be useless, if they are not recognized at higher political levels. In such situations it can be difficult or even impossible for the community to enforce the rules. Furthermore, external authorities could overturn the rules in place, if they have different ideas about the optimal governance system for the CPR (Ostrom, 1990, p.101).

2.5.8 Design Principle 8: Nested enterprises

"Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises." (Ostrom, 1990, p.101)

In order to provide a system that is able to endure over time, more complex CPRs must be organized in various layers of nested enterprises. The rules of one level of governance must accord to the rules of other levels of governance (Ostrom, 1990, p.101f.). In larger CPRs such as irrigation systems, different parts of the resource system might be organized and managed on different, nested levels (Cox et al., 2010).

While Ostrom described horizontal linkages among the community, nesting can also occur between user groups and higher governmental jurisdictions (Cox et al., 2010, p.11). Such "vertical linkages" (Cox et al., 2010, p.11) can lead to comanagement arrangements. Comanagement will be outlined in the next section.

2.6 Comanagement

While the principles provide a suitable tool to describe successful self-organized CPR management, the concept of comanagement serves to supplement the analysis of this study. Comanagement is a process in which the state shares power and responsibility of resource management with resource users (Berkes et al., 2001, p.34). This is what happened at Apo Island. Berkes et al. offer the following description for comanagement in fisheries:

> Fisheries comanagement can be defined as a partnership in which government, the community of local resource users (fishers), external agents (non-governmental organizations, academic, and research institutions), and other fisheries and coastal resource stakeholders (boat owners, fish traders, money lenders, tourism establishments, etc.) share the responsibility and authority for making decisions about

> the management of a fishery. This partnership can be seen on a continuum between purely government-based management and community-based management. (Berkes et al., 2001, p.201)

Comanagement leads to an agreement in which the partners specify their roles and responsibilities. By providing the local resource users with a considerable share of authority, it combines central-based and local management, involving both formal and informal governance. In general, comanagement seeks increased equity in management. It enables the less privileged groups to participate in management activities, giving them a share of responsibility (Berkes et al., 2001, p.206).

Comanagement can be seen as a process that is potentially beneficial for both resource management and development. The approach stands for a more open and autonomous process. It can be more economical than state-centered governance because less administration and enforcement is needed when fishers themselves take over management functions. At the same time, local governance is strengthened through linkages to higher government levels and external actors. This addresses one of the major weaknesses of purely self-organized CPR management. Comanagement provides more flexible management that takes into account the particular conditions and needs of local settings. It is more adaptive, as local resource users can adjust to changing conditions and information sharing among stakeholders facilitates mutual learning and improvements of the management structure. With the community taking over part of the management, the concept also allows for local knowledge to be included in the governance system (Berkes et al., 2001, pp.202–208). Comanagement has the potential of empowering and enhancing the capabilities of communities. Ownership[8] together with a governance system that represents local norms and values lowers the discount rate and increases compliance.

Comanagement should not be viewed as the remedy for fishery governance problems, however, as the approach does not work for every fishery. A community that has long been dependent on state regulation and is provided with little organization and no political leadership might not be willing or able to manage its fishery. There might be no adequate economic, social and/or political incentives to take part in management (Berkes et al., 2001, p.208f.). Chapter 3 will outline how difficult and uncertain institutional change can be. Potential costs of comanagement arrangements could outweigh potential benefits for the majority of stakeholders. A fishery could also be difficult to manage due to migratory patterns

[8] Ownership will be highlighted in section 4.1.5

of the fish, or actions by resource users external to the community that threaten the CPR. The process of finding solutions that fit all different interests might be slow. It could lead to weak and compromised arrangements that turn out to be inefficient. Power shifts are usually against the interests of people that see their position weakened. This could lead to resistance to the process (Berkes et al., 2001, p.209). Donor driven comanagement in which the resource users are too dependent on the implementing organization can lead to paper agreements[9] and paper organizations that collapse after the project ending. The Government might not be interested in strengthening a community based governance system, because of distrust in the management abilities of a community. Local, regional or national governments could also have other interests than sustainable fisheries, they should not carelessly be considered benevolent. Christie and White (2007) refer to cases where governments have used the comanagement approach as an instrument to establish management systems more efficiently by including fishers in the implementation process without giving them adequate shares of power afterwards. Comanagement approaches are also potentially vulnerable to political change. Local politicians that are not supportive of the governance system can quickly put a comanagement arrangement to an end, after being elected (Ratner et al., 2012, p.134). A marine reserve at Sumilon Island, the Philippines, was over-harvested after the local government had changed and the new one objected the rules. The newly elected mayors even encouraged fishermen to fish in the sanctuary. Heavy fishing and the use of illegal fishing methods soon devastated the fishery[10] (Alcala, 2001). Another problematic issue is devolution of authority to the community level when resources are already depleted. Ostrom (2012) mentions cases where local resource users were given authority to manage severely degraded CPRs with the expectation that they would and should improve things quickly.

These aspects show that comanagement works under particular conditions. For example, all partners need to be willing and able to cooperate in order to enable successful comanagement arrangements. Chapter 4 will examine problems related to the impact of external actors on local institutional settings. Thereby, conditions that facilitate cooperation between local and external actors will also be discussed. In chapter 5, the concept of comanagement will serve to include external actors in the analysis Apo Island's fishery management system.

[9] White and Cabanban (1981, p.319) refer to paper agreements, as "agreements accomplished with pressure from higher officials [that] would not bring lasting results".

[10] Sumilon Island had different characteristics though. The most important difference to Apo Island was that it had no residents. Fishermen from neighboring Cebu Island used its fishing grounds (Alcala, 2001, p.63).

The design principles are a useful tool to examine how CPRs are governed. They help examining which important variables are featured in the governance system, and how specific configurations look like. With the design principles it is possible to analyze why some institutional arrangements work while others do not. In the context of this study, comanagement will serve as a complementary concept to grasp the importance of external actors at Apo Island. Both the design principles and comanagement cannot adequately explain how a governance system develops, however. In order to analyze institutional change, different aspects have to be addressed. These will be examined in the next chapter.

3. Analyzing Institutional Change

At the beginning of an analysis of institutional change one has to raise the question of setting up and supplying institutions. In this context, it is useful to distinguish between a

> *first order dilemma*, which represents the initial dilemma, and a *second order dilemma*, which represents the dilemma that one might face when deciding whether to contribute to a costly system that might promote cooperation in the first order dilemma […]. (Van Lange et al., 2013, p.5 emphasis in original)

The supply of institutions that overcome a first order collective dilemma is facing the same incentive driven problems that it tries to overcome. Supplying institutions that serve as a collective benefit is equivalent to providing a public good - rational individuals would attempt to free ride the benefits (see section 2.2). For that reason the supply of institutions that solve a first order collective dilemma is considered to be a second order collective dilemma (Ostrom, 1990, p.42).

Nevertheless, people are clearly able to organize themselves. Humans regularly create rules that benefit society. To answer this theoretical puzzle, one has to find out how people are able to solve the second order collective dilemma. The idea of the dilemma is based on the assumption that it does not pay off for an individual to supply institutions that provide second order collective benefits. Individuals compare the expected benefits and costs of supplying new institutions with the expected costs and benefits of sticking with the status quo. Consequently, the decision of changing the rules[11] depends on the expected costs and benefits (Ostrom, 1990, pp.43, 139f.).

The costs of changing the rules can vary a great deal. It is possible that the benefits of changing a small part of the dilemma might be high enough for some individuals to actually provide initial efforts to change the status quo. Each change alters the situation and the incentives people face, and transforms the structure of the institutional arrangement (Ostrom, 1990, p.139). Instead of understanding institutional change as one large (and costly) step it should thus be considered as an "incremental, sequential and self-transforming process." (Ostrom, 1990, p.139)

[11] According to Ostrom (1990, p.140), "[a] change in any rule affecting the set of participants, the set of strategies available to participants, the control they have over outcomes, the information they have, or the payoffs […] is an institutional change."

3.1 Framework of Institutional Change

What remains unclear is when and under which circumstances appropriators are rather able to organize themselves and supply institutions that govern their CPRs. In 'Governing the Commons', Ostrom (1990) suggests a general framework [12] that helps to focus on the important variables needed to explain the likelihood of successful institutional supply. The framework focuses on CPRs that are self-organized and self-governed. That means it helps to structure analysis of why and how appropriators fail or succeed, respectively, to organize and govern their CPRs. The following passages are largely based on this framework.

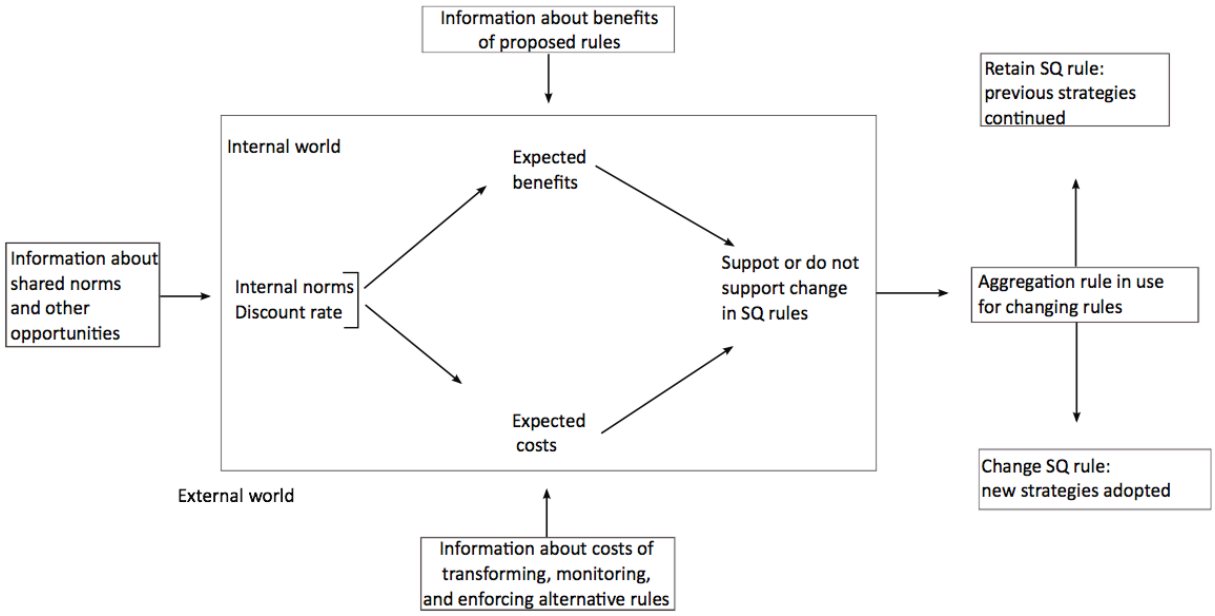
The process of institutional change essentially consists of a process of institutional choices. Rules are established and changed by people. People's decisions about continuing or changing rules depend on their expected gains and losses from either action. Thus, an analysis of institutional change has to deal with institutional choice (Ostrom, 1990, pp.141, 192f.). Ostrom (1990, p.52f.) distinguishes among three levels of rules that affect CPR settings: Operational rules affect the daily decisions of appropriation, monitoring, enforcement and provision. Collective choice rules have an indirect effect on operational rules. At this level the rules that govern CPR management are determined, for example through setting up policies. Constitutional choice rules also affect operational rules indirectly. They determine who decides about collective choice rules and how those rules are being used, thereby affecting the power structures at the level of collective choice rules.

Collective choice and constitutional choice situations both affect the rules used in operational situations. Referring to constitutional choice and collective choice situations together, Ostrom (1990, p.192) uses the term institutional choice situation. In order to analyze such institutional choice situations, she takes the perspective of the individual that decides upon operational rules. As described before, a rational individual weighs expected benefits and costs of the proposed rule(s) against the rule(s) in place. Thus, individuals have basically two options. They either support the status quo or a change of the status quo. Whether a change in rules is actually realized depends on the level of support for the proposed rules and the institutional arrangement that shapes power relations. As shown in figure 2, institutional

[12] It is important to understand that a framework "identifies, categorizes, and organizes those factors deemed most relevant to understanding some phenomenon." (McGinnis, 2011, p.170) In contrast to models, a framework does not put the variables into specific causal relationships that are then assumed to work under explicitly defined conditions (McGinnis, 2011, p.170). A framework helps to describe empirical situations by broadly structuring the factors that repeatedly have been found to be most important to understand situations. For each particular analysis, therefore, one needs to pick out the variables that fit best for the specific situation (Ostrom, 2012; Schlüter & Madrigal, 2012, p.150).

choice depends on the expected benefits and costs, and is affected by internalized norms and discount rates.

Figure 2. Summary of variables affecting institutional change[13].



Source: (Ostrom, 1990, p.193).

All four main variables affecting the evaluation of an individual depend on the available information. The information concerning benefits, costs, shared norms, and opportunities is itself affected by a number of situational variables. These will now be explained for each of the four main variables.

3.1.1 Evaluating benefits

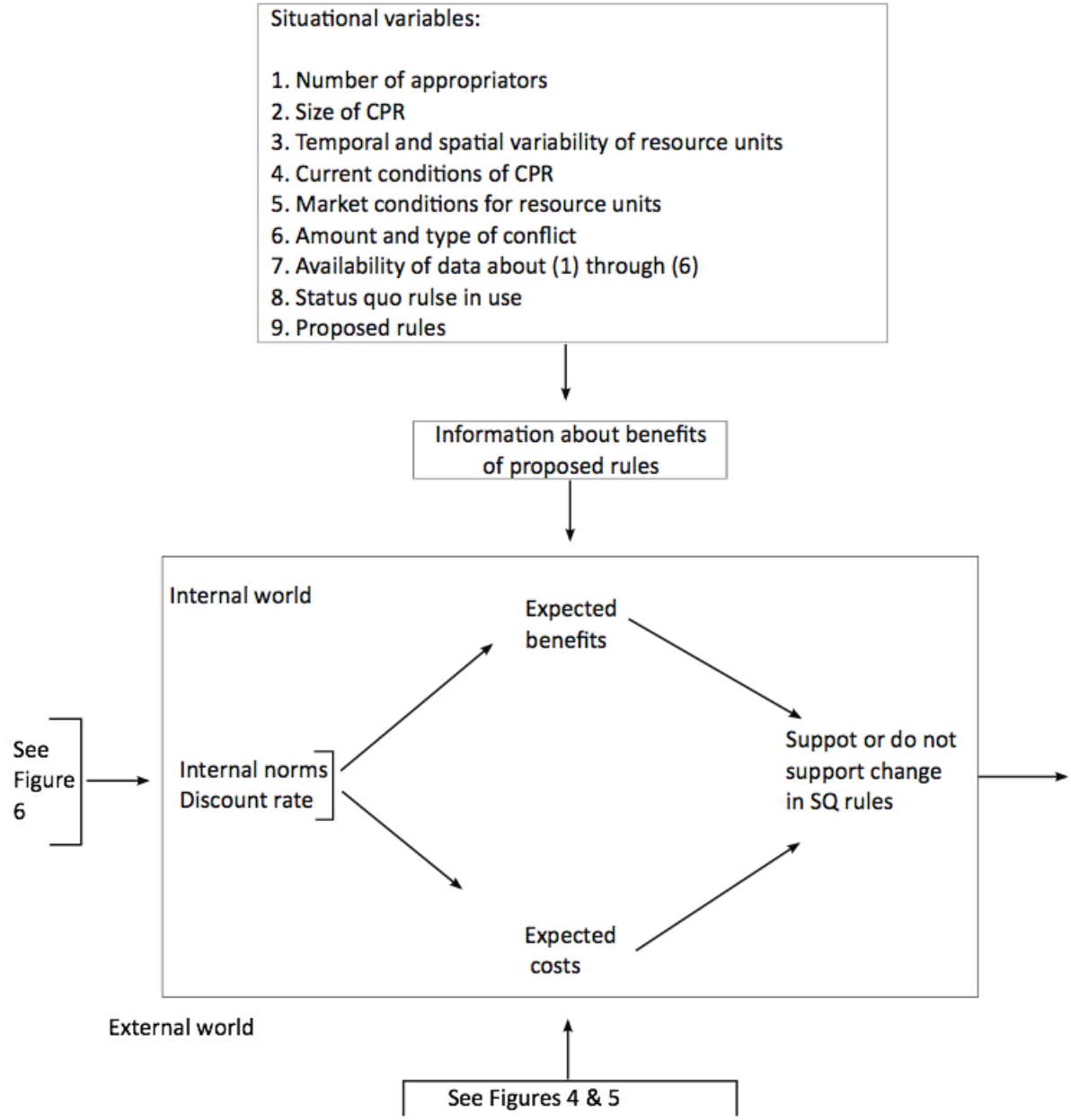
In order to evaluate the benefits of a change in rules Ostrom (1990, p.196) poses the following questions:

1 What are the predicted average flows and the predicted values of the resource units in the future under a proposed set of rules, as compared with the status quo rules?
2 How variable is the flow of resource units expected to be under a proposed set of rules, as compared with the status quo rules?
3 What quality differences will occur under a proposed set of rules, as compared with the status quo rules?
4 How long is the resource itself likely to generate resource units under a proposed set of rules, as compared with the status quo rules?
5 Will conflict be reduced, stay the same, or increase under a proposed set of rules, as compared with the status quo rules? (Ostrom, 1990, p.196)

The shape of the answers to these questions will then depend on the situational variables listed in **figure 3.**

[13] SQ = Status Quo.

Figure 3. Situational variables affecting judgment about the benefits of an institutional choice.



Source: Adopted from Ostrom (1990, p.197)

Therefore, whether or not an individual considers a change of rules beneficial depends on the condition of the CPR, the type of information available and the proposed rules. It is important to understand that information is not freely available and objective - it has to be searched for, structured and evaluated (Ostrom, 1990, p.197f.).

3.1.2 Evaluating costs

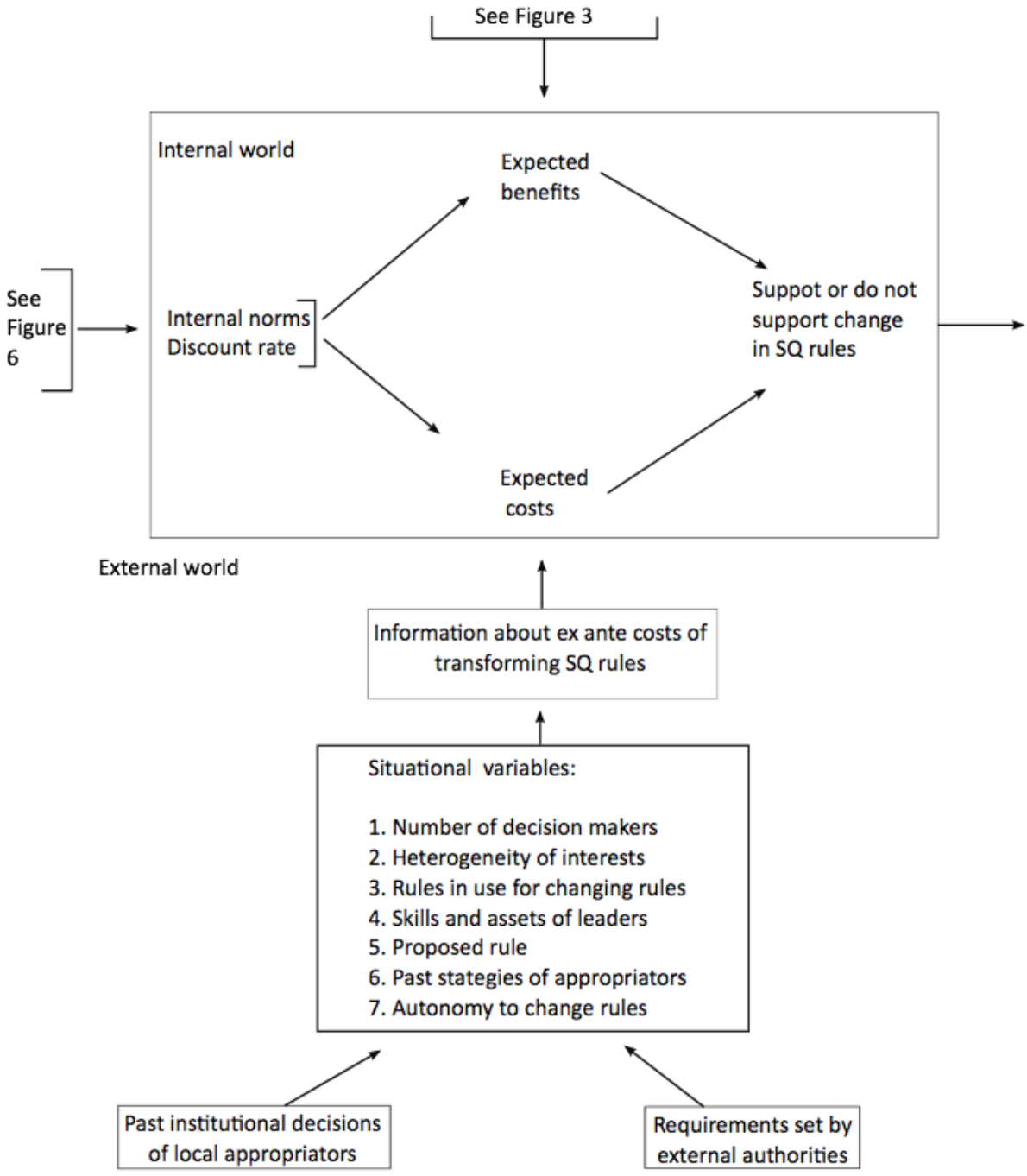
Situational variables also affect information about expected costs. Two types of costs have to be considered: transformation costs and enforcement and monitoring costs. If the

costs of changing the rules exceed the expected benefits under new rules, change will not happen in the first place. If not, the expected effects of new rules on monitoring and enforcement costs have to be evaluated (Ostrom, 1990, p.198f.).

Transformation costs

Information about the expected costs of transforming the status quo rules is affected by the situational variables listed in **figure 4.**

Figure 4. Situational variables affecting judgment about the costs of transforming status-quo rules.



Source: Adopted from Ostrom (1990, p.199)

While the first four variables quite obviously affect the costs of changing the rules, the last three justify a closer look. Proposed rules that are not too costly to implement are more likely to be adopted than rules that require high transformation costs. If the costs of altering a rule are low, the benefits might be high enough for some participants to provide the resources needed. The situation may not be a second order dilemma for them. Point 6, past strategies of appropriators, can lead to different levels of conflict. Some strategies will lead to more cooperation while others will increase conflicts. Hence, the experienced past strategies of appropriators always affect future agreements (Ostrom, 1990, p.198ff.).

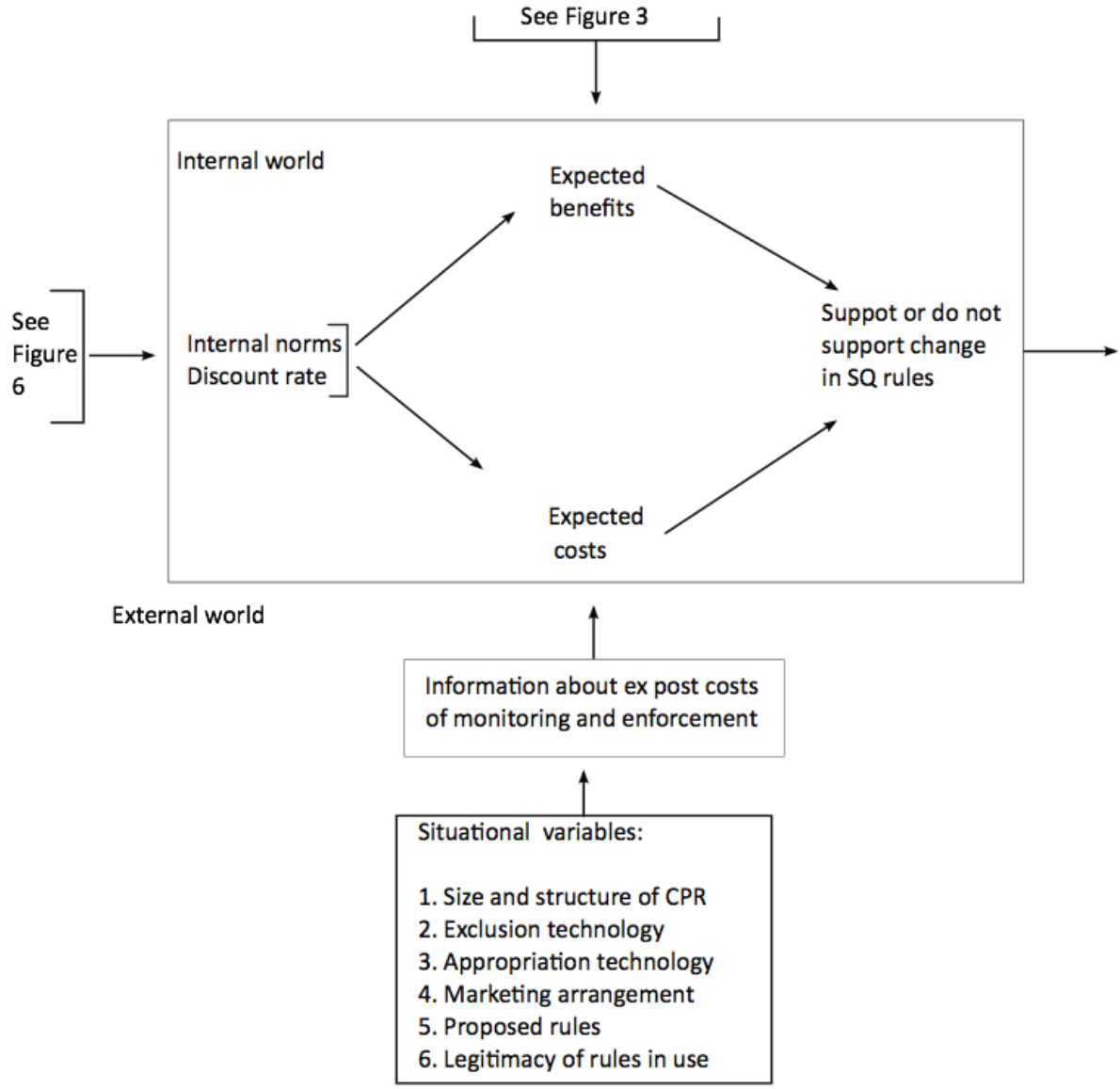
Differing autonomy levels of individuals also affect transformation costs. It is more difficult for local appropriators to change the rules if the government manages resources centrally. This increases transformation costs. A regime that offers appropriators some degree of autonomy to craft their own rules, on the other hand, can make transformation costs lower. Autonomy also depends on the location of the CPR and the effectiveness of the political regime. CPRs may have higher autonomy when located in remote areas without an administrative apparatus close by (Ostrom, 1990, p.200f.).

Two additional factors have an impact on situational variables; requirements set by external authorities and past institutional decisions of local appropriators. Institutional requirements structure the process of changing rules. Past institutional decisions affect future decisions, because of the incremental process of institutional change (Ostrom, 1990, p.201f.).

Monitoring and enforcement costs

The second type of costs appropriators consider are the expenses needed for monitoring and enforcement of the new rules. Monitoring and enforcement costs are affected by the variables listed in **figure 5.**

Figure 5. Situational variables affecting judgments about monitoring and enforcement costs.



Source: Adopted from Ostrom (1990, p.203).

The bigger the resource system, the more expensive monitoring becomes. The structure and exclusion technology used for a CPR also affect monitoring and enforcement costs. It is easier to fence a meadow than a fishery. The technology used to appropriate resource units can itself serve as a barrier[14]. If it is possible to hear and see other appropriators, monitoring becomes significantly cheaper (Ostrom, 1990, p.202f.).

Shared norms about rule compliance can decrease monitoring and enforcement costs. Rules that are perceived legitimate and fair will be followed more likely. The specific

[14] The groundwater basins described by Ostrom *(1990)* required some technology to be able to pump out water.

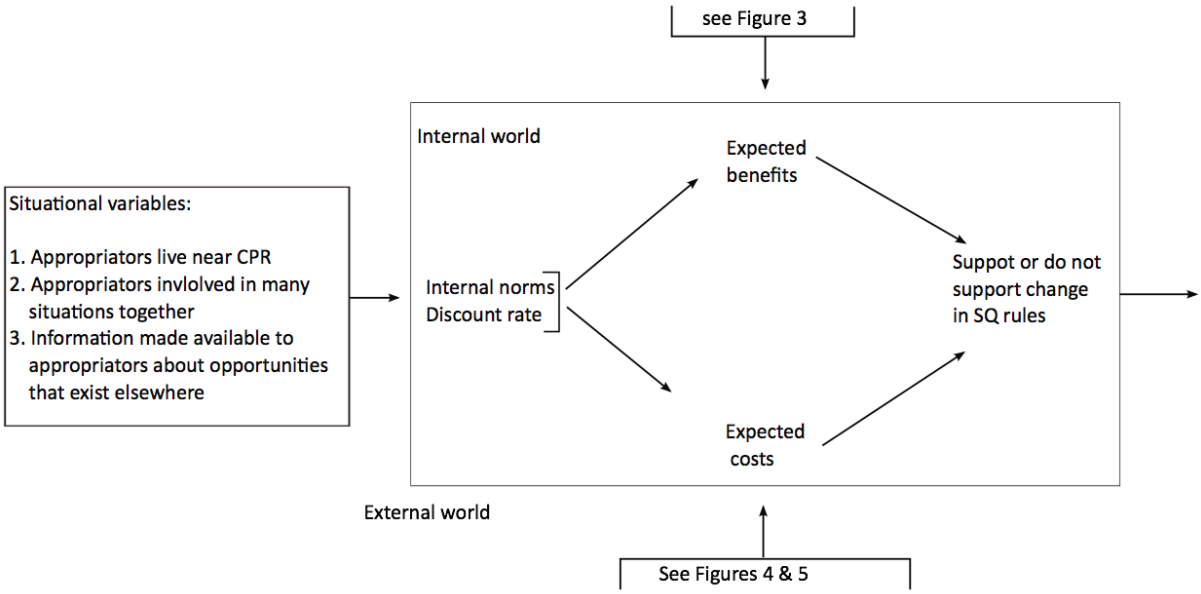
characteristics of rules themselves bring about differing monitoring and enforcement costs (Ostrom, 1990, p.204). A marine sanctuary that prohibits fishing in a selected area is cheaper to monitor than rules that require more specific information.

Another factor that influences monitoring and enforcement costs is the legitimacy of local rules. It is more difficult to enforce them without recognition by the surrounding political regime (Ostrom, 1990, p.205).

3.1.3 Evaluating shared norms and other opportunities.

The individual assessment of costs and benefits depends on internal norms and discount rates (figure 6). Social norms, "shared understanding about actions that are obligatory, permitted or forbidden" (Ostrom, 2000, p.143f.), lead to sanctioning of nonconformity.

Figure 6. Situational variables affecting internal norms and discount rates.



Source: Adopted from Ostrom (1990, p.206).

Norms are the *do's* and *don'ts* that are enforced in a more informal way. The community usually sanctions people that do not follow the norms in the form of disapproval and less reciprocity (Gibson et al., 2005, p.8). Individuals also internalize shared norms, making them feel bad and guilty if they do not behave according to the norms. People that live near a CPR and interact frequently are likely to develop shared norms of correct behavior (Ostrom, 1990, p.206).

Discount rates also affect the evolution of costs and benefits. Appropriators with alternative economic opportunities have higher discount rates than appropriators that depend on the CPR. The presumption that future generations will depend on the CPR also lowers the

discount rate (Ostrom, 1990, p.206). A fisherman believing that his children will also depend on fishing will be more interested in a sustainable fishery.

3.1.4 The process of institutional change

Institutional change can be derived from institutional choices. It is a process of making informed decisions about changing the rules, an uncertain and complex environment (Ostrom, 1990, p.208). Individuals have limited mental capacities and information is never complete (section 2.4). Individuals plan their various actions in the light of their own actions and the actions of others, considering the possible outcomes that they can think of (Gibson et al., 2005, p.9).

In such situations human judgment is biased. Potential losses outweigh potential gains, making benefits of avoiding harm more important than benefits of future goods. People are more likely to be willing to change rules in a situation of perceived crisis. Furthermore, immediate costs attract more attention then future benefits (Ostrom, 1990, p.208). Likewise, recent events are weighed more heavily than events that took place longer ago. It is also unlikely that people adopt rules completely new to them. They would rather agree on rules that have already proven to work under similar circumstances elsewhere (Ostrom, 1990, p.208f.). This shows that individuals are never perfectly informed and fully rational. Instead, individuals are intendedly but only limitedly rational (Gibson et al., 2005, p.28).

It is important to remember, that it is by no means certain that societies are able to craft sets of rules that enable sustainable CPR use. CPRs remain overharvested in many parts of the world. Ostrom's (1990) design principles can also be used to find out what elements of successful CPR governance might be missing. Societies that deplete their CPRs are trapped in social dilemmas and need to change their respective institutional arrangements. The framework outlined in the last chapter illustrates the various factors that influence institutional change of self-organizing appropriators.

If a society is trapped in a setting in which people are not able to craft a set of rules on their own, however, external input might be required to bring about a change of the situation. Capacity building can enhance the ability of people to address social dilemmas in a better way[15]. External actors that intervene in communities can have considerable impact on local institutional arrangements, however. In the next chapter, this influence of external actors on

[15] This will be outlined in section 4.3.1.

local settings will be discussed from the perspective of institutional economics. The pool of development literature serves well to highlight these aspects, as it implies external input of some sort.

4. Institutional Change with External Input

This chapter will serve to discuss the influence of external actors on local institutional settings. In the next section key concepts of development that are important for this work will be examined. After a first clarification of these concepts, it will be explained how they are linked to the process of development cooperation. Subsequently, the concept of sustainable development and the importance of institutions and ownership in development cooperation will be highlighted. These concepts will be crucial for the discussion of institutional change at Apo Island. Next, various forms of collective action problems and possible ways to solve them will be discussed. They will be distinguished in problems related to inadequate motivation on the one hand an problems that occur because of limited information on the other hand. Concluding, the process of enhancing the ability of communities to solve collective action problems will be outlined with a discussion of capacity building.

4.1 Development Cooperation, Incentives and Institutions

Development cooperation implies some sort of external influence on local settings. A focus on the institutional settings of development cooperation provides explanation to the poor outcomes of many development projects. Institutional economics focuses on incentives generated by the institutions of development cooperation. In order to understand the incentives embedded in development cooperation, it is necessary to study the collective action situations through which aid is created and carried out (Gibson et al., 2005, p.5). This chapter seeks to highlight the various forms of institutional influence involved in situations with external input. Before further discussing some of the main collective action problems of development, key concepts for the institutional analysis of development cooperation have to be clarified.

4.1.1 Development

There is an ever ongoing and heated debate about nearly all aspects of development, ranging from discussions about programs, projects and goals to critique about the very

fundamental idea(s) of development [16] (Sachs, 1992; Easterly, 2003; Williamson, 2008; Rahnema & Bawtree, 1997; Escobar, 2012; Esteva, 1992; Ziai, 2004; Wallerstein, 2004; Sen, 2001). For that reason, there are numerous conflicting definitions of development. For the context of this work, the perspective of institutional economics towards development will be adopted, consciously excluding the question of physical infrastructure development, certainly also required for economic prosperity. Hence, according to Shivakumar (2005), development is related to finding solutions to collective action problems:

> Development is always a *local* phenomenon, where local refers to the relevant problem arena. Human development and economic progress are rooted in the enhanced ability of individuals – brought together within specific contexts and in light of some encountered collective action problem – to adapt by developing the institutional contexts needed to deal with their situation. To be effective, therefore, institutions must refer to a particular context of a collective action problem and may ramify to other domains. (Shivakumar, 2005, p.105 emphasis in original)

Thus, development is the process of increasing the ability of individuals, acting within a specific context, to solve collective action problems. Solutions depend on the institutional context that shapes the way people deal with situations. This context is embedded in a larger institutional environment. Therefore, development depends on the creation and usage of institutions at various scales (Gibson et al., 2005, p.10).

4.1.2 Collective action situations

An important part of development is characterized by collective action situations. As Gibson et al. (2005, p.15 emphasis in original) put it, "[a] *collective action situation* … occurs whenever a desired joint outcome requires the input of several individuals". In an economy with division of labor the aggregated output of people working together is higher than the aggregated output of the same people working independently. This holds true for agricultural production, most manufacturing and service activities, etc. Collective action situations in which individuals choose actions that lead to outcomes that are worse than possible alternatives, on the other hand, are regarded as "*collective action problems*" (Gibson et al. 2005, p.15 emphasis in original). Social dilemmas, as defined in section 2.3, can therefore generate collective action problems (Ostrom, 2010, p.155).

With this understanding of development and collective action situations it can be analyzed why Hardin's (1968) parable of an overharvested pasture was based on a limited consideration of the institutions that govern collective action[17]. As mentioned in section 2.3,

[16] For an overview of the history of development theory (in German) see (Fischer et al., 2008).

[17] To do him justice, it has to be mentioned that Hardin used the parable of a pasture in order to exemplify the problem of the commons. One drawback of the parable is that the common grazing lands are an example of CPRs that worked well for centuries (Cox, 1985). However, he actually wrote about the implications of

Hardin's work "The Tragedy of the Commons" had a strong influence on CPR based policies. His metaphor describes a pasture with open access to everyone. Each herder receives a direct benefit from letting additional animals graze. The costs the herders are facing are delayed because they arise in the form of overuse. According to Hardin, the herders will let their cattle overuse and eventually destroy the pasture. Ostrom (2007, p.15182) illustrates, however, that one has to make several additional assumptions for the Tragedy of the Commons to happen as Hardin predicts. A) No form of governance that regulates the resource system is present. B) The resource units, in form of animals, have economic value, are mobile and owned by the different herders. C) There are enough users for the size of the pasture to overuse it. D) Finally, the herders make their decisions independently and only concerned with the maximization of their personal short-term returns. This reveals that Hardin's metaphor was built on a constricted view of CPRs and the institutions that govern them. A slightly different setting, which seems realistic, changes the described situation. If resource users are able to communicate face-to-face they tend to avoid sever overharvesting by discussing the situation and building norms of conducive behavior (Ostrom, 2007, p.15182). Hardin's major flaw was the assumption that CPRs are necessarily characterized by open access (Berkes et al., 2001, p.170).

4.1.3 Sustainable development

The advertising material from multi- and bilateral development organizations is filled with the term sustainable development. Sustainable development has been used in that many different situations and contexts that it seems to be in danger of becoming an empty slogan. When defined, though, sustainable development remains an important concept not least because of its power to attract so much interest and discussion. In the context of this work, the efforts to establish a fishery at Apo Island will partly be evaluated on the basis of the concept. This section provides a brief discussion and a subsequent definition of sustainable development.

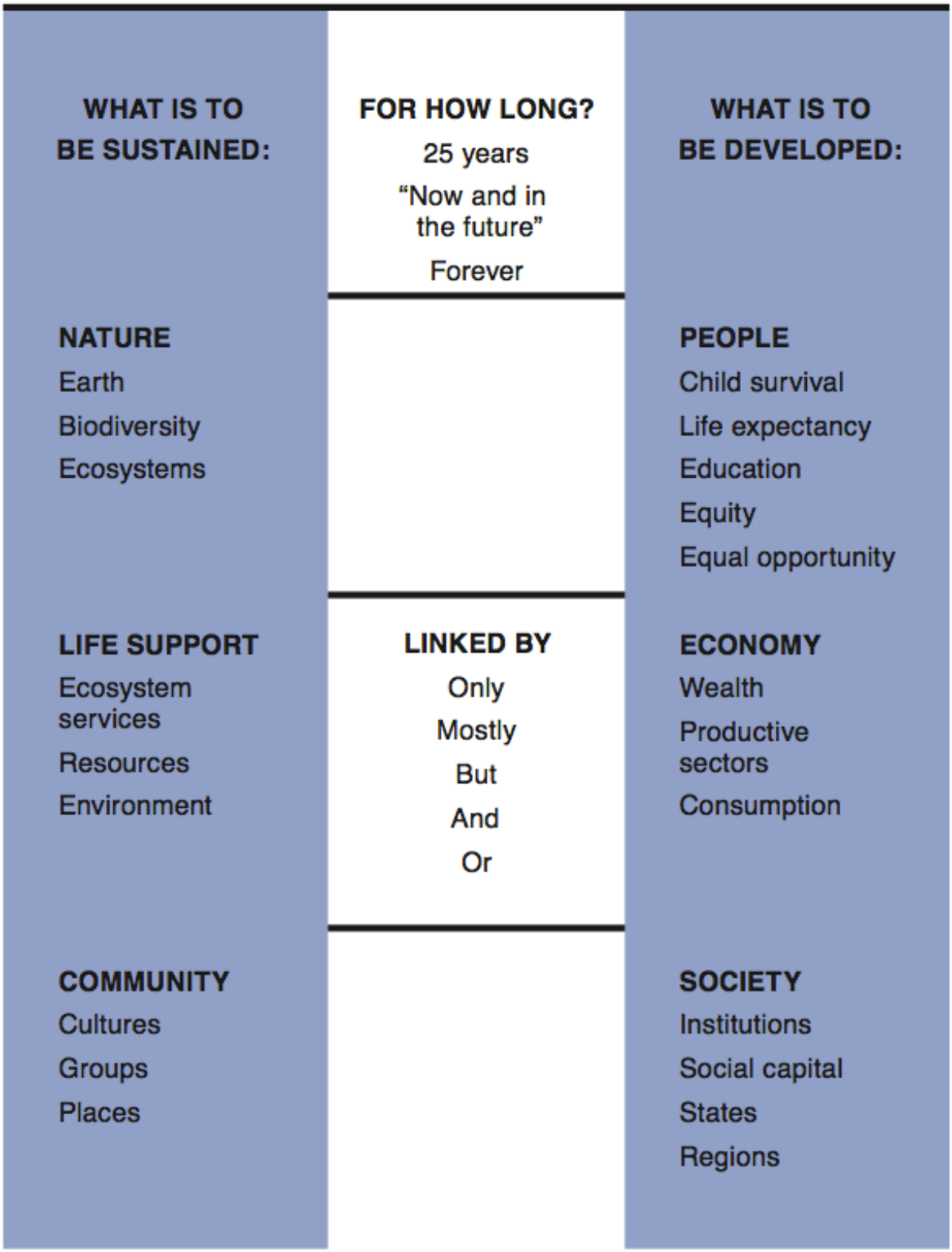
Sustainable development is a loose concept, allowing for seemingly endless definitions in numerous contexts. The concept became well known through the report *Our Common Future,* commonly known as the Brundtland Report, by the World Commission on Environment and Development in 1987. According to the report, which still provides the most cited definition, "[s]ustainable development seeks to meet the needs and aspirations of the

population growth on the resources of the earth. For larger CPR problems, say worldwide pollution or open sea fisheries, Hardins point is remains persuasive, since regulation is much more difficult.

present without compromising the ability to meet those of the future." (WCED - World Commission on Environment and Development, 1987) The definition connects two important concepts; development and environment. With respect to development, the reports makes clear that economic growth, together with equity, is needed to sustain the satisfaction of human needs. In addition, it states that development must be aware of the constraints that the way technology is currently used and the form of social organization impose on environmental resources.

Sustainable development has since gained increasing importance on numerous conferences, summits and policy statements (Robert et al., 2005, p.10). The meaning of sustainable development remains somewhat vague, however. Many definitions of the concept differ in what exactly they want to sustain and/or develop, and what time horizon they consider. Figure 7 shows the major categories of distinction, found by the Board on Sustainable Development of the U.S. National Research Council (Clark et al., 1999, p.24).

Figure 7. Sustainable development: common concerns, differing emphases.



Source: (Clark et al., 1999, p.24)

Most definitions recognize the environment as important source for human survival and focus on sustaining life support systems. Other parts of the literature emphasize that nature has

intrinsic value and/or concentrate on cultural diversity. The exact balance between the importance of sustaining and developing has also often been subject of considerable discussions. This does also apply for the time horizon, which can span from intergenerational to forever (Clark et al., 1999; Robert et al., 2005, p.11).

Sustainable development is widely recognized concept because it enables a compromise among three big topics; environmental conservation, economic development, and social development. In addition, both sustainability and development have positive connotations for most people. Definitions are therefore often characterized by workable compromises that reflect the differing objectives of the parties taking part. On a global scale, for example, sustainable development reflects the attempt to combine development ambitions with the need to sustain natural resources of the planet (Robert et al., 2005, p.19f.).

Because sustainable development can have so many different connotations, it is necessary to specify what is meant by the concept in a particular context. Within this work, then, sustainable development is related to sustainable utilization of small-scale CPR resources. While the intrinsic value of nature is not neglected, CPRs are primarily regarded as life supporting systems that serve as source of survival for humanity. In order for a CPR to be sustainable, its resource system has to endure. At Apo Island, catch rates and catch per unit effort (CPUE) of the fishery serve to test the sustainability of the resource system. The design principles (section 2.5) describe essential elements of sustainable and stable CPR governance. Moreover, the well-being of the resource system is contingent with the well-being of the community (see section 4.2.1 on CPR Problems).

Sustainable development depends on finding solutions to collective action problems in order to enable enduring CPR governance. Development therefore often involves enhancing the ability of societies to solve such problems (section 4.1.1).

The time horizon of CPRs is large. To be regarded as sustainable both the resource system and the institutions must survive for long periods of time. The cases analyzed by Ostrom (1990, p.53), for example, have institutions that survived from 100 to over 1000 years. As this work focuses on the establishment of a fishery system that was initiated in the early 1980s, the assessment of its sustainability can thus only be momentarily. These specifications are summarized in figure 8.

Figure 8. Sustainable development in the context of small-scale CPRs

What is to be sustained?	For how long?	What is to be developed?
CPR as life supporting system - Community - Design Principles	100 to >1000 years	Society's ability to solve collective action problems - Institutions

Source: Adapted from (Clark et al., 1999, p.24)

4.1.4 Development cooperation and institutions

Development goals have changed along with the dominant paradigms in the discourse, and also differ among countries, agencies and individuals. Today, the Millennium Development Goals (MDGs) represent the prevailing development paradigm (Sachs, 2005).

What has become accepted, however, is the fact that institutions represent core factors to be considered in development cooperation (also see section 2.3).

As outlined above, within this work development relates to the capacity of social groups to solve collective action problems. Institutions and incentives thus have a strong impact on development; they can either act facilitating or inhibiting (Gibson et al., 2005, p.14f.). External actors that intervene in local settings should therefore evaluate with great care what impact they have on the institutional settings at place.

Donors frequently use external stimuli[18] to induce a change in behavior of beneficiaries. Donors must analyze whether particular incentives - or institutions that provide incentives - actually lead to the intended change of behavior, and whether such change is sustainable. Development can only be successful if political and economic institutions generate incentives that enable the achievements of development goals (Gibson et al., 2005, pp.9 –14).

[18] External stimuli represent one element of incentives (see section 2.4 on incentives).

4.1.5 Development cooperation and ownership

After decades of donor driven development cooperation, ownership has become increasingly important in the development discourse. The central argument is that no commitment takes place without ownership on the beneficiary side. Lack of commitment undermines the intended long-term results of development cooperation. While it represents an important concept among development agencies and recipients, the meaning of ownership often remains unclear (Gibson et al., 2005, p.11f.). Gibson et al. (16ff.) identify 4 dimensions of ownership in joint projects: (1) Enunciating demand, (2) making a tangible contribution, (3) obtaining benefits, and (4) sharing responsibility for the sustainability of a project. Enunciating demand refers to the independent articulation of needs. This first element of ownership holds when people take part in articulating what needs to be done and how resources should be distributed. The second dimension is related to the participation in the production of desired outcomes. People that spend time, effort and other resources for a project expect to obtain benefits from their contributions. Obtaining benefits refers to actually receiving a share of the outcomes, which characterizes the third component of ownership. The final dimension is associated with the right of alienation. It indicates that full ownership also implies to participate in decisions about the time of continuation and eventual end of joint projects.

The 4th dimension of ownership is especially important because it is related to sustainability. Projects may be regarded sustainable when they continue even after funding ends. However, sustainability should not be about the projects themselves. Projects have limited time horizons and certain activities might become less important at some point in time. Instead, a project should enhance the ability of the people involved to sustain progress beyond the lifetime of the project (Gibson et al., 2005, p.11). While designing a project, therefore, it is crucial to focus on the expected situation at the end of its duration.

Knowledge about the preferences, needs and problems of the people involved is crucial. In order to gain access to that knowledge, active ownership of the people involved is critical, as they possess the information needed. Successful institutional change with involvement of external actors thus requires the participation of beneficiaries in all dimensions of ownership (Gibson et al., 2005, p.18).

4.2 Collective Action Problems in Development Cooperation

To comprehend the incentives in development cooperation, it is important to know the collective action problems that the people involved have to deal with. Incentives that

undermine cooperation among individuals can result from motivation and information problems. Motivation problems include CPR problems, public good problems, the Samaritan's dilemma and asymmetric power. Asymmetric or missing information about actions and characteristics of individuals exemplify the second type of problems that hinders cooperation. Principal agent problems, moral hazard and signaling problems all occur because of limited information (Gibson et al., 2005, pp.35, 41).

People commonly do not face only one particular problem, however. Collective action situation can turn into collective action problems for various reasons. The problems described below provide examples of different aspects hindering collective action. It is possible that some of these problems occur or are at least addressed in some form in many collective action situations. Development cooperation can be characterized by situations that include aspects of both motivational and informational problems (Gibson et al., 2005, p.41).

4.2.1 Motivational problems

One reason for individuals not to contribute to joint benefits is inadequate motivation. The following phenomena are frequently characterized by incentives that hamper motivation.

Public goods

Four types of goods were classified according to excludability and rivalry in section 2.1. As described in section 2.2, individuals face incentives to free ride the creation and provision of public goods. However, people are often able to create institutional arrangements that limit incentives that would undermine the creation and provision of public goods. It is possible to overcome first - and second order collective dilemmas. This is outlined in chapter 3.

In the context of development cooperation, donors often fund projects that provide public goods. This, however, can produce situations, in which the public goods are not sustainable. A project to develop capacities in the Ministry of Environment of a given country with the aim to demarcate national parks, for example, can induce the resistance of local villagers which use the area for farming or hunting. Donors have to be careful not to generate incentives for the local community to remain passive or object the project (Gibson et al., 2005, p.37).

CPR Problems

CPRs and have been outlined in chapter section 2.2. Resource users also face temptations to free ride creation and provision of CPRs. Policies related to CPRs were long based on the

alleged helplessness of the resource users (section 2.3). These policies often failed to take into account the importance of the institutions that generate incentives for certain behavior.

Motivation to overcome CPR problems also depends on the vitality of the community. In the case of small-scale fisheries, for example, the vitality of the community is essential for viable fish stocks. Resource users can represent a threat to a CPR if they are indifferent about the community and the sustainability of resources. In such communities, fishers might lose their ability to solve collective action problems, because they do not communicate and cooperate with each other. Therefore, a small-scale fishery does not only depend on the well-being of the resources, but also on the well-being of the community. In this view, fishers are viewed as mutually dependent, possibly supportive of each other and part of a social group with common culture and history (Berkes et al., 2001, p.182f.).

Communities should not be romanticized, though. Usually, both cooperation and competition occurs. People are also individually different, with some being more cooperative, some less. Communities are neither homogenic entities, nor do they consist of utility maximizing egoistic individuals only. Such an understanding calls for a different perception of adequate small-scale CPR management. Sustainable management of CPRs is dependent on working rules *and* a vital community (Berkes et al., 2001, p.185f.).

If external actors take part in the establishment of new rules governing a CPR, they need to carefully consider local institutions and try to build on them, rather then impose new rules from scratch. As Ostrom (1990) showed, CPR governance developed by the resource users themselves can provide sustainable CPRs, because it is in accordance with local institutions. Self-organization is no easy task, however. It is thus essential to find out how the ability of communities to solve collective action problems can be strengthened. This will be outlined at the end of this chapter.

Samaritan's Dilemma

The Samaritan's Dilemma illustrates another situation in which inadequate motivation hinders development. Buchanan (1977) uses the parable of the Good Samaritan to examine problems of development. In his example, there are two actors: A, the Samaritan, and B, the recipient. A is an altruistic person that is willing to help B. B, on the other hand, chooses between making high or low effort to solve the problem.

Figure 9. The Samaritan's dilemma

		Recipient (B)	
		High effort	Low effort
Samaritan (A)	No help	2, 2	1, 1
	Help	4, 3	3, 4

Source: (Raschky & Schwindt, 2009, p.4)

As can bee seen in figure 9, A has clear preferences to help B. Once B knows that A's dominant strategy is to help, B will strategically choose low effort as dominant strategy. Hence (3, 4) will be the Nash equilibrium (Raschky & Schwindt, 2009, p.4).

Even if helping B is not the dominant strategy of A, the outcome will be the same. Figure 10 illustrates this slightly different situation, known as the passive Samaritan's Dilemma. Here, A's preferences are different. A prefers not to help B if B puts in high effort.

Figure 10. The passive Samaritan's dilemma

		Recipient (B)	
		High effort	Low effort
Samaritan (A)	No help	4, 2	1, 1
	Help	2, 3	3, 4

Source: (Raschky & Schwindt, 2009, p.4)

In other words, the Samaritan might choose to help only recipients that are really bad off. The two possible outcomes of the passive Samaritan's Dilemma are (4, 2) and (3, 4). If B behaves in a strategic manner, however, the equilibrium will still end up in (3,4) (Raschky & Schwindt, 2009, p.4).

Both situations have in common that the Samaritan is committed to help. Once the recipient knows that, he will choose low effort to gain the most out of the situation. In a way the Samaritan's commitment to help the recipient if he is in need serves as a tax on the recipients effort. For every bit of effort that the recipient makes today, the Samaritan will provide an according bit of help less (Lagerlöf, 2004, p.2). The Samaritan's commitment can therefore create an incentive for the recipient to make less of an effort.

Poor outcomes in development projects can partly be explained with the Samaritan's dilemma. In repeated situations recipients may even loose skills and motivation in the long run. Solutions to motivational problems that resemble the Samaritan's Dilemma would be

certain conditions on development aid. For example, ownership and participation can lead to higher efforts by the recipient (Gibson et al., 2005, p.38).

Asymmetric power relations

While public good and CPR problems are often anticipated to have equally distributed power relations, this does not hold true in reality. Asymmetric power relations frequently shape communities, governments and development agencies. Unequal distribution of power can hinder solutions to collective action problems. In CPR systems power can be related to location and/or the hierarchical structure of society.

In irrigations systems, resource users that are located upstream may have greater power over the water (the resource unit) than the people further downstream. People located downstream may have considerable bargaining power if the irrigation system needs maintenance work to be done by all resource users. Donors that fund construction or maintenance of irrigation systems have to be very careful not to lessen such power, if they do not want upstream users to behave fully egoistic (Gibson et al., 2005, p.40). Elites with greater political or economical power often make sure that the CPR governance system transfers an unequally big share of the resource units to them. If, in such a situation, institutional change could enhance the productivity of a CPR for most while bringing about diminished benefits for the elites, one can expect them to resist the process. Privileged groups, on the other hand, might be willing to invest more heavily in solutions, when they expect to benefit more from them. Solutions to collective action problems sometimes require some kind of leadership, such as in the form of entrepreneurs who are more eager then others to take initiative and invest in new rules (Gibson et al., 2005, p.40f., also see section 3.1).

Nevertheless, collective action problems can be solved more easily in the long run, if most of the people affected by the rules can take part in changing them (design principle 3). Societies with open access to political participation are arguably more efficient in producing solutions to challenges. Such open access provides a basis for competition in solution finding and reduces the danger of rent seeking by elites (North et al., 2009). In addition, because solution finding always depends on costs and benefits, it is more likely to successfully solve collective action problems if conflict resolution can take place at low costs (design principle 6).

4.2.2 Informational problems

After the discussion of various motivational problems that can hamper collective action, informational problems will now be in focus. While models commonly assume perfect

information, collective action problems often occur due to missing and asymmetric information. One of the reasons why institutions are so crucial is the fact that people face limited information (see section 2.3). The discussion in chapter 3 demonstrated that information has a fundamental impact on decision-making and institutional change. As illustrated in figure 2, all the variables that affect evaluation of institutional choice depend on the available information. In this section, typical situations in which people face problems related to limited information will be discussed.

Missing Information and local knowledge

Solutions to Public good and CPR problems require knowledge of the particular circumstances. Design principle 3 (section 2.5.3) points out the importance of local knowledge[19] to enable successful CPR governance. In the context of fisheries management, for example, approaches that incorporate local knowledge are commonly applied at community level, where larger technocratic management systems do not exist. In addition to augmenting information, incorporation of local knowledge also involves fishermen and strengthens their role in the process. The use of local knowledge in management enhances participation and ownership (Martin et al., 2007, p.227). While local knowledge is helpful because it makes use of the specific and particular context based on experience of the resource users, scientific knowledge is critical for many aspects including discussions about the impact of certain harvesting methods, monitoring and assessment of the environment, and infrastructure building (Gibson et al., 2005, p.42).

It is difficult and costly to incorporate both local and scientific knowledge in a functioning system of CPR governance, however. Local knowledge cannot easily be abstracted from local contexts. In addition, it can be hard to incorporate local knowledge into verifiable and publicly reviewable data. Communication between scientists and local people is often asymmetric (Martin et al., 2007, p.230f.). Nevertheless, combining both types of knowledge can increase sustainability in the long run, not least because of increased legitimacy of governance, based on the enhanced ownership of local stakeholders.

[19] People that live and work in a CPR system for a considerable amount of time are likely to acquire valuable local knowledge. An experienced fisher that has been fishing in the same area for a long time will know where and when it is best to fish, and what methods to use. Local knowledge, being generated and maintained through interactions within local contexts, is qualitative to a large extent. It is applied specifically and holds true in particular places. In comparison to verifiable scientific knowledge, therefore, local knowledge is difficult to acquire and use in a systematic manner. Nonetheless, sustainability of CPRs enhances through usage of both scientific and local knowledge. Different sources and sorts of knowledge broaden the availability and diversity of information (Martin et al., 2007, p.226f.).

In addition to problems with different forms of knowledge, people also face problems of asymmetric Information. Asymmetric information occurs in situations in which individuals interact without having full knowledge about other people's actions and characteristics, respectively (Gibson et al., 2005, p.42).

Principal - agent problems

Principal – agent relationships are examples of problems related to asymmetric information about people's actions. In situations that are characterized by one person, the agent, working for another person, the principal, asymmetric information can lead to suboptimal outcomes. If agent and principal do not have the same goals, the agent will not be motivated to work in the principal's best interest. The principal, on the other hand, doesn't have full information about the agent's actions. In companies, the workers (the agents) from lower hierarchical levels will rather pass information beneficial to them to the upper levels. This leaves the principals with biased and limited information. Companies commonly try to mitigate principal - agent problems by designing institutions that align individual and company goals. Special contracts with bonuses, commissions and promotions or even stock options change the incentives for workers (Gibson et al., 2005, p.43f.).

In the development sector, designing such institutions is challenging. Principle – agent problems occur at all levels of development cooperation. Donor governments don't have complete information about the actions of the development agencies they pay to implement projects. Within development agencies there are similar problems to the ones illustrated with respect to companies. Public employees in recipient countries often receive low wages but long-term contracts; a situation that generates incentives for moral hazard. In such a situation, the objectives of public employees don't necessarily coincide with their principals. Because public employees may devote their time to gaining private returns, their work might become suboptimal (Gibson et al., 2005, p.44).

Moral Hazard

Another situation that is characterized by asymmetric information about people's actions is moral hazard. In general, the problem occurs when one party doesn't have to bear the full consequences of its actions. This generates an incentive to be less careful. In development cooperation, financial support can produce incentives to delay efforts to change social dilemmas. The availability of financial support, for example, 'insures' responsible governments from the results of bad or delayed reforms (Gibson et al., 2005, p.42f.).

Asymmetric Information about characteristics

Not only people's actions matter, also their characteristics do. Different people act differently in specific situations. With respect to solving collective action problems, therefore, it is important to know the characteristics of the people involved. Two types of problems are related to asymmetric information about characteristics; adverse selection and signaling problems (Gibson et al., 2005, p.44f.).

Adverse selection and signaling problems

While individuals commonly know their own characteristics, others don't necessarily have access to that information. It is very important for an insurance company, for example, to have information about accident probabilities of particular customers (Rothschild & Stiglitz, 1976). Customers with a low rate of accidents don't want to pay for high insurance costs. If they opt out of an insurance system because they don't assume it to be worth the prize, the insurance company will have to raise insurance costs for the remaining pool of customers in order to compensate for the higher risk. The increased prize could lead others to opt out because now they become the ones that don't want to pay such a high prize for an insurance they don't need so often. Adverse selection problems generate incentives that are difficult to solve for private markets.

Development cooperation also faces adverse selection problems. People rather pass along the information about their characteristics that serves their interests (Aerni, 2005, p.29). Situations in which adverse selection hampers development can occur all along the development chain. In competitive markets, companies prevent adverse selection problems to some extend through screening and testing procedures. In the context of development cooperation this can proof more difficult, especially if the respective principals don't exactly know how excellence is signaled in other cultures (Gibson et al., 2005, p.45).

This section dealt with various forms of problems that can hamper collective action. Motivational problems are related to the nature of goods, the development process and power relations. Another type of problems is connected to different knowledge types and asymmetric information about actions and characteristics of people. Development actors should carefully analyze what collective action problems people face in particular situations. The incentives that people face differ significantly among the motivational and informational problems that have been discussed.

4.3 Solutions to Collective Action Problems

In places where the formal rules differ considerably from the *de facto* rules, the institutions that provide solutions to problems are often more informal. Many activities are undertaken by relying on informal networks, families, kin, and friends. Motivational and informational problems can, especially on smaller scales, often be addressed with the reciprocity and trust built in social networks. For anyone involved in development on small scales, therefore, it is crucial to understand both the various forms of collective action problems and the impact external actors can have on local institutions and group behavior (Gibson et al p 46f.). The next section will deal with the process of enhancing the ability of communities to deal with collective action problems in the context of small-scale fisheries.

4.3.1 Capacity and institution building

The last chapters outlined that successful collective action and self-organization is possible but challenging in various aspects. For many reasons, communities can lack the ability to create their own rules and regulate themselves. How can the ability of communities to solve collective action problems be enhanced? In the context of coastal resource management, community based institutional capacity building is known to be a fundamental factor (Berkes et al., 2001, p.186). When people in a community are not organized above the household level and have no experience in collective action, it may be difficult for them to self-organize and solve problems. In such a situation, capacity building might be needed.

According to UNDP, capacity development - how capacity building is also referred to today[20] - is defined "as the process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time." (UNDP - United Nations Development Programme, 2009, p.4)

Capacity building emphasizes that the institutional setting, related policies and stakeholder participation have to be considered in order to enhance the abilites of people. Institution building can be seen as a part of capacity building. Often, the consequences of a centralized resource regime have to be addressed and reversed (Berkes et al., 2001, p.187). Chapter 5 will provide a example for the loss of local institutions due to colonization and state centered management.

[20] UNDP has renamed the term, because contrary to capacity *development*, capacity *building* would only refer to the initial phase of the creation of capacities. According UNDP, capacity building also implicitly assumes that there wouldn't be any capacities to start from. Therefore, it would be less comprehensive than capacity development (UNDP et al., 2009, p.3). By including the elements used by Berkes et al. (2001), however, capacity building can be regarded as sufficiently comprehensive, which is why their definition will be used.

Berkes et al. (p. 187f.) mention 4 major elements of capacity building: (1) Improve the knowledge base to facilitate better decision-making, (2) develop better policies and strategies, (3) enhance management practices and techniques, and (4) reform institutions. To improve the knowledge base both scientific research and traditional knowledge have to be supported. Legislation and policies must be (re)formed and awareness of sustainable management raised. Staff must be trained to adapt to participatory decision-making. Partnerships that involve important stakeholders must be created and strengthened to address activities that influence the marine environment. In a review of a similar case of capacity building in the Philippines, Berkes et al. (2001, p.190f) found that the process of institutional development from the beginning of community organizing to the working community based management system took about 10 years. This demonstrates that capacity and institution building are comprehensive long-term processes. Capacity building is not about enhancing specific management functions. Its focus lies on the general capability to solve problems (Berkes et al., 2001, p.187). For that reason, capacity building can take different forms, depending on the specific needs of particular circumstances. The history of Apo Island's fishery management system (chapter 5) will provide an example of an ample process of capacity building.

Chapter 3 showed that institutional change is a process that depends on a cost benefit analysis of the people involved. If the costs are too high and the benefits too low for institutional change to happen, capacity building might help by addressing the factors that influence the cost benefit analysis in a way that reduces costs and increases benefits for the majority of the people. Thereby, any external actor has to be careful not to generate incentives that lead to underinvestment by local stakeholders. Chapter 5 will provide an example of successful capacity building.

The last chapter outlined the influence of external actors on local institutional settings. After clarifying key concepts, the importance of institutions in the development context was highlighted. Ownership and participation were found to be crucial for successful institutional change. Subsequently, collective action problems and possible ways to tackle them were discussed. Capacity building represents a fundamental way to address and enhance the ability of people to solve collective action problems.

The design principles (chapter 2) outline the elements needed for sustainable CPR governance. In addition, comanagement describes resource governance that involves a sharing of power and responsibility between the community and external actors. For institutional change of CPR governance arrangements to be successful and enduring, the rules that change

the status quo must be in accordance with the local circumstances, as they have to work for particular resources in a particular setting. The resource users frequently possess valuable knowledge about the specific situation. It is therefore important that they take part in crafting the rules. The framework to analyze institutional change (chapter 3) demonstrates how societies change their institutional arrangements; it can be used to study how sustainable CPR governance might be initialized. If the resource users are trapped in a social dilemma that prevents them from changing the rules, however, external actors can be crucial to alter the situation. In such a situation, it is critical to analyze the underlying collective action problems that hinder solution finding. Chapter 4 dealt with collective action problems both generally and in the context of development cooperation. In the next chapter, the process of institutional change at Apo Island will be analyzed.

5. Case Study: Fishery Management at Apo Island

In this chapter, both the design principles and the framework for institutional change will be used to analyze the establishment and change of fishery governance at Apo Island. In addition, the findings of chapter 3 and 4 will be used to understand, how the collective action problems that the islanders faced were tackled. As will be shown, external actors played a significant role both in initializing institutional change and in strengthening the established governance system. After a brief overview of the Philippine fisheries and important institutional developments in the country, the institutional change that brought about a sustainable fishery at Apo Island will be examined. Then, it will be assessed to what extend the rules in place where consistent with the design principles. Subsequently, the process of institutional change will be highlighted making use of the framework presented in chapter 3 and the discussion of external input in chapter 4. Assessing the sustainability of Apo Island's fishery will constitute the concluding part of this chapter.

5.1 The Philippine Marine Fisheries

The Philippines consists of 7,117 islands[21] with a total coastline of about 36,289 km. Over 60% of the population lives in coastal areas, with the fishing industry being an important source of income and nutrition. The people living in coastal communities that depend directly on marine and coastal resources are among the poorest in the country (The Nature Conservancy et al., 2008, p.23). Philippine fisheries are overexploited and catch rates decline. The fishing industry suffers from overcapacity and lack of management (White et al., 2002, p.2f.). In the last 30 years, the national legal framework has undergone considerable change, with local government units (LGUs) receiving a larger share of responsibility.

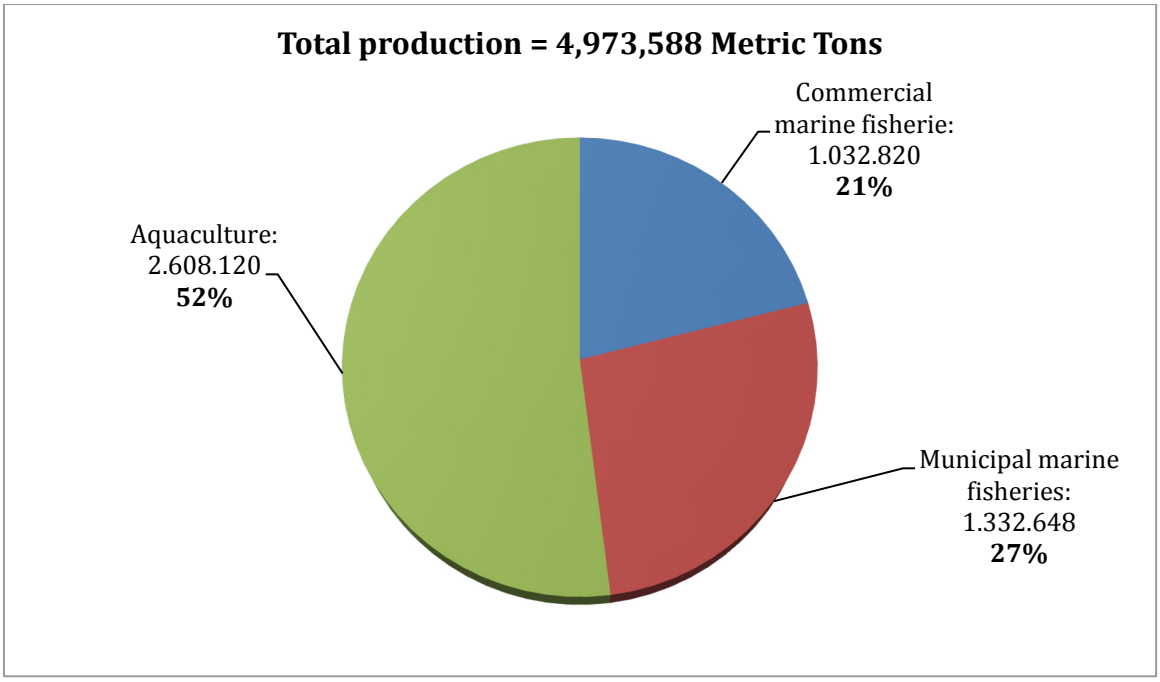
5.1.1 Overview

Marine fisheries are characterized by "the extraction of wild living resources in coastal and open seas in the service of human needs or markets" (Luna et al., 2004, p.3). In the Philippines they can be divided into large-scale or commercial fisheries and small-scale or municipal fisheries. Municipal fishing is defined as fishing without use of vessels or with vessels up to 3 gross tons (GT); fishing with vessels above 3 GT is considered commercial fishing. Commercial fishing is restricted to areas beyond the border of municipal waters, which is 15 km from the shoreline (Luna et al., 2004, p.3).

[21] At low tide.

The Philippines is among the major fish producers of the world. Total fisheries production reached 4,973,488 metric tons (MT) in 2011. Aquaculture accounted for 52.4%, municipal fisheries for 26.8% and the commercial sector for 20.8% (figure 10). In the same year, the fishery industry contributed about 2%[22] to the GDP. In addition, it generated a net trade surplus of 654 million dollars (DA-BFAR, 2011). A total of 1,614,368 fishing operators work in the Philippine fishing industry. With 1,371,676 operators the large majority is working in the municipal sector, followed by the aquaculture (226,195) and the commercial sector (16,497) (figure 11).

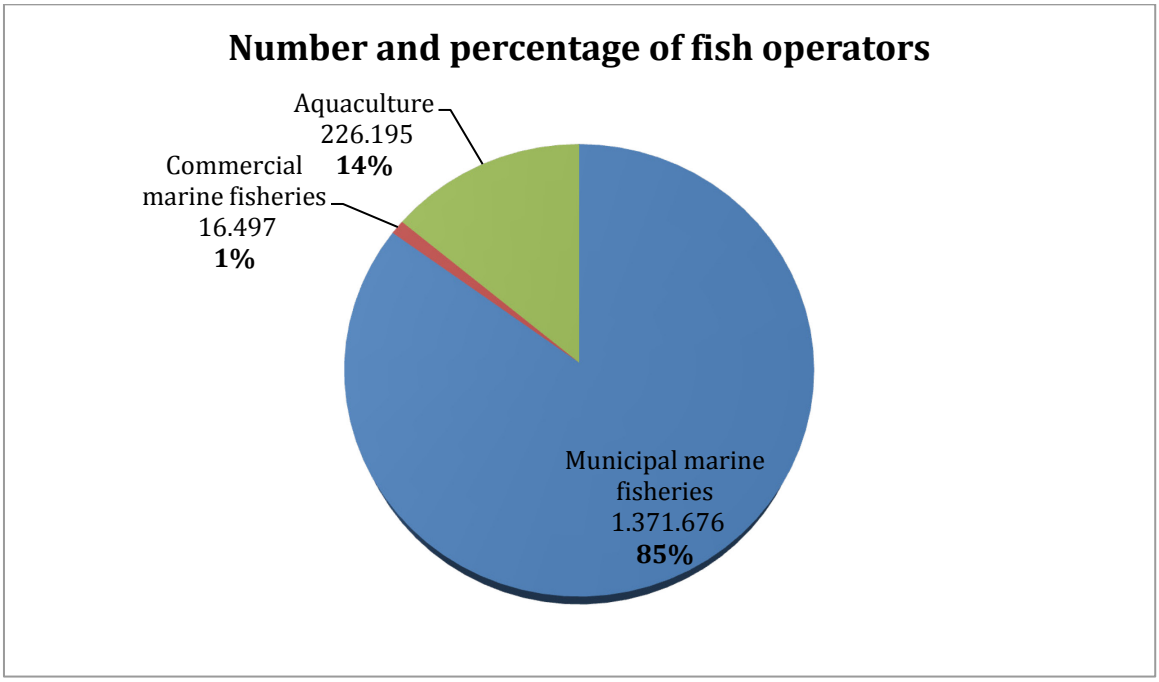
Figure 11. Total fish production, by sector, 2011



Source: Da –BFAR (2011, p.54)

[22] 1.9% at current prices and 2.2% at constant (2000) prices.

Figure 12. Employment in the fishing industry

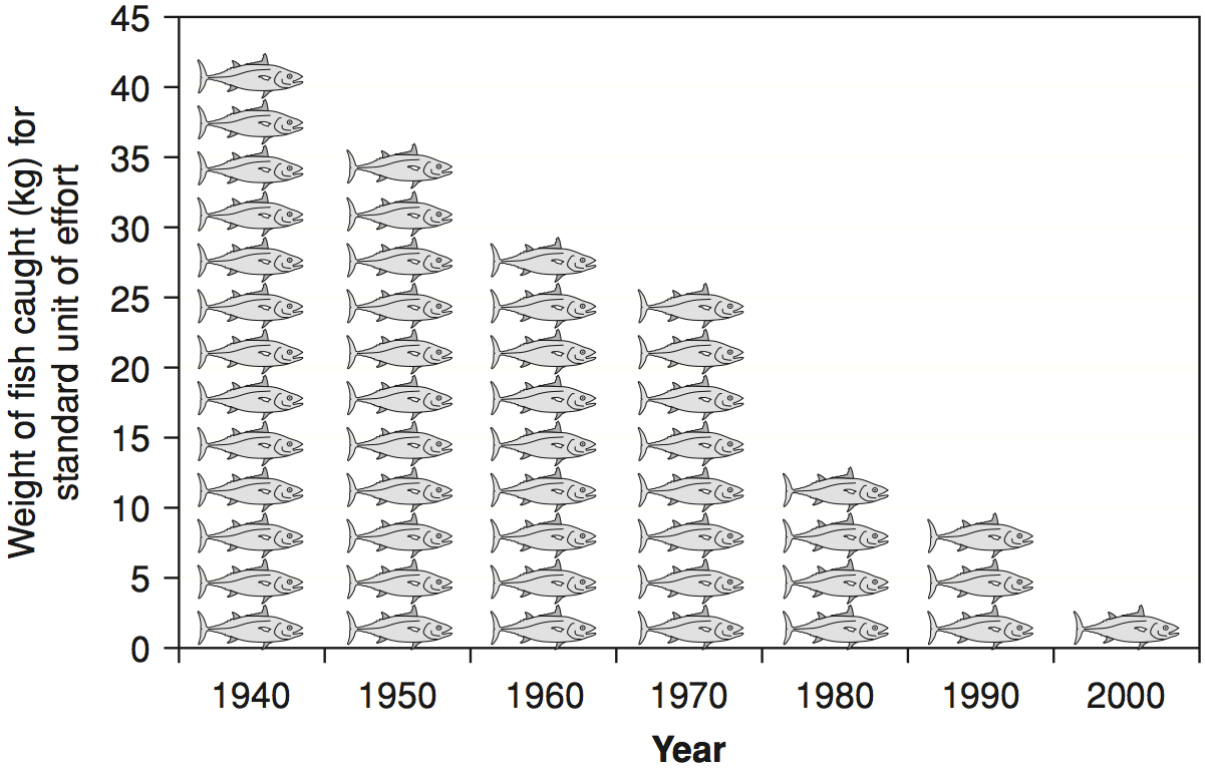


Source: Da-BFAR (2011, p.9)

The municipal fisheries sector has suffered greatly of destructive fishing practices and overfishing. The consequences are increasing resource conflicts, poverty and the degradation of costal areas. CPUE[23] analyses of hook-and-line fishing revealed that catch decreased dramatically (figure 13), when measured in standard units of effort. This dramatically affects the largest workforce in the sector (figure 12).

[23] Catch per unit effort

Figure 13. Average CPUE since 1940s for fishers using hook-and-line from six provinces in the Philippines



Source: Green et al. (2003, p.10)

Another good indicator for the status of fisheries is the condition of coral reefs. In the Philippines, these key ecosystems of the sea are under intense pressure through human activities. According to a recent assessment, less than 1% of coral reefs are in excellent condition[24], 6% in good condition[25], 53% in fair condition[26], and 41% in poor condition[27] (Nañola et al., 2004, p.1056). Green et al. (2003, p.13) summarized the major critical issues affecting Philippine fisheries:

- Open access
- Overfishing and excessive fishing pressure
- Lack of management
- Inappropriate exploitation patterns
- Post harvest losses
- Small and large-scale fisheries conflicts
- Habitat degradation

[24] (> 75% live coral cover (LCC))
[25] (51-75% LCC)
[26] (26-50% LCC),
[27] (< 25% LCC)

- Lack of research and information
- Inadequacy of technical/human resource capabilities particularly among managers and concerned agencies to analyze fisheries.

These issues show that fisheries regulation and management needs to be improved. To understand the current institutional context of fishery management, it is necessary to examine the development of Philippine fisheries.

5.1.2 History

Before the colonization from the Spanish Empire in the 17th century, the *Barangay*, the smallest governmental unit of the country[28], regulated and controlled fisheries throughout the territory, which is today known as the Philippines. During the colonial period the traditional governance system was abolished, and community authority was replaced by centralized state control. Natural resources fell under the control of the crown, and *Barangays* ceased to exist as official administrative entities. Subsequently, municipal governments took over control of local fisheries.

The Spanish colonial administration, however, did not show much interest in the regulation of the Philippine marine resources. Fishery development was promoted to some extend under the Americans, who took over political control in 1898 (Alcala, 2001, p.3). After World War 2, the Philippines declared independency in 1946. Struggling to build its economy, the country also invested heavily in its fisheries. Commercial fishing vessels grew in number and from the 1960s on, the Philippine government undertook intensive infrastructure programs to further develop its fishing industry (Pomeroy & Carlos, 1997, p.446f.).

Population growth intensified the pressure on fishing as a major supply of nutrition and the use of unsustainable and destructive fishing methods began to reach dramatic levels. Dynamite fishing started with leftovers of explosives from the World War and was increasingly used from the 1960s on. Cyanide fishing was originally introduced for aquarium fish trade but soon became popular in normal fish trade too (Marten, 2005). Another popular but destructive method was muro-ami fishing, which involves beating on corals to scare fish and drive them out into waiting nets (Olivier, 2007, p.105f.).

In the 1970s, government control was further tightened as Ferdinand Marcos ruled the country under martial law. Fisheries regulation was centralized through the Fisheries Decree

[28] A *Barangay* is equivalent to a village.

of 1975. The Fisheries Decree encouraged maximal growth and exploitation of fisheries (DENR et al., 2001a, p.5). Because unit catch of small-scale fishers was decreasing, the government invested in programs aiming at increased efficiency. While the number of commercial fishing vessels and municipal fishermen continued to increase, as did aquaculture production, the output of fishery production stayed relatively stable (Pomeroy & Carlos, 1997, p.448).

As a result fishery decline, marine habitat destruction, and poverty in coastal areas worsened and scientists found that the coral reefs of the entire archipelago were in bad condition. Reef fisheries showed signs of depletion mainly due to overfishing and habitat destruction. It became apparent that management and regulation methods of the central government were inappropriate to face the challenges of Philippine fisheries (Alcala, 2001, p.7). The Philippines give a good example of the problems that state managed property regimes can face. Due to limited budgets, insufficient capabilities and a lack of enforcement the state couldn't adequately address the two characteristics of the CPR, low excludability and high rivalry. The top-down, non-participatory policies had resulted in increased depletion of natural resources. In order to enhance protection and management of coastal resources, alternative ways of resource management were considered. Non-governmental organizations (NGOs) and academic institutions started to experiment with community based resource management approaches (Ferrer et al., 2004).

Furthermore, a jurisdictional transition of powers from national to local responsibility took place and management authority was devolved from central to local governments. Officials started to understand that the government simply didn't have the capacities to ensure that its regulations were monitored and enforced. It was recognized that effective management depends on the people who use coastal resources on a daily basis (Alcala & Vandel Vusse, 1994, p.14). The 1987 Philippine Constitution embodied first important regulations for local autonomy. It provides general guidance for the use, regulation and conservation of natural resources and coastal management. The Local Governance Code (LGC) of 1991 (Republic Act 7160) provided municipalities with more powers over their waters. Local governments were given the authority to exclusively manage their coastal resources up to 15 km offshore. In addition, they were entitled to establish municipal fish sanctuaries and marine reserves through municipal ordinance (White et al., 2000, p.10; Eisma-Osorio et al., 2009, p.294). The Philippine Fisheries Code of 1998 (Republic Act 8550) reaffirmed and further strengthened the role of municipalities in managing and conserving their coastal resources. The code thereby also increased the responsibilities of municipalities

in management. It obligated the authorities of LGUs to limit access through closed seasons, prohibitions of certain fishing activities and provided a framework to plan the establishment and management of marine protected areas (MPAs) (White et al., 2002, p.10f.).

In 1992, the National Integrated Protected Area System (NIPAS) act provided ground for MPAs that are not exclusively ruled by the community. The NIPAS Act was enacted to help the government identify areas of water and land that classify as MPAs. All sanctuaries established before 1992 were automatically incorporated into the act. Once under the NIPAS legislation, those sanctuaries underwent a change of their management structures (DENR et al., 2001a, p.21f.).

One of the earliest MPAs of the Philippines was the marine reserve at Apo Island. In the following section, its management history from 1979 - 1994 will be assessed. The efforts of the small island community to change the set of rules governing its marine resources in order to enable a sustainable use of its fisheries will be traced. Beginning in the early 1980s the community successfully created and enforced a set of rules that prevented the destruction of its surrounding coral reef and limited fishing to a degree that ensured sustainable yield rates.

In 1994, Apo Island was declared a *protected landscape and seascape* under the NIPAS Act. This led to vast changes of the Islands fishery governance system, which will be examined in section 5.6.

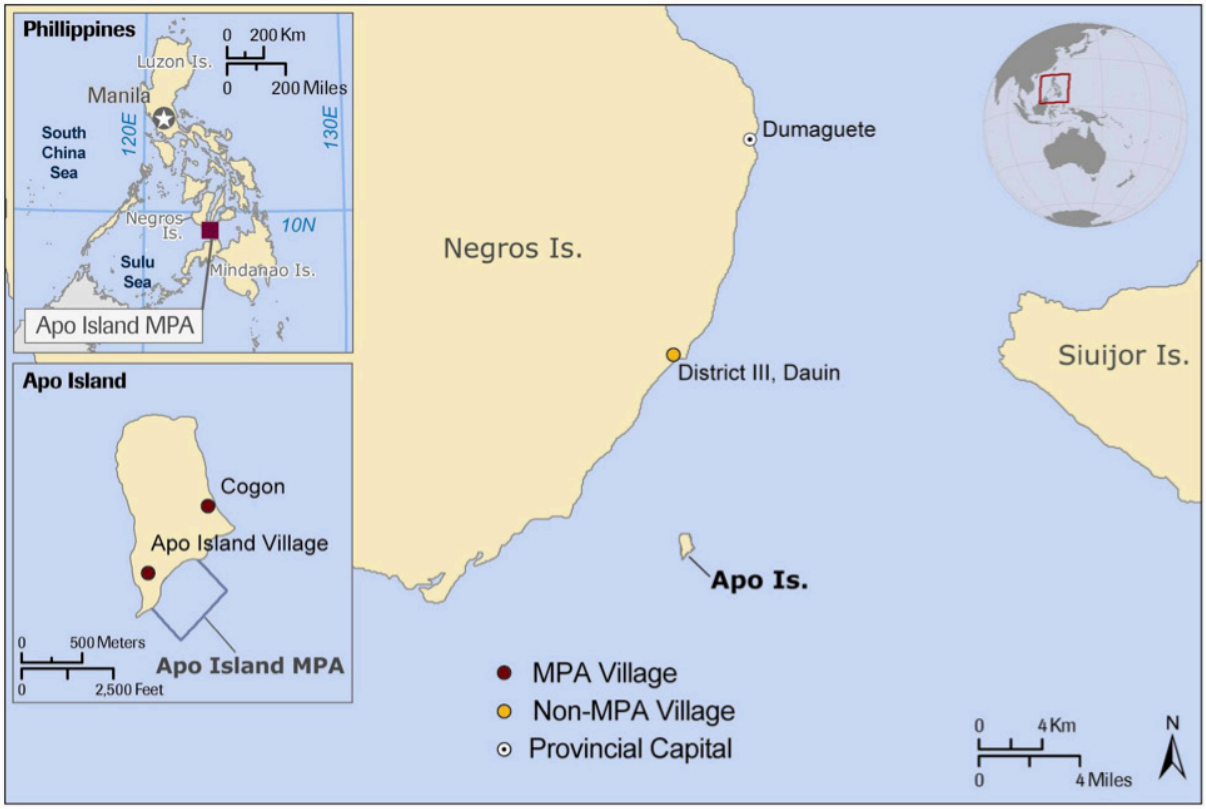
5.2 Apo Island: site description

Apo Island is located in Central Visayas, Philippines, southeast of Negros Island (see figure 6). It is a small and rocky volcanic Island of 72 ha surrounded by a 106 ha coral reef. The 5 major sand beaches are situated on the southwest and southeast sides of the island. Fringing reefs[29] surrounding the island provide extensive and diverse coral cover.

The community of Apo Island is under the jurisdiction of the municipality of Dauin, situated at nearby Negros Island. Politically, the island is a *Barangay* of Dauin, with its own *Barangay* captain and council. The captain dominates the community hierarchy (Alcala & Russ, 2003; Olivier, 2007; White, 1984).

[29] Fringing reefs consist of reefs close to shore that prevent erosion of coastal areas and support fauna that small-scale fishermen can access and exploit (Kennedy, 2002; White & Cabanban, 1981, p.317).

Figure 14. Apo Island, Philippines



Source: (Leisher et al., 2007, p.22)

5.2.1 Setting before the marine reserve

In the late 1970s Apo Island had about 600 residents, most of which had immigrated within the last 20 years (White & Cabanban, 1981, p.318). As a result of high birth rates and immigration the population had been growing steadily. Apart from fishing the islanders cultivated coconut trees, corn, sweet potatoes, cassava and raised cattle.

Fishing, however, was by far the most important economic activity. Fishing took place during the whole year, was undertaken at different times of the day and the produce was sold fresh and dry. The 80 - 100 local fishermen used *bancas* - small locally built outrigger boats. Fishing methods included baited hand lines, bamboo traps, gill nets and spear guns. Muro-ami and blast fishing (section 5.1.2), both highly destructive to coral reef, also occurred. Two thirds of the reef around Apo was still in relatively good condition, but the marine environment seemed to be disturbed. Population increase and increased reef utilization, combined with overfishing and destructive fishing practices had led to a decline in reef quality (White & Cabanban, 1981, p.318; White, 1984, pp.64f., 71).

While the number of fishermen increased and fishermen spent more time fishing, catch per effort decreased. The decreasing resource abundance was ascribed to population growth, dependence on fishing and lack of economic alternatives (White, 1984, p.71).

5.2.2 Logic of the game

Overfishing and destruction of marine habitat was the logical consequence of this situation, which also reflected the national developments. All fishermen had an incentive to fish as much as would maximize their individual benefit. The late 1970s, therefore, were characterized by a *de facto* open access situation. No clear rules determining the number of people fishing, quantity of fish caught, or methods allowed, existed.

As catch per effort decreased and the number of fishermen increased, people had to increase their effort. Fishermen spent more time at sea going out to more remote areas utilizing more destructive fishing methods. Furthermore, people didn't know much about the condition of the maritime resources. Nobody monitored fish stocks or coral reefs, which brought about a general lack of information about the CPR condition.

This situation has a lot in common with Hardin's Tragedy of the Commons. Population pressure, individuals maximizing their benefits and an unregulated CPR caused a steady deterioration of the islands maritime resources. There was no collective action that offered substantial benefits for the fishermen of the island. Yet, Apo Island became a role model for successful community based fishery management. The islanders found solutions to the problems they faced and disengaged from the Tragedy of the Commons. The next part addresses the developments that led to this remarkable conversion.

5.3 Institutional Change: from open access to community based management.

Apo Island is situated approximately 25 km south of Dumaguete City, Negros, which is home to Silliman University (figure 14). Since the 1970s Apo Island was often visited by researches of the university, which studied marine habitats of the Island's surrounding coral reefs. The scientists took note of the destructive developments described above. Blast and muro-ami fishing and the use of fine mesh nets were considered especially problematic (White, 1989b, p.86). Interviews with older residents revealed that significant changes had taken place on the island. In 1979, the university initiated efforts to protect the marine environment in the area.

5.3.1 Initial conservation efforts of Silliman University

Starting from July 1979 University staff undertook a one year capacity building program that included marine conservation and education programs at Apo Island (White & Cabanban, 1981, p.318; White, 1984, p.66). Silliman University incorporated a marine reserve concept to propose conservation of natural coral communities. Marine reserves are often used interchangeably with MPAs and marine sanctuaries. In order to distinguish and clarify these three notions, they must be defined shortly.

MPAs are highly effective marine and coastal conservation tools. When working efficiently, they preserve habitats and important species (White et al., 2006, p.1). A marine protected area can be

> any specific marine area which has been reserved by law or other effective means and is governed by specific rules or guidelines to manage activities and protect part or the entire enclosed coastal and marine environment. (DENR et al., 2001b, p.65)

A Sanctuary, on the other hand, is

> an MPA where all extractive practices, such as fishing, shell collection, seaweed gleaning, and collecting of anything else is prohibited. It allows for control of other human activities, including access, in order to protect the ecosystem within the specific site. (DENR et al., 2001b, p.65)

Lastly, a reserve is defined as

> an MPA where strict sanctuary conditions are not mandated for the entire area yet there is still a desire to control access and activities, such as boating, mooring, and various fishing techniques. It allows for zones that include a sanctuary area. (DENR et al., 2001b, p.65)

The establishment of marine reserves is a difficult task, since sociological, economic and political factors influence its management and conservation is contingent on people's perceptions and attitudes towards the environment. Extensive educational campaigning is usually needed to convince local residents of the benefits of a marine reserve. In the case of Apo Island, therefore, Silliman University therefore launched the Apo Island Marine Conservation Program in order to raise environmental awareness of local residents and to establish of a marine reserve (White & Cabanban, 1981, p.317f.).

The university conducted the Marine Conservation Program using non-formal education with the goal to gain villagers support and commitment for marine conservation. Methods used included presentations, group discussions, face-to-face conversation and the use of charts to explain ecological concepts. Economic and ecological importance of natural marine communities was illustrated, and possible ways of degradation reduction were presented. After raising environmental awareness of the community, the concept of a marine reserve was

introduced. With the help of local leaders, environmental awareness could be raised to some degree. In order to avoid merely written paper agreements without real life effect, however, working directly with the residents was considered highly important. The University tried to raise awareness of the community members for a proper conservation concept. Data collection was done in a participatory way. Fishermen listed their daily catch for a period of 12 month. Collected data was then presented by Silliman University to the general assembly (Garcia, 2010, p.25; White & Cabanban, 1981).

Causes and effects of coral reef destruction through certain fishing practices were reported to be a delicate issue. Rather than blaming people for bad fishing practices, the university workers tried to show effects of the various practices and let the people decide for themselves. Initially, the community's perception of the marine environment deterioration was different to actual deterioration measured by the University. The fishermen had no information about the actual state of their resources and believed that the marine environment degradation was not severe. Perceptions were slowly changing due to the education campaign (Garcia, 2010, p.25; White & Cabanban, 1981).

The degree of acceptance of the proposed marine reserve was mixed not least because of different perceptions and wrong information. Some community members confused scuba fishing and spear fishing by tourists with a marine reserve plan (White & Cabanban, 1981, p.320). There were also rumors about islanders being thrown off the island at a similar project elsewhere (Olivier, 2007, p.106). To mitigate these concerns, Silliman University displayed the benefits fishermen received from the concept at the neighboring Sumilon Island marine reserve. The fact that Silliman University initiated the conservation program raised questions about the risks of management from outside institutions. Many islanders expressed the need for autonomy of management. Nevertheless, people worked together with Silliman University and offered support for conservation approaches (White, 1984, p.71).

Various management ideas were debated. Although fishing was traditionally allowed everywhere, a new feeling of territoriality emerged. This was due to the realization that decreasing fish stocks and the growing number of fishermen caused CPUE to decrease. Some local fishermen felt that fishing should be prohibited for non-residents. Others argued in favor of a prohibition of certain fishing methods like dynamite and muro-ami fishing and a protected reserve. Several fishermen saw a marine reserve as a possibility to legitimately prevent access to non-resident fishermen and stop dynamite fishing, which occurred occasionally. The Philippine Constabulary (PC) could patrol the protected area against poaching (White, 1984, p.73f.) .

Initial acceptance of the no-take area stemmed from a lack of alternatives to the problems of overfishing. The decline of catch and the impact of the educational efforts resulted in some people being willing to experiment with alternative rules. Ms. Liberty Pascobello Rhodes, the newly elected *Barangay* captain, knew Silliman University from meetings in the 1970s. She was well educated about the usefulness of conserving the marine habitat to ensure sustainable fishing. In 1982, she formally endorsed an agreement with the town of Dauin to implement a marine sanctuary. The *Barangay* council agreed to run the sanctuary for 2 years. Without apparent results, the community would revert to an open access regime afterwards (Asuncion, 1998; Garcia, 2010, p.24).

The community of Apo Island declared a roughly 500m long section – approximately 10% of the coral reef area - of the southeast side of the island a no-take sanctuary (Russ & Alcala, 1999, p.311). Inside this section, neither fishing nor collecting activities were allowed. The sanctuary site extended 500 meters from shore and had considerably well-preserved coral. One person watching the sanctuary from the beach was enough to monitor the no-take area. Members of the participating families took turns in guard duty. The women of Apo Island contributed a great deal to the development of organized collective action. They started to take turns in monitoring the no-take area. They would call the police and let them arrest poachers, that fished in the sanctuary (Asuncion, 1998; Marten, 2005, p.79). Guidelines for management were suggested by Silliman University and marker buoys designating the protected area were placed. According to the university, conservation efforts needed to be formulated following the needs of the local community. Ultimate control should be in the hands of the residents, legal instruments at the local level should be supported and – if required - enforced by national agencies (White, 1984, p.75).

Initially, the community had some knowledge about the sanctuary but occasional fishing inside the newly built boundaries continued. During the agreed two years slight protection and management took place. Yet, the rest of the island remained without legal protection. Degradation at the sanctuary area was lower than at the southwest reef in front of the village, where boat anchors, heavy fishing and occasional blast fishing destroyed the coral (White, 1989b, p.89; White, 1984, pp.66, 221). After the 2 years, increased fish yields and a 2% - 3% increase of hard coral cover convinced a larger part of the community to make the sanctuary permanent (Garcia, 2010, p.24).

However, with growing fishing pressure the sustainability of the reef was still not secured. The reserve management was weak and protection unstable. Community members still were not fully supportive of the sanctuary. Observing the management programs at

Sumilon Island and Apo Island, Russ (1984, p.46) argued that the problems of the conservation efforts in place had to do with incentives. The protective management programs would promise long-term gains but deny immediate benefits to the people affected.. In this view, successful management programs need to offer more immediate benefits. Russ thus suggested efficient and ecologically sound fishing methods and alternative sources of income to be included in the management efforts. Concerning the latter, reef-based tourism would serve as economic incentive to maintain a reserve.

5.3.2 The Marine Conservation and Development Program

In 1984 Silliman University implemented the Marine Conservation and Development Program (MCDP), financed by the United States Agency for International Development (USAID) through the Asia Foundation, with the goal to empower three island communities, in order to protect and improve their marine resources (Green et al., 2004, p.68). The MCDO included Apo Island. The basic idea behind the two-year program was that sustainable protection and management of maritime habitats needed a stronger commitment and involvement of those exploiting the resources. Consequently, the project took additional efforts to educate, organize and involve the community. During the first three months of the two-year project the field workers met with community leaders, introduced the project, and collected data. Subsequently, educational activities with a focus on marine ecology and resource management began. Emphasis was put on mostly non-formal methods like group discussions and the involvement of local people in the educational process (White, 1989a, p.120f.).

At the heart of the MCDP was the formation of marine management committees (MMC). Groups of enthusiastic people were involved in the various activities supported by the program (White, 1989a, p.121). These activities promoted communication and motivation among participants. For instance, a special work group was responsible for the construction of a community education center. The center was used for meetings and discussion, and eventually also rented out to tourists, for overnight stays. Community members that were particularly interested and motivated gradually formed the structure of a core group (White, 1989b, p.92). The core group was well interlinked with the existing political island structure. When the concept of the marine reserve for the entire reef around Apo Island was discussed, a group interested in its implementation formed a MMC (White & Vogt, 2000, p.139f.; White, 1989b, p.92). Island residents elected members of the MMC to take responsibility for the

management plan in 1985 (Garcia, 2010, p.21). The committee also took part in drafting a municipal ordinance, which would eventually become the legal base of the marine reserve.

As the sanctuary started to generate benefits for the residents of Apo Island a larger part of the community began to recognize the accomplishments of the MMC and gradually became supportive of the project. University staff trained committee members in guiding of scuba and snorkeling tourists, collecting user donations, and commencing alternative economic activities such as mat weaving (White, 1989b, p.92). The MMC gained additional respect by visitors that were excited about the reserve and the condition of the coral reef. The emerging marine reserve was also used as a training site for similar projects. Workshops were held with help of the MMC, which shared its experiences and knowledge with the trainees. In this way, formalizing and strengthening of the newly formed MMC took place (White & Vogt, 2000, p.539f.).

5.3.3 Marine reserve plan and municipal ordinance

In 1985, the community endorsed a marine reserve plan including the 500 meters sanctuary with its no-take area. The municipality of Dauin formally approved of the plan that asserted the entire reef up to 500 meters off the island a marine reserve. Objectives included:

- Stop fishing in the area by non-residents.
- Prevent destructive fishing methods around the Island and fishing within the no-take sanctuary.
- Provide an undisturbed breeding site for fish and allow build up of fish biomass in the sanctuary.
- Encourage tourism (Alcala, 2004, p.12).

Subsequently, a municipal ordinance (see Appendix 1) officially declared Apo Island a marine reserve on November 3, 1986 (Russ & Alcala, 1999, p.312). Rules governing the marine reserve and fish sanctuary were defined in the ordinance. Main points of the management plan were:

1. All fishing methods and other actions destructive to the coral reef habitat banned within the marine reserve. Prohibited methods include dynamite fishing, muro-ami fishing, spear fishing using scuba, use of cyanide or similar poisons and small mesh gill net fishing.
2. Inside the coral reef fish sanctuary - which also serves as a breeding area - no fishing or collecting is permitted.

3. The rest of the marine reserve is to be called a traditional fishing area. Methods allowed are hook-and-line, bamboo traps, gill nets, spear fishing without scuba, other types of netting, and traditional gleaning.
4. The MMC has responsibility to maintain the reserve and its sanctuary, with support from the BFAR[30], enforcement by the PC-INP[31] and advice from Silliman University. (Appendix 1)

Following the end of the MCDP, Silliman University withdrew from Apo Island, and the community started to manage the MPA of Apo Island, with governmental support by the local *Barangay* and the municipality of Dauin. The University remained an important actor at the Island, however. Until today it has continued to advise and assist the community. In addition, its on-going research about the marine environment around Apo Island has served as a source of information about the effectiveness of the island's CPR governance. This will be outlined further below.

Being the main authority, the MMC managed the marine reserve until Apo Island was placed under the NIPAS Act in 1994. The residents of Apo Island trusted the MMC to effectively manage the reserve (Alcala, 2004, p.12; White, 1989a, p.121f.). It held monthly meetings for discussion and formulation of policies. Policies had to be approved by the general assembly, which consists of all island residents.

While enforcement was the responsibility of the provincial police, volunteering residents continued to ensure day-to-day implementation in rotating shifts. Eventually the *Bantay Dagat*, an organization of volunteer fish wardens emerged and became the official enforcement team. The *Bantay Dagat* consists of community residents that patrol the waters of the marine reserve and monitor the behavior of fishermen and tourists. Gradually monitoring became less important, because of greater support and compliance by the community. Everyone would report people disrespecting the rules of the sanctuary (Asuncion, 1998; Garcia, 2010, p.22; Olivier, 2007, p.110).

[30] The Department of Agriculture – Bureau of Fisheries and Aquatic Resources (DA-BFAR) has jurisdiction over all fisheries and aquatic resources except those that belong to the municipalities. It formulates and enforces rules and regulations of fisheries conservation and management. In addition, it prepares and implements development plans, issues licenses and identification cards for commercial fishing, monitors fishing agreements, formulates research and development programs and provides extensive support and advisory services for fisheries in general. In municipal waters, it coordinates and assists LGUs, councils and other actors concerned in management activities (DENR et al., 2001a, p.49ff.; Green et al., 2004, p.70).

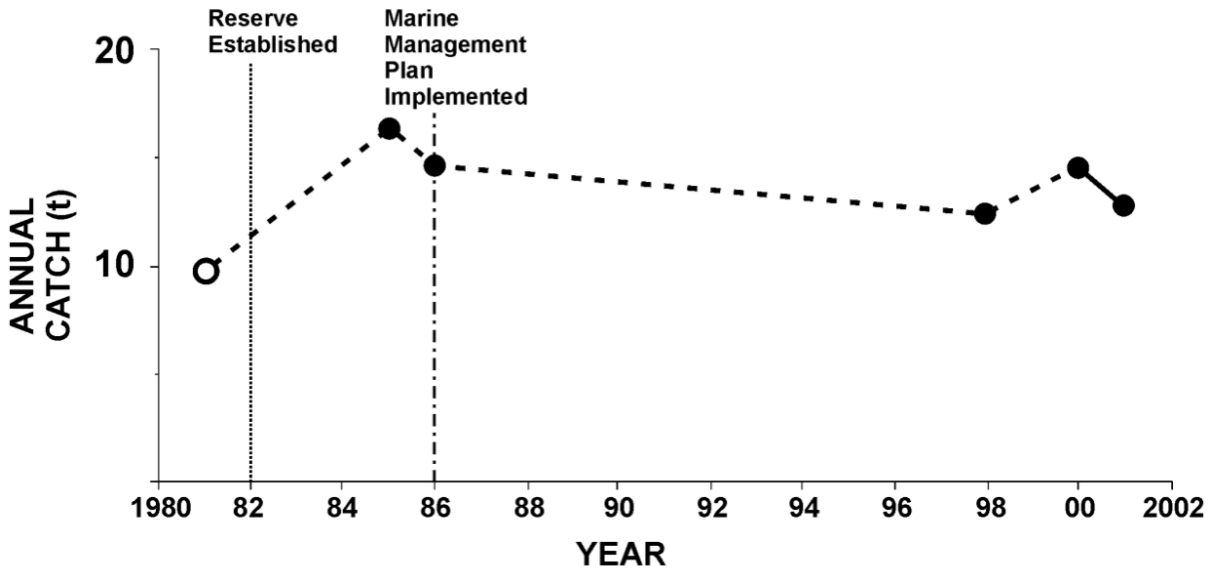
[31] PC-INP - Philippine Constabulary-Integrated National Police

Planning, constructing and operating activities further strengthened the community involvement in the reserve project. The center became an important venue for the community. Meetings and discussions of the MMC and other groups took place, and educational material was displayed for locals and visitors (Russ & Alcala, 1999, p.312; White & Vogt, 2000, p.541).

5.3.4 Performance of the new set of rules until the late 1990s[32]

Surveys, questionnaires and observations revealed strong local support for the reserve and its sanctuary and high levels of compliance with rules and regulations by the entire community of Apo Island. Fishermen interviewed in 1986, 1992 and 2001 expressed a positive attitude towards the marine reserve and reported increased catch. This was supplemented by data showing higher catch rates and reduced fishing effort. Figure 15 shows that total catch rates of Acanthuridae[33] and Carangidae[34] - the most important target fish at Apo Island – remained stable despite a 10% reduction of the fishing area (in form of the no-take sanctuary) (Russ et al., 2004). At the same time, hook-and-line CPUE increased considerably (figure 16) while hook–and-line effort decreased (figure 17).

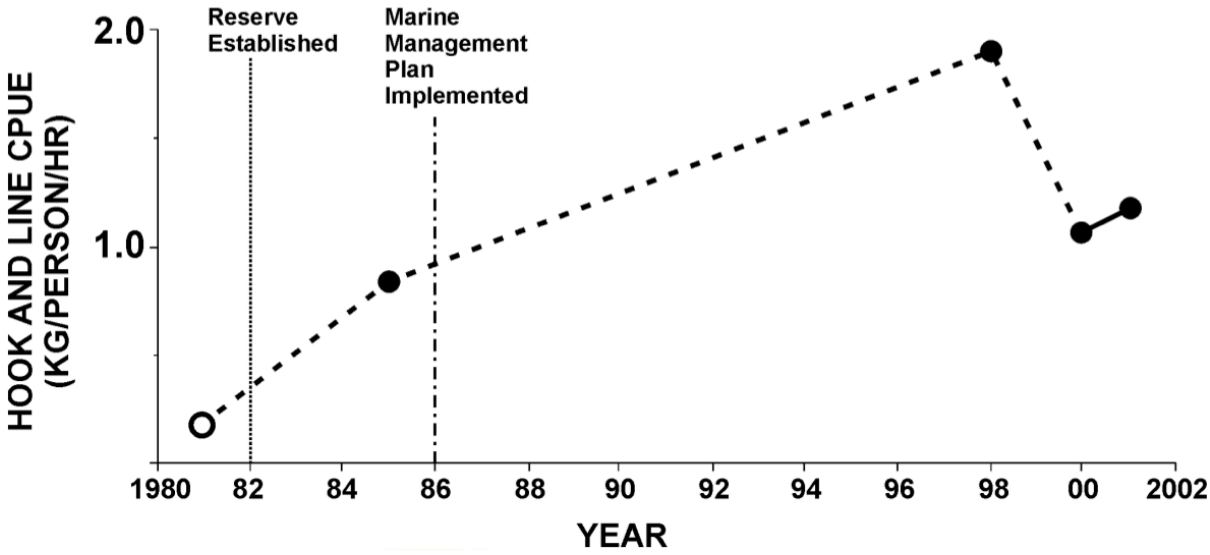
Figure 15. Catch (t) of acanthuridae and carangidae at Apo Island (1981-2001)



Source: (Alcala & Russ, 2003, p.6)

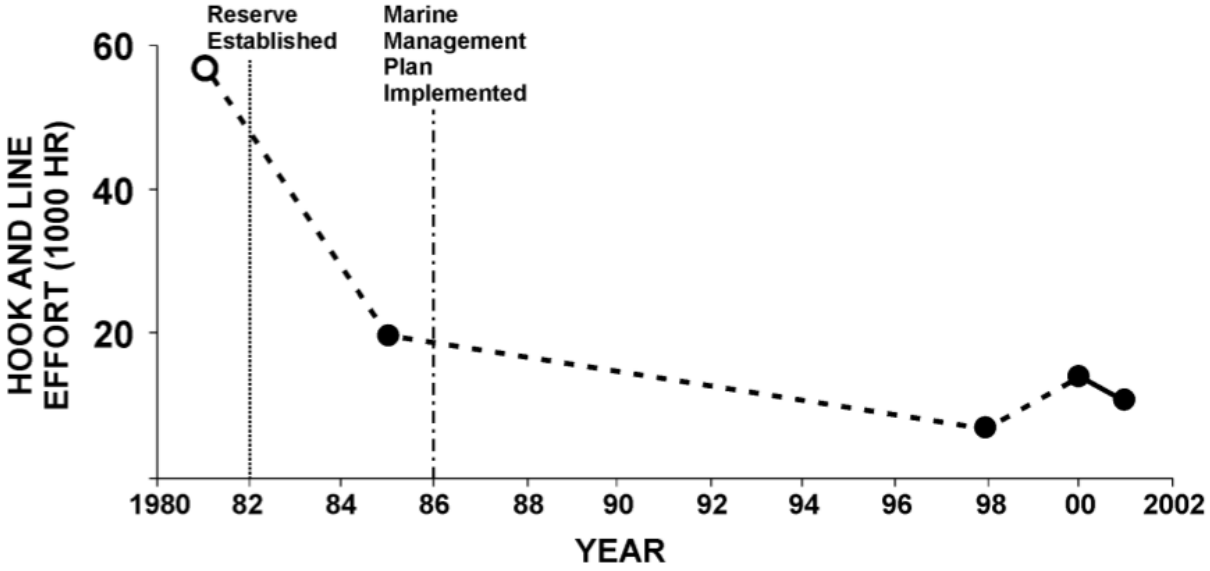
[32] After Apo Island was placed under the NIPAS act, management changed gradually. The rules governing fishery effort didn't change. Therefore, data until the late 1990s and early 2000s is included in the evaluation of the systems performance.
[33] Surgeonfish.
[34] Jacks.

Figure 16. Hook-and-line catch per unit effort at Apo Island (1981-2001)



Source: (Alcala & Russ, 2003, p.6)

Figure 17. Hook-and-line effort at Apo Island (1981-2001)



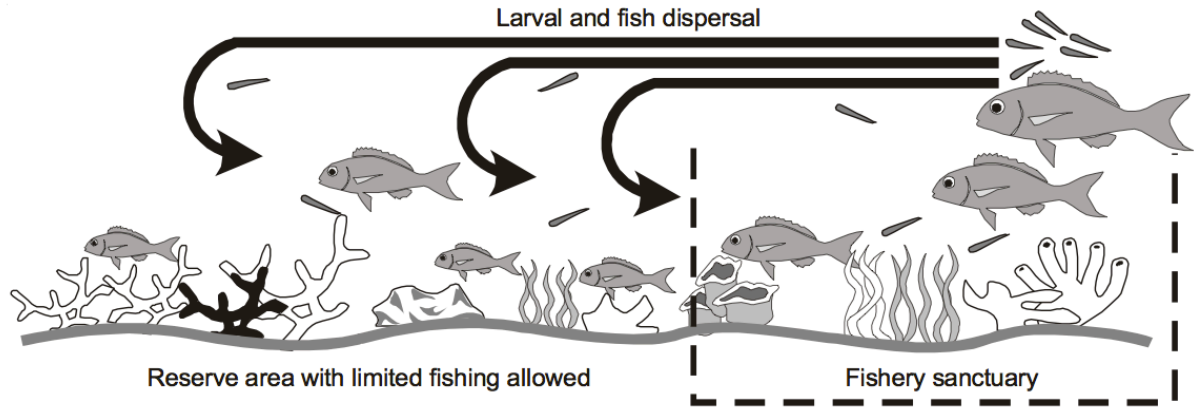
Source: (Alcala & Russ, 2003, p.7)

Improved catch rates and reduced fishing effort at Apo Island have been ascribed to various reasons. One is the spillover effect, which can be defined as the "net export of adult-fish biomass from marine reserves[35] to adjacent fished areas." (Alcala & Russ, 2006, p.249) According to the theory of spillover effects, populations of fish species will increase inside a

[35] Alcala and Russ are referring to *no-take* marine reserves, which is equivalent to a marine sanctuary.

no-take area. At a certain point conditions become so crowded that some fish will move out of the protected area (figure18). No-take areas thus lead to emigration of species to adjacent fishing grounds. Consequently, density of species should be higher close to the sanctuary boundaries than farther away. The effect only becomes apparent, however, after the rate of spillover exceeds the rate of removal by fishermen in the same area (Roberts et al., 2000, p.21ff.).

Figure 18. Spillover of fish and larvae from a marine sanctuary



Source: (White et al., 2006, p.4)

Evidence for spillover effects is critical because it demonstrates the direct benefits of no-take marine sanctuaries to fishermen. Studies that undertook underwater census delivered good evidence for spillover effects at Apo Island. Within 18 years, biomass of Acanthuridae and Carangidae tripled inside the sanctuary. Density of biomass outside the no-take zone was found to be highest in the area close to the sanctuary. In addition, fishing patterns changed. The percentage of Acanthuridae and Carangidae in total fishery catches increased from 42.5% in the early 1980s to 73.4% in 2001. Catch rates of hook-and-line fishing increased while the use of gill nets and bamboo traps decreased considerably. Instead of traveling off reef to fish with drift gill nets, fishermen apparently preferred to catch reef fish like Acanthuridae and Carangidae that became more available. This implied reduced fishing efforts and fewer expenses for fishermen. They could now catch the same amount of fish with less effort (figure 16, 17). Total catch remained quite stable since the beginning of the sanctuary (figure 15). In response to increased fish stocks fishermen seem to have reduced their effort instead of catching more fish (Alcala et al., 2004, p.217; Marten, 2005, p.79; Russ et al., 2004, p.601). This type of behavior is interesting; it doesn't fit into the picture of the rational egoistic fisherman.

Another reason for improved catch rates and reduced fishing effort can be ascribed to the emerging tourism at the island. The good condition of the island's coral reef and its fish abundance attracted many visitors, which brought alternative sources of income for parts of the community. This caused some of the fishing pressure to decrease (Alcala et al., 2004, p.217). Since the construction of two resorts in the 1990s, Apo Island has in fact become one of the prime destinations for scuba diving in the Philippines. The increasing numbers of tourists also generated money for conservation. The MMC established a system of donations for people visiting Apo Island. Donations were used in the following fashion: 10% were given to the collector, 5% to the caretaker, another 15% to the MMC and the remaining 70% were used for maintenance of the MPA (Cadiz & Calumpong, 2002, p.173). Tourism was perceived ambivalently nevertheless. All Fishermen interviewed in 1992 acknowledged the creation of revenue from tourism, but less then 50% considered it beneficial for their livelihood. Several claimed that larger boats for scuba diving caused anchor damage to the reef. According to the fishermen, much of the income from tourism wouldn't benefit the local community (Russ & Alcala, 1999, p.312f.). The impact of tourism will be further discussed in section 5.6, which assesses the sustainability of Apo Island's fishery.

The most important reason for improved catch rates and reduced fishing efforts, however, was the creation of a set of rules that found solutions to the problems facing the community of Apo Island. The institutional change initiated in the early 1980s made spillover effects and increased tourism possible in the first place. In the next section the fishery management settings of Apo Island will be examined in the light of Ostroms design principles.

5.4 Conformance to Rules

Why did the CPR regime of Apo Island work, while so many fisheries under similar circumstances continued to be overfished and depleted? In order to explain the effectiveness of the set of rules governing Apo Island's fisheries it is useful to consider the perspective of institutional economics. In a first step, the situation can be analyzed making use of Ostroms work.

Successful collective action was surely facilitated by the following factors. The population of Apo Island is a relatively stable close-knit community. Most people are long-term residents that have a shared past and future. Fishing is the major economic activity and most households depend on sustainable fisheries for a viable future. Therefore, discount rates

are quite low. People know each other and interact frequently. They have a shared understanding of correct behavior (Alcala, 2004, p.13).

In addition, it can be demonstrated that the people affected by the marine habitat around Apo Island set up management patterns that incorporated all of the design principles.

5.4.1 Clearly defined boundaries

Through the establishment of a marine reserve with an affiliated no-take sanctuary the residents of Apo Island successfully delimited their fishery. The boundaries of its CPR were defined through a municipal ordinance. The entire marine habitat around the island until 500 meters off coast was declared a marine reserve. Buoys marked the sanctuary's boundaries, situated at the southeast corner of the island. The rest of the islands surrounding fisheries were not prohibited for non-resident fishermen. However, large boats (> 3GT) and destructive fishing methods were prohibited. In addition, Apo Island is protected quite effectively by its relative remoteness (Christie & White, 1997, p.161).

5.4.2 Congruence between appropriation and provision rules and local conditions

The no-take area and the limits on technology in the traditional fishing area are well-tailored rules to preserve the fisheries of Apo Island. Within the sanctuary, any exploitive activities were prohibited. Inside the marine reserve only traditional fishing methods were allowed. Appropriation was regulated by a limit on certain fishing methods. Contrary to the management methods of many industrialized countries, there were no direct limits on catch, effort or landing size. The rules matched local conditions and enabled an improved fishery. Numerous studies showed increasing fish abundance and healthy coral reefs (Abesamis et al., 2006; Alcala & Russ, 1981; Alcala & Russ, 1981; Gerry R. & Angel C., 1996; Russ & Alcala, 2011; Russ & Alcala, 1998). The prohibition of destructive fishing methods in combination with a no-take area that provides spillover to adjacent fishing grounds served well to provide a healthy resource stock.

Congruence between the appropriation and provision rules and local conditions was assured, because the community of Apo Island was included in the creation of the rules.

5.4.3 Collective-choice arrangements

The partnership among an organized fisher community, an academic institution and LGUs was successful in establishing collective choice arrangements that enabled the people affected to participate in drafting the rules. The form of this partnership reveals that management wasn't purely self-organized. In the successful cases described by Ostrom (1990, pp.93, 229) external authority didn't enforce the agreements. Neither did they interfere. At

Apo Island, external authorities did agree with the local arrangement and strengthened it. This will be further discussed in section 5.5.1.

Drafting of the ordinance that formalized the marine reserve of Apo Island was done by the MMC to a large extent. Community involvement was facilitated due to the small and closely-knit community of long-term residents that interacted on a day-to-day basis. The MMC evolved out of a core group of enthusiastic people of the community. The community center became an important venue for meetings and discussions of upcoming problems. Questionnaires indicated strong local support for and compliance with the management settings in place. The Community generally had a very positive attitude towards marine reserve and MMC (Russ & Alcala, 1999, p.312).

After the marine reserve was established officially in 1986, Silliman University continued to assist and advise the community. The local *Barangay* leader was supportive of the MPA and worked together with the MMC (White, 1989b, p.93).

5.4.4 Monitoring

Because the community was involved in drafting the rules governing their CPR, compliance was high. The community had developed shared norms about the accuracy of their set of rules and it would have been socially harmful for anyone to break the rules. Compliance was additionally enforced through monitoring. In the beginning, the people supportive of marine sanctuary took shifts in watching the no-take area. Women played an important role. They were the ones that started monitoring the sanctuary. Poachers were reported to the police, which was responsible to sanction them. With growing acceptance of the marine reserve, monitoring the sanctuary became less important.

Since the establishment of the reserve, residents no longer used destructive fishing practices. It became more important to monitor outsiders. The *Bantay Dagat,* an organization of volunteer fish wardens consisting of community members, emerged and became responsible for monitoring activities. Its main task was to check on boats that entered the fishing grounds of Apo Island from other areas. *Bantay Dagat* and the community were also watching the behavior of tourists (Marten, 2005, p.79; Walmsley & White, 2003, p.404).

Silliman University continued to monitor the general condition of the sanctuary and the surrounding traditional fishing areas. Thereby, it provided the MMC with valuable information about the state of the islands resource system.

5.4.5 Graduated sanctions

The police was responsible for sanctioning activities. However, high support for the marine reserve and its no-take sanctuary resulted in quasi-voluntary compliance by the islanders. People complied with the set of rules because they perceived that it would achieve the collective objective of sustaining coastal resources. In addition, it was obvious for everyone that the others also complied. Local fishermen even avoided fishing close to the marine sanctuary even though they would benefit from having higher catch rates (Abesamis et al., 2006, p.373). To be labeled a threat to the reserve would have implied serious social harm for any resident of Apo Island.

5.4.6 Conflict-resolution mechanisms

The MMC consisted of elected people of the local community. In the community with a population as small that it allowed for frequent face-to-face interaction, communication occurred on a day-to-day basis. Additional meetings and discussions took place at the communication and information center, which became an important venue for resolving conflicts.

5.4.7 Minimum recognition of rights

When the community started its conservation efforts in the early 1980s, the government didn't officially recognize the rules governing the marine sanctuary. However, the municipality of Dauin was generally favorable of decisions made at the *Barangay* level of Apo Island, because it didn't want to loose influence on the island (White, 1989b, p.93). With an ordinance that declared the marine habitat around Apo Island a marine reserve in 1986, the CPR regime was formally recognized at municipal level. In addition, the *Barangay* council was involved in the establishment of the fishery. The reinforcement of LGUs, together with the involvement of Silliman University, strengthened the governance system.

At the national level, much of the policies concerning fishery management emerged after the institutional change at Apo Island. This ultimately led to significant change of the governance structure of the MPA.

5.4.8 Nested enterprises

The rules governing management at the *Barangay* level of Apo Island were recognized and formalized by the municipality of Dauin. With the recognition of the rules in place by the municipality, they were incorporated in the rules governing fishery management at higher political levels. Like design principle 3 (collective choice arrangements), this design principle also doesn't perfectly describe the situation of Apo Island. Ostrom (1990, p.189f.) argues that

the larger and more complex CPRs in her study were characterized by design principle 8. In these cases she found that organizational units were built on other organizational units, because of the cost reduction in establishing new units once the initial structure is created. At Apo Island, institutional nesting looked different. It will be outlined in section 5.5.1.

In the years following the establishment of the marine reserve, the Philippine national framework governing fishery management changed substantially. This development was partly influenced by the community based management approach of Apo Island. The marine reserve of Apo Island became a role model for coastal management and had a considerable effect on fishery policies in the Philippines (Russ & Alcala, 1999, p.308). The change of the national framework eventually led to a change of the rules governing Apo Island at the local level, however. This happened after the island was put under the NIPAS Act. It will be discussed in section 5.6.

These points summarize the essential elements that made the governance system successful in sustaining the fisheries of Apo Island. All of the design principles were included in the set of rules established at the island. With respect to design principle 3 and 8, the arrangement can be described more accurately as a form of comanagement. This will be done in section 5.5.1.

Nevertheless, the development of marine resource policies at the national level eventually changed the management settings of the marine reserve. After the island was declared protected landscape and seascape in 1994, the fishery management of Apo Island underwent considerable change. Design principle number 7, a minimal recognition of rights to organize, didn't endure for a long time. When the national government overruled the set of rules at Apo Island, it changed important parts of the management structure. Therefore, the original CPR system of Apo Island did not persist very long. This will be further outlined in section 5.6.

After the examination of the governance system in the light of the design principles, the next section will analyze how the process of institutional change took place. The set of rules governing the MPA of Apo Island is well documented. Therefore, the management history provides useful ground for the analysis of institutional change. The framework presented in chapter 3 enables us to identify the crucial points responsible for a successful change of institutions. In addition, insights from chapter 4 are critical to evaluate the role of Silliman University. The following section discusses how and why institutional change at Apo Island took place.

5.5 Analysis of Institutional Change

At the start of analyzing institutional change one has address the question how the people of Apo Island solved the second order dilemma of supplying institutions that ended their first order dilemma, the malign fishing race. As discussed in chapter 3, the process of institutional change can be derived from individual institutional choices. Such choices are considered and made by individuals that decide whether or not to support change in status quo rules. Figure 2 (section 3.1) provides a summary of the variables affecting institutional change.

The likelihood of institutional change is higher when more people perceive a change of the status quo rules beneficial for themselves. This can happen in times of perceived crisis (Ostrom, 1990, p.208). In the late 1970s the people of Apo Island faced a CPR with alarming signs of degradation. However, there was no sign of an emerging governance system that ensured a sustainable fishery. The islanders didn't seem to consider a change of the rules. To the contrary, the situation would have been a good example of the helplessness of resource users to govern their CPR (section 5.2).

Silliman University played a critical role in changing the islander's perceptions of the conditions of their surrounding marine resources. It started to raise environmental awareness and gradually improved the information available to the residents of Apo Island. The community became interested in protection and reef maintenance only after the university - an external actor - introduced corresponding ideas. Without the efforts of the university, institutional change would probably not have happened. The university workers managed to avoid the Samaritan's dilemma (section 4.3) by involving the resource users in the development process from the beginning on. Non-formal education programs and early involvement of important stakeholders (including local leaders) in the process resulted in increased support and commitment for institutional change by the people of Apo Island.

After demonstrating the high costs of continuing with the status quo, which was basically an open access situation, a concept containing the marine reserve and sanctuary was proposed by Silliman University. In the beginning, it was not supported by the majority of the community because people were uncertain about the benefits of the proposed new rules. Fishermen were worried about the prohibition of certain fishing methods, and a cut of their fishing grounds. Another concern was the fear of loosing autonomy, not least because an external actor proposed the new rules. Expected benefits, on the other hand, were to limit the number of non-resident fishermen, to increase catch rates, and to provide an additional source of income through tourism.

The decrease of catch and potential crisis of their fishery eventually convinced some people that an alternative to status quo had to be found. In this situation the newly elected *Barangay* supported the marine sanctuary. The *Barangay* council eventually decided to test the concept of the no-take area, which would not be part of the main fishing grounds, for 2 years (Garcia, 2010, p.26). The sanctuary was comparably easy and not costly to set up and one person was enough to monitor the area. Under these circumstances, parts of the community accepted the establishment of new rules without perceiving it to be too costly. The municipality of Dauin agreed to implement the sanctuary.

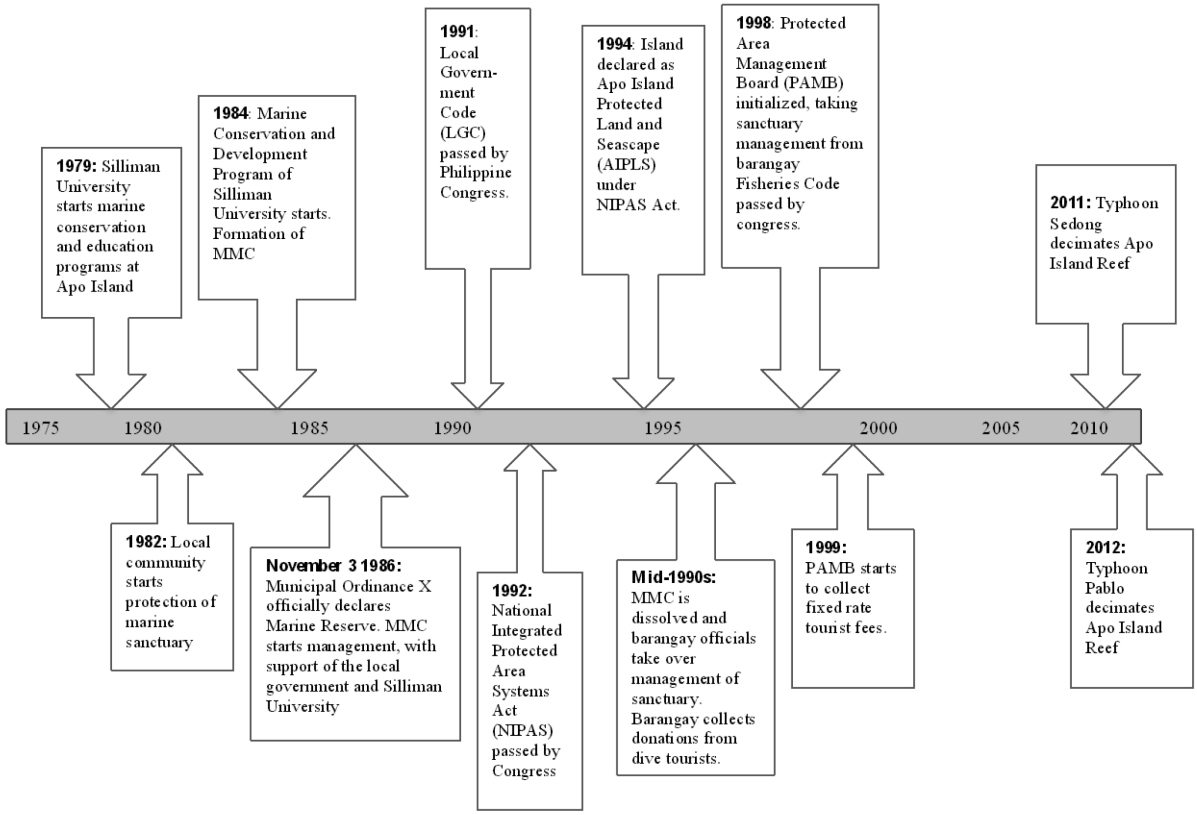
With the start of the MCDP in 1984, Silliman University increased education, organization, and involvement of the community. Various conservation activities and increased communication further transformed perceptions regarding the importance of change. A core group of residents formed the MMC and started to formulate a new set of rules that included the entire CPR around Apo Island. In 1986, the new rules were officially formalized through municipal ordinance. As hard coral cover, fish yields and tourism increased, a greater part of the community became supportive of the reserve plan and the MMC. The fact that people could articulate what they thought to be important and participate in the formulation of the new rules was crucial for commitment. The community was not only informed of some new rules, it had to invest time and effort in the process of institutional change.

Successful drafting and implementing of the new set of rules governing the fisheries of Apo Island was also facilitated through low discount rates and shared norms of the community. It is in the interest of the community to sustain their fisheries for future years and generations. In closely-knit community of Apo Island, residents developed shared norms of correct behavior. Soon, it became socially harmful to disrespect the new rules. The fact that the process of implementing new rules was done by the community itself certainly also reinforced the legitimacy of the new regime. However, the legitimacy of Apo Island's MPA cannot be derived from the municipal ordinance only. It was provided through the full set of rules that governed the MPA. In addition to the formal rules, therefore, the informal institutions that structure human interactions have to be considered as well.

While the ordinance was endorsed in short time, the rest of the institutional setting took some years to develop. Institutional change was not a one step action. It was a lengthy process of many stages that continuously transformed the structure of incentives people faced. Figure 17 shows a timeline of key events that influenced fishery management at Apo Island. Events past 1994 will be analyzed in section 5.6. The process took several years of awareness raising,

educational programs, community training and management planning until a first governance system was established. The system increasingly gained support, when people started to draw benefits from the new rules. In addition, it was reinforced by national and regional developments that lead to more legitimacy of local resource governance.

Figure 19. Timeline of key events influencing Apo Island's fishery management



Source: Adapted from Hind et al. (2010, p.56)

Figure 19 indicates that the process of establishing a new institutional arrangement governing the fishery of Apo Island wasn't primarily self-organized. An external actor and the local governments played a critical role facilitating the governance system. National devolution of management authority also reinforced the process. Silliman University took part in the process of institutional change from the very beginning on. The university provides an example of how successful sustainable development can look like. Without it, the process probably wouldn't even have been initialized. Silliman University engaged in long term capacity building and continuous assistance (until today). All 4 elements of capacity building (section 4.4) were included in the process of change. The ability of the people of Apo Island to establish and mange a successful fishery was enhanced through (1) an improved knowledge base, (2) reformed legislation, (3) trained management staff and (4) reformed institutions. In addition, the community developed considerable ownership (section 4.2) of the process.

People articulated what they wanted and discussed how they could reach their goals. By spending time, effort and other resources, they contributed to the process of institutional change. The community itself was strengthened and continued management beyond the MCDP. The development efforts resulted in sustainable CPR utilization, which was provided through a set of rules that incorporated all design principles. Increased catch, higher CPUE rates, and additional sources of income were the measurable benefits that the community drew from the new rules.

5.5.1 Apo Island's fishery: community-centered comanagement

The success of both institutional change and the persistence of Apo Island's management system can be attributed to a cooperative partnership of an organized community, an NGO (Silliman University) and LGUs (Apo *Barangay* and municipality of Dauin) (Alcala, 2004, p.13). This shows that the common solutions offered for CPR governance (privatization, government control or communal control) are somewhat stereotyped. The case of Apo Island gives an example of a governance system that lies somewhere in between a purely communal and a purely state governed regime. Design principle 3 describes situations in which external authorities don't interfere. Design principle 8 describes situations where the governance system is nested in higher jurisdictional levels. While these descriptions partly characterize the case of Apo Island (section 5.4), they are not precise. In order to specify the cooperative partnership mentioned above, it is useful to make use of the concept of comanagement (section 2.6).

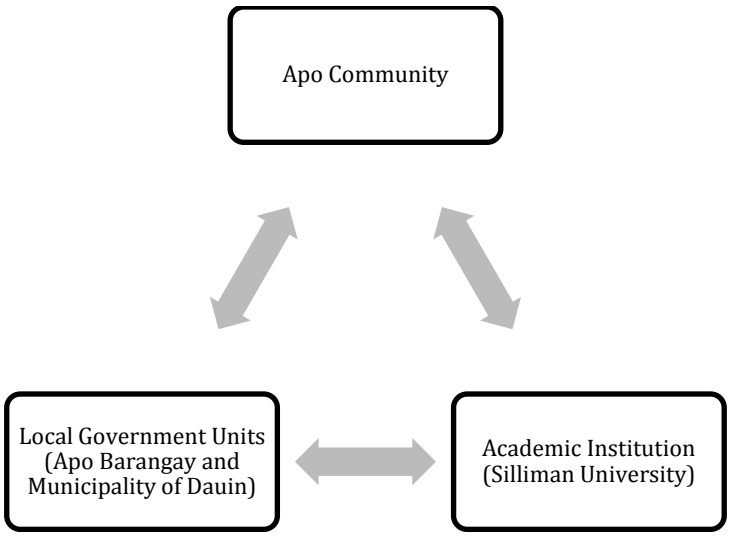
There are many possible forms with varying degrees of power-sharing between fully central based and purely local management, from mere consultation of the community by the government to a full and equal partnership (Pomeroy & Berkes, 1997, p.566). While it is possible to label the fishery governance of Apo Island as community based, comanagement puts the role of external actors in the governance system in focus. Analyzing trends of coastal area management in tropical countries, Christie and White make the following statement:

> In reality, it may be that many management regimes labeled as community based are closer to co-management. This has been suggested by several analyses of community based coastal management projects in the Philippines, which have concluded that there are few truly community based regimes. This is because those that have survived through time have been dependent on associations with government or nongovernment institutions from outside the community. In fact, most such projects were implemented through some legal or logistical support mechanism which helped provide external assistance and continuity. (Christie & White, 1997, p.162f.)

They maintain that the main differences between community-based and comanagement approaches would often only lie in the relative prominence of higher level governance

contribution and the time of initial government involvement (Christie & White, 1997, p.164). Therefore, the example of Apo Island should be regarded as a community-centered comanagement arrangement. While the MMC and the community had a major share of responsibilities, linkages to higher levels of governance where recognized to be crucial. Silliman University was an additional important component of the governance system (figure 20).

Figure 20. Co-management Partnership (1982-1994)



Source: Adapted from Alcala and Russ (2003, p.3)

The ordinance of 1986 (Appendix 1) formalized the agreement between the partners. As outlined in section 5.3, it specified the objectives, roles and responsibilities of the different stakeholders. The government delegated the authority and responsibility to manage the marine reserve. It provided support, legitimized community rights and enabled enforcement by the provincial police. Financial and technical advice was additionally provided by Silliman University and the DA-BFAR[36]. The community was involved in the setting of policies and all management functions. In addition to years of capacity building, Silliman University has since continued to monitor the marine conditions and provide advice to the community. A corresponding devolution of management authority from the national to more local levels (section 5.1) also created a more favorable environment for local governance systems.

The involvement of the community in the comanagement arrangement required ownership and capacity building as prerequisites for an adequate partnership. The process

[36] The Department of Agriculture – Bureau of Fisheries and Aquatic Resources

thus had an empowering effect on the community and enhanced its ability to deal with collective action problems. In the next section, the sustainability of Apo Island's fishery will be assessed

5.6 Assessment of Sustainability

This section will focus on the question if the fishery at Apo Island can be regarded as sustainable. Sustainability has already been discussed in section 4.1.3 about sustainable development. The fundamental goal of CPR literature is to find ways to avoid overexploitation of the commons. To enable sustainable CPR utilization, one has to focus on the institutions that govern collective action. The community is an important element in the production and maintenance of institutions; its well-being is critical for the well-being of small scale CPRs. In the case of Apo Island, sustainability can be measured by analyzing both the fishery and the institutions of the governance system. With regard to the time horizon, the evaluation of the sustainability of the fishery governance can only be momentarily.

As outlined in section 5.3.4, the establishment of the new governance system in the 1980s unmistakably improved the fishery. Surveys, questionnaires, observations and monitoring activities at Apo Island showed an enriched and sustainable marine environment. In addition, the community clearly enhanced its ability to solve collective action problems and established an institutional arrangement that included all of the design principles (section 5.4). By including linkages to higher government levels and an NGO in its the governance system, the fishery of Apo Island even addressed some potential weaknesses of purely self-organized CPR governance (section 5.5.1).

However, additional factors since had a strong impact on the fishery system of Apo Island. In 1994, the governance system underwent vast changes, when Apo Island was declared a protected landscape and seascape and put under the NIPAS Act. Increasing tourism put pressure on the CPR. Moreover, 2 typhoons destroyed large parts of the sanctuary in 2010 and 2011 (figure 17). The following sections will deal with these factors.

5.6.1 Governance change: Apo Island Protected Landscape and Seascape (AIPLS)

As mentioned in section 5.1, the system governing Apo Islands fishery was thoroughly transformed in 1994. On August 9, Presidential Proclamation No. 438 declared the entire Island and its surrounding waters as protected landscape and seascape and under legislation of the NIPAS Act (Appendix 1). This denoted far-reaching changes for the management system that had governed Apo Island since the early eighties.

Environmental changes under the AIPLS system cannot be judged adequately, since the PAMB only took over management in 1999. Also, rules governing fishery effort haven't changed. Marine resources seem to have stayed in relatively good conditions (Garcia, 2010, p.55; Hind et al., 2010, p.59f.). The section will therefore focus on the other institutional changes and their implications.

Why was Apo Island declared a protected area, despite its successful governance system? Garcia (2010, p.53) argues that the centralization of management was done to protect the Island from being exploited by investors that could undermine the community-managed reserve. Hind et al. (2010, p.56) suggest three additional reasons. First, fear of limited awareness and understanding of the importance of the reserve by the community. Second, concern with the vulnerability of community based MPAs to political change. This probably had to do with the events that happened on Sumilon Island mentioned above. The third reason was related to the fees for Apo Island. Since the NIPAS Act established and *integrated* system, income generated through tourism was supposed to support other protected areas that didn't receive that much money.

Structure

The NIPAS Act provides the national legal framework for establishing and managing protected areas in the Philippines. Its main implementation and administration agency is the Department of Environment and Natural Resources[37] (DENR) (La Viña et al., 2010, p.11). A special management body, the Protected Area Management Board (PAMB), manages protected areas under the NIPAS Act. It consists of multiple stakeholders:

- the DENR Regional Executive Director (Chairman),
- the provincial development officer,
- a representative from the municipality,
- a representative from the *Barangay*,
- at least three representatives from local NGOs and community organizations, and, if necessary,

[37] The DENR is responsible for sustainable use of the Philippine's environment and natural resources. In addition to its duties in the context of the NIPAS act, it also deals with the management, implementation and enforcement of environmental issues such as forestry laws and projects, pollution laws and waste disposal systems (DENR et al., 2001a, p.49ff.; Green et al., 2004, p.70).

- a representative from other departments or national agencies involved in the area (Alcala, 2001, p.80; La Viña et al., 2010, p.20).

The DENR secretary appoints all members of the PAMB except the chairman and the provincial development officer. Decisions depend on majority vote and members of the PAMB serve for five-year periods (Garcia, 2010, p.50f.). Following the declaration of the AIPLS, the MMC was dissolved and since 1998 the PAMB has taken over management.

The new system involves residents and NGOs in monitoring activities and uses parts of its funds for conservation, education and livelihood projects. Until 2009, 51 community members were trained as tour guides and *Bantay Dagat* that receive monthly payments (Garcia, 2010, p.54). The fees were used to buy a generator and provide electricity access to all residents (Olivier, 2007, p.184).

In comparison to the former management system, however, local residents lost a large part of control, authority and ownership over the MPA. Furthermore, fishermen aren't really represented in the new management body (DENR et al., 2011, p.30). The composition of the PAMB demonstrates that the former community-centered comanagement arrangement made a shift back towards a more centralized CPR governance regime.

Nonetheless, community influence has remained existent. The *Barangay* leader and local NGOs have a say in the PAMB. Moreover, a part of informal management is still done by community members on a day-to-day basis (Alcala & Russ, 2006, p.252). In interviews of Hind et al. (2010), some local respondents made it very clear that environmental protection depended on them rather than the PAMB. The following statements cited by the researches give examples of their argumentations. "Forget PAMB! The people are the ones that protect the island. Without the people there would be no respect for the law!" "So why is this place protected? It's from us! Not from the DENR. The DENR is just here to collect money'' (Hind et al., 2010, p.60).

Major changes

In addition to the new management structure, other major changes include registration requirement for all visitors and boats, designated anchoring/mooring areas for boats, diving regulation and the introduction of fees and charges. Tighter regulation was also a reaction to increasing levels of tourism. The PAMB reacted to booming tourism with regulations such as higher fees, limits on the number of snorkelers and divers in the sanctuary and a minimum of 100 meters distance to be kept from fishermen (Appendix 1).

Apo Island is currently among the protected areas generating the highest incomes of the Philippines. The restructuring of its former donation based system is one of the major benefits of the new management regime. Returns from user fees saw an increase from about PHP 1 million to PHP 4 million between 2000 and 2009. Distribution of this revenue follows guidelines by the PAMB. In 1999, 41% was allotted for maintenance of the MPA, 44% was used for administration and management and 15% went to livelihood projects (Garcia, 2010, p.55f.).

However, fund allocation and projects are regularly delayed and enforcement is hampered. It can take up to one year for the funds to be channeled to its purposes[38] (La Viña et al., 2010, p.12). Hind et al. (2010, p.60) mention complaints by the community about the lack of financial transparency. While money was held on Apo Island and used when needed under the old management system, it is now channeled through bureaucratic processes[39]. Referring to the delayed payments, they report that *Bantay Dagat* and Dive Rangers were continuously under-funded and ill equipped.

Moreover, the problems related to tourism couldn't be solved adequately. Olivier (2007) provides a comprehensive study of tourism related implications on Apo Island. She reports of several problems related to increasing tourism. Divers and snorkelers reportedly destroyed (legal) fish traps and coral reefs, leading to frictions with the fishing community. Tourism development also aggravates the growing garbage problems Apo Island faces. These observations match with those of Hind et al. (2010) who also report about the PAMBs problems to protect fishing grounds from tourists. The impact of tourism on Apo Island will be further discussed in section 5.6.2.

Changes of design principles

The institutional change that took place will be structured based on the design principles (section 2.5). While the boundaries of the marine reserve (design principle 1), the rules governing appropriation and provision (design principle 2), monitoring (design principle 4) and sanctioning (design principle 5) didn't essentially change, design principles 3,6,7 and 8 were altered.

[38] This has to do with the bureaucratic nature of the AIPLS fund process. Revenues generated from protected areas under the NIPAS Act must go through the national Integrated Protected Areas Fund (IPAF), which then channels the funds to projects of the integrated areas system. 75% of the revenues go to a sub fund that is used for projects in the area and 25% go the national fund to support protected areas that don't generate enough revenues themselves. While PAMBs mange the sub funds, the national fund is under administration of the DENR (La Viña et al., 2010, pp.34f., 39f.).

[39] Oracion (2008) mentions local complaints about mismanagement under PAMB. She states that similar problems were also reported under the MMC, but size and severity seem to have worsened.

Under the former governance system, the collective-choice arrangement (design principle 3) was a partnership among the MMC, Silliman University and LGUs. This community-centered form of comanagement ended with the establishment of the AIPLS. Contrary to the former one, the new system doesn't guarantee that "*most individuals affected by the operational rules can participate in modifying the operational rules" (Ostrom, 1990, p.93)*. For example, fishermen aren't adequately represented in the PAMB. Moreover, complains about the limited range of participation and diminished authority for the local community have repeatedly been reported (DENR et al., 2011, p.30; Rosales, 2003, p.69; Hind et al., 2010, p.61). These changes also imply that the conflict-resolution mechanisms (design principle 6) were altered. Under the former management structure, the MMC consisted of local people and communication took place on a day-to-day basis. The AIPLS has a more bureaucratic structure and not all members of the PAMB reside on the Island. Conflict resolutions have thus become more difficult. Establishing the new governance system implied a direct violation of design principle 7 (section 2.5.7). By implementing the AIPLS through presidential proclamation, the institutions devised by the community together with Silliman University and LGUs were changed. Therefore, "*the rights of appropriators to devise their own institutions"* (Ostrom, 1990, p.101) were not only challenged but even overruled by higher-level authorities. The governance system of the AIPLS provides rules that are in accordance with the NIPAS legislation. Activities regarding appropriation, monitoring, enforcement and conflict resolution are nested in higher governmental jurisdictions. Strengthening the management regime through stronger embedding in higher jurisdiction was indeed one of the reasons for the establishment of the AIPLS. CPR governance cannot be labeled a community-centered comanagement regime anymore. Rather, it has become a more centralized governance regime. However, while it formally shifted back top down governance, the informal community management seems to have continued to some extent.

Summarizing, the establishment of the AIPLS brought considerable institutional change to the governance system of Apo Island's fishery. Major changes include tighter tourism regulations, higher income and reduced institutional vulnerability on the one hand and less financial transparency plus a weaker role of the community on the other hand.

Considering that successful CPR governance to a large extend depends on the involvement of local stakeholders, it can be argued that the recent institutional development bears risks for the fishery of Apo island. After all, the local residents have the highest interest

in sustaining their MPA (DENR et al., 2011, p.30). Under the new governance system, some of the essential elements of stable CPR governance (design principles) have eroded. Even though the NIPAS Act supports the combination of local and higher level management and incorporates elements of decentralization, the new system has clearly weakened the role of the community of Apo Island. The PAMB is regarded more like an external actor imposing rules on the community (Hind et al., 2010, p.57f.). From the perspective of institutional economics, diminished ownership leads to less commitment (section 4.2). Moreover, higher asymmetry in power relations can weaken legitimacy and lessen the ability of the CPR system to adapt to change[40] (section 4.3.1).

The loss of control implies that the fishermen are deprived of the possibility to engage in further institutional change. The structure of the AIPLS reveals that the community has not much to say in the higher levels of decision-making[41].

More centralized management also bears the risk of undermining the high compliance of local resource users. Disappointed fishermen might start to reconsider, if the benefits they obtain from complying with the rules still exceed the costs (design principle 2). The weaker role of the community may also undermine reciprocity and trust of the informal networks that were strengthened under the former regime.

However, most of the operational rules, norms and values that were established under the comanagement partnership since the eighties seem to be still existent. The community still values conservation and local residents are proud of 'their' MPA. This is quite different to the situation in the late seventies, when depletion wasn't even recognized as a problem and the use of illegal fishing methods was not frowned upon (section 5.2). Nowadays, the whole community including little children know about the importance of the rules that ensure sustainable fishing grounds and the fishers remain committed to conservation (Alcala, 2001, p.81; Olivier, 2007, p.185f.). Informal constrains and rules governing the day-to-day operations of the fishermen so far haven't changed under the new regime. The process of institutional change that was initialized by Silliman University has substantially affected the community. Continuous compliance with the rules seems to have endured despite the recent institutional changes.

[40] The NIPAS law does provide some adaptability mechanisms. Sections in the law allow for additional areas to be integrated and established areas to be modified or disestablished. In addition, individual management plans for the different protected areas are mandatory. However, since there is no timeframe for the establishment of such an individual plan, numerous protected areas still just use the general management plan (DENR et al., 2011, p.56f.).

[41] In section 3.1, institutional choice is described to imply both collective choice and constitutional choice. People that are not represented in decision-making on either level cannot engage in institutional change.

5.6.2 Tourism

Tourism has become a fundamental factor at Apo Island. As mentioned in section 5.3.4, Apo Island is today considered one of the top diving spots in the Philippines. The continuous increase of visitors has also made tourism the biggest industry on the island. Tourist traffic has reached dimensions that make it a threat to Apo Islands environment and surrounding waters (Rosales, 2003, p.63). This was also outlined in the last section. The AIPLS was implemented in part as a result of the increasing numbers of visitors and the need to regulate tourism.

With regard to the fishery, tourism seems to have controversial implications. On the one hand, it increases pressure on the marine environment. On the other hand, tourism decreases fishing pressure to some extent and visitor fees generate income that can be used for conservation activities. In addition, visitors come mainly because of the healthy marine habitat. A long enduring resource system should thus also be in the interest of people working in the tourism sector.

Tourists and tourist operators can be regarded as an additional type of resource users, because they use the same resource system. They don't necessarily appropriate resource units, but they put pressure on the resource system (garbage, coral reef destruction). Moreover, they disturb both the marine environment and the activities of fishermen. Contrary to fishermen, though, tourists are not subject to the informal sanctioning mechanisms of the community. Although divers and snorkelers have to comply with regulations set by the PAMB, they don't necessarily do so. First, it is not clear that they have very good knowledge about them. Unmindful snorkelers stand on corals and break them (Olivier, 2007, p.179). Second, there have been events of vandalism. For example, people have reportedly carved their names in corals (Olivier, 2007, p.177) and destroyed fish traps (above section). Third, monitoring and sanctioning is difficult. Incidents of noncompliance happen under water. Dive rangers and tour guides are often underpaid and underequipped. In addition, there are many external diving operators offering tours at Apo Island that don't value the marine environment as much as local residents. Olivier (2007, p.193f.) also reports of a "the customer is always right" attitude in the tourism sector that makes it even more difficult to enforce regulations.

Therefore, fishermen and tourists have a fairly conflicting relationship. Fishermen have helped to sustain the coral reef for years (chapter 5). For them, tourism has undoubtedly brought undesirable changes to the marine life (Olivier, 2007, p.168ff.). They perceive divers to disturb the marine environment and chase away their catch. Hind et al. (2010, p.59) found that fishermen complained about divers scaring off fish with their bubbles and camera flashes.

Tourists, on the other hand, often have a completely different perception. They tend to blame the local community and fishers for overfishing and environmental damage. Fishermen are perceived to be in conflict with people that focus on marine conservation (Olivier, 2007, p.170ff.).

Despite these conflicts, the tourism industry also brought benefits to Apo Island. The large number of tourists generated alternative livelihood options such as the selling of souvenirs, working for the resorts, for diving operators, or in boat transfer. Olivier (2007, p.184) maintained that tourism is a source of income to 1/9 of the adult population of Apo Island. At the same time, only 20% of the total generated revenues would go to the residents of Apo Island. Most of the profits and benefits generated in the tourism sector would stay out of reach for the community. Foreigners own the two local resorts and many diving operators come from neighboring Negros Island. Boat owners from Malatapay at Negros Island are the main players in the transfer business (Olivier, 2007, pp.122ff., 184). In this context, Oracion (2008, p.50) notes that it is very important to disburse generated benefits properly. Those who invest in maintaining the CPR should also draw proper benefits from their efforts. Otherwise, a biologically successful MPA can also be a social failure. Nonetheless, income through fees has also benefited Apo Island and its marine environment. As mentioned in the last section, funds are used for conservation, education and livelihood projects.

An interesting livelihood project that addressed some of the issues related to the growth of tourism is the Dive Ranger Program[42]. The program was implemented to monitor the behavior of tourists under water. Local fishermen were to become 'wildlife guards' of the seas. Dive Rangers were trained in reef biology and the use of SCUBA. Their responsibilities include maintenance work (cleaning of reefs, maintaining mooring buoys, etc.), education and monitoring of divers and diver guides, observing boat behavior, and enforcement of regulations (Olivier, 2007, p.194ff.,267f.). Like the *Bantay Dagat*, the Dive Rangers receive monthly payments of by the PAMB (Amarado, 2007).

[42] When Olivier conducted her study in 2004, the Dive Ranger Program was only starting. However, local newspapers have reported about the Dive Rangers and in diving blogs people mentioned that they accompany visitors diving and snorkeling in the marine sanctuary (Amarado, 2007; Pal, 2008; Amarado, 2009). Moreover, the CCEF reports of assistance by both the local community and the Dive Rangers in the rehabilitation program after the typhoons in 2013 (Maypa, 2013). This proves that the Dive Rangers have successfully been established and that they are important enough to be named among the main stakeholders that engage in the recovery program.

Summarizing, tourism has become a major factor influencing Apo Island and its marine environment. It has both beneficial and detrimental impact on the fishery system of the island. From a theoretical perspective, people of the tourist sector are additional resource users of Apo Islands CPR. A sustainable marine environment greatly benefits the tourism sector. Interestingly, divers and snorkelers don't necessarily increase the degree of rivalry of the resource units, because they use the marine environment in different ways than fishermen. However, they do put pressure on the resource system. As neither the tourists nor the larger part of the tourist operators are community members, they don't face the same incentives to participate in provision/maintenance of the CPR. Also, tourists don't necessarily comply with the rules.

Sustainable tourism with involvement of the local community or even fishermen as tourist operators or tour guides would probably solve some of the problems related to the business. The Dive Rangers are a promising example of a solution to the problems related to tourism. Stricter regulations under the AIPLS system have certainly helped to reduce some of the pressure, although monitoring and enforcement seems to be difficult.

5.6.3 Typhoons

The third factor that has had strong impact on Apo Island is beyond human control. By creating and maintaining a set of rules, a society can organize and sustain CPRs to some extent. It cannot protect them from external shocks like typhoons, however. Alcala (2012) found that destructive typhoons have sadly become increasingly regular occurrences in recent years. He stated that the frequency with which the typhoons hit the southern part of the country is much higher now than it was a few decades ago.

Apo Island was severely hit by "super typhoons" (Alcala, 2012) Sendong in 2011 and Pablo and 2012, respectively. Together, they devastated parts of the precious coral reef surrounding the island. According to surveys of the Coastal Conservation and Education Foundation (CCEF), 99% of the coral reef inside the sanctuary has been damaged. The CCEF also reported a 50% decline of coral reef fish abundance (Maypa, 2013). Both Sendong and Pablo were responsible for thousands of deaths and costly damages of infrastructure across the country. According to regional newspapers, large waves hurled rocks on the shore of Apo Island and crushed the corals (Basilio, 2013), leaving a major part of the sanctuary's coral reef reduced to "rubble" (M. J. Partlow, 2013). Subsequently fish yields reportedly declined (J. Fl. Partlow, 2013b).

While the sanctuary is devastated, the reefs on the other sides of Apo Island have not been hit and remain healthy (Greenpeace, 2013). The CCEF, together with Silliman

University, the PAMB and LGUs, and assisted by the Apo Island Dive Rangers and the local community, is undertaking rehabilitation works at the destroyed parts of the coral reef. Local residents helped to install artificial corals to facilitate coral recovery. In addition, a recovery plan for the MPA has been designed (Maypa, 2013; Basilio, 2013). A proposal for a new marine sanctuary has already been discussed in the *Barangay* council. It would be located at the northwest portion of Apo Island, where the marine environment remained in good condition. The site is an important fishing ground, which is why there has been some opposition to the proposal (J. Fl. Partlow, 2013a).

The devastation of the sanctuary and its accompanying decline in fish catch denote a considerable threat to the CPR. However, the impact of the typhoons on fishery yields will not be considered in the evaluation of the institutional robustness of the governance system. While the effects of these natural disasters are a crucial factor for Apo Island, they cannot be addressed adequately in this work. Both the degree of damage and the time needed to recover are difficult to measure, as the events happened very recently and sufficient data doesn't exist. It cannot be judged if the typhoons will affect the ability of the resource system to produce resource units in the long run. However, it is useful to consider the typhoons for two reasons: First, they sadly proved that marine fisheries are vulnerable to external shocks beyond human control. Second, the reactions of important stakeholders to the disaster proved that the people are dedicated to solve their problems in a collective effort.

5.6.4 Summary

The past decades have brought substantial change to the CPR of Apo Island. With assistance of an academic institution and LGUs, the community had established a fishery governance system that ensured a healthy marine environment and sustainable catch rates. It incorporated the full set of Ostrom's design principles that are necessary to ensure enduring self-organized CPR governance. In addition, the community-centered comanagement arrangement ensured institutional nesting and continuous assistance of Silliman University.

This system underwent vast changes, when Apo Island was declared a protected landscape and seascape in 1994. Under the new governance system, the community lost a substantial share of control over the management of the CPR. In fact, it lost a substantial share of its right to self-organize (design principle 7). Important rules governing fishery effort didn't change, but the former collective choice arrangement was dissolved (design principle 3). This also implies more difficult conflict resolution (design principle 6). On the other hand, the new governance system has reduced institutional vulnerability and generates higher income for the island. Moreover it addresses increased tourism through stricter regulations.

Tourism, being the major industry of the island, has become a key factor of influence for Apo Island. It provides jobs opportunities and visitor fees generate revenues that are used for conservation and maintenance activities, among other things. Divers, snorkelers and tourist operators are additional resource users of the marine environment or the island. They commonly don't appropriate resource units, but they disturb fishermen and the environment in other ways. A system governing the Apo Island's CPR has to address this new factor. The Dive Rangers could embody an ingenious solution to some of the problems related to tourism.

In the years 2011 and 2012, two typhoons hit the island. They devastated the marine sanctuary and lead to a decline fish catch. Various organizations, including Silliman University, the PAMB, LGUs and the local community, are engaging in recovery efforts, and a new sanctuary is being planned.

This section concentrated on factors that have influenced and changed the fishery of Apo Island after 1994 in order to assess the sustainability of its governance system. Because of the short time horizon (the beginning of institutional change was only 4 decades ago), its sustainability cannot yet be conclusively judged (section 4.1.3). If sustainability was measured today, one could argue that the external shocks lead to a destruction of the sanctuary and an accompanying decline in catch rates. However, this incident might or might not be significant for the ability of the CPR to ensure a constant flow of resource units, when looked upon from the perspective of 100s of years. From that viewpoint, the institutional robustness of the governance system and the ability of the residents to solve collective action problems are more important.

The institutional arrangement governing Apo Islands fishery did change considerably. On the one hand some of the design principles (3,6,7) eroded, on the other hand formal institutional strengthening occurred, and tourism has been addressed. The diminished role of the community bears certain risks. Less ownership and more asymmetric power relations could lead to reduced commitment and legitimacy of the institutional arrangement. The increasingly important tourism sector has become an extra force of influence for the fishery system. Tourists can be regarded as additional resource users that are not subject to the informal sanctioning system of the community. While the tourism sector doesn't lead to higher appropriation and even generates a substantial income for the island, it still puts pressure on the resource system. Yet, tourism hasn't weakened the resource system's ability to produce resource units, not least because it is regulated by the PAMB.

Despite the recent institutional changes, the new resource users and the external shocks, compliance with the rules has endured. CPR appropriation patterns remained the same after the declaration of the AIPLS. The community seems to have retained influence to some extent. No incidents of severe overexploitation occurred. Even after the typhoons destroyed large parts of the marine sanctuary, people have quickly started to engage in recovery efforts and plan to implement a new one. Local residents value their marine environment and the rules that enable a healthy marine environment and sustainable fishery. Most people at Apo Island are very conservation conscious and the informal institutions that govern correct behavior apparently haven't been weakened. This is certainly also due the enhanced ability of the community to collectively solve the problems they are facing and the continuous support of Silliman University.

Therefore, it is argued that the institutional arrangement governing the CPR is fragile to some extent, but there is legitimate reason to believe that it can continue to provide for ongoing appropriation. There has been substantial progress since the *de facto* open access regime prior to the late 1970s. Moreover the ability and interest of the community, LGUs and NGOs (first and foremost Silliman University) to engage in successful collective action is a promising combination. Government officials should acknowledge this and reconsider the governance structure of the AIPLS. Even though the governance system of the fishery didn't endure in its initial form and some of the essential elements needed for long enduring CPR governance were weakened or eroded, there seems to exist strong determination to sustain the marine environment of Apo Island.

6. Conclusion

This study has presented the sustainable management of natural resources as imperative to the survival of communities at large. It argued that in certain cases successful CPR governance must entail elements of external and local regulation in order to be successful. The case study adopted, that of Apo Island, shows that cooperation between local and higher authorities, as well as the incorporation of third parties was necessary for the successful establishment of the management techniques needed to ensure the resource's viability in the long term. In conclusion, a summary of the research results will be presented, followed by concluding remarks and lessons learned.

6.1 Results

This study provides an analysis of the fishery governance system of Apo Island since its establishment in the early eighties. It was undertaken from an institutional perspective in the context of common pool resource (CPR) studies. The analysis is based on beliefs that the institutions governing human behavior constitute the critical factors to be considered. These institutions must address the two main characteristics of CPRs, low excludability and high rivalry. To structure the investigation, three central research questions were posed and the results are summarized below.

6.1.1 What lessons can be learned from the fishery regulatory system implemented on Apo Island in the early eighties?

The first research question was addressed by an examination of the set of rules that characterized the governance system of Apo Island between 1982 and 1994. Ostrom's design principles as covered in chapter two, provide a suitable tool to study the essential variables of self-organized CPR governance. It was shown that the regulatory system of Apo Island incorporated all of the design principles (see section 5.4), but in regard to the collective choice arrangement (design principle 3) and nested enterprises (design principle 8), the design principles did not accurately describe the conditions present at Apo Island. The concept of comanagement was added to complement the analysis (5.5.1), because the governance system of Apo Island was not entirely self-organized,. Until 1994, the governance system was characterized by the following elements:

Design principle 1: Clearly defined boundaries

Through municipal ordinance, Apo Island's surrounding marine habitat up to 500 meters offshore was declared a marine reserve. In addition, a 500m2 wide no-take sanctuary was established on the southeast corner of the island.

Design principle 2: Congruence between appropriation and provision rules and local conditions

Inside the marine reserve, fishing was limited to traditional methods. Destructive practices including muro-ami, small mesh gill net, and cyanide fishing were prohibited and boats were limited in size. Furthermore, within the core sanctuary, fishing was completely prohibited as well as appropriation of corals, shells and other marine life. .Congruence between rules and local conditions was proven by numerous surveys (section 5.3.4).

Design principle 3: Collective - choice arrangements

The collective choice arrangement of Apo Island was characterized by a partnership among an organized community, an academic institution and Local Government Units (LGUs). A core group of enthusiastic community members formed the Marine Management Committee (MMC), which became the organization that managed the CPR locally. In addition, the municipality of Dauin and the local *Barangay* supported and strengthened the marine protected area (MPA) governance arrangement by providing technical and legal support and legitimization. Silliman University, which had started and facilitated the entire process of institutional change, also assisted in the arrangement.

Design principle 4: Monitoring

Monitoring activities were conducted by the community, the *Bantay Dagat* and Silliman University. Within the community, it soon became socially harmful to break the rules. Shared norms about the legitimacy of the rules sprang from the visible benefits and were largely responsible for high compliance rates. People took shifts in watching the no-take sanctuary, with women playing an important role. Poachers were reported to the police. Volunteer fish wardens of the community formed the *Bantay Dagat*, which became the organization responsible for monitoring. They mainly checked on boats and fishermen from other areas and monitored the behavior of the increasing number of tourists. Silliman University was responsible for surveying the condition of the marine environment and habitat development.

Design principle 5: Graduated Sanctions

Mutual monitoring combined with the fact that rule breaking had become *taboo* and would have serious social consequences for perpetrators. This resulted in high support for the governance system and very low violation rates. This quasi-voluntary compliance occurred because the benefits of the system were obvious to most and the others followed suit. Nonetheless, police were responsible for prosecuting poaching incidents.

Design principle 6: Conflict resolution mechanisms

Local management was done by the MMC, which consisted of elected people from the community. Frequent interaction and communication led to low-cost conflict resolution on a day-to-day basis. Additionally, a communication and information center was established for discussion, meetings and planning.

Design principle 7: Minimum recognition of rights

As stated above, both the municipality of Dauin and the *Barangay* of Apo Island were involved in the partnership that enabled local governance. The ordinance of 1986 formally declared Apo Island a marine reserve and recognized its governance system. Renown Silliman University further strengthened the partnership.

Design principle 8: Nested enterprises

The recognition through municipal ordinance was further underscored when the rules governing Apo Island were formally incorporated into law.

The concept of comanagement has also been incorporated, as not all the elements outlined above are relevant to the case of Apo Island. This is mainly because the design principles focus on self-organized and self-governing CPR institutions.

A complementary approach: Community-centered comanagement

As mentioned above, the successful governance arrangement at Apo Island can be attributed to a partnership between an organized community, Silliman University and LGUs. Apo Island thus gives an example of a form of management with elements of both communal and government control as well as an additional external facilitator and, as such, could be labeled a community-centered comanagement arrangement. While the community maintained a substantial share of authority and responsibilities, LGUs legitimized the arrangement,

provided support and enabled enforcement. Silliman University's role was to facilitate the process and continuously assist the community.

6.1.2 What were the main factors stimulating institutional change at Apo Island?

The second research question focused on the process of institutional change. Contrary to many CPR governance systems, both the initiation and the entire process of institutional change at Apo Island are well documented. Chapter 3 portrays a framework for the analysis of institutional change., The impact of external actors on local institutions was additionally highlighted in chapter 4, due to the crucial role Silliman University played in the process. The concepts of sustainable development (section 4.1.3), ownership (4.1.5) and capacity building (4.3.1) were added to complement the analysis based on the framework for institutional change.

As mentioned, institutional change was not primarily self-organized, although, no rules were arbitrarily imposed on the community. The community engaged in a lengthy process of institutional change facilitated by Silliman University and local government units (LGUs). The process was also accompanied by ceeding of authority from the national level to the municipalities. Thus, while the national government remained indifferent to what happened at Apo Island, the municipality of Dauin and the *Barangay* were empowered to make and enforce rule changes. This allowed the creation of a working legal framework optimized for local conditions.

However, Silliman University proved to be of immense importance for the process of institutional change. The university took part in the process from the beginning and engaged in long-term capacity building and on-going assistance. Figure 2 (p.15) describes the core variables of the framework for institutional change. Silliman University altered the perception of local residents regarding the main variables affecting institutional change, expected benefits, expected costs, and internal norms[43]. With its educational programs, the university also supplemented the information available to the community. A carefully planned education initiative appears to have been an essential factor for success, as it changed the intuitive individual cost/benefit analysis of the islanders.

In a process that took several years raising awareness, providing education and community training and assisting in management planning, the university exemplified how sustainable development in the context of CPRs can function efficiently. Through the enhanced ability of entities involved in the CPR to solve collective action problems and the

[43] Discount rates of Apo Island's fishermen were generally low from the beginning on.

establishment of an effective institutional approach, sustainable CPR utilization was achieved. The community took substantial ownership of the process and people articulated what they wanted and discussed how to reach their goals. All parties spent time and effort contributing to the process and continued active management even after the official development programs had run their course.

The change of rules came about incrementally and sequentially. Gradually, the islanders began to notice that they needed to change the rules governing their marine resources in order to stop the downward spiral threatening their livelihood. A relatively small number of appropriators with low discount rates, shared norms and a local leader supported the process of change. Also, setting up and monitoring the sanctuary was not very costly with increased yields and a boost to tourism, which offset costs and provided tangible benefits to the local community.

The example of Apo Island proves that it is possible for fishermen to create their own rules and solve their own CPR problems. Yet, it is by no means certain that they will do so. Careful and long-term facilitation efforts by external actors can prove crucial to implementing solutions. External actors can enhance factors that stimulate and sustain collective action on a local level. There is no guarantee, however. Institutional change is a highly complicated and unpredictable process that depends on a wide variety of local and national factors.

6.1.3 To what extent can the fishery of Apo Island be regarded as sustainable?

Assessing the fishery's sustainability was the primary focus of the third and last research question. As outlined in section 4.1.3, the sustainability of CPRs can be measured by concentrating on three factors: the ability of the CPR to generate resource units, the institutional arrangement that governs human behavior related to the CPR, and the well-being of the community that creates and maintains institutions. In regard to the first factor, catch rates and catch per unit efforts (CPUE) serve to measure the 'healthiness' of the CPR. The institutional arrangement can be measured by looking at the design principles. Third, a community can be considered vital when it possesses the ability to solve collective action problems (see section 4.2.1 on CPR problems). However, sustainability cannot yet be judged comprehensively as the process of institutional change has commenced fairly recently (in comparison to some CPR institutions that have existed for centuries),.

Research on the fishery regulatory system implemented on Apo Island in the early eighties showed that all three factors were present until 1994. Catch rates and CPUE improved substantially. All design principles were incorporated in the management regime and the facilitation and assistance of external actors even strengthened the governance system.

In addition, the community proved to be capable of managing their own CPR. Since then, however, important events have led to considerable changes in the governance system.. Consequently, these factors had to be examined before a viable assessment of the sustainability of Apo Island's fishery could be produced.

Factor 1: Apo Island Protected Landscape and Seascape (AIPLS)

In 1994, the government system was altered when the island was declared a protected landscape and seascape by presidential proclamation. Significant changes of the institutional arrangement followed.

The boundaries of the MPA (design principle 1) as well as the rules governing appropriation and provision (design principle 2), monitoring (design principle 4) and sanctioning (design principle 5) remained unchanged. Design principle 3,6,7 and 8, on the other hand, were directly affected. A more centralized, top-down management led by the Department of Environment and Natural Resources (DENR) replaced the former community-centered comanagement arrangement (design principle 3). The Marine Management Committee (MMC) was dissolved and subsequently replaced by a DENR-led Protected Area Management Board (PAMB). The AIPLS maintains a more bureaucratic structure and the community has comparatively less representation in the PAMB. This meant a substantial loss of authority and control for the community, and more complicated conflict resolution mechanisms (design principle 6). By overruling the former institutional arrangement, the national government invalidated design principle 7. However, with respect to institutional nesting (design principle 8), the rules of the AIPLS are in accordance with the National Integrated Protected Areas Systems (NIPAS) Act.

In summary, the new governance system brought about tighter tourism regulations, higher income through restructured visitor fees, and reduced vulnerability to political change. On the other hand, it undermined some of the design principles and weakened the role of the community. This bears risks for the sustainability of the CPR, as ownership and decision-making power are directly related to commitment and compliance. However, most of the rules, norms and values established under the former management regime seem to have persisted, and informal community management still continues to some extent.

Factor 2: Tourism

Tourism has significantly increased and today represents the main industry on Apo Island. Most visitors come for diving and snorkeling and, for that reason, can be regarded as an

additional type of resource user. While they do not physically appropriate resource units, divers and snorkelers nevertheless influence the marine environment and conflict with local fishermen. On the other hand, tourism brings higher income, which is partly used for education, livelihood projects and conservation efforts. Tourists and tourist operators are not subject to the informal sanctioning system of the community, but their behavior is regulated by the PAMB. Monitoring and sanctioning is difficult, however, because of numerous external tourist operators, the 'customer is king' attitude and the fact that noncompliance often occurs under water and out of sight. The Dive Rangers of Apo Island, community members trained as underwater guards and paid by the PAMB, provide a promising solution to some of these problems.

Factor 3: Typhoons

In the years 2011 and 2012, typhoons Sendong and Pablo devastated parts of the coral reefs around Apo Island, including the marine sanctuary. The destruction of 99% of the coral reef inside the sanctuary led to a 50% decline of the fish abundance. Reefs on the other sides of the island were not affected and remain intact.

This highly destructive event was excluded from consideration of the fishery's viability, because of the long time horizon (from 100s to over 1000 years) considered to be an adequate measure of sustainability (section 4.1.3). The momentary effects of typhoons are negligible for the assessment of long-term sustainability and the institutional robustness of the governance system and the enduring ability of resource users to engage in collective problem solving is considered more important.

In this regard, the reactions to the disaster proved that there remains a clear determination to collectively work on problems resulting from typhoons. Important stakeholders are currently undertaking rehabilitation projects in the destroyed parts of the marine environment. Participating parties include Silliman University, the PAMB and LGUs, the local community, the Apo Island Dive Rangers and other NGOs. Moreover, a recovery plan for the MPA that includes a new sanctuary has been designed and is currently under discussion.

Assessment of sustainability

In conclusion, the fishery of Apo Island is currently in a fragile state, mainly due to the erosion of important design principles, the implications of the weakened role of the community and the unsolved issues with tourism. In regard to the design principles and the

role of the community, the institutional arrangement has regressed since 1994. On the other hand, formal institutional strengthening and tighter regulation of tourism has been achieved. The community remains vital and has not lost its ability to collectively solve problems. Overall, human activity has not degraded the fishery's ability to produce resource units. The impact of the typhoons has been disregarded due to the time scale of sustainability time horizon, although. if such natural disasters appear more frequently in the future, they will represent a gigantic threat to the CPR.

6.2 Conclusive remarks

The aim of this research has been to contribute to the quest for reproducible patterns of sustainability in the context of CPRs. The case study of Apo Island's fishery entails a detailed description of the community-centered comanagement regime (1982-1994) and an analysis of the factors that stimulated institutional change at the island. In addition, recent changes were examined in an attempt to assess the sustainability of the fishery.

Apo Island provides an example of a community-centered management system that was established and maintained with facilitation of actors external to the community. During both the process of institutional change and the comanagement arrangement some of the limitations of purely self-organized CPR management could be addressed while maintaining local commitment. The cooperation of community, higher-level government units and an academic institution, itself interested in maintenance of the environment, represents a promising approach to workable CPR governance.

The case study also showed that local CPR institutions are affected by various external factors. Higher-level rule changes, emerging tourism, natural disasters and external actors have thoroughly influenced Apo Island's fishery governance system. More research is needed to elaborate the factors that affect institutions and institutional change in a world in which most CPRs can no longer be regarded as isolated entities.

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Appendix 1:

Summary of the ordinances that affected the governance system of Apo Island, 1986 and 1999.

EXCERPTS FROM THE MINUTES OF THE *SANGGUNIANG BAYAN*'S REGULAR SESSION HELD AT THE OFFICE OF THE MUNICIPAL MAYOR ON MONDAY, NOVEMBER 3, 1986.

WHEREAS, The rationale for the marine reserve and fish sanctuary is as follows:

a) The coral reef serves as habitat for fish and once physically disturbed supports fewer and fewer fish;
b) A fish sanctuary is necessary to allow coral reef fish to breed and grow to maturity without fishing so that reproduction rates may increase potential fish catch to local fishermen;
c) A fish sanctuary where increased numbers of tame fish reside will attract scuba diving and snorkeling tourists and non-tourists to Apo who will give a small amount in the form of donation that will go to the community development project, e.g. toilet facility, beach cottages, etc.
d) The entire marine habitat surrounding Apo be declared a marine reserve to help prevent illegal and destructive fishing activities done by outsiders to Apo;
e) The area extending at least 500 meters on the southeast corner to be chosen as a fish sanctuary because this topographically diverse drop-off area with strong currents provides good breeding habitat for fishes which will circulate around the island, and the minimum 500 meters area is necessary to insure breeding and protection for sufficient number of species.

NOW THEREFORE, to fully protect the reserve area, particularly Apo Island fish sanctuary, Dauin, Negros Oriental, the body RESOLVE, as it is HEREBY RESOLVED, to adopt an ORDINANCE protecting the reserve area from all fishing methods or other ways destructive to the coral reef habitat, viz:

ORDINANCE NO. I_

"AN ORDINANCE PROTECTING THE MARINE RESERVE AND FISH SANCTUARY OF APO ISLAND, DAUIN, NEGROS ORIENTAL

Be it ordained by the *Sangguniang Bayan* that:

Section I. The entire marine habitat around Apo Island, from the high tide mark to a distance of 500 meters offshore be protected from all fishing methods or other ways destructive to the coral reef habitat including:

a) dynamite fishing
b) *muro-ami* type of fishing or related methods using weighted scare lines or poles
c) spear fishing using SCUBA
d) cyanide or other strong poisons and
e) every small mesh gill net.

Section II. A coral reef fish sanctuary and breeding area be located on the southeast corner of the island where the following rules apply:

a) no fishing or collecting is permitted
b) anchoring of boats is allowed but destruction of corals be avoided

Section III. The marine habitat outside of the fish sanctuary but within the marine reserve be called a traditional fishing area where all destructive fishing methods are prohibited and where the following traditional fishing methods are permitted:

a) hook and line
b) bamboo traps
c) gill nets
d) spear fishing without scuba
e) other types of netting and
f) traditional gleaning

Section IV. The Apo Marine Reserve area be protected by municipal resolution and managed by the Apo barangay Marine Management Committee in conjunction with the Dauin Municipal Council with logistic and legal support from the BFAR and PC-INP in Negros Oriental and management advice from the Marine Conservation and Development Program of Silliman University.

Section V. This Ordinance shall take effect immediately upon approval.

PROTECTED AREA MANAGEMENT BOARD (PAMB)
APO ISLAND PROTECTED LANDSCAPE/SEASCAPE
Municipality of Dauin
Province of Negros Oriental

BOARD RESOLUTION NO. 1
Series of 1999

A RESOLUTION PROHIBITING, REGULATING AND PRESCRIBING FEES FOR ACCESS TO AND SUSTAINABLE USE OF RESOURCES IN APO ISLAND PROTECTED LANDSCAPE/SEASCAPE.

Pursuant to Republic Act No. 7586 known as National Integrated Protected Areas System (NIPAS) Act and Presidential Proclamation No. 438, dated August 9, 1994 that declared the Apo Island and its surrounding waters as Protected Landscape/ Seascape situated within the Municipality of Dauin, Province of Negros Oriental, containing an area of 681.45 hectares is established and reserved for the purpose of protecting and conserving the ecological, scientific, educational, economic and recreational values of the area. Sustainable development of the area shall be pursued to address the social and economic needs of the local communities without causing adverse impact on the environment.

Section 1. Basic Policy – The Protected Area Management Board (PAMB) hereby adopts the following policies on the sustainable use of resources within Apo Island Protected Landscape and Seascape:

1.1 The use of resources and facilities in the protected area shall be regulated.
1.2 Fees and charges shall be collected for every access to and sustainable use of resources and facilities located in the protected area for recreational, commercial, educational, subsistence, and all other purposes.

Section 2. Registration Requirement – All tourists/visitors including their carrier or boat are required to register at the Apo Protected Landscape and Seascape (APLS) Visitor Assistance Center, to give the following information: name, age, status, sex, address, occupation, purpose of visit, the proposed duration of stay and activities, number of logged dives/certification level for scuba divers and such other information of a similar nature.

Section 3. Anchoring/Mooring Area – Anchoring/Mooring shall be allowed at the following designated areas only as shown in the map below which are marked buoys.

For purposes of this resolution, anchoring is distinguished from mooring. Anchoring is understood as the throwing of the anchors overboard while mooring shall mean the act of tying the boat in to a mooring buoy.

3.1 For boats weighing less than 1.5 tons
   a. From Baluarte Point to Point Pook at Sitio Baybay on the west side of the island, provided that the anchor is within 40 meters from the beach at the mean lowest tide level.
   b. In front of the beach at Sitio Cogon on the east side of the island in the vicinity of the canal, provided that the anchor is within 40 meters from the beach at the mean lowest tide level.
   c. On the eastern boundary of the marine sanctuary at Sitio Ubos on the south side of the island in the vicinity of the canal, provided that the anchor is within 40 meters from the beach
3.2 For boats weighing 1.5 tons or more but not to reach 5.0 tons:
   a. From Baluarte Point 200 meters southward at Sitio Baybay on the west side of the island, provided that the anchor is within 40 meters from the beach.
3.3 Boats weighing 5.0 tons or more are prohibited to anchor in the whole-protected seascape. However, these boats are allowed to moor at designated mooring buoys.

Section 4. Diving Regulation – The number of divers and snorkelers inside the marine sanctuary shall be regulated.

4.1 Only fifteen (15) scuba divers including 3 dive guides shall be allowed to dive in the marine sanctuary area (Strict Protected Zone) per day, provided that they have registered in accordance with Section 2 thereof. A guide or watcher shall be required for every four (4) scuba divers in order to monitor the activities of the divers.
4.2 Only eight (8) snorkelers shall be allowed to swim in the marine sanctuary at any one time. Swimming and bathing in the marine sanctuary are strictly prohibited. The term "snorkelers" does not include swimmers and bathers.
4.3 **Entry and Exit Area** – Scuba divers and snorkelers shall use the designated entry and exit points in the marine sanctuary area (Strict Protected Zone).

4.3.1 Diving Gear – Scuba diving with spear guns is strictly prohibited in the Apo Island Protected Landscape and Seascape (APLS). Spear guns carried around the APLS except those carried by Apo Island residents is disallowed, hence it shall be deposited in the APLS Center.

4.3.2 Scuba divers and snorkelers shall not wear gloves, except for research purposes and with prior approval by PAMB thru PASU

4.3.3 Divers are not allowed to dive or approach within 100 meters from fishers conducting fishing activities in the APLS.

Section 5. Fees and Charges – It shall be collected from every tourist/visitor at the APLS Visitor Assistance Center or at other designated areas.

5.1 **Visitor Entrance Fee:**

a. Adults (local)	PhP	10.00
b. Students (local)		5.00
c. Foreign Nationals		20.00

5.2 **Additional Charges/Fees:**

5.2.1 Scuba diving per day/per diver or fraction thereof:		
a. Within marine sanctuary	PhP	150.00
b. Outside marine sanctuary		75.00
c. With camera (still picture)		50.00
5.2.2 Snorkeling per day or fraction thereof:		
a. Within marine sanctuary	PhP	25.00
b. Outside		10.00
5.2.3 Camping per day or fraction thereof:		
a. Adults	PhP	20.00
b. Students		10.00
5.2.4 Filming for movie production, TV, and commercials per day or fraction thereof:		
a. Landscape area	PhP	500.00
b. Seascape (within marine sanctuary)		1,000.00
b. Seascape (outside marine sanctuary)		750.00
Acknowledgement of the area shall be included in the film production for promotion.		
5.2.5. Lodging at cottages		
Per person/day or fraction thereof:	PhP	50.00
5.2.6 Per picnic shed per unit/day or fraction thereof:	PhP	50.00
5.2.7 Mooring per boat/day or fraction thereof: (1 day = 24 hrs.)		
a. Less than 1.5 tons	PhP	50.00
b. 1.5 tons or more but not to reach 5.0 tons		100.00
c. 5.0 tons or more		500.00
5.2.8 Anchoring per boat/day or fraction thereof at designated areas: (1 day = 24 hrs.)		
a. Less than 1.5 tons	PhP	50.00
b. 1.5 tons or more but not to reach 5.0 tons		100.00

Section 6. Mode of Collection. The following procedure shall be observed in the collection of fees and charges:

6.1 Entrance fee shall be collected from tourists/visitors at the APLS's Visitor Assistance Center after filling-up the registration form. Corresponding tickets or official receipts shall be issued for such fees.

6.2 Charges for resource/facility use and services shall be collected upon reservation and corresponding official receipts shall be issued for such payments.

6.3 Payment of fees and charges shall be made on cash basis only. Personal checks or credit cards shall not be honored.

Section 7. Collection Responsibilities: The following shall be responsible for the collection and account of pertinent fees, charges, and donations.

a. The Protected Area Superintendent (PASU)

b. PASU duly appointed representative concurred by PAMB. All collecting officers shall be bonded.

(The remainder of the Resolution describes penalties and is not included here.)

** These samples are indicative only. They should not be copied but rather adapted for any given area and its requirements.*

Source: (DENR et al., 2001b, p.87)

Abstract

Sustainable management of natural resources is imperative for the long-term survival of humanity as a whole. This study explores the possibilities of sustainable management by analyzing the fishery governance system at Apo Island, Philippines. It is undertaken from an institutional perspective in the context of common pool resource studies. The design principles of Elinor Ostrom provide the primary methodology for the analysis. It is argued that sustainable CPR utilization can require a combination between local and external regulation. Furthermore, the origins of successful CPR governance are examined. At Apo Island, CPR governance was established through a comanagement arrangement between the local community, local government units and Silliman University. The case study shows that external actors can be imperative for the stimulation of institutional change. The origins of sustainable CPR management of Apo Island can be ascribed to the engagement of Silliman University. Extensive education programs represented the vantage point of local efforts to conservation. Moreover, capacity building efforts of the university enhanced the ability of the community to engage in mutually beneficial collective action. The study concludes that more research is needed to identify factors that affect institutions and institutional change in a world in which most CPRs can no longer be regarded as isolated.

Zusammenfassung

Nachhaltiger Umgang mit natürlichen Ressourcen ist eine wesentliche Herausforderung unserer Zeit. Diese Arbeit untersucht nachhaltige Managementansätze am Beispiel von Fischerei auf der philippinischen Insel Apo Island. Im Zuge der Arbeit wird aus institutionenökonomischer Sicht der Frage nachgegangen, wie Allmenden nachhaltig genutzt werden können. Hierzu werden Elinor Ostroms Design Prinzipien als Analyserahmen verwendet. Am praktischen Beispiel wird argumentiert dass nachhaltige Nutzung von Allmenden auf eine Kombination aus lokaler und externer Regulation zurückgeführt werden kann. Darüber hinaus wird untersucht, wie nachhaltige Regulierung von Allmenden angestoßen werden kann. Auf Apo Island gelang dies durch eine Partnerschaft der lokalen Gemeinde mit der regionalen Regierung und der nahegelegenen Silliman University. Das Beispiel zeigt auf, dass externe Akteure einen entscheidenden Einfluss insbesondere auf den Beginn institutionellen Wandels haben können. So werden die Anfänge nachhaltiger Fischerei auf Apo Island auf das Engagement der Silliman University zurückgeführt. Einleitende Informationskampagnen bildeten den Ausgangspunkt lokaler Bemühungen zur nachhaltigen Regulierung der Meeresfischerei. Capacity Building Programme der Universität trugen zur langfristigen Stabilisierung des Regulierungsregimes bei. Die Arbeit kommt daher zu dem Schluss, dass der Frage der Initiierung und dem Erhalt von selbstregulierenden Managementsystemen natürlicher Ressourcen besonders in einer interdependenten Welt eine stärkere Gewichtung zukommen sollte.

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