

**CO-MANAGEMENT IN TRAO REEF MARINE RESERVE, VIET NAM
A TRANSACTION COSTS APPROACH**

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ABBREVIATIONS

CBA:	Cost – Benefit Analysis
CBFM	Community based fisheries management
CM	Co-management
Com:	Communities
CPUE	Catch per unit effort
Decr:	Decrease
DICAFIREP	The Directorate of capture fishery and fisheries resource protection
FAO	Food and Agriculture Organization
FICEN	Fisheries information center of Viet Nam
FMS	Fisheries management system
Gov:	Government
IMA	International Marinelife Alliance
Incr:	Increase
MARD	Ministry Agriculture and Rural Development
MCD:	The Center for Marine life Conservation and Community Development
MEY	Maximum economic yield
Mofi	Ministry of Fisheries
MPAs	Marine Protected Areas
MSY:	Maximum Sustainable Yield
MSY	Maximum sustainable yield
NGOs:	Non-Government Organizations
NIO:	National Institute of Oceanography
OA	Open Access
OSY	Optimal sustainable yield
Sta:	Stable
TACs	Total allowable catches
TURFs	Territorial use rights in fisheries
VACNE	The Vietnam Association for Conservation of Nature and Environment
VASEP	Vietnam Association of seafood exporters and producers
VIFEP	Vietnam Institute of Fishery Economic and Planning SCAFI
VINAFIS	Vietnam Fisheries Association

ABSTRACT

Humans are getting more dependent on marine and coastal resources. This has led to increased fishery exploitation and in many cases overexploitation with habitat degradation. This threatens coastal and marine resources all over the world. The current management approaches have failed to control fishing capacity and conflict in sharing fisheries resources due to population growth, poverty and a lack of awareness raising. The management and governance of small-scale fisheries is ready for worldwide reform.

In recent years, Marine protected areas (MPAs) are becoming a popular tool for management and conservation of marine resources. Co-management is a recommendation as a solution of governance for marine protected areas. Co-management is a process that involves democratization and decentralization mechanisms through collaboration and power-sharing between resource users and government officials (Pomeroy and Rivera-Guieb, 2006)

This paper highlights the co-management of an MPA in Trao Reef locally managed marine reserve, which was established in 2001 to protect and rehabilitate fisheries resources in general and the coral reef in particular. In addition, this paper demonstrates one way to approach co-management which include the transaction-costs, the method for measuring the transaction costs in fisheries co-management system. Transaction costs are defined as “the cost of transacting, which consists of the costs of measuring the valuable attributes of what is being exchanged and the costs of protecting rights and policing and enforcing agreements” (North 1990).

The study is based on fisheries management, co-management, transaction-cost literature and secondary and primary data. The reduction of transaction-costs in the last stage of co-management regime is used to choose alternative institutional arrangements for managing a fishery for public policy decisions. This study is also the first paper to mention transaction-costs in fisheries co-management in Viet Nam.

Key words: Co-management, Fisheries co-management, transaction costs.

INTRODUCTION

Today, the fisheries are becoming more important. According to the state of world fisheries in 2008, fishers, aqua-culturists and those supplying services and goods to them assure the livelihoods for about 520 million people worldwide, which constitutes 7.9 percent of the world population (FAO,2008). In addition, the changing in the supply, demand, value, management and uses of fisheries resources in the global-scale could threaten progress towards sustainable food security and resource development in many parts of Southeast Asia (Pomeroy, 1995). In order to decrease the continuous depletion fisheries resources, it is required that the decision-makers have to find better ways to manage fisheries resources. Establishment of marine protected areas (MPAs) is as an effective management tool for natural resource in general and fisheries in particular throughout the world. According to the Professor Claire W Amstrong in the an MPA workshop for the officer of fisheries sector in Ha Noi, Viet Nam (February, 2010), MPAs have 3 main goals: conservation, fisheries benefits, and benefits for other sectors (tourism, recreation, etc.) and she also represented that the general economist stance on marine reserves that marine reserves have to be incorporated with other management tools.

In Vietnam, a country with a coastline of 3,260 km long and thousands of small and big islands scattered along the coast and has the potential for developing aquaculture (Heen K., L.T. Tuan, 2007). The East Sea and it's coastline have abundant and diversified natural resources like coral reefs and mangrove forests, and it also has potential for developing an economy with the multi-industries and multi-targets. According to the Vietnam Association for Conservation of Nature and Environment-VACNE, this therefore is an exciting place to focus on the human's development activities included over 50% of big cities, 60% of the population which is calculated based on the provincial units, most of the big industrial parks and export processing zones, most of aquaculture areas, seaport – shipping activities and tourism will be built here in 2010 (VACNE). These activities lead to increased the migration and demand for using natural resources. In consequences it is creating huge pressure on the urban environment, coastal communities, and over the capacity of urban planning, leading to depletion and degradation on marine resources. There are very little of fisheries in the near-shore waters in which to catch fish however the lives of about 600,000 fishermen and their families still need fish for everyday and the instinct to survive has forced them to exploit much more fishes (VACNE). Poor fishermen, who gave up fishing on the coastline and changed to aquaculture, but they are lack the capital and cultivation techniques necessary for aquaculture. Therefore most of them remain poor, and eventually have to go back to the sea as before and only to resort to much more intensified

exploitation of natural resources with hopefulness of higher income for their family. Finally, they fall into a vicious cycle: livelihood requirements - excessive exploitation - depleted resources - poverty - livelihood requirements. High poverty rates make difficult for investment and development towards industrialization and modernization. Because of instinctive existence, the poor and disadvantage people often find themselves willing to "mortgage the future". And because of the vicious circle, the fishermen seem to do not care about natural resources and environmental protection. In addition, the living habitats and customs of coastal residents in general and fishermen in particular, until now, is characterized by low education because lack of conditions for learning (Most fishermen's children only finish the primary school). Their awareness about environmental and natural resource protection is therefore still poor. Additionally, the infrastructure development of culture and society (electricity, roads, schools, stations ,...) in coastal areas is low. The first reason for this is that investment in the past mainly focused on big cities, industrial parks, so that the investment rate for this is not adequate. Furthermore, the coastline areas have high risks of natural disasters so that the construction here has often degraded rapidly. With this current status of the fisheries, it is getting more established or proposed MPAs are being established and proposed in Viet Nam, with up to 15 MPAs proposed to exist by 2015, most of them were managed by local government (Hon Mun MPAs) or government officials (Nui chua Park).

However, the fisheries management realities in Viet Nam have shown that if the fishermen do not increase their awareness, have chance to improve their living standards, or are not attracted in participating in the management process, then the natural resources and environment will continue to be destructed by exploitation. There are a lot of different economic activities in the marine and coastal areas in Viet Nam and they are managed by industry. According to this way of management, the industry often focuses more on the goals of economic development, and the social and environment objectives suffer from lack of attention while each industry only considers own their benefits. This system It is leading to increased the conflicts of interests in using natural resources in this areas and is negatively affecting sustainability. In the fact, the sectors like fisheries, maritime, oil and gas, tourism and the coastal provinces - 28 provinces in Viet Nam, Mofi (Ministry of Fisheries, now is into MARD – Ministry Agriculture and Rural Development) have the duties to manage and protect marine resources. The Government has also established some consultancy organization or manage the fisheries resource like Frontier Committee (Ministry of Foreign Affairs), the Coast Guard (Ministry of Defense), Island and marine committees at the central and local levels. However, it is still a lack of unifying regulations about concrete tasks and functions of the each organization and the lack of a

consistent decision-making processes that results in effective coordination among involved agencies, still under way “who are stronger, who made”. There is a lack of coordination among management agencies, scientific institutions and non-governmental organizations (NGOs) in using and managing the marine resources, especially in coastal areas. Participation of local communities in managed processing is not frequent and when it exist, it is completely passive, including lack of detail regulations on rights and responsibilities of participants. The local communities are not only using the resources but also subject to management of the natural resources. They have indigenous knowledge, and can understand exactly their own works and aspirations. Appeals to local communities into managing marine resources is contributing to successful implementation of the policy of the Government in order to strengthen democracy at the locals level and the principle of "people know, people discuss, people do, people check” in the Viet Nam government.

Understanding this common practice, members of the Van Hung community established Trao Reef Marine Reserve in 2001 in co-management system, with the support of the Centre for Marine life Conservation and Community Development (MCD), to protect the reef from over-fishing and destructive fishing practices, and allow the reef to rehabilitate. It is one of the first examples of a locally-managed Marine Reserve in Vietnam. Kuperan, et al (1999) said that one of the purported advantages of co-management compared to centralized management is that it will reduce transaction costs - the cost of gaining information about the resources and what users are doing with it, reaching agreements and coordinating with others in the group with respect to use of the resource, and enforcing agreements that have been reached (Abdullah et al. 1998b). He also points out that a centralized approach is often associated with low program design costs but high implementation, monitoring and enforcement costs as the management regime may have little legitimacy with user groups. A co-management approach, on the other hand, is associated with high program design costs as effective participation is time-consuming and therefore costly. However, co-management is likely to lead to lower implementation, monitoring and enforcement costs as legitimacy of the regime is greater (Hanna, 1995).

There are many researchers (The Nha Trang Institute of Oceanography officers) and students (Lam Anh, 2003; N.T.Thao, 2009 and Nguyen, 2009, etc) that have investigated about this co-management model. Most of studies only have evaluated the technical aspects and only one researcher have done about economical evaluation (N.T.Thao, 2009) using the Cost Benefit analysis (CBA) method. However, Thao’ research also said in her paper that the research can not calculate all of the benefit from Trao Reef through the cost-benefit analysis (CBA) method. This conclusion encouraged this author to research and find out another way to evaluate economic

efficiency when applied the co-management in Trao Reef, that is transaction cost. The transaction costs that may either increase or decrease in total costs of fisheries management in a co-management system. But, co-management is expected to lead to improved natural resources using outcomes as measured by economic efficiency, equity and biological sustainability. Co-management is believed to be an institutional arrangement for managing fisheries resources, will effectively address some of the problems of fishery overexploitation; dissipation and redistribution of resource rents; limited fisher participation and conflicts among the different groups of resource users (Abdullah al et, 1998). However, the application co-management is different in deferent areas, politics etc and this is the first paper mentioned about transaction costs in Viet Nam. Therefore, it will only explore some issues related co-management and transaction costs based on a case study of Trao Reef, Khanh Hoa province, Viet Nam. The data for this study is primary data collected from interviewing the people living in Xuan Tu 1 and Xuan Tu 2 commune, and Secondary data were collected from archives, MCD, People's Van Ninh district committee, People's Van Hung commune, Dicafirep.

There are three (3) main objectives in this paper:

- *Review the literature of fisheries co-management of relevance to the Trao Reef situation, show achievements in new management institution (co-management);*
- *Explore measurement transaction costs in Trao Reef in co-management system;*
- *Identify opportunities and obstacles for applying transaction costs in Trao Reef 's fisheries co-management model.*

To achieve these 3 above objectives, the paper is comprised of 5 main chapters with the exclusion of introduction and conclusion. In chapter I background about world fisheries management is presented. The literature framework (of fishery co-management and transaction costs) are presented chapter II. Chapter III of the paper provides information on the case study in Trao Reef, Van Ninh district, Khanh Hoa province, Viet Nam, the research site for the transaction cost analysis, the data collection and measurable methodology of transaction costs. This is followed by the chapter IV, which explains the results of the research. Discussion from results and recommendations after researching is final chapter of the article.

Chapter I

BACKGROUND OF GLOBAL FISHERIES MANAGEMENT

1.1. Global fisheries management and mismanagement

1.1.1. *Global fisheries management and mismanagement status*

According to the data collected by Food and Agriculture Organization (FAO), the food fish worldwide supply in 2006 was about 110 million tones, including 47 percents from aquaculture. Fish provides animal proteins for more than 2.9 billion people. Fish protein's contribution in total world animal protein supplies increased from 14.9 percent in 1992 to 15.3 percent in 2005. The worldwide capture fisheries production was about 92 million tones in 2006, including about 10 million tones from inland waters and 82 million tones from marine waters. Capture fisheries and aquaculture play an important role in the livelihoods of millions of people around the world. In 2006 it was estimated that there were 43.5 million people who were directly involved with the production of fish either capture from the wild or in aquaculture. Eighty six percent of fishers and fish farmers world-wide live in Asia (FAO, 2008). All of 50 of the world's 51 million fishers come from developing countries and are employed in small-scale fisheries. In addition, more than half of the world's annual marine fish catch of 98 million tones are consumed in the developing world is supplied by them (Berkes, et al, 2001). Before the turn of the 20th century, it is believed that fishery resources were inexhaustible by the industrialized countries of Europe (Berkes, et al, 2001). However, today, together with the development of fishing technology (fishing lines, fishing vessels ...), population growth, ... leading to overexploit. The state of world fisheries and aquaculture in 2008 showed that "in 2007, about 28 percent of stocks were either overexploited (19 percent), depleted (8 percent) or recovering from depletion (1 percent) and thus yielding less than their maximum potential owing to excess fishing pressure. A further 52 percent of stocks were fully exploited and, therefore, producing catches that were at or close to their maximum sustainable limits with no room for further expansion. Only about 20 percent of stocks were moderately exploited or underexploited with perhaps a possibility of producing more" (FAO, 2008). If fishing continues at the current rate, fish could disappear from our oceans within half a century. The literature is full of examples citing that unmanaged fisheries will lose their economical viability or even collapse in the current literature (Berkes, et al, 2001). Berkes affirmed some fish stock decline examples related in large fish stocks like the Peruvian anchoveta, northern cod, New England groundfish, bluefin tuna and Atlantic swordfish (Buckworth 1998). From the global perspective there is a consensus that there is an urgent need for improved fisheries management. There are a lot of goals of fisheries management but all of

them are leading to use resource sustainability. There are some ways to approach fisheries management, depend on management's objectives, and these objectives have changed over time (example: Larkin, 1977 chose maximum sustainable yield (MSY), Roedel 1975 used Maximum economic yield (MEY) and optimal sustainable yield (OSY) (Berkes, et al 2001)). It is more clearly in this figure:

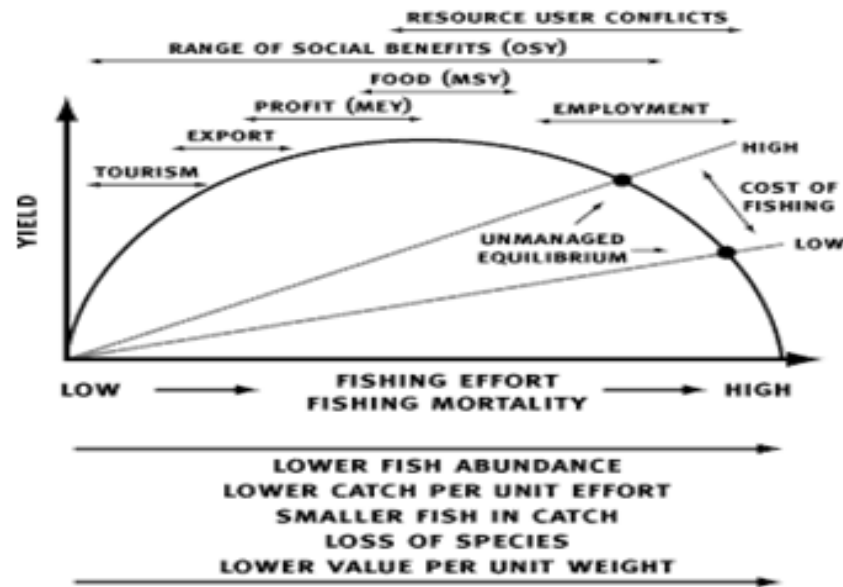


Figure 1: Fisheries yields and objectives

Source: adapted from Caddy and Mahon 1995 (Berkes, et al, 2001)

MSY looks at the biological to measure of harvested fish, based on information from stock assessment. MSY research still do not coordinate human predatory behaviour adequately. Berkes, et al (2001) affirmed that “MSY is a dominated approach, which is coordinated with command-and-control input regulations that the harvest sector seeks to circumvent, therefore, raising costs of administration and enforcement to obtain compliance”.

MEY is biologically more conservative than MSY. Economic measures which include taxes and quotas, is used in fisheries management. Hardin (1968) said that MEY seeks the rent maximization from the fishery and therefore the total economic benefit to society while preventing the “tragedy of the commons” (Berkes, et al, 2001). The Lecture Notes on Fisheries Economics and Management, The Norwegian College of Fishery Science, University of Tromso, Norway in 2010 also affirmed that in the open-access the maximum sustainable yield stock level, X_{MSY} , may be below, above or equal to stock level, X_{∞} , whereas the rent maximizing stock level, X_{MEY} , is always above the MSY level. It is showed in Figure 1 that increased fishing effort leading to erode both rent and biological viability. There is also consensus that property rights are important in managing fisheries. Open access (OA) is undesirable and to ignore

management at the communal level is a very important oversight. Managing fisheries using best available information relates not only to biology and economics but also to the cultural, social, and political components of the fisheries system is an obligation (Berkes et al, 2001). Optimum Sustainable Yield (OSY) mixed all components to arrive at yield targets depend on management objectives that are broader than MEY and MSY. Berkes et al (2001) also said that the idea of optimal yield from a fishery revealed that the benefits is derived from fisheries could be measured in many ways other than simply the weight or the landed value of the catch (Roedel 1975). The trouble is that multiple objectives are messy and OSY rather vague. Maximizing for a single objective is much easier than optimization. The fishery resources are under common property or open access situations with the top-down management regime. The overexploitation and degradation are often subject in management regime due to over-capitalization, inefficient technologies and lack of proper management (Pomeroy, 1998) A key fisheries management issue is the lack of progress with the fishing capacity reduction and related harmful subsidies. A further and important reason to promote capacity building occurs where regional co-operation and collaboration underpin the implementation of agreements (FAO, 2008).

1.1.2. Solutions to deal with the fisheries mismanagement in the world

In summary, there was not an appropriate management scheme during the fishing industry’s rapid development and this has led to the problem of over-fishing and finally depletion in fishery resources as outlined in the above analysis. In open-access fishery, because of no guarantee that if fishermen do not fish today, they can catch tomorrow, therefore they catch as much as possible until the return from fishing can not cover the cost (see fig 2 example from Vietnam).

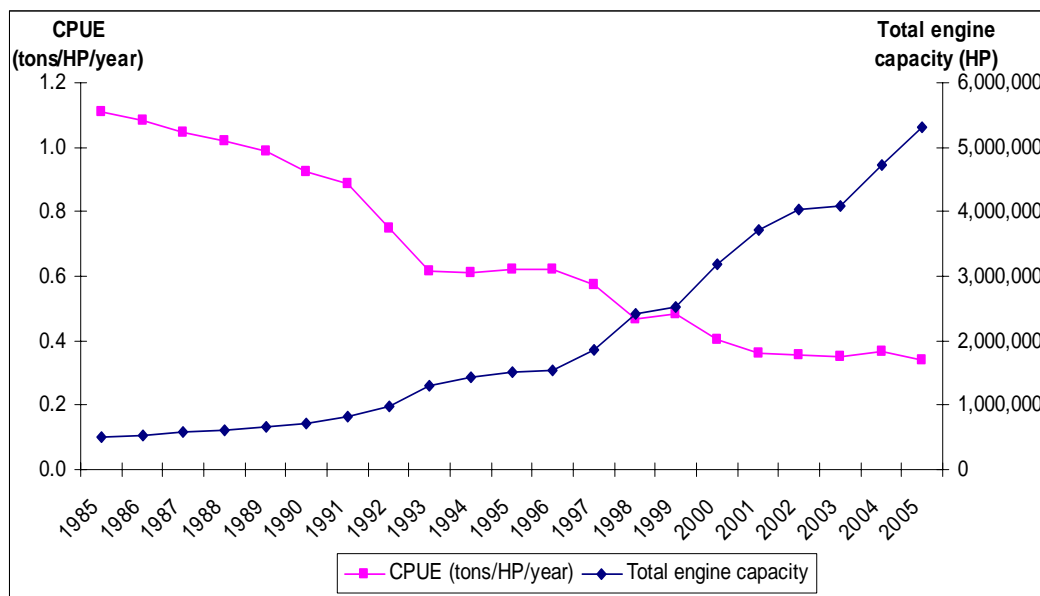


Figure 2 : Catch per unit effort related to engine capacity
(Source: Ministry of fisheries, 2006)

Where marginal revenue equals marginal cost, does not lead to profit maximization in open-access fishery. Instead, equilibrium will be reached where average revenue equals average cost (i.e. total cost equals total revenue). In open-access, scenarios fish abundance is getting degraded and this leads to less fish being available for future generations. Various attempts have been carried out in order to manage fisheries such that we can optimize exploitation of fishery resources. It is often found conventional fishery regulations involve both renewing resource abundance (including closed season, closed area, and gear restriction) and control on fishing effort (including limited license, individual fish quota, and taxation).

Arnason (1990) suggested that fisheries management may be classed in to two groups: biological fisheries management and economic fisheries management.

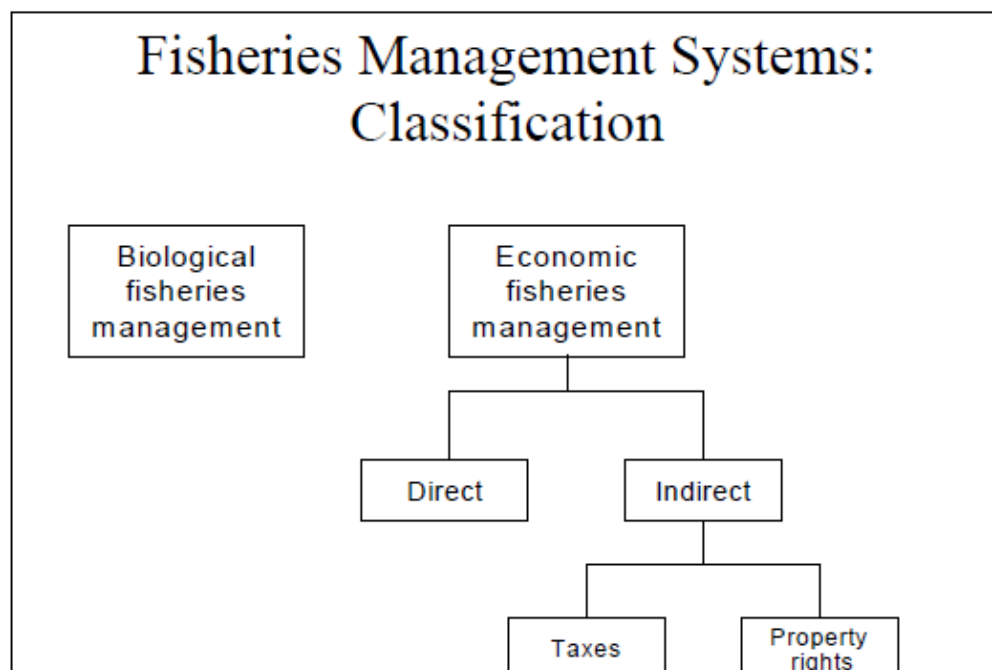


Figure 3: Fisheries management systems: classification

(Source: Handbook Of Operations Research In Natural Resources, Part II, chapter 9: fishery management, page 166)

Biological fisheries management included “mesh size regulations, total allowable catch, area closures, nursery ground protection and so on, may conserve and even enhance the fish stocks” (Arnason, 1990). As a presentation in Figure 3, economic fisheries management may be included two types: direct and indirect. The indirect economic management may be detail divided into taxes and property rights.

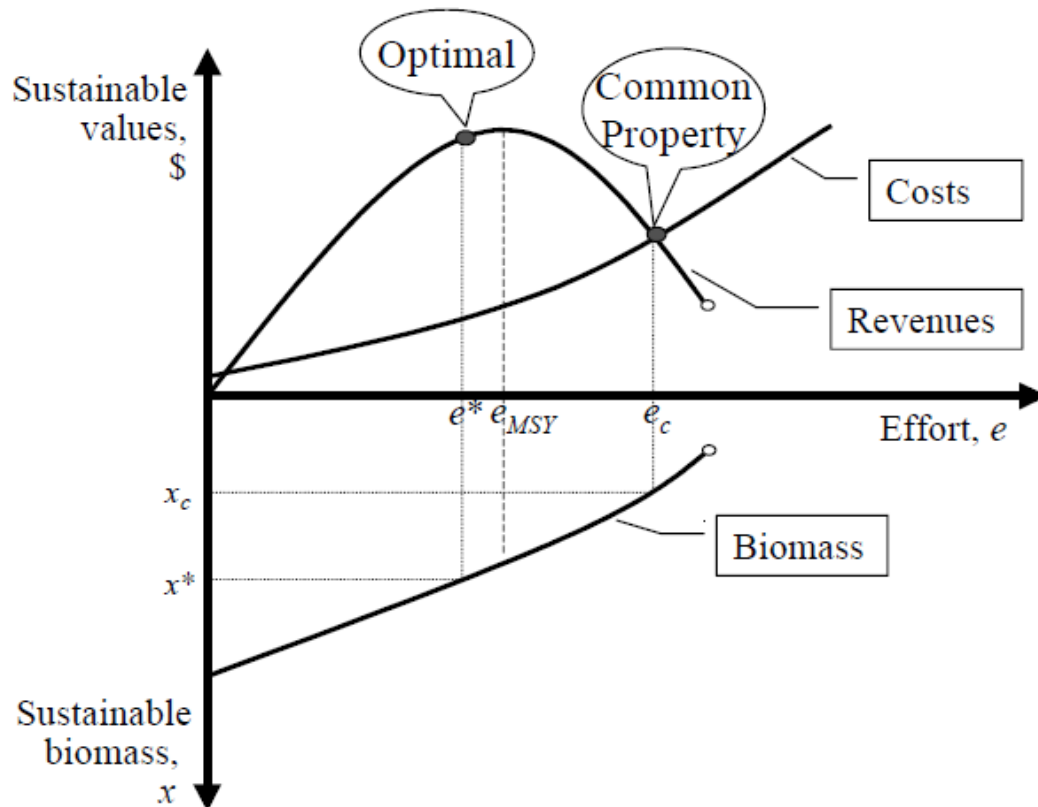


Figure 4: The sustainable fisheries model

(Source: Handbook Of Operations Research In Natural Resources, Part II, chapter 9: fishery management, page 159)

The analysis about the biological fisheries management mentions about effect of total allowable catches (TACs). The fishery is beginning at a competitive equilibrium without profits and the fishing effort is at point e_c (total costs equals total revenues). TAC restriction is enforced by effort limitations. When the effort is less than e_c , it showed that the fishery will become profitable (the revenue curve is above the cost curve). Companies try to raise the fishing effort to get more profits. The more vessels that were built the less profits was shared. Therefore, the TAC restriction is maintained, the operating time of the fleet will have to be shorted further and so on and finally, a new equilibrium been established, sustainable fishing may have raised and improvement of fish stocks. “However, what really counts, the profits, that is net economic benefits of the fishery will be not different as before, equal zero”, Arnason, 1990 said that. A lot of the same applies to direct economic restrictions like limitations on fishing time, days at sea, engine size, number of vessels, holding capacity of the vessels, and so on. It is the same as biological fisheries management, the failure of these methods is to generate economic rents because they do not remove the common property nature of the fishery. Consequently, TAC can not solve the conflict between the fishermen, they continue in the catch through expansion of the

fisheries inputs that are not controlled. Within the setting and enforcing of biological and economic fisheries restrictions, it is easy to see that this is always costly, to control. In conclusion, these fisheries management methods – biological fisheries management and direct economic restrictions – may be worse than nothing because biological and economic restrictions do not create any economic benefits, at least not in the long run, these costs of management show a net economic loss.

As Figure 3, Indirect economic fisheries management divided into taxation and various types of private property rights. The appropriate taxation included tax on landing, tax on fishing inputs, make the fishing industry operate in the social optimal way.

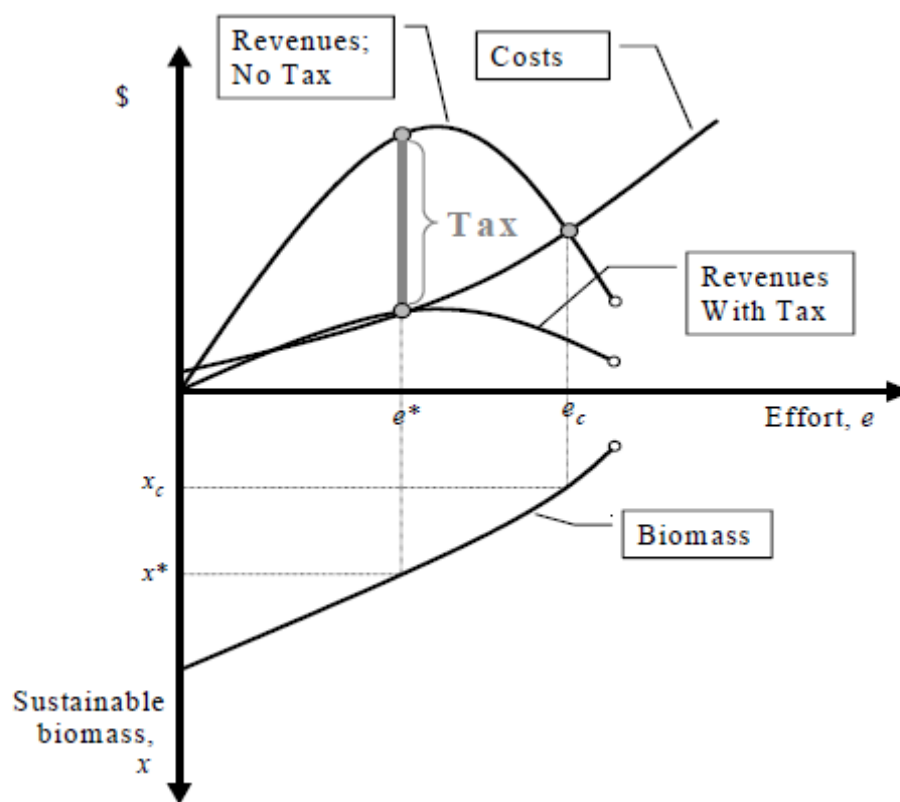


Figure 5: The effect of tax on landings

(Source: Handbook Of Operations Research In Natural Resources, Part II, chapter 9: fishery management, page 168)

From Figure 5, it is presented that the taxes can do this by reducing revenues or increasing the costs of fishing. However, there are some technical and social problems with using taxes (Arnason, 1990). The managing of fisheries by means of taxes has not been used further in any significant ocean fishery. There are some ways to manage fisheries resource that apply property rights-based regimes, especially ITQ systems, this approach based on property rights to attempt to eliminate the common property problem by establishing private property rights over the fish

stocks. Some types of property rights regimes included: fishing licenses, sole ownership, territorial use rights in fisheries (TURFs), individual catch quotas and community fishing rights (Arnason, 1990). Fishing licenses is the right to capture or aquaculture, constitute a property right. Indeed, under those issues, TURFs are seem the same as sole ownership and should lead to full economic efficiency. Arnason showed empirical studies seem to affirm this prediction (Panayoutou,1984). However, with migratory stocks that periodically migrate in and out of the TURF-area, the effectiveness of TURFs is much decreased. In fact, the indications are that the stock does not have to spend much time outside the TURF to create huge decreases in the applicability of this method. Individual quotas have been applied around the world with a suitable degree of success. Individual transferable quotas or ITQs was understood as transferable and perfectly divisible catch quotas. If the ITQs were also permanent they establish a complete property right just like a building or a piece of land (Arnason, 1990). There are two ways, ITQs do this essentially in: secure rights to a certain quantity of harvest and ITQs further economic efficiency is by quota trades. Given quota tradability this leads to only the most efficient fishing firms to operate in the fishery. The less efficient or inefficient firms will sell their quota and leave the fishery. Thus, under an ITQ system, there will be a convergence to the optimal use of overall fishing capital and fishing effort and to the most efficient fishing firms operating in the fishery. Shotton has been verified this prediction in empirical studies of actual ITQ fisheries (Shotton, 2000) and it is verified in a lot of empirical studies (references in Shotton 2000). However, the ITQ system will not automatically lead to full efficiency in fisheries. The quota price is one of the most visible outcomes of a quota system, that is the price by which quotas are traded in the market is leading to the same with the tax on landings in above discussion. The main disadvantage of communal fishing rights as a way towards good fisheries management is that this simply may not happen. Arnason, 1990 confirmed that reorganization that community fishing rights do not constitute an FMS is important. They simply showed that devolution of the authority of fisheries management from a higher level to a lower level. “The community will still have to deal with the problem of establishing and implementing a good FMS”, Arnason (1990), said that. The management system adopted can easily be just as inefficient as the one preceding the community rights. Thus, in order to increase the probability of success, it is required that the communities have the ability to exclude new members, the rights allocated to the communities should be as high quality as possible, the communities should include homogenous group of fishermen as possible and the communities should, if at all possible, be set up so that each member’s pay-off is an increasing function of the aggregate pay-off. It can be represented that if these four conditions are met, there is a high probability that the fisheries community will

manage fisheries in an efficient manner. Other advantages of communal fishing rights is that they often facilitate effective enforcement of fisheries management rules on the basis of social and socially acceptable, social group pressure and physical proximity. (Handbook Of Operations Research In Natural Resources).

Due to the poor management system under the open access scenario, coastal resources have been overexploited and damaged by damaged fishing methods and environmental pollution (Vũ Trung Tạng, 1994, Ha Xuan Thong, 1998). This is in response to the failure of centralised management in the need and search for improved approach and performance in resource conservation and sustainability. It also is getting more awareness that resources can be better managed when fishermen and other stakeholders are directly involved in resource management process and use rights are located, either individually or collectively (Pomeroy, 2000). In New Zealand, fishermen have a very strong position in fisheries management (Jentoft and McCay, 1995; Hersoug, 2002). There are some other strategies being used around the world in fisheries management like consultative, co-operative, community-based and absolutely bottom-up local management systems (Jentoft and McCay, 1995; Sen and Nielsen, 1996; Pomeroy, 1998). Nearly all small-scale fishing communities develop systems of community-based management, which can be distinguished from other management that is instituted by government authority (FAO, 2000). Coastal community issues and problems are multi-faceted and must therefore be addressed an integrated manner. The primary concerns of fisheries management should focus on the relationship of the resources to human welfare and the conservation of the resources for use by future generations (Pomeroy, 1995). Thus the effective management requires multidisciplinary knowledge emphasizing not only on biological aspects but also on socio-economic issues. Opposite of the top down system, bottom up regime starts at the local level. Therefore, the sustainable fisheries are only achievable through collaborative planning strategies, which is combined by the top-down and bottom-up regime as well as governance system. Rather, it must find ways enabling and creating the conditions for sustainable development based more on local resources skills and knowledge. Fishers, the day-to-day managers, have to be equal and active participants in resource management (Pomeroy, 2000). This system is called community based fisheries management (CBFM) /co-management (CM).

1.2. Overview of Vietnamese Fisheries

1.2.1. Resources

From final report of Vietnam fisheries and aquaculture sector study (2005) showed that Vietnam has a land area of 329,200 km² and an exclusive economic zone of about 1 million km². There are 4 main regions in the sea areas of Viet Nam namely northern, central, southeast and southwest as shown in Table 1. Current fish stock estimates total almost 4.2 million tons and a total allowable catch (TAC) or Maximum Sustainable Yield (MSY) is about 1.67 million tonnes per year (The TAC in Vietnam is used the same with the Maximum Sustainable Yield (MYS) in other countries because of the problems with mixed catches, it is very difficult to estimate specific stocks for protection and setting of Total Allowable Catch (TACs).. Biomass has recently been re-estimated. Although the data have yet to be made official by MOFI, it is likely that biomass estimates will be reduced to around 3 million tons and MSY to 1.4 million tons. The official estimates of marine fisheries resources are included in Appendix A (source: Ministry of Finance, 2004)

Table 1: Biomass and estimated MSY

	Fish stock 000 tons	TAC 000 tons
Tonkin Gulf	681.2	272.5
Central Region	606.4	242.6
South Eastern	2075.9	830.5
South Western	506.7	202.3
Sea mounts	10.0	2.5
Total sea area	300.0	120.0
	4180.2	1670.4
Small pelagic	1730.0	694.1
Demersal <50m	597.6	239.2
Demersal >50m	1542.6	617.1
Deep sea pelagic	300.0	120.0
Total	4180.2	1670.4

MSY = maximum sustainable yield,

TAC = total allowable catch

Source: Fistenet based on RIMF 1997 estimates

There are 2,038 fish species in Viet Nam's seas with more than 130 commercial species. Depending on the biological and ecological characteristics, fish species can be distributed into four groups: pelagic fish, the small pelagic fish, the demersal fish. The big pelagic fish are the main targeted species of Vietnam's offshore fisheries with high economic value. They included tuna; Swordfish; Marlin; Mahi Mahi; Indo pacific Spanish mackerel; Wahoo; Narrow barred

Spanish mackerel, ... (*RIMF, 2001*). The small pelagic fishes are abundant in three coastal areas of Viet Nam (the North, Centre, and South). They spawn near the shore in March and April. There are 260 species (both the small and big pelagic fishes). (*RIMF, 2001*). The demersal fish also have high economic value. Most of them distributed in coastal areas and have small in size. They are the major export species among marine fishes of Vietnam and the targeted species of bottom trawlers. They are about of 69% of total number of species in Vietnamese waters, equal 1,432 species as Speckled tongue sole; Largehead hairtail; Long spine seabream; Black pomfret; Silver pomfret; Silver croaker; Silver grunt; Bully mullet; Goldband goatfish; Pale-edged stingray, etc. (*RIMF, 2001*). The coral reef fishes are group fish species which their habitation is in coral reefs. They are colorful and diversity animals. They are about of 16% of the total number of species in Vietnamese waters (340 species) (*RIMF, 2001*).

Because the Vietnam Sea belongs to the tropical environment therefore it has specific characteristics as:

- Oceanography: Tropical and high temperature;
- Biology: High species richness, high biodiversity;
- Fisheries: Mixed species fisheries.

There have been many projects for assessing stock in the Vietnam Sea by many researchers such as Menavesta (1973), Nguyen Van Boi (1976), Pham Thuoc (1984), Bui Dinh Chung (1978, 1981), Le Trong Phan (1985), Bui Dinh Chung, Chu Tien Vinh and Ngyen Huu Duc (2001). But the results are very different (Table 2)

Table 2: The demersal stock and TAC of Vietnamese marine waters

	Stock (tons)	TAC (tons)	Researchers, year
Tonkin Gulf	440,000	280,000	Gulland, 1970
	290,000	145,000	Shindo, 1973
	446,000	223,000	Ayoama, 1973
	800,000	40,000	Le Minh Vien, 1973
Central	160,000	89,000	Shindo, 1969 – 1970
	52,000	26,000	FAO, 1969 – 1971
	193,000	96,000	Van Huu Kim, 1971
South-East	643,000	481,000	Shindo, 1971
	371,000	185,000	FAO, 1971 – 1972
	874,000	437,000	Ayoama, 1973
South-West	900,000	450,600	Isarankura, 1971
	528,000	264,000	FAO, 1969 – 1971
	1,223,000	611,000	Ayoama, 1973

(Source: Thao,N.T, 2005)

1.2.2. Fishing labors

The human resources in Viet Nam are abundant and assiduous. This is advantage for fisheries and other fields. The fisheries sector created a lot of jobs, both directly through employment on boats and farms, and indirectly in upstream and downstream activities such as processing. Direct employment in the sector is estimated at 555,000, at present and has been growing at around 26,000 per year. (FICEN)

Table 3: Fisheries labor (thousands)

	93	94	97	98	99	00	01	02
South	78.1	92.2	143.5	154.8	155.7	156.3	160.7	167.8
S Central	144.2	157.3	187.7	195.6	242.9	246.1	249.8	215.9
N Central	103.8	99.5	108.5	111.9	110.6	115.9	121.7	112.1
North	35.9	38.0	42.6	46.0	37.9	37.4	37.5	58.1
SOEs	2.2	2.2	1.7	1.8	1.9	1.9	1.9	1.9
Total	362.0	387.0	482.3	508.4	547.1	555.8	569.7	553.9

Source: FICEN

However, the fisheries development is not sustainable. It is very difficult for the Government to reduce the number of fishing boats to develop sustainable fisheries while the education level of fishermen is low. Specifically, only 10% of them graduated from high school, 20% have primary education while 68% did not or less than and just 0.65% graduated from vocational schools or universities. Therefore, fishermen have no alternatives to fishing. (Vietnamese Ministry of Fisheries, 2006). Few women are involved in fishing. It is found that only 1.4% of fishing workers are women, and these are all shore-based (Dang & Ruckes, 2003). However, women often own fishing vessels or fleets and some of the larger private fleets as an example in Kien Giang are owned and managed by women. Women usually prepared materials for fishing trips, for gear repair, sorting fish landed and fish retailing in local markets.

1.2.3. Fishing fleets

The final report for Viet Nam fisheries and aquaculture (2005) showed that the number of mechanized vessels has increased rapidly from 29,584 in 1981 to 44,000 in 1991, to 77,000 in 2002 (by an average of 4.6% per year) and this number was 85,914 in 2005. The average power of the vessels has increased by 12%/year to reach 48 horsepower (hp) in 2002. There are different about horsepower of vessel between different areas in Viet Nam. The engine power of southern vessels averaged over 90hp, compared to 30hp for the rest of the country. Of the mechanized vessels, almost 7,000 operated in off-shore with engines of over 90hp. The average

of horsepower in vessel has increased rapidly. In 1991, only 10% of mechanized vessels exceeded 45hp, this number is 27% in 2001 and increased more than 30% in 2004. The main increase in size class has been in the over 75hp and 46- 75hp classes. There were 453,871 Hp in 1981, this number was 4,721,701 in 2004. It means that the engine capacity is increasing at a rate of 164,579 Hp/year. Vessels with engines less than 20hp decreased from almost 60% of the fleet to 25% in 2005. The offshore fleet, which is generally classified as including vessels with engines exceeding 90hp, are now around 6,000. Among the main gears, trawling (both pair and single) predominates in the south with around 40% of vessels. The increasing number of fishing boats and total engine capacity implied more fishing effort and more pressure on the fisheries resources, lead to over-exploitation of the marine resources. Trawling threatens to damage marine resources, fishing grounds, and marine ecosystems (Jennings et al. 2001, Kaiser et al). Vietnam has about 21,641 trawlers, occupied 25% of total number of fishing boats. The trawlers often operate in coastal areas lead to damage to the seabed where many species dwell. Trawling is also major factor of degradation marine environment (Dong, N.V. 2000). In some other countries, like China, the Government banned trawling in inshore waters. However, this is still a big problem in Viet Nam, which is difficult to solve because most of fishers and millions of people are very poor and they fish for subsistence. Thus, it is difficult to ban this effective fishing method. Most of the fishing boats are very small. There are 82,5 (90%) boats under 20 meters in length. In addition, the engine capacity and the speed of fishing boats are low, making them unable to withstand high waves and strong winds. In fact they are vulnerable to bad weather (Source: Vietnamese Ministry of Fisheries, 2005)

1.2.4. The catch

Together with the increasing number of fishing boats and the total engine capacity the catch has also been unceasingly growing annually whilst catch per unit effort (CPUE) is declining.

The marine fisheries sector in Vietnam has developed rapidly over recent years. Total landings increased from around 0.5 million tons in 1980 to 0.8 million tons in 1990 1,7 million tons in 2004 and 2 millions in 2006, the average productivity (ton/Hp/year) tended to decrease, especially since 1985 (FICEN, 2007). Fish landings have raised at 5%/year, crustaceans at 10%/year and mollusks by an average of 16%/year from a low base. Of total marine capture landings in 2003, the south contributed 55%, 28% in south central and 11% in north central. There is no single accurate measure for assessing the productivity of the marine fishing fleet in Vietnam. The measure most commonly used is catch per horsepower for the mechanized vessels which is not accurate particularly during a period of rapid mechanization and increase in power. Nonetheless, catch per unit effort has declined from the peak of 1.11 ton/Hp/year in 1985 to 0.7

t/hp/y in 1993 to about 0.4 t/hp/y in 2003, indicate the rapid declination in productivity in relation to unit effort. A number of the fishing gears in Vietnam have high catches of trash fish. Edwards (2004) pointed that trash fish occupied about 33% of total marine fish landings. Southern fisheries had the highest proportion of trash fish (averaging around 60% of the catch), compared to 5% in central, and 14% in northern regions. Qualities of fishes are often low because salt is usually used for preservation as opposed to ice. Trash fish landings are likely to increase in the future, unless trawl net designs reduce catches of small fish. The productivity (CPUE) obtained from the peak of 1.11 ton/Hp/year in 1985 and only around 0.35 ton/Hp/year in 2003 and 0.04 ton/Hp/year reducing annually (*RIMF, 2005*). The by catch was up to 30% (for offshore trawling) and 60% (inshore trawling) of the total catch, (Luong, N.T, 2003).

In addition, because of the resource decline, excessive number of fishing boats, both fishing productivity and income of each unit have reduced constantly. The uncontrolled increase of fishing effort development has caused the marine resources to decrease and caused the extinction of commercially important species, example: shrimp, giant tiger prawn, etc. The quality of fish products has also decreased, the percentage of trash fish has increased and the proportion of valuable fishes has been declined, and the profit of fisheries has fallen (Dong, NV, 2001, Tinh, H.V, 2004).

The catch is increasing lead to over-fishing, overexploitation and destroying the biodiversity and habitat.

1.2.5. The value of fisheries export

Both of volume and price in capture fisheries and aquaculture products are increasing lead to raise the fisheries exportation turnover, from 205 million USD in 1990 to more than 3.3 billions USD (See in Table 4), and 4,5 billions USD in 2008 (Vasep). Annual contribution occupied 1.7% in 1985 and 4.0% in 2004 of the total Gross Domestic Product (GDP).

Table 4: Fisheries data trend line of Vietnam in the period of 1990-2006

Years	Total Fisheries Products (tons)	Marine Fishing (tons)	Aquaculture (tons)	Export value (1,000USD)	Total Vessel (units)	Labors (1,000)
1990	1,019,000	709,000	310,000	205,000	72,723	1,860
1991	1,062,163	714,253	347,910	262,234	72,043	2,100
1992	1,097,830	746,570	351,260	305,630	83,972	2,350
1993	1,116,169	793,324	368,604	368,435	93,147	2,570
1994	1,211,496	878,474	333,022	458,200	93,672	2,810
1995	1,344,140	928,860	415,280	550,100	95,700	3,030
1996	1,373,500	962,500	411,000	670,000	97,700	3,120
1997	1,570,000	1,062,000	481,000	776,000	71,500	3,200
1998	1,668,530	1,130,660	537,870	858,600	71,799	3,350
1999	1,827,310	1,212,800	614,510	971,120	73,397	3,380
2000	2,003,000	1,280,590	723,110	1,478,609	79,768	3,400
2001	2,226,900	1,347,800	879,100	1,777,485	78,978	Unknown
2002	2,410,900	1,434,800	976,100	2,014,000	81,800	Unknown
2003	2,536,361	1,426,223	1,110,138	2,199,577	83,122	Unknown
2004	3,073,600	1,923,500	1,150,100	2,400,781	85,430	Unknown
2005	3,432,800	1,995,400	1,437,400	2,738,726	90,880	Unknown
2006	3,695,927	2,001,656	1,694,271	3,357,960	Unknown	Unknown
2007	4,160,000	2,060,000	2,100,000	3,702,000		
2008	4,580,000	2,130,000	2,450,000	4,500,000	>130,000	>5,000

(Source: Vietnamese Ministry of Fisheries, 2006 and VASEP 2010)

1.2.6. The management systems

MOFI (now MARD) is the main Government body responsible for protecting and developing fishery resources. MOFI is responsible for defining (i) TAC and fishing capacity, (ii) protection measures relating to the marine environment and living resources; and (iii) zoning, monitoring and research. MOFI also issues and withdraws fishing permits. The set up of fisheries management system in Vietnam is fairly voluminous from Ministry of agriculture and rural development to office (commune) but due to lack of economic resources the required manpower are not sufficient. Most of the human resources were graduated from universities or colleges. However, the enforcement some times is not up to the mark, specially the monitoring on the sea, due to there were many fishers infringe on the fisheries law and other regulations in fisheries sector.

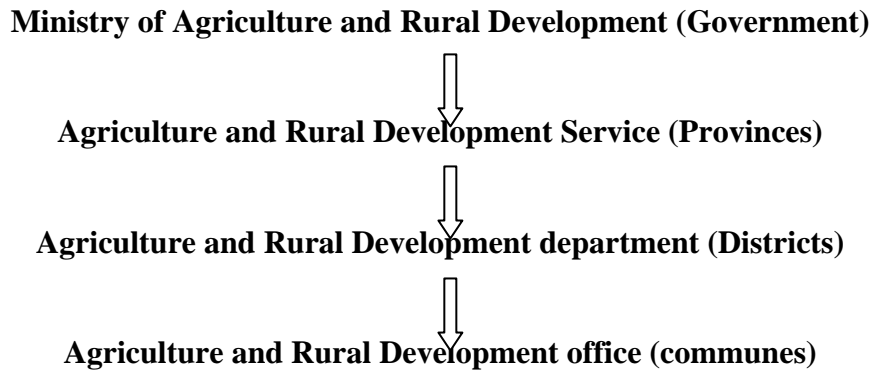


Figure 6: Set up of fisheries management system in Vietnam
(Source: MARD, 2010)

Up to now, Vietnam's Government has issued one Ordinance of Marine Resources Protection in 1989, one Fisheries Law in 2003 and many fisheries regulations in order to control the fisheries sector. Besides this, the Ministry of Fisheries and MARD (now) has issued many standards of fisheries such as fishing gear standard, the minimum length of fish allowable catch, ect. Example Coastal zone fishing with 10 meters in depth or far from the coastline 3.2 miles, in-shore fishing with 10 - 30 meters in depth or far from the coastline 3.2 - 8.6 miles, off-shore fishing with the depth of the sea is over 30 meters or in areas located 8.6 miles or more from the coast line, requirement about mesh size of fishing gear; the minimum size of allowable catch, forbid some kind of destructive fishing gears such as estuary set net, scoop net and chemicals; to forbid the fishing for 21 species without the time-limit for example *Pteria maxima*, *Tenualosa toli*, *Anguilla bicolor Pacifica*, *Chitala* and to forbid the fishing for 19 species with the time-limit.

Traditionally, fisheries management in has been the responsibility of the government. However, agencies such as DOFI have lacked the resources of staff and budget to provide the required management, monitoring, surveillance or enforcement of Vietnam's inshore (or offshore) waters. With increasing population pressure and the development of more effective (and/or destructive) fishing gears, inshore resources have been raising over exploited or destroyed. In this case, almost the only option for improved fisheries management is co-management, the sharing of responsibility and authority for fisheries management between local communities and government agencies. This approach is easier when countries have a tradition of resource ownership by communities, as in much of the Pacific. In a situation of Vietnam where marine resources have traditionally been open access, leading inevitably to a "tragedy of the commons", it is more difficult but not impossible. Vietnam also has some historical community resource management regimes in history. Some inland resources were managed by villages (the forest resources is an example) or by some ethnic minority groups. However, even where inshore

resources are shared, rights can be allocated if the national legislative framework is adequate. The new fisheries law provides the basis for provinces to develop co-management systems with local communities.

Chapter II

LITERATURE FRAMEWORK

This section reviews the definition of MPAs as well as the role of MPAs, theory of community-based coastal resources management, co-management, fishery co-management and the transaction costs in fishery co-management, as well as experiences about the transaction costs measurement in co-management from the other countries, especially from some countries which have similar characteristics to Vietnam.

2.1. Marine Protected Areas (MPAs)

Over-fishing is a major problem in the world where, by 2007 estimate, 52 percent of the fish stocks were fully exploited and about 20 percent of the stock groups monitored by FAO were underexploited (2 percent) or moderately exploited (18 percent). The other 28 percent were either overexploited (19 percent), depleted (8 percent) or recovering from depletion (1 percent). The status of full exploitation and depletion of world fisheries indicates a need for better governance (FAO, 2008).

To conserve and restore the high-value species and/or habitats, marine reserves are established (Kelleher, 1996; Dayton et al., 2000). Marine protected areas (MPAs) have been used as an efficient tool to manage the fisheries resource for over 40 years (Wood, 2008). The IUCN (1999) defines the marine protected areas as: “Any area of intertidal or subtidal terrain, together with its overlaying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment”. According to Noella J. Gray, Marine protected areas (MPAs) are rapidly transforming the international seascape, changing both ideas and practices regarding management of the marine commons. In 1970, there were 118 legally designated MPAs (MPAs) in the world; by 1985 this number had increased to 430, by 1994 it was 1306 (Kelleher 1999), and in 2005, the estimated number of MPAs worldwide was 4600 (Wood, 2008). Although they cover only a small percentage of the world’s oceans, MPAs are concentrated along coastlines where they impact fishers, the tourism industry, and other resource users. MPAs, therefore play an important role in world fisheries. A form of enclosure, MPAs represent a range of property/governance regimes, including traditional/customary sea tenure, community-based management, co-management, centralized/state management and private management (Christie and White 2007). Despite various regimes, these MPAs are managed under two types of management: conventional centralized management (top-down approach) and co-management with participation of local

communities (bottom-up approach). Francis et al (2002) has also pointed out that the success of MPAs in management context in Eastern Africa is attributable to the involvement of local people in management and planning as well as involvement of NGOs and private sectors.

2.2. Co-management

2.2.1. What is co-management?

Jentoft (1989) also argued that the lack of legitimacy in the top-down management regimes has caused, to some degree, the current crisis in fishery management

The traditional approach to fisheries management by national governments worldwide has been to establish fishery laws and regulations, which then had to be enforced. With the top-down management regime, fishery resources are under common property or open access situations and are often subject to overexploitation and degradation due to over capitalization, inefficient technologies and lack of proper management (Pomeroy, 1998).

Hersoug and Rånes also said that basic realization and idea is that, highly centralized, top-down management systems are not working properly, and that new approaches have to be found in order to manage resources on a sustainable basis.

Gray said that in complex systems such as the ocean, where assumptions of (relatively) complete biological knowledge do not hold and resource boundaries can be difficult to define, co-management is considered to be the best strategy (Baland and Platteau 1996; Pinkerton 1989; Singleton 2000; Wilson 2002).

Co-management (or collaborative management) is ‘the term given to governance systems that combine state control with local, decentralized decision making and accountability and which, ideally, combine the strengths and mitigate the weaknesses of each.’ (Singleton, 1998). The World Bank has defined co-management as ‘the sharing of responsibilities, rights and duties between the primary stakeholders, in particular, local communities and the nation state; a decentralized approach to decision-making that involves the local users in the decision-making process as equals with the nation-state’ (The World Bank, 1999: 11). In essence this is the same definition as the one adopted by the World Conservation Congress, Resolution 1.42: ‘a partnership in which government agencies, local communities and resource users, nongovernmental organizations and other stakeholders negotiate, as appropriate to each context, the authority and responsibility for the management of a specific area or set of resources’ (IUCN, 1996). It should be noted that this latter definition regards the State as only one among a set of stakeholders. Co-management also can be understood as ‘a situation in which two or more social actors negotiate, define and guarantee amongst themselves a fair sharing of the management

functions, entitlements and responsibilities for a given territory, area or set of natural resources’ (Borrini-Feyerabend et al., 2000: 1).

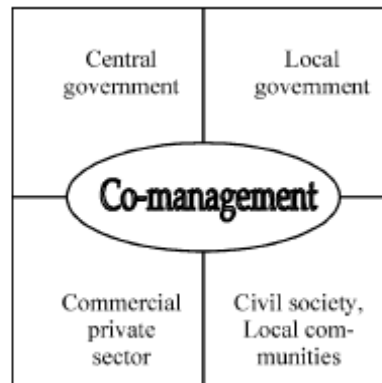


Figure 7: Stakeholder categories and co-management
(source: The World Bank, 1999:11)

Pomeroy (1998) affirmed that "co-management is a middle course between state-level concerns on fisheries management for efficiency and equity and local concerns for self governance, self-regulation and active participation. The strategy to alternate the “top-down” policy making in fishery management is the community self-regulation of fishery resources. The active involvement by the community and the legal support of the government (local and national) in the protection of fishery resources can enhance the harvests in sustainable ways. And co-management involves various degrees of delegation of management responsibility and authority between the local community and the government. This process will depend upon specific conditions of country or local. However, in all cases of co-management, the ultimate authority is held by the government (Pomeroy, 1995). Figure 8 shows a hierarchy of co-management arrangements. In the hierarchy, co-management is in middle between government-based management and user group-based management. Co-management seeks to harmonize the government concerns in fisheries management for efficiency and equity, and local community concerns for self-regulation and active participation. Consequently, co-management becomes an appropriate mechanism for both fisheries management and for community and economic development by the set of strategies in order to encourage participation of community in actively solving problems and addressing needs

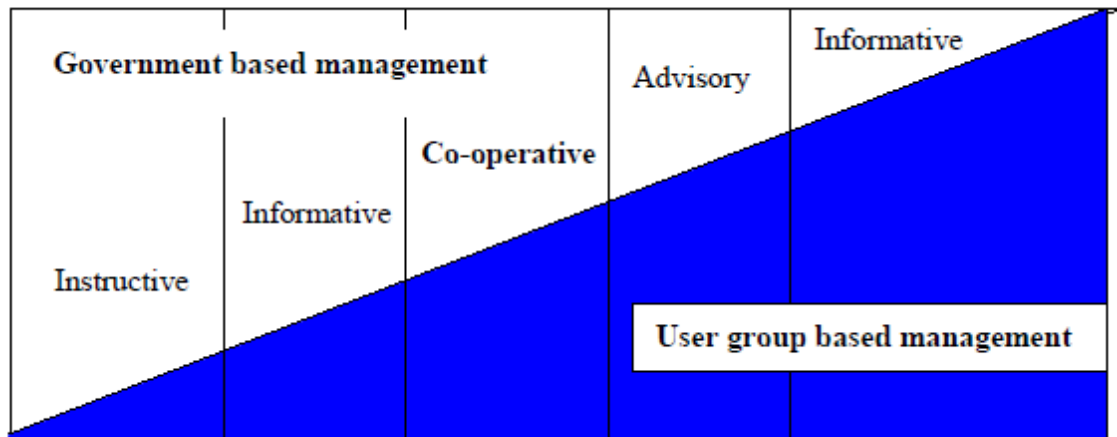


Figure 8: Spectrum of co management arrangements
 (adapted from McCay 1993 and Berkes 1994)
 (Source: Sen.S and J.R.Nielsen, 1996)

Jentoft *et al.* (1998) defined co-management as the collaborative and participatory process of regulatory decision-making among representatives of user groups, government agencies, and research institutions. In terms of which stakeholders make decisions in management, there are two extremes: state power and fishermen’s power. In top-down management, government decides and act unilaterally to which user groups adhere as receivers: meanwhile, in co-management user groups have full control and organize and run their own management systems. The decision making ladder has several steps, according to the degree of fisher influence in the policy-making process.

Nielsen (1996) indicates that co-management as an arrangement where responsibility for resource management is shared between the government and user groups is considered to be a solution to the growing problems of resource overexploitation. It is a dynamic partnership using the capacity and interest of user groups complemented by the ability of the fisheries administrators to provide enabling legislation. As such a co-management arrangement is not a static legal structure of rights and rules, but a dynamic process of creating new institutional structures. Thus the anticipated outcome is sustainability, efficiency and equity of the resource use.

Furthermore, co-management refers to “the sharing of power and responsibility between the government and local resource users” (Berkes, George, and Preston 1991: 12). Two of the commonly cited factors in favor of co-management include: (1) local knowledge and scientific knowledge, when combined, offer a more complete picture; and (2) monitoring and enforcement

will be more effective because they will have local legitimacy, while still remaining accountable to state oversight (Singleton 2000). These factors make co-management an appropriate institutional arrangement for most MPAs, rather than state or community-based management (e.g. Jones 2002, 2006; Rudd et al. 2003).

2.2.2. Fishery co- management

Multiple co-management definitions consequently lead to a lot of definitions of fisheries co-management. Abdullah, et al showed that fisheries co-management is defined as the sharing of responsibility and authority between the government and the community of local fishers to manage a fishery (Pomeroy and Williams 1994; Sen and Nielsen 1996).

Abdullah also affirmed that fisheries co-management can be defined as a partnership arrangement in which government, the community of local resource users (fishers), external agents (nongovernmental 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 decision making over the management of a fishery (Pomeroy & Williams, 1994; Sen & Nielsen, 1996; Pomeroy et al., 1999; Pomeroy & Rivera-Guieb, 2006).

With Brown, et al, 1999, fisheries co-management, as a process of participation, empowerment, power sharing, dialogue, conflict management and knowledge generation, holds potential as an alternative fisheries management strategy for the region. Survey data shows a strong preference among fishers for co-management. Co-management will, however, involve the establishment of new fisher organizations, institutional arrangements, and laws and policies to support decentralization, fisher participation in management, and partnerships for management.

The analysis of Sen, et al (1996) also said that fisheries co-management is defined as an arrangement where responsibility for resource management is shared between the government and user groups. It is considered to be one solution to the growing problems of resource over-exploitation (Jentoft, 1989; Nielsen, 1995; Berkes, 1989; Hanna, 1992)

2.2.3. Advantages and obstacles of fisheries co-management

a, Advantages

From the above co-management concepts and analysis about fisheries co-management, it is easy to see the advantages of fisheries co-management like the combination of indigenous local and scientific knowledge, and more effective and feasible management through local legitimacy. In addition, the responsibility toward sustainability is increased through the co-management model. Another advantage is that with co-management, the monitoring, control and surveillance (MCS) cost is reduced. Finally, the most important advantage in co-management regime is that all of

stakeholders benefit from co-management, not only the direct user groups but also environmental activist, government managers, research institutions and others.

b, *Obstacles*

Although co-management is considered an efficient way to manage the natural resources in general and the fisheries in particular, it nevertheless have some obstacles in application. The first is that the stakeholders who may be most enthusiastic about co-management are likely those who would have more to gain, whereas stakeholders with certain advantages in the current situation may not be willing to embrace co-management, fearing, for example, the loss of power and existing privilege. Some stakeholders may be not willing to commit at an early stage of pre-implementation, especially if the process of implementation is long, and therefore leads them to think that co-management might not happen. For the pre-implementation of co-management, this pose a clear challenge since participation of stakeholders in these different positions may be required (Ratana, 2007).

Secondly, co-management is very time-consuming work and it requires the fisher's management skills and the fishermen have to associate in dealing with complex and changing situations in implementing the co-management system. For instance, a community-based coastal resource management project in Orion (in the Philippines) started in 1990 which is supposed to terminate after 2004 (Mulekom, 1999).

Thirdly, there is a lack of empirical knowledge mentioned about actual costs and benefit. And the finally, the legal framework for co-management is high, particularly in developing countries where an open access nature of fisheries resources is dominant. Co-management in Norway and Japan are examples of the co-management on the national levels (Jentoft, 1985; Ruddle, 1987; Lim *et al.*, 1995), and both of them have a legal basis.

2.2.4. *The successful co-managed conditions*

Pinkerton (1989) and Ostrom (1990, 1992) recognize the key successful conditions for a co-management regime. Those conditions are presented in Pomeroy and Williams (1994) and then reviewed under the Asian context for co-management of fishery by Pomeroy *et al.* 1998 as follows:

1. Clearly defined boundary
2. Membership is clearly defined
3. Group cohesion
4. Existing organization
5. Benefits exceed costs
6. Participation by those affected

7. Management rules enforced
8. Legal rights to organize
9. Co-operation and leadership at community level
10. Decentralization and delegation of authority
11. Co-ordination between government and community

And further in detail, Pomeroy *et al.* (1998) affirmed 28 principles and conditions of co-management in fisheries under Asian contexts as follows:

1. Individual incentive structure
2. Recognition of resource management problems
3. Leadership
4. Stakeholder involvement
5. Empowerment
6. Trust between partners
7. Property rights over the resources
8. Local political support
9. Capability building
10. Organizations
11. Conflict management
12. External agents
13. Clear objectives from a well-defined set of issues
14. Effective communication
15. Political and social stability
16. Networking and advocacy
17. Enabling policies and legislation
18. Provision of financial resources/budget
19. Government agency support
20. Fit with existing and traditional social and cultural institutions and structures of
21. Partner sense of ownership of the co-management process
22. Effective enforcement
23. Partnerships and contractual agreements
24. Overlap of interests
25. Flexibility
26. Appropriate scale
27. Coordinating body

28. Social preparation and value formation

2.3. Transaction costs in Fisheries co-management

In this section, transaction costs are described, along with how transaction costs are measured, and their meaning in managing fisheries, in particular and in natural resource in general.

An axiom in the business world is “what gets measured gets managed”. Analyses of public policies is necessary to include transaction costs, as well as transformation costs, and to be included, they must be measured. It is important to note that transaction costs can be substantial (McCann et al, 2005). Coase, 1988 affirmed that “*without the concept of transaction costs, which is largely absent from current economic theory, it is my contention that it is impossible to understand the working of the economic system, to analyze many of its problems in a useful way, or to have a basis for determining policy*”

And McCann, et al (2005) also said that Coase’s seminal paper, 1937 “The Nature of the Firm” was the first paper to mention transaction costs, especially as related to the firm as well as public policy issues (Coase, 1960).

A lot of definitions of transaction costs are presented in the literature such as Williamson (1973, 1975, 1981), Randall (1972), Dahlman (1979), North (1990), Davis (1986), Barzel (1989), Allen (1991), Zerbe and McCurdy (1999), and Cheung (1969) (Kuperan et al, 1999). Murshed-e-Jahn et al showed that the definition of transaction costs as the costs of running the economic system in Arrow’s market failure theory (Arrow, 1970). It is pointed out by Libecap (1991) that having lower transaction cost need rather than a sufficient condition for acceptance (McCann et al, 2005) Arrow, 1970 also argued that an institution’s existence depends on minimizing the transaction costs (Murshed-e-Jahan et al ? year)

McCann et al, 2005 have similarly stated that it is a necessary to examine transaction costs when the potential of new institutions as alternatives to existing institutions is evaluated. When multiple individuals are related to environments where complex activities have to be coordinated across space and over time, they may try to reduce the substantial uncertainties that they face through various forms of implicit or explicit arrangements (Kuperan et al, 1999). Kuperan et al, 1999 also said that these contracts involve costly activities used in the process that previously achieved agreements and in continuing to co-ordinate activities after uncertain environment can reached an beginning agreement. Transaction costs in this paper are defined as the total costs involved in developing and running the co- management institution. The main challenge of this research is to identify the components of the transaction costs involve in the co-management system as well as obstacle to identify this cost in centralized management system in the Trao reef, Van Hung commune, Van Ninh district, Khanh Hoa province, Viet Nam.

Williamson (1985) identifies the transaction costs as comparative costs of adapting, planning, and monitoring under alternative government structures. Thus, the transaction costs in co-management of fisheries can be divided into three major cost items: (1) information costs; (2) collective fisheries decision-making costs; and (3) collective operational costs. The first two items are ex ante transaction cost and the latter is as the ex post transaction cost. The schematic flow diagram of the transaction costs in fisheries co-management is presented in Figure 9 as more detail analysis

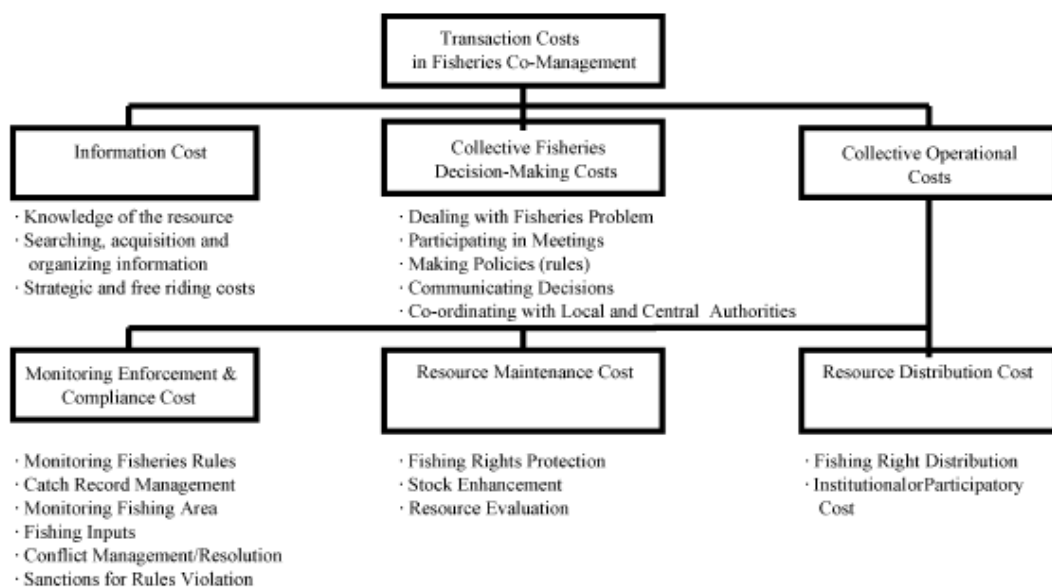


Figure 9: The schematic flow diagram of the transaction costs in fisheries co-management

(source: Kuperan et al, 2008 – adapted from Mustapha et al., 1998)

Information Costs

Pomeroy (year) affirmed that in any centralized management system or co-management system, management information for the system must be collected and organized for decision-making (Abdullah et al., 1998). Information is the key factor in the success of a public program in general and in fisheries co-management programs in particular. It also depends on the amount and types of information available to both participants or resource users and decision-makers. For the purposes of this paper, “information” - includes information about the market, the number of stakeholders and preferences; about fish catch, size of fish stocks; information about the fingerling supplier; information about allocation of resources among stakeholders and other interested parties over time. It is costly to search and gain this information is that and they are

relative to strategic and co-ordination costs (Abdullah et al., 1998). In co-management system, the information can be provided by the fishers on fishing patterns, catches and the status of the resource while fishers in centralized management systems might only be focused on maximizing their own welfare and they may feel no responsibility to provide information to management authorities. Such as scenario lead to higher information costs in centralized management systems compared with co-management system.

Decision -Making costs

The decision-making costs includes costs to coordinate tasks with local and central authorities, deal with fisher's problems, make policies, participate in meetings, make rules and regulations and communicate decisions to the community.

One of the challenges of a fisheries co-management regime is how to get the fishers to reach some level of consensus on certain, contracts or collective actions with regard to resource management (Abdullah et al., 1998). The decision making process has some transaction costs, which are expected to be higher under a co-management system in the initial stage.

Operations Costs

The collective fisheries operations cost is the third major component of transaction costs. There are three transaction costs from operations process 1) Monitoring, enforcement and compliance costs 2) Resource maintenance costs and 3) Resource distribution costs. Monitoring, enforcement and compliance costs include the monitoring of the fisheries rules, guarding, catch record management, conflict management and sanction for rule violations (Abdullah et al., 1998).

Management decisions of fisheries resources involve multiple stakeholders with different interest in long term, creating uncertain and interdependent processes. This leads to the transaction costs created from the problems of coordination, control and information.

The main difference between centralized management and co-management is the user participation level in designing and implementing the management activities. Kuperan, 2008 showed in his paper that the expected different level of transaction costs involved for each of the management activities under a pure centralized management system compared with a co-management system with a high level of user participation is shown in Table 5 (Adapted from Mustapha et al., 1998).

Table 5: Transaction costs in centralized and co-managed system
(Source: Mustapha et al., 1998)

Resource management activities	Centralized management	Co-management
Information seeking	Low	High
Collective Fisheries Decision making	Low	High
Resource distribution among users over time	High	Low
Monitoring, enforcement and compliance	High	Low
Resource maintenance	High	Low

2.4. Empirical studies of co-management and transaction costs in Southeast Asia and in the world

Communities-based resource management (CBRM) is developed over the world (Pomeroy, 1994). A lot of investigations on coastal fisheries management in the Southeast Asian region and over the world have demonstrated that when left to their own-devices, fisheries communities, under given conditions, can adjust access and enforce rules base on community institutions and social practices to use resources of fisheries in a sustainable way (Pomeroy, 1995). In this paper, some examples from different parts of the world will be shown.

In Africa (South Africa):

One of the key findings of the study of coastal fisheries co-management in South Africa is that the national government must shift its position from one of rhetoric to active support for co-management (Hauck et al, 2001).

Most government officials require a basic change in behavior and thinking and a move towards co-operative and participatory governance styles. The resources have to be allocated to these efforts of co-management. The willingness to transfer powers of decision-making and management responsibilities to institutions and local stakeholders is a significant challenge and a co-management framework has to satisfy that all of negotiations and agreements take place in an open and non-threatening environment, drawn on both scientific information and indigenous local knowledge and by all stakeholders. One of the most difficult challenges for government is enforcement and rule-making in the area. This devolution of power must be implemented simultaneously with the allocation of access rights to users. For successful co-management, government must be willing to revisit rules and regulations and provide user groups with an opportunity to input into rule-making (Hauck et al, 2001).

In The Caribbean Community (CARICOM):

The countries of the region have a relatively poor record of management in fisheries and the necessary of reform fisheries governance is urgent. And in CARICOM region, fisheries co-management, as a process of participation, dialogue, power sharing, empowerment, conflict management and knowledge generation, holds potential as an alternative fisheries management strategy for the region (Brown et al, 1999). Co-management establishment is same as with other places with new fisher organizations, institutional arrangements, and policies and laws to support decentralization, partnerships for management, and fisher participation in management. The analysis of the CARICOM situation shows that the major partners - government, fishers and NGOs - in any co-management strategy for the CARICOM region are organizationally and structurally weak; it also shows that the pilot projects should be initiated in which all stakeholders can gain practical experience with co-management and demonstrate to each other their commitment to the process, developing trust and credibility (Brown et al, 1999)

In the Asia (Southeast Asia):

The Southeast Asia is now realizing the important role that CBRM and co-management system can play in future fisheries management and it is seen most extensively applied in the Philippines. Since 1991, CBRM has achieved acceptance in the policies of the government (Mulekom, 1999). Thailand, Malaysia are other countries also supporting co-management. Each country has a different approach to co-management.

Thai Land

In Thai Land, the Law, Fisheries Act, B.E.2490, had been enacted on the fundamental of freshwater fisheries which was the leading fishery. In Thailand, several of the fisheries laws can be employed as a legal basis for Community-based resource management (Pomeroy et al, 2003). In recent years, any of the CBRM projects have been undertaken with supporting of NGOs in Thailand in general and in Southern Thailand in particular. Pomeroy et al, 2003 presented that all projects have focused on awareness creation among the community members about sustainable management; the building of local organizations and the capacity for conserving and rehabilitating the coastal resources and the encouragement of coordination among resource users, the government and NGOs (Tokrisna, Boonchuwongse and Janekarnkij, 1997). And it is recommended in Thailand that the sub-district administration Authority (Or-Bor-Tor) which included the sub-district head, village head, sub-district council, have been used like core unit of CBRM and Or-Bor-Tor could be in order to organize fishers and manage conflicts. Therefore, this activity will need to support to the Thailand institutions which will support to national government.

Philippines

The Philippines has a long history of traditional fisheries rights and allocation (Kalagayan, 1991; Lopez, 1983). In 1991, the government decentralized the management of near-shore fisheries to municipalities and local fishing communities (Sen et al, 1996).

But in 1998, the Republic Act No.8550 or the Philippine Fisheries Code was signed into Law (Pomeroy et al). Carlos C. Baylon in the University of the Philippines conducted research to evaluate the Integrated Municipal Council (IMC) as an institution for co-management in the coastal zone. The IMC, which acts as an institution for co-management on a larger scale, is evaluated on the criteria of sustainability, efficiency and equity. A comparison of Banate Bay IMC and Batan Bay IMC was carried out based on levels of co-management undertaken (Pomeroy et al, 1997). The Council included representatives from local government, NGOs, groups of user, people's organizations, academics and policymakers. It is supported and advised by a number of advisory and administrative committees and task forces, which comprise representatives from different administrative levels (i.e. municipal, district, province). Recently, it is popular in Philippines to use the transaction costs to express a the successful co-management model, with the example of San Salvador Island. In this case study, transaction costs are used to analysis the co-management approach. The results of the San Salvador area for the period 1988–1996 indicate that “the difference in the total costs of fisheries management between centralized government management and co management is not that significant. However, there is significant difference in the costs at the different stages of management. In stages one and two, which are the stages of initiating a new management regime and community education, the costs are higher for the co-management approach compared to the centralized government approach. The costs are however lower in the third stage for a co-managed approach when monitoring and enforcement and conflict resolution become important. These findings appear to be consistent with Hanna’s (1995) view that the downstream or implementation costs are likely to be lower for a co-managed approach” (Kuperan et al, 2008)

2.5. Legal framework to implement co-management in Viet Nam

In the report in IIFET in 2008, Lai said that although Vietnam has issued several legal documents related to co-management and democracy in general and especially for fisheries co-management, it is clear that those documents are not sufficiently facilitating fisheries co-management. However, up to now, the latest document in 2009 become the first legal framework for fisheries co-management in Viet Nam. The framework development in fisheries co-management in Viet Nam follows:

In 1998, the Government issued Decree 29/1998-NĐ-CP on Democracy at the grass roots level, which supported democracy at grass-root level; it has created an environment to empower

ordinary citizens “People know, People discuss, People decide, People do and People supervise”. This document provided general conditions for people to participate in some certain levels of the local planning process and give comments on policy or projects/program implementation including fisheries-related projects. However, under the political and administrative system in Vietnam, those comments are not easy to be heard by the authorities or in other words, the decree did not really empower people to access to a real democracy as defined by western countries.

In 2001 MOFI (now is into MARD) issued the Decision on formulation of Vietnam Fisheries Association (VINAFIS) with the network throughout the country. This organization is not a fully independent organization but acts as a *lengthened hand* of the government to govern fishers and fisheries. Theoretically, VINAFIS will act as a bridge or connection between government and the local fishing community and speak on behalf of its members. However, most of VINAFIS leaders are the present MOFI/MARD leaders or retired government fisheries officers, so there are no real fishers in the Chairman Committee of VINAFIS. Truly, the voice of fishers only are heard if the fishers go through the administrative system of government control such through the Vietnamese Fatherland Front (local and central level) system or People Council system (local and central level). However, this is complicated and take time to solve problems.

In 2003, the new Fisheries Law, section 2, 3 of article 15 on management on capture fisheries indicated the central government would decentralize power to provincial government for the management of coastal fisheries and offshore fisheries. Under this legal document, the provincial government will be responsible for issuing the policy, and for regulation of rivers, lakes, reservoirs, lagoons and other natural waters belonging to their territory according to the guideline of the MOFI (MARD); provision of environment for fishers engaged in monitoring, and informing on illegal fishing practices. The central government will be responsible for zoning of provincial fishing territory and lines: decentralizing ministries (MOFI, MARD, MONRE), sectors and provinces for ensuring the tied cooperation, comprehensive among Coast guard, marine police and fisheries investigators on fisheries MSC.

In 2006, the Vietnamese government issued Decree 123/2006/NĐ-CP on decentralizing for the local level, which decentralized more power to the provincial government in management of inland and coastal fisheries. The decree also mentioned about the government facilitation for community based fisheries management in coastal water and decentralizing to local government on managing of coastal fisheries (registration, community based fisheries management models). However, after nearly two years enacted, no fishing rights were given to the local community due to lack of instruction from the central government and unclear arrangements under this document. The coastal zoning is also not finished, which as created difficulties for provincial

government to zones coastal area and provide fishing rights to communities. MARD is also confusing on how to zone the provincial water along 29 provinces along the coast.

In 2006, under support of DANIDA/SCAFI, Working Group on Fisheries Co-management (FICO), Vietnam was setup up at national level based on MARD. The aim of the FICO is to coordinate and advise for fisheries co-management in Vietnam however, this is just bureaucratic unit with representatives from various sub-organizations under MARD, and many of those are un-knowledge of fisheries co-management and how to work together to coordinate fisheries co-management at national level.

In 2007, VIFEP collaborated with SCAFI on conducting a review on fisheries co-management in 18 sites along Vietnam. It found that, among 18 sites on fisheries “co-management“ it was very expensive to have permission form government on piloting the project and providing fishing rights to individuals or a community. Only some rare cases observed in Tam Giang lagoon (Thua Thien Hue), Tra O lagoon (Binh Dinh), Easoup reservoir and Lak lake (Dak Lak) found that the fishing rights were given to the local community through VNIAFIS. In most of other cases, fishers and project officers complained that, due to unavailable fishing rights provided, any kinds of or activities related to fisheries co-management, specially conservation and secured livelihood based on existing legal environment had failed already and would continue to fail if no change was enacted.

Also in 2007, under support by SEAFDEC, a proposed national guideline on fisheries co-management was developed. One of the important concepts in the national guideline is the fishing rights for local communities and establishment of local fisheries organization. However, it seems that MARD did not fully understood the concepts or did not express a strong interest in legalizing this document. MARD assigned the STOF/DANIDA project to continue to support for re-formulating this national guideline and indicated that it might complete in the end of 2008. The approval of MARD for this guideline is crucial but possibility of official approval is not secured due to shortage of political will.

Decree 57/2008/NĐ-CP of regulations on rights and obligations of the community to protect and develop marine protected areas includes content of regulations on rights and obligations of the community in marine resource management. Article 4 of the decree showed that communities participate in MPA protecting and development. (1. The State encourages organizations, individuals, community participation in management activities, conservation and construction, development Marine Protected Area in accordance with the law. 2. Organizations, individuals and communities can participate: a) The communication, education and awareness improvement about protecting and conserving biodiversity; b) Observations, patrol and protect the marine

protected area; c) Scientific research and training in MPA; d) Services for ecotourism in the MPAs ...)

Until 2008, there were not documents that clearly and effectively supported the co-management of fisheries in Viet Nam. The latest document is letter No.1700/BNN-KTBVNL, issued on June 16, 2009, on the implementation of fisheries management in small scale. The letter promotes activities implemented in the co-management model in small-scale fisheries in Viet Nam.

Based on the above analyses, it can be said that the Vietnam government is willing to provide fishing right to the individual or fishing community and the government is decisive in ways of promoting fisheries co-management. It is legal framework to apply co-management approach in Viet Nam.

Chapter III

METHODOLOGY AND DATA COLLECTION

This chapter will present the chosen area for study before applying the co-management model and after applying the co-management model. After that the methodology will be described (method to measure transaction costs in fisheries). The way to collect data to measure these transaction costs is the last part in this chapter.

3.1. Study site

3.1.1. *General information*

Trao Reef is an area located in Van Hung Commune (Figure 10), a coastal sea of Van Phong Bay, with rich coral reefs. It is managed by Xuan Tu Community. It is nearly 55 km north of the tourist center of Nha Trang City, Khanh Hoa Province. The total land of Van Hung commune is 4,842 ha and the population in 2010 is 10,841 people (2,556 households) including 5,497 males (50.7 % of population) and 5,344 females (49.3 % of population) (People's Van Hung committee, 3/2010) .More than 70% of the community of Van Hung rely on fisheries and aquaculture as a primary or secondary source of income. However unsustainable practices have reduced wild commercial stocks by over 90% in 20 years (Reef Check, 2009).

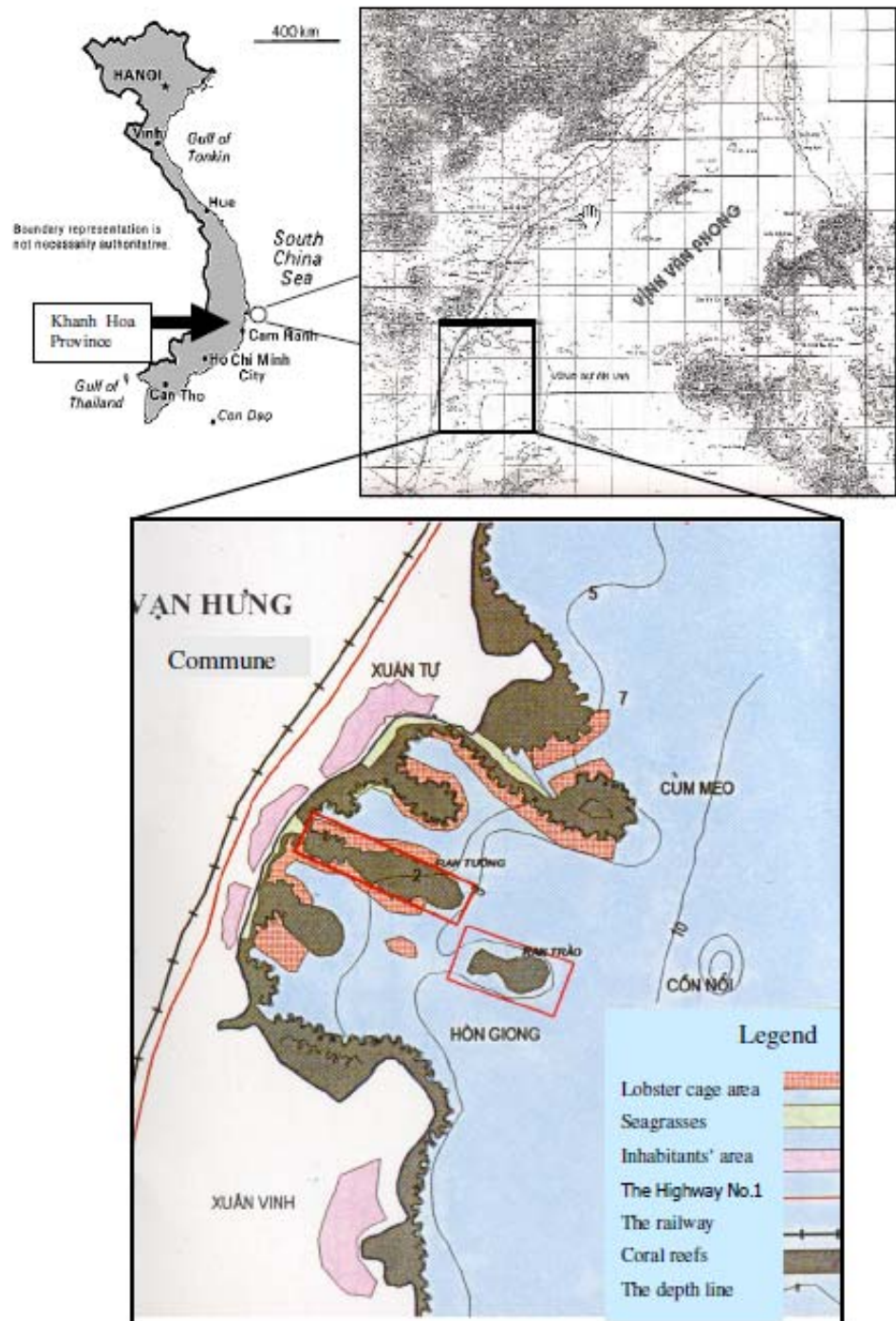


Figure 10: Site map and transect locations (Source: McDonald, 2005)

The Van Hung community members established Trao Reef Marine Reserve in 2001, 3 km from shoreline and including the total areas of 89 ha covering the core zone area of 54 ha, and coral reef of 25 ha (Figure 10) (MCD,2009) with the support of the International Marine-life Alliance Vietnam (IMA) (now is MCD - Centre for Marinelifelife Conservation and Community

Development), to improve the fisheries resources, to prevent the reef from over-fishing, to prevent destruction of natural resource in general and fisheries resource in particular, to allow the reef to rehabilitate.

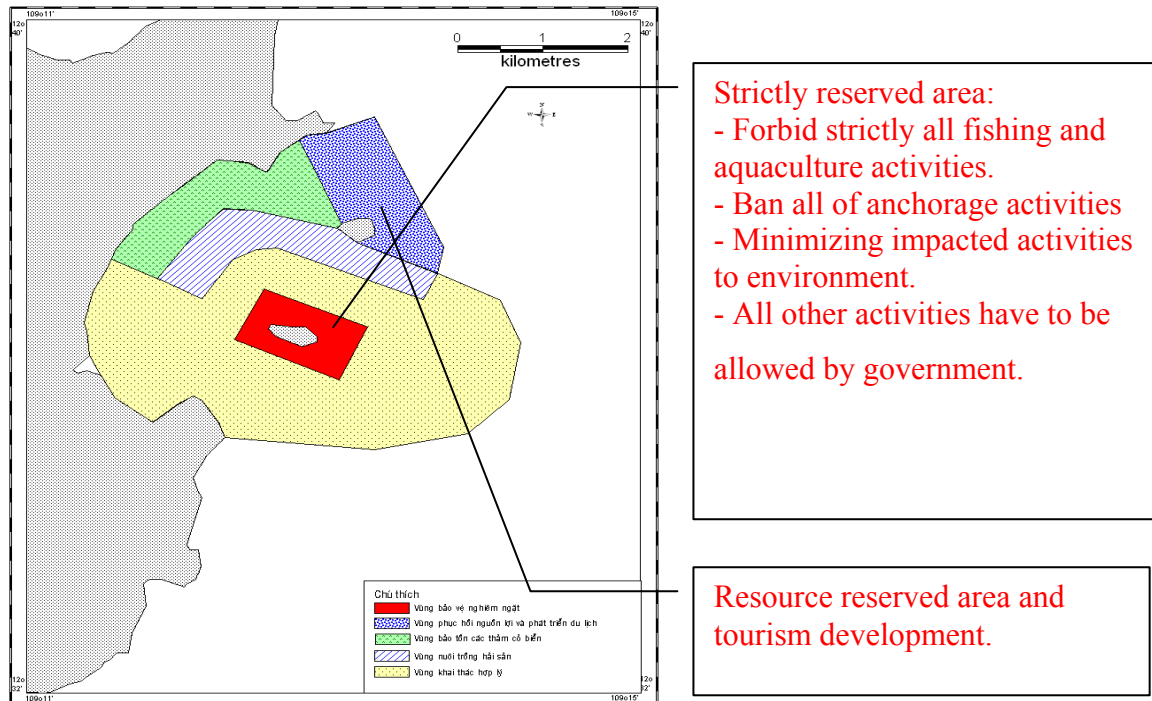


Figure 11: Map of functional zones in Trao Reef Marine Reservation.
 (Adapted from NIO, 2004).

Trao Reef area is quite small against Van Phong Bay, but the diversity of species and ecosystems are high in comparison with total of Van Phong Bay. The coral reef species and reef fish species numbered in this area are higher compared to other Reefs in Van Phong Bay. There are 69 reef fish species (69% of total number species in Van Phong Bay) and 59 coral reef species (64% of total species in Van Phong Bay) in Trao Reef (Hoang X.B., 2005). Coral reefs are also habitats of many kinds of fish for feeding and breeding activities. Now, all fishing activities are banned in Trao Reef Marine Reserve. Community members are hoping to increase depleted commercial fish stocks, and allow one of the most diverse coral reef environments in the region to recover.

3.1.2. Trao Reef before applying co-management

During the period when the project had not yet been operated, the local natural resources were over-exploited because of the open access status of fishing by local people.

- Coral reef: in the previous years, the illegal and uncontrolled activities of harvesting coral in the Ran Trao waters appeared extreme so that the coral reef areas as well as the fisheries resources were reduced seriously together with the great damage to the natural environment and

habitats for all local species and the loss of the ecosystem balance. The exploitation of the coral reef in order to make ponds to aquaculture tiger shrimp is also leading to marine resource depletion. Combined with the diminishing of coral resources, many negative impacts in the culture of Tiger shrimp and the cage culture of the lobster can be seen clearly. For instance, the reduction or even the disappearance of the lobster juveniles in nature, low growth of the lobster and shrimp, weak immunization against disease, or sometimes mass amount of death due to the pollution of water resources. Obviously, the more the coral reef was destroyed, the more challenges the aquaculture was faced with. By this way, the aquaculture would disappear little by little.

- Coral fish: Coral fish's habitat depended completely on the coral reef. The appearance of coral fish was regarded with the great value because of the variety of color and the coral fish family diversity. According to Vo Si Tuan (1996), when the coral reef was depleted, the cover of coral was reduced, the substrate was covered by dead corals and organic residues, and the landscape that was one of the important components of community was be changed. Most of the commercial fish (grouper, snapper, sweetlips ...) described by local residents in the past seemingly disappeared or rarely appeared in transect (NIO, 2001). As some local fishermen mentioned, 50% of the amount of high value fish with the great size reduced in the waters around Van Hung commune in compared with the past (NIO,2001). In addition, according to Ho (Đao Tan Ho, 1991), on the coral reef in Van Phong Bay, there are 630 species; however, a survey by Reef check method based on some high value species showed that they are seemingly disappeared in surveyed transects except for 4 species that appeared in Trao reef (NIO, 2001).
- The fishing status: the results of the assessment for Van Hung commune in 2000 showed that the yield of the fishery harvest had been diminished continuously for 10 years. In 1996, the total amount of harvest was at 250 tons; however, the amount only reached a peak of 100 tones in 1999 (reported by People's Van Hung committee, 2001). The number as well as the size of the fisheries productions also reduced along with the extinction of some precious species. By 2000, in former Xuan Tu village, there were 468 fishing households, 45 of which worked as professional divers and 10 owned the trawlers to fish the main target species of lobster juveniles (MCD, 2001). This was the dangerous career, as the fishermen is used to the primitive tools without basing their efforts on any scientific methods to catch fish. The use of the tools such as dynamite, Xianua, or trawler is leading to the harvest of the smaller sized fish; and the harvest is diminsihing and it has forced some species to extinction (milkfish juveniles, ray fish and sea star).

Aquaculture: in 2000, 587 local households, who cultured over 1000 lobster cages, lived in the former Xuan Tu village (MCD, 2001). The development of these lobster cages was not controlled or planned. In addition, the high density of cultivation caused the low quality of water and the stream of water. The disposal from the industrial culture ponds of Tiger Shrimp as well as the throw of rubbish into the sea created the pollution of seawater. The uncontrolled harvest of coral reef impacted seriously the natural resource of lobster juveniles. There was no specific plan for aquaculture areas, and the lack of cultivated technical information lead to the low growth and the serious epidemics in the aquaculture of shrimp.

3.1.3. Trao Reef after applying co-management

Now, Trao reef marine reserve has maintained good status and the protection activities have been carried out 24 hours per day. The improvement of local people’s perception for preservation of marine resource can be seen clearly. Extinction and depletion fishing method do not exist now. Besides, the uncontrolled harvest of coral was reduced and there was the willing participation from local authorities to be against and to forbid such illegal activities.

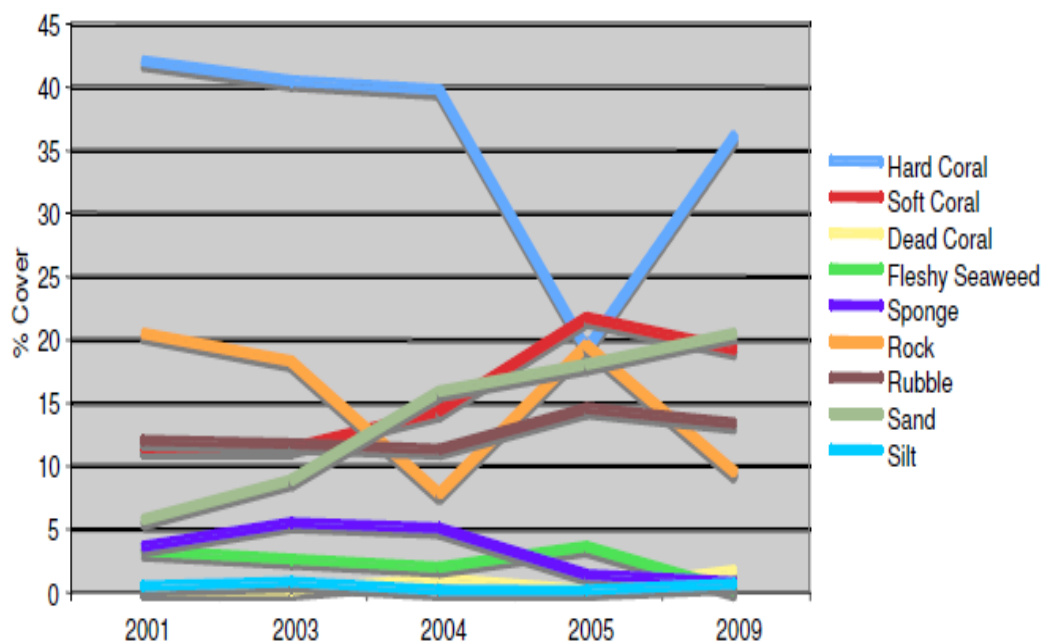


Figure 12: % Cover of each substrate type at Trao Reef North 2001-2009
(Source: Reefcheck, 2009)

- Coral reef: Hard coral cover has steadily decreased in Trao Reef North over the survey from 2001 to 2009, with 2009 results showing a 6% reduction in hard coral from 2001 (Fig 12). In contrast to Trao Reef North, Trao Reef West has presented an 18.3% increase in hard Coral cover since surveys were initially conducted in 2004 (Fig 13). Reefcheck (2009) also presented that hard coral is an exceptionally slow growing species, growing at average rates of 0.5-

2cm/year (McCook, 1999). There is difference of results from 2005 and 2009, because of variations in transect locations in surveys in each year (Reefcheck, 2009). The reduction may be due to increased bleaching events or coral disease because of natural oceanographic processes. Soft coral cover coverage has steadily increased at Trao Reef North, with 7.3% more coverage in 2009 compared with 2001 results (Fig 12). Soft coral are faster growing coral and compete with hard coral for space.

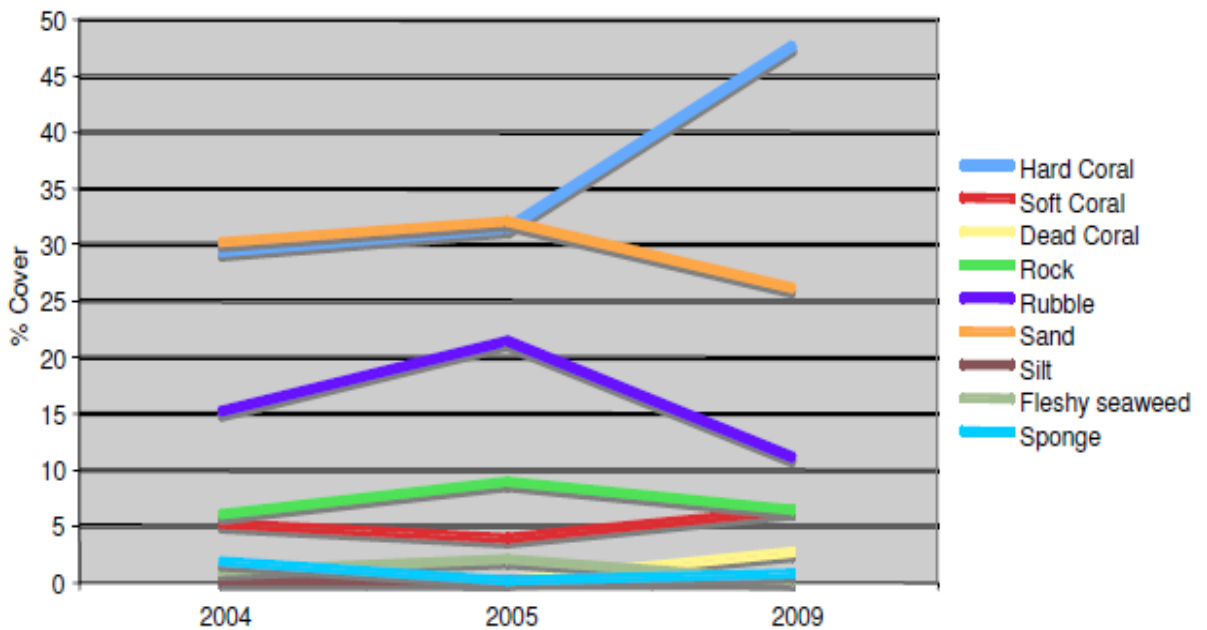


Figure 13: % Cover of each substrate type at Trao Reef West 2001-2009
(Source: Reefcheck, 2009)

- Coral fish: the individual density of coral fish in Trao Reef was of 1.500 individual/400 m² in 2005 in comparison to 318 individual/400 m² in 3/2001 (McDonald, 2005). In most of the monitoring areas, there was the significant increase in the average individual density of coral fish; especially, in the northern and Western in Trao Reef for the group of small size fish (1-10cm). However in the group of larger size fish (>20cm) this change was not remarkable. The increase occurred mainly in the family of snapper, *Chaetodon lunula*, Pomacentridae. Meanwhile, *Chaetodon lunula* was considered as the indicator species due to the sensitivity of this fish with the degradation of coral reef. Based on the increasing individual density of *Chaetodon lunula* (from 15 in 2001 to 23 individual/400m² in 2003) (NIO,2004), it can be said that the operation to protect the coral reef in Trao Reef was efficient.

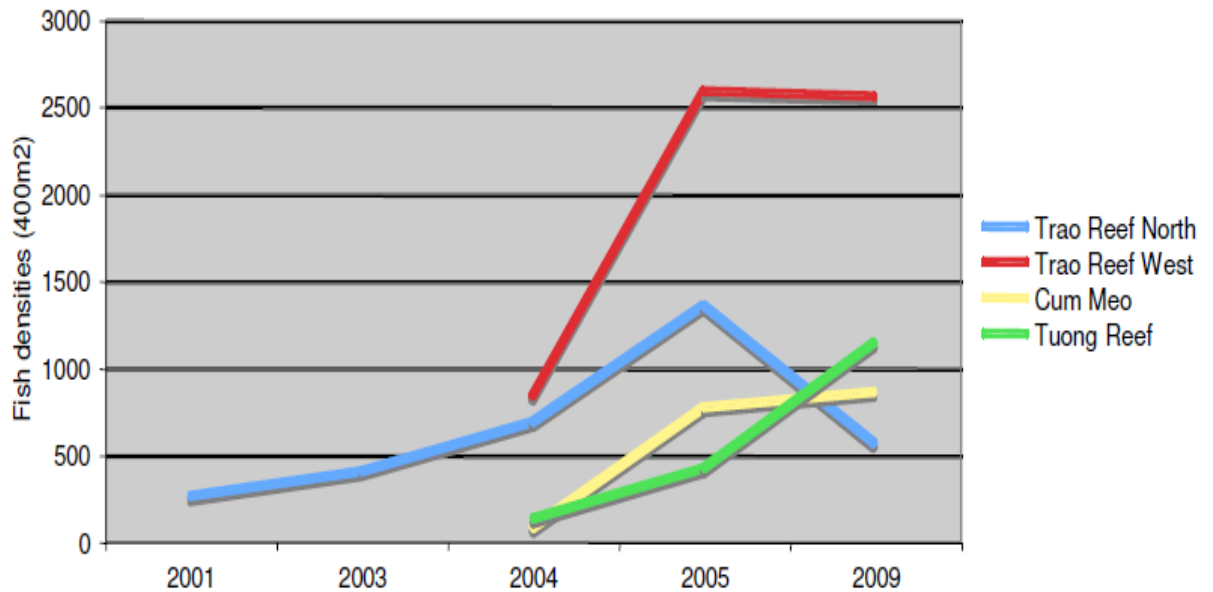


Figure 14: Total fish densities (400m²) observed across sites from 2001-2009
(Source: Reefcheck, 2009)

- The annual yield of fish increased by year; but, it is obvious that this change was not completely caused by the establishment of Trao Reef. There are some possible reasons for this, including that local fishermen went fishing in pelagic waters in Van Phong Bay and only a third of local households fished in the planned areas around Trao Reef (People's Van Hung committee, 2009). However, in answering the questionnaires, nearly all local households supposed that the yield was increasing in as a result of the reduction of extermination methods of fishing (see more details in Result chapter). The supports from Trao Reef marine reserve project in term of technology provided the countable increase in the fishing yield and the limitation of impacts by disease. In addition, along with the success of the trial model to culture sweet snail, the income of local residents was remarkably accelerated (Reefcheck, 2009)

3.2. Methodology

In order to analyze the transaction costs of fisheries co-management system, the research has to mention about the development process from existing management regime to the co-management. The activities involved in the development process of co-management (Fig 14) included: recognition for the need of a new management regime, discussion and meetings, information collection, organizing and leadership, defining the management objectives and strategies and developing institutional arrangements; all of which is considered as the first stage for developing a co-management institution. The second or the implementation stage involved

community education, training for the development of technical skills and management capacity of the fishers and developing institutional arrangements. The third stage include monitoring and enforcement, maintaining institutional arrangements, adjudicating conflicts, sanctioning violators and adjusting institutional rules were considered as the third stage (. The sum of the costs of each of these activities was the total transaction costs of initiating, implementing and maintaining the co-management system (Abdullah et al, 1998).

The development process of co-management has 3 stages while the process of developing the centralized management system is divided basically into two stages, including: 1) establishing the institution, collecting information, implementing the decisions through dissemination of information, training of government officers to be acquainted with the management expertise and technical knowledge of fish culture; and 2) maintaining, monitoring and ensuring compliance with institutional rules and adjusting rules as conditions in fishery change (Kuperan et al, 1999). The centralized management system is not focused on community development and is only concerned with revenue earnings, thus takes less time to implement policies than in a co-managed system.

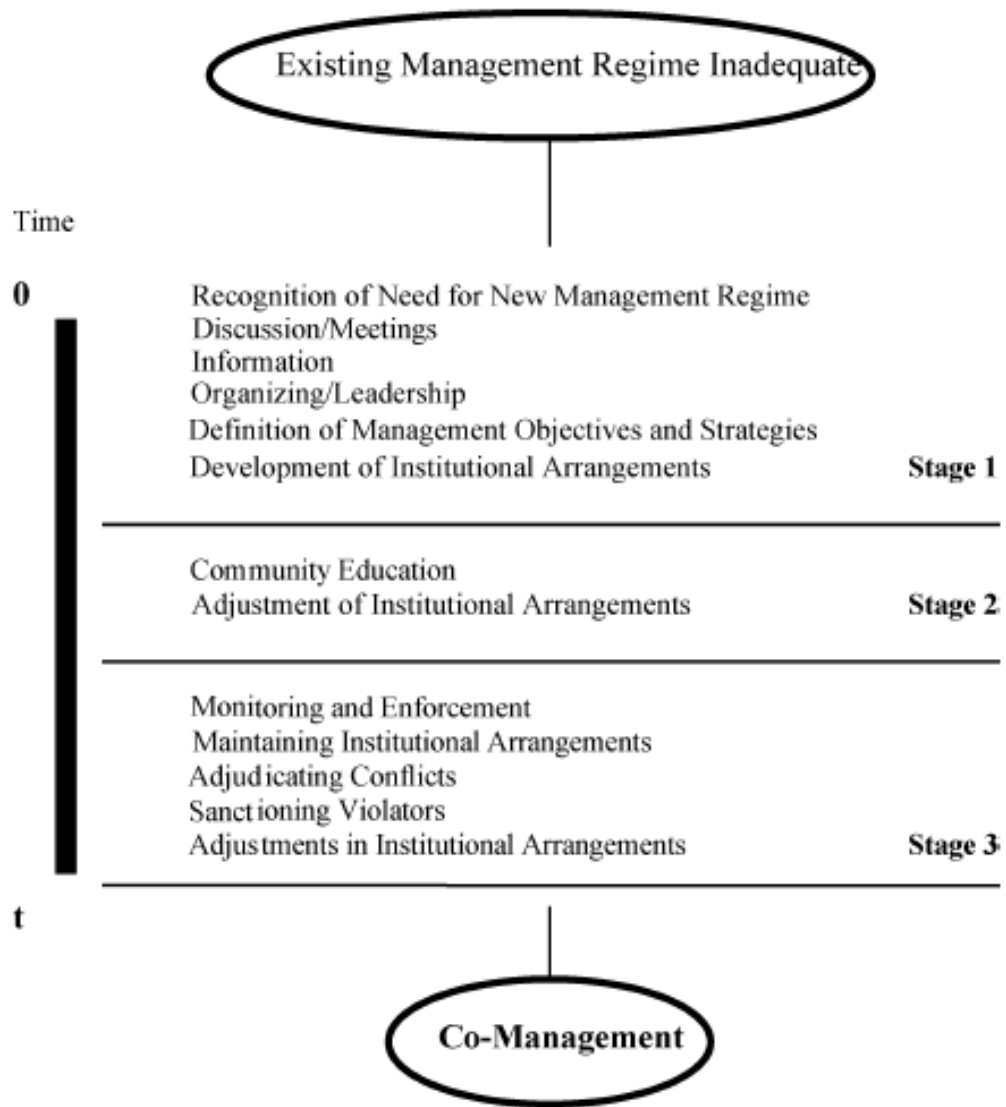


Figure 15: Process of Moving towards Co-management
(Source: Kuperan et al. 1999 – modified from White et al, 1994)

3.3. Data collection

The data were collected in the some days at the end of March, 2010. The method is used to collect that data is randomly sampled. There are 2 kinds of data to serve for this research as following:

- Secondary data,
- Primary data.

3.3.1. Secondary data

In order to identify and measure transaction costs and identify the obstacle to applying measuring transaction costs, the secondary data is collected from MCD Viet Nam, DICAFIREP. The

general socio-economics data were gathered from District People's committee, Fisheries Section and MCD.

3.3.2. Primary data

To obtain information to evaluate management efficiency in socioeconomic issues and identify the opportunities and obstacles to apply transaction costs in Trao Reef, the socioeconomic survey was conducted in two villages in Van Hung commune named Xuan Tu No.1 and Xuan Tu No.2 both of which are affected directly by the sustainable development in Trao Reef

The sample size is 60 households in the both villages. This survey focuses on questions related to with the perceptions of the local community about Trao Reef as co-management model, awareness about environment protection: related activities in Trao Reef, ... All information needed for solving research problem is showed in full questionnaire in Appendix 5



Xuan Tu village (2010) (Source: Nguyen Hai Anh, 2010)

3.3.3. Data analysis

To show the results of management efficiencies, the opportunities and obstacles in applying the transaction costs in Co-management in Trao Reef, the questionnaires are collected from 3 interviewers, and filtered wrong questionnaires (because of conflicts in answering questionnaire or other reasons – this will be presented more clearly in the next chapter). After that the Excel software is used to present all data in the questionnaire, after that using the filter, count, sum, average, ... functions in excel software to have appropriate results.

To have the result related measuring transaction costs, the collected data from MCD are also presented in Excel software and next step is identification what are transaction costs, and measure total transaction costs by sum function in Excel software.

Chapter IV

RESULTS

This chapter will show about results after research about case study in Trao Reef, Van Hung commune, Van Ninh district, Khanh Hoa Province, Viet Nam. It include the part of overview about general information, socioeconomic issues, the management status in Trao reef, and after that identify and measure transaction costs as well as point out the obstacles in applying transaction costs in Viet Nam.

According the data collection in the chapter III – Methodology and data collection, the data were collected from 60 informants, but when check and input the data from questionnaire into excel software, 6 questionnaires have unsuitable information. Therefore, this analysis only based on 54 questionnaires, and the results from them as following:

4.1. General information

Because the sample is random, the survey is implemented along the coastal of Xuan Tu Sea. Therefore, the result is that 21 questionnaire is answered by in Xuan Tu 1 community, and 33 in Xuan Tu 2 community (Appendix 1). And it is about 24.07 % (13/54) of fishermen are female and 70.37 % are male and the rest of 5.56% is undefined gender because the interviewers forgot this information in the interview (Figure 16).

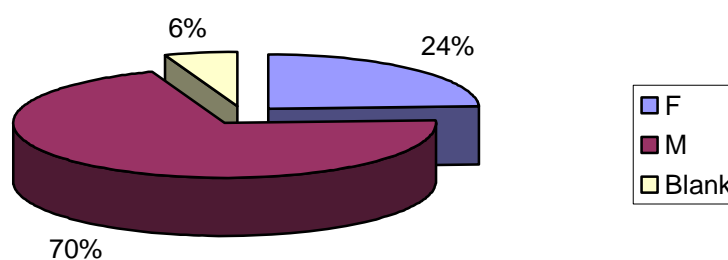


Figure 16: Gender distribution

In this survey also showed that the header of family in the study site is often a man who makes main income for the whole family, the women usually stay at home as a housewife, most of them have not got jobs, and feel shy when they were asked. It explains why most of informants are male.

In 54 interviewed household, there were 45 households (about 83%) involved in fisheries activities and 64 – 70 % of their living depend on fisheries (Appendix 1)

4.2. The hierarchy of co-management system

Asking about the management regime, 100% of the informants affirmed that they were free in Xuan Tu Sea for fisheries activities before applying the co-management in managing Trao reef area (Appendix 2). After applying the co-management system the hierarchy in Trao Reef marine reserve following the Figure 17 , and all of fishing activities is banned in this area, and Trao Reef is protected directly by core group, ecosystem tourism group, propaganda group ...and all members in this communities.

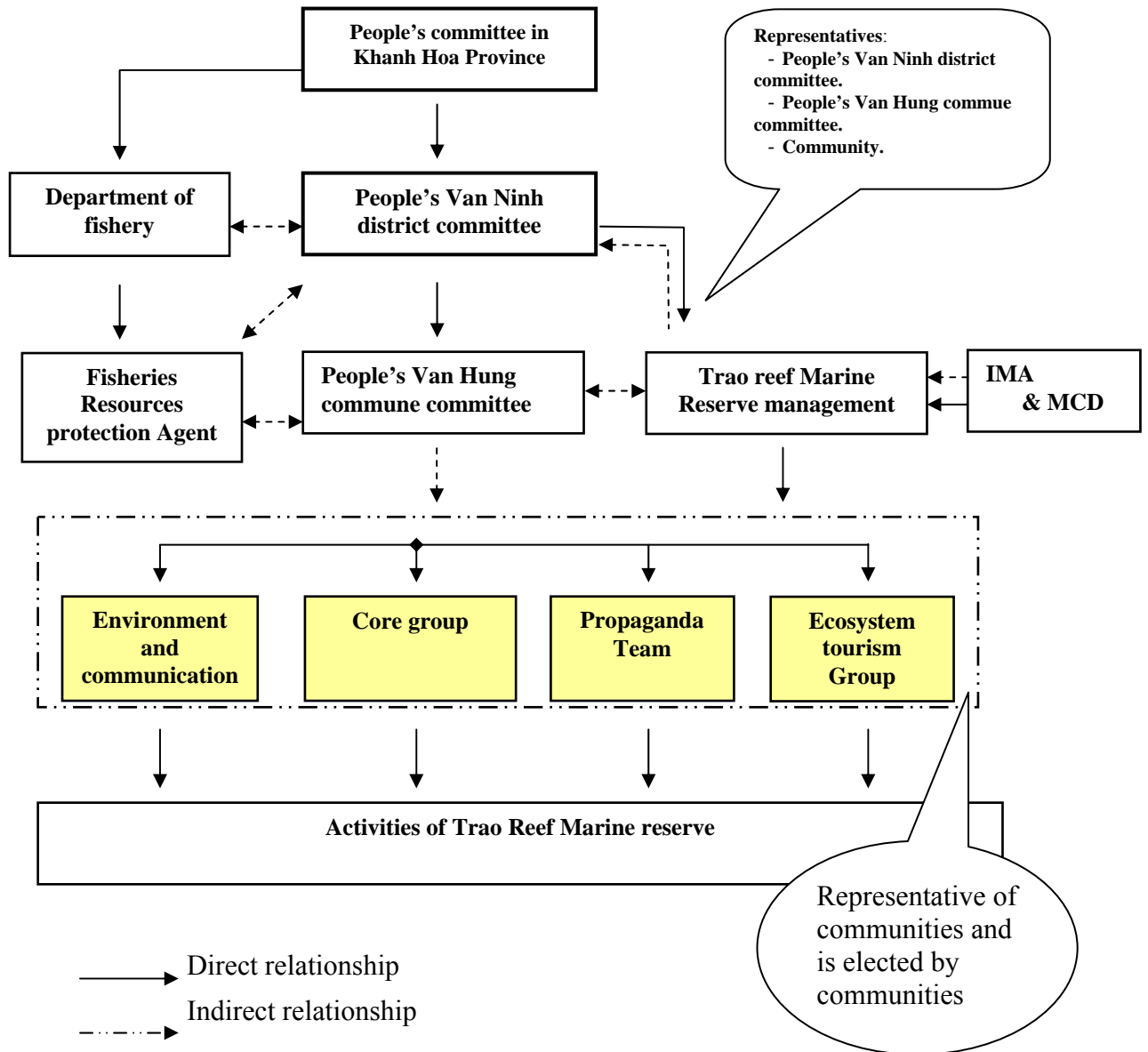


Figure 17: Hierarchy of co-management arrangement in Trao Reef
 (Source: People's Van Hung district Committee, 2009)

4.3. Knowledge of communities about co-management in Trao Reef Marine Reserve

In order to measure the knowledge of the Trao Reef communities, the questionnaire focuses on the issues related to the knowledge of marine reserve such as management, core group, the necessary of the Trao reef model, decision-making in Trao Reef management, ... 38 of 54 (70.37%) interviewees affirmed that the establishment of the marine reserve come from all stakeholders' requirement, 5 of 54 (9.26%) did not know about this information, and the rest thought that establish Trao Reef Marine reserve come from requirement of NGO, or Gov-NGO, ... as following:

Table 6: Establishing Trao Reef Marine reserve accordance with stakeholders expectations and requirements

Establish Trao Reef depend on Requirement of	Number	Percentage
All stakeholders	38	70.37%
NGO	6	11.11%
Gov-NGO	5	9.26%
Unknown	5	9.26%
Total	54	100.00%

(Source: My own survey)

Although, only 70.37% interviewees understood that the establishment of Trao Reef came from all stakeholders' requirements, but 92.59% (50/54) informants said that it is necessary to establish Trao Reef for reservation and sustainable development goals of nature resource in general and fisheries in particular, but still have 7,41% think that it is not necessary. 70.37% of 54 informants knew about the core group's operation, and 62.96% of them agreed that the core group operated effective. The Table 7 bellow will show more detail about informant's view about core group's role:

Table 7: Information related core group and their operation:

Items	Number			Total	Percentage			Total
	Yes	Unknown	No		Yes	Unknown	No	
Informant said that there are core group/associations in this area	38	16	0	54	70.37%	29.63%	0.00%	100.00%
The core group has effective operations	34	16	4	54	62.96%	29.63%	7.41%	100.00%

(Source: My own survey).

4.4. The communities participation and their perception

4.4.1. Communities participation

Although the communities were educated, participated workshop, training ... to know about Trao Reef model as well as co-management, but only under 50% (44.44%) informants said that decision-maker in this area are all stakeholders, other informants answered as the Figure 18 bellow:

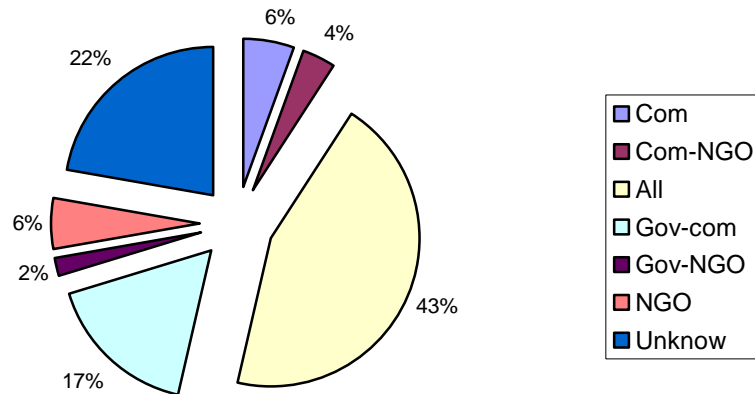


Figure 18: Who makes decision in management Trao Reef Marine Reserve

There are 45/54 interviewees said that they participated in initial establishment process, the high percentage of communities participation in the different activities of Trao Reef show that intensive community involvement in management process and 9/54 interviewees said that they did not participate any activities in the initial process of Trao Reef establishment, but most of them lived in Van Hung commune under 10 year (6/9) – after the Trao Reef started.

Table 8: The years living in Van Hung commune of the informants who did not participate in initial process of Trao Reef establishment

Informant	Years living in Van Hung commune	Did you participate in initial process of Trao Reef establishment
3	8	No
6	7	No
9	8	No
17	No information	No
22	10	No
25	35	No
29	No information	No
33	5	No
50	10	No

(Source: My own survey)

4.4.2. Communities perception about changing in Trao Reef Marine Reserve

Through education, propaganda, workshop, ... the awareness of the local people about environment, knowledge of policies and law improved a lot. Example they changed their habit, for instance, instead of throwing household garbage into the sea, the villagers fixed them in the ground or paid for rubbish collecting service. 81% of interviewees affirmed that the awareness about environment increased and is about 76% affirmed that the environment is better and the violation cases - 69% of 54 informants said that the violation cases decreased. The communities awareness and knowledge is higher is leading to the management in Trao Reef is effective. Table 9 shows the results of the survey about the Trao Reef marine reserve according to 54 interviewed villagers as following:

Table 9: Perception of informants about changes in Trao Reef
(the detail information in the Appendix ...)

Items	Increase		Stable		Unknown		Decrease		Total	
	No	%	No	%	No	%	No	%	No	%
Awareness about Environment	44	81%	10	19%	0	0%	0	0%	54	100%
Knowledge of policies and laws	43	80%	11	20%	0	0%	0	0%	54	100%
Violation cases	5	9%	11	20%	1	2%	37	69%	54	100%
Number of fishes	37	69%	12	22%	3	6%	2	4%	54	100%
Number of high value fishes	33	61%	15	28%	4	7%	2	4%	54	100%
Size of fish	29	54%	13	24%	4	7%	8	15%	54	100%
Jobs	25	46%	26	48%	0	0%	3	6%	54	100%
Living standard	36	67%	17	31%	0	0%	1	2%	54	100%
Environment	41	76%	9	17%	0	0%	4	7%	54	100%

(Source: My own survey)

Environment conservation was improved leading to resources conservation and resources rehabilitation, job opportunities and living standard was enhanced, it is presented clearly in Table 9 that it is about 94% of informants said that the job opportunities is increased or stable, only 6% said that it is decreased. The fisheries resource was getting better, that 69% of interviewees were happy to say that the number of fish increased and 61% answered that number of high value fishes increased, and more than 50% of 54 informants said that the size of fish in the Trao Reef is bigger.

4.5. Communities conflicts

Under the co-management regime, the conflicts between the people in the same community and between people inside and outside of community and also between the people doing in fisheries with the people not doing in fisheries were solved. The data from the survey is as an evidence

that 37 of 54 (68.51%) informants said that the conflict between people in the Trao Reef communities is decreased, the conflicts between the people inside and outside of community and the conflicts between the people doing in fisheries and people not doing in fisheries were decreased or kept stable in the same percentage at 87%. (47/54).

4.6. Measure transaction costs

According the presentation in the chapter III about the methodology and data collection, it showed that the method to measure transaction costs is that first of all, we have to identify 3 stages in process movement from current management regime to co-management regime. The Figure 19 presented this process in Trao Reef:

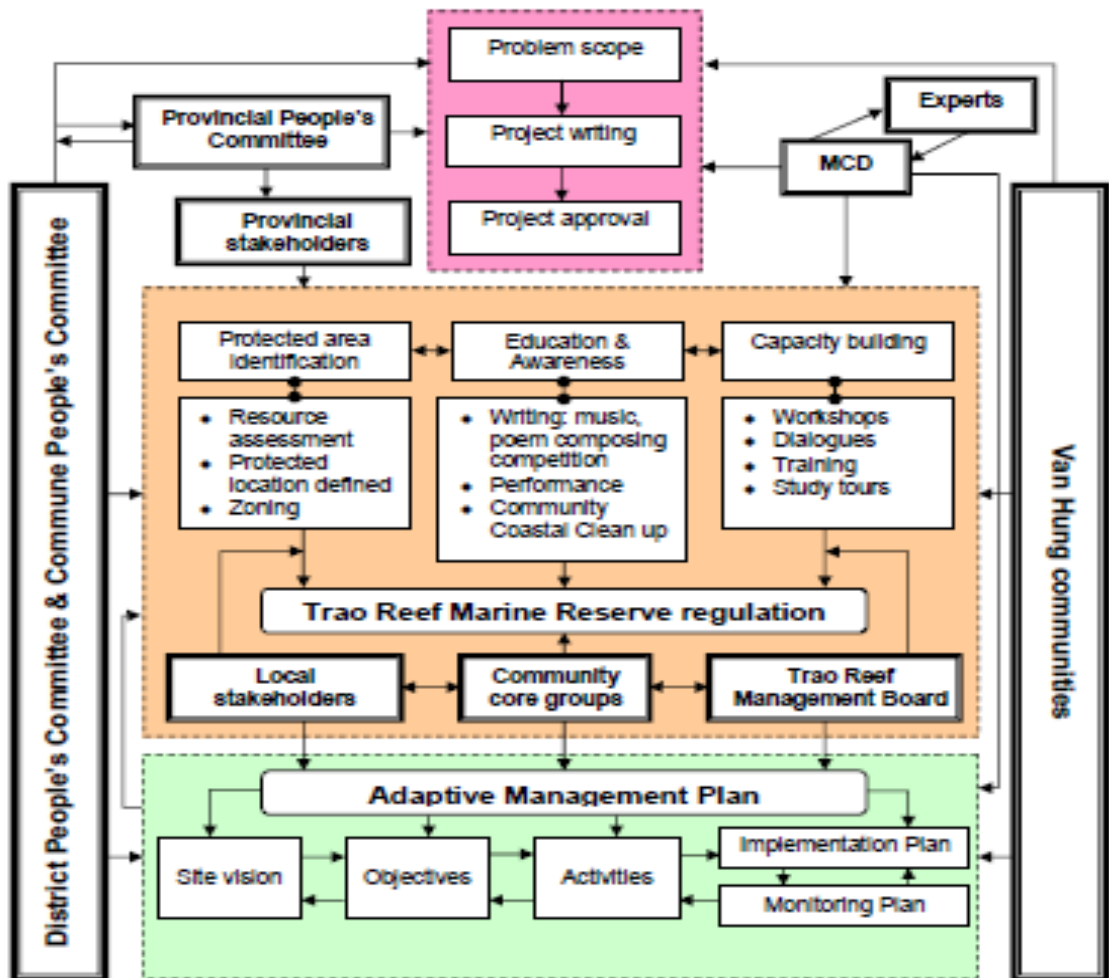


Figure 19: Process of Moving towards Co-management

(Source: MCD, 2009).

The secondly is identification of all transaction costs. According the data, which is provided by the MCD, we have the table below:

Table 10: Transaction costs in implementation of co-management in Trao Reef from 2001 to 2009 (Millions)

Activities	2001	2002	2003	2004	2005	2006	2007	2008	2009
Zoning	5.00	-	-	-	-	-	-	-	-
Environment investigation	82.50		82.50	7.00	-	-	-	-	-
PRA	20.00	-	-	-	-	-	-	-	-
Improvement of communities awareness	27.00	3.00	4.00	4.00	22.00	78.00	45.00	48.00	6.65
Infrastructure and equipment	55.70	-	25.00	-	-	-	-	-	-
Research of Resource Rehabilitation	-	22.00	-	-	-	-	-	190.00	5.50
Another assessment research	-	-	-	-	115.50	-	-	44.55	-
Marine reserve Establishment	24.75	-	-	-	-	-	-	-	-
Regulation Building	-	109.50	-	-	-	-	-	-	-
Livelihood	-	-	-	-	58.00	50.00	45.00	67.00	30.01
Communication and broadcast	3.50	2.50	2.50	2.50	2.80	3.50	3.50	3.50	4.00
Labors	240.00	240.00	360.00	360.00	360.00	360.00	360.00	240.00	10.00
Movement	35.20	17.60	56.40	56.40	56.40	56.40	56.40	56.40	-
Build management Plan	-	15.65	15.65	15.65	15.65	15.65	15.65	15.65	95.00
Management and operation in the local	10.00	10.00	10.00	10.00	40.00	40.60	45.00	49.44	34.00
Total	503.65	420.25	556.05	455.55	670.35	604.15	570.55	714.54	151.16

(Source: MCD, 2009)

According the above mention, the process to moving towards to co-management have 3 stages: 1) from 2001 to 2002; 2) from 2003 to 2008 and the last was 2009. The average of transaction cost for each year in 3 stages are:

Table 11: Average of transaction costs for each stage:

Content	Stage 1 (2001 - 2002)	Stage 2 (2003 - 2008)	Stage 3 (2009)
Total costs	923.90	3571.19	151.16
Average cost/year	461.95	595.19	151.16

Chapter V

DISCUSSION AND RECOMMENDATION

5.1. Discussion

According to the report of IMA (2004) about evaluation of co-management model in Trao reef marine reservation, the long term purposes of the establishment of Trao reef were to protect and manage the reef ecosystem in a sustainable way. Moreover, the co-management model should contribute both to keep the reef in a good condition and support sustainable capture and aquaculture activities that could improve the socioeconomic status and the living standards in the local communities in Van Hung commune. Based on these purposes the required outcomes from this project were:

- Protection and rehabilitation of the coral reef and reef fish in Trao Reef (Outcome related to “Fisheries Resource”)
- Improvement of local communities awareness of environment protection. (Outcome related to “Local communities awareness”)
- Improve peoples’ access to credit sources. Enhancement of livelihood and technical improvement in fisheries and aquaculture to increase the productivity and decrease negative impacts with the environment and sea waters. (Outcome related “Household income”)
- Improve the management abilities of fisheries resource for local communities and fisheries staffs in coastal areas (Outcome related “management abilities”)

In general, as below description, several of the expected outcomes were reached:

5.1.1. Fisheries Resource

The reports of NIO (2001, 2003, 2005), reef check (2010) and an original survey for the purpose of this research (3.2010) indicate that the amount of fish (included reef fish), high value fish, and fish size has increased in the Trao Reef area. Thus, there is a correspondence between the reports and the results in this paper. As the description in Chapter IV, 69% of interviewees reported that they had experienced that the number of fish had increased. Sixty-one percents answered that number of high value fishes increased, and more than 50% of 54 informants said that the size of fish in the Trao Reef has increased (Table 9). Both the reports and this study’s results point forwards positive ecological outcomes of the Trao Reef marine reserve. Furthermore, when the people in the communities in the area anticipate/expect higher benefits in the future from the marine reserve, the establishment of the reserve seems to have improved and increased the peoples opinion about marine conservation.

5.1.2. Local communities awareness

Local communities awareness about Trao Reef Marine reserve:

The survey results indicated that 70.37% of interviewees affirmed that the establishment of the marine reserve came from all stakeholders' requirement (Table 6) . Consequently, these results can be interpreted as an increase in the local communities awareness of the need for marine protection. This awareness can be seen as an effect of all the activities related to the establishment process of the Trao Reef marine reserve. Furthermore, the results show that the stakeholders compliance with the regulations of marine reserve is very high. This is evidenced by the fact that 92.59% (50/54) informants see it as necessary to establish Trao Reef to fulfill the sustainable development goals of nature resource protection in general and fisheries in particular in this area. Additionally, 70.37% of 54 informants knew about the core group's operation, and 62.96% of them agreed that the core group operated effectively. (Table 7). This means that they had knowledge and concern about the Trao Reef, kept track of all activities of Trao reef, and that their awareness about co-management model is increasing over time.

Participation:

45 of 54 interviewees reported that had participated in the initial establishment process. A high percentage of communities participate in the different activities of Trao Reef as 100% respondents said they have participated in the clean up the beach events, and they are willing to contribute to maintain the Marine reserve by their own effort when the supporter (NGOs) stops support for this area. It shows that communities have been involved intensively in the management process.

5.1.3. Household income

The principal source of cash income for the majority of households as revealed in this study is from the fishery (according the Reef Check, 2009). In the MCD's report, more than 70% of the community of the inhabitants in communities of Van Hung relies on fisheries and aquaculture as the primary or secondary source of income, and from the current survey, this proportion is from 60 to 70%. Other significant economic activities are agriculture and small business, which together contributed only about 30% in total household income. This indicates that the income from fisheries is very important in role with this area. Therefore, it is vitally important build an appropriate management regime to protect the fisheries and the incomes they provide.

5.1.4. Management abilities

Under the co-management regime, the conflicts between all stakeholders in the same or different communities were solved. Their compliance, the awareness of regulation, and the willing participation increased and 100% of stakeholders said that they will contribute money for the

funds or their strength which are used for Trao Reef management. These are evidences for management efficiencies in Trao Reef Marine reserve.

5.1.5. Measurement transaction costs in Trao Reef

The expected results with regards to measurement transaction costs are often that “the difference in the total costs of fisheries management between centralized government management and co management is not significant” (Kuperan, et al, 2008). However, Kuperan, et al (2008) affirmed “there is significant difference in the costs at the different stages of management. In stages one and two, which are the stages of initiating a new management regime and community education, the costs are higher for the co-management approach compared to the centralized government approach. The costs are however lower in the third stage for a co-managed approach when monitoring and enforcement and conflict resolution become important” (Kuperan, et al, 2008). However, in this thesis it is not possible to do a direct comparison of the total transaction costs between a centralized and a co-management system because no system existed here before the Trao Reef project. Therefore a more indirect approach was applied. In the survey, direct interview was implemented with local communities (Commune level), Mr Dao Van Luong – Chief of District Agriculture and Rural Development Division (District level), Mr Dau – Deputy of Department of Fisheries resources protection (Province level). Also utilized was indirect interview by sending email to Dr. Chu Tien Vinh – Director of Directorate of capture fisheries and fisheries resource protection, now is Deputy Director of General Directorate of Fisheries (Government level) about management regime for fisheries in Trao Reef before Trao Reef Marine Reserve establishment. 100% interviewees confirmed that there were not any management activities and regime in Trao Reef before the co-management model was implemented. Trao Reef was an open access area and no information of management costs in the centralization regime existed. The current research tried to reveal the transaction costs in centralization regime by some different indirect ways like calculation of the total transaction costs in centralization regime based on budgets of Van Hung commune, or management costs of Van Phong Bay because Trao Reef is located in Van Hung commune and belong to Van Phong Bay. However, a problem was that the budget for Van Hung commune did not have allocations for fisheries management, and Van Phong Bay was established after Trao Reef Marine Reserve. Because of limited time of current survey, therefore, there was not a solution presented here for this problem.

Although, the study still pointed out some achievements. Firstly, the transaction costs for the stage 3 is less than the costs for stage 1 and 2. It is consistent with the literature in above analysis. This is because of the lower cost of monitoring and enforcement because local communities

complies easier with rules and regulations that are developed by themselves and not by an external regulatory authority. Second, from the case studies which were mentioned in literature framework part in this thesis and from a lot of research of co-management were presented in the book “Fisheries co-management, the role of local institutions and decentralization in Southeast Asia” highlighted some aspects and instruments which are important in co-management. These aspects and instruments are property rights, participation, local knowledge, conflict resolution, compliance and enforcement, and transaction costs. The author said that “the reduction of transaction costs is one of main arguments for adopting co-management”. Third, the current survey also showed that 100% interviewees answered that they prefer to answer the question in questionnaire related to only cost than both costs and benefits.

5.2. Recommendation

This research is based on the literature related with MPAs, Co-management and transaction costs and from my own survey in Trao Reef marine reserve, Van Hung, Van Ninh, Khanh Hoa. The study presented about the success of co-management in the sharing of power and responsibility between all stakeholders in using and managing fisheries resources in general and in transaction costs approach in particular as well as revealed some obstacles in applying transaction costs in co-management system in the case study in Viet Nam, recommendations are as bellow:

- The universities in Viet Nam and other international programs in Viet Nam (specially, master and PhD programs) should be supported to encourage students to research about co-management in particular and management regimes in general as well as the transaction costs approach. All these studies will contribute to prove to the government that co-management is maybe a good management solution for fisheries resources in particular and natural resources in general for the future.
- The co-management regime is maybe a good solution for future fisheries management in Viet Nam, therefore the government should be focused on this issue like supporting the legal framework of government policies with an update of the fisheries law. The ministry of agriculture and rural development (government level) should have a national guideline¹ of co-management to guide and apply for all co-management models in Viet Nam. The provinces (local level) should create good conditions for applying co-management models at the local level, and attract NGOs and other stakeholders (private sector, civil society, universities and others) to support this model application.
- For the research to be successful, access to quality data is an important thing. Therefore, the government should prioritize information management systems.

¹ The National Fisheries Co-Management Guidelines (drafting assisted by Danish International Development Assistance - Danida) have been submitted to MARD for approval and the document is currently being revised by the Legal Department.

- The last recommendation is that there should be a holistic approach, a synchronization and comprehensive exchange mechanism in co-management application from the government level to local level in Viet Nam.

5.3. Further study

- This study presents some of the obstacles related to transaction costs in co-management in a case study in Vietnam, however, it also revealed the important roles in applying transaction costs in co-management, and some certain achievements thus, for the further studies should focus on studying more about this issue.

-Based on the previous studies and this study showed that MPAs and co-management is important solutions for fisheries resource management in Viet Nam in the future. While an obstacle in applying in co-management is lack of information about the costs in a centralized system. Therefore, further study should focus on researching about the application of co-management in MPAs, transaction costs approach in Viet Nam to prove the success of co-management model and can avoid lacking of cost information.

CONCLUSION

Trao reef marine reserve is the first marine reserve applying co-management in Vietnam. In addition, this study is the first paper study about the transaction costs approach in fisheries co-management in Vietnam. Therefore, the study had a lot of difficulties and obstacles in the development process, like lack of information and national documents related to transaction costs in fisheries co-management in Vietnam. Although, with the best endeavor in studying and the valuable support from all of supervisors and supporters, the study has some achievements:

- Overview about literature of MPAs, fisheries co-management, fisheries co-management in MPA and transaction costs as well as the methodology to measure transaction costs in co-management. For instance, fisheries co-management is understood as the sharing of responsibility and authority in using and managing fisheries resources, and transaction costs are the total costs of information collection, collective fisheries decision-making and collective operation in fisheries management, and it may either increase or decrease in total costs, but the study showed that the cost for the stage 3 will reduce compare with stages 1 and 2. It means that the transaction costs in co-management will reduce in the future.

- Effectiveness evaluation of Trao Reef marine reserve based on co-management regime like improvement of fisheries' awareness, rehabilitation of fisheries resource, solve conflicts between stakeholders in using and managing fisheries resource, ... and transaction costs approach, is possible a good approach for evaluate fisheries co-management in Trao reef. The study also pointed out that co-management is solution for managing the Trao reef Marine Reserve.

The study based on the secondary data and primary data as well as the MPAs, co-management literature framework and methodology of measurement transaction costs in fisheries co-management.

The study is in a case study in Van Hung commune, Van Ninh district, Khanh Hoa province, Viet Nam and the survey took place in Xuan Tu 1, 2 villages in Van Hung commune with 60 informants, included 54/60 the interview papers are valid, and 6/60 are invalid

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Appendix 1: General information from the survey

Informant (54/60)	Gender	Commune	Years living in Van Hung commune	Working relative with fisheries	% income depend on fisheries
1	M	1	40	1	100
2	M	1	35	1	100
3	F	1	8	1	100
4	M	2	40	1	100
5	M	2	35	0	0
6	F	2	7	1	100
7	M	1	35	1	100
8	M	1	45	1	100
9	F	1	8	1	50
10	M	1	58	1	50-75
13	F	1	30	1	100
15	M	1	30	1	100
16	M	1	20	1	50-75
17	M	1		0	0
18	M	1	30	1	75-100
19	M	2	80	1	100
20		2	56	1	25
21	M	2	35	1	100
22	M	2	10	1	75-100
24	M	2	30	0	0
25	M	2	35	1	25
26	F	2	49	0	0
27	M	2	31	1	100
28	M	2	50	1	100
29	M	2		1	100
30	F	2	50	1	25
31	M	2	40	1	100
32	M	2	70	1	50
33	M	2	5	1	100
34	M	2	50	1	75-100
35	M	2	35	1	50-75
36		1	40	1	75-100
37	M	1	40	1	50-75
38	M	2	13	1	100
39	M	2	35	1	50
40		2	50	1	25-50
41	F	1		1	25-50
42	F	2	12	0	0
43	M	1	15	0	0
44	M	1	60	1	50
45	M	1	32	0	0
46	M	2	43	1	75
47	F	2	49	1	50
48	F	2	29	1	100
49	F	2	30	1	75-100
50	M	2	10	0	0
51	M	2	55	1	100

52	M	2	32	1	100
53	F	1	44	1	100
55	M	1	67	1	100
56	M	1	53	1	75-100
58	M	2	45	0	0
59	F	2	47	1	50
60	M	2	24	1	100

Appendix 2: Knowledge of communities about co-management and communities participation

Informant (54/60)	Are there any management activities before co-management project	To establish Trao reef come from :	Is co-management model necessary ?	Were there core group/associations in this area?	Whether it is effective or not?	Who are management decision-makers in this area	Who were management decision-makers before establishment of Trao Reef	Did you participate in Trao Reef establishment process.	Have you been proposed something for this area?
1	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
2	No	All	Yes	Yes	Yes	Gov-NGO	Gov	Yes	Yes
3	No	Unknown	Yes	Yes	Yes	All	Gov	No	No
4	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
5	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
6	No	Unknown	Yes	Yes	Yes	Com-NGO	Gov	No	No
7	No	All	No	Yes	No	Unknown	Gov	Yes	No
8	No	All	Yes	Yes	Yes	Unknown	Unknown	Yes	No
9	No	Unknown	Yes	Yes	Yes	Unknown	Unknown	No	No
10	No	All	Yes	Unknown	Unknown	Com-NGO	Gov	Yes	No
13	No	All	Yes	Unknown	Unknown	Unknown	Unknown	Yes	No
15	No	Gov-NGO	No	Unknown	No	Unknown	Unknown	Yes	No
16	No	All	No	Unknown	Unknown	Unknown	Unknown	Yes	No
17	No	Unknown	No	Unknown	Unknown	Unknown	Unknown	No	No
18	No	All	Yes	Unknown	Unknown	Gov-Com	Gov	Yes	Yes
19	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
20	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
21	No	All	Yes	Yes	Yes	Gov-Com	Gov	Yes	No
22	No	All	Yes	Yes	Yes	All	Gov	No	No
24	No	All	Yes	Yes	Yes	Com	Gov	Yes	Yes
25	No	NGO	Yes	Yes	Yes	Unknown	Gov	No	No
26	No	All	Yes	Yes	Yes	Unknown	Gov	Yes	Yes
27	No	All	Yes	Yes	Yes	All	Unknown	Yes	No
28	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
29	No	All	Yes	Yes	Yes	All	Gov	No	Yes
30	No	Gov-NGO	Yes	Yes	Yes	All	Gov	Yes	Yes
31	No	All	Yes	Unknown	Unknown	Gov-Com	All	Yes	No
32	No	All	Yes	Yes	Yes	All	Gov	Yes	No
33	No	Unknown	Yes	Unknown	Unknown	All	Gov	No	No
34	No	All	Yes	Yes	Yes	NGO	Gov	Yes	Yes
35	No	All	Yes	Unknown	Unknown	Com	Unknown	Yes	No
36	No	All	Yes	Unknown	No	Gov-com	Gov	Yes	No
37	No	All	Yes	Yes	No	All	Gov	Yes	Yes
38	No	All	Yes	Unknown	Unknown	Gov-Com	Gov	Yes	No
39	No	Gov-NGO	Yes	Unknown	Unknown	Gov-Com	Gov	Yes	No
40	No	All	Yes	Yes	Yes	Com	Gov	Yes	Yes
41	No	All	Yes	Yes	Yes	Gov-com	Gov	Yes	Yes

42	No	NGO	Yes	Yes	Yes	All	Gov	Yes	Yes
43	No	NGO	Yes	Unknown	Unknown	All	Gov	Yes	No
44	No	Gov-NGO	Yes	Yes	Yes	All	Gov	Yes	Yes
45	No	All	Yes	Unknown	Unknown	NGO	Gov	Yes	No
46	No	All	Yes	Yes	Yes	All	Gov	Yes	No
47	No	All	Yes	Yes	Yes	All	Gov	Yes	No
48	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
49	No	Gov-NGO	Yes	Unknown	Unknown	NGO	Gov	Yes	No
50	No	NGO	Yes	Unknown	Unknown	Unknown	Gov	No	No
51	No	NGO	Yes	Yes	Yes	All	Gov	Yes	No
52	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
53	No	NGO	Yes	Yes	Unknown	Unknown	Gov	Yes	No
55	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
56	No	All	Yes	Yes	Yes	Unknown	Unknown	Yes	No
58	No	All	Yes	Yes	Yes	All	Gov	Yes	Yes
59	No	All	Yes	Yes	Yes	Gov-Com	Gov	Yes	No
60	No	All	Yes	Yes	Unknown	Gov-Com	Gov	Yes	No

Appendix 3: The communities perceptions about changing in Trao Reef Marine Reserve.

Infor mant	Environ ment	Number of fishes	Number of high value fish	Size of fish	Jobs	Livin g stand ard	Violation case	Residents' knowledge of policies and laws	The behavior in associating among stakeholders.	Awareness of residents in general about environment, ...
1	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
2	Incr	Incr	Incr	Incr	Sta	Sta	Decr	Incr	Incr	Incr
3	Incr	Sta	Sta	Incr	Incr	Incr	Incr	Incr	Incr	Incr
4	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
5	Incr	Sta	Sta	Incr	Incr	Incr	Decr	Incr	Incr	Incr
6	Incr	Incr	Incr	Incr	Incr	Sta	Decr	Incr	Incr	Incr
7	Sta	Sta	Sta	Incr	Sta	Incr	Incr	Incr	Incr	Sta
8	Sta	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Sta
9	Incr	Incr	Sta	Decr	Sta	Sta	Sta	Sta	Sta	Incr
10	Incr	Incr	Incr	Incr	Sta	Sta	Sta	Sta	Sta	Incr
13	Decr	Decr	Sta	Decr	Sta	Sta	Sta	Sta	Sta	Sta
15	Decr	Decr	Decr	Decr	Incr	Decr	Decr	Sta	Sta	Sta
16	Sta	Sta	Sta	Sta	Sta	Sta	Sta	Sta	Sta	Sta
17	Sta	Sta	Sta	Sta	Sta	Sta	Sta	Sta	Sta	Sta
18	Incr	Incr	Incr	Sta	Sta	Incr	Decr	Incr	Incr	Incr
19	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
20	Incr	Incr	Incr	Sta	Incr	Incr	Sta	Incr	Sta	Incr
21	Incr	Incr	Incr	Incr	Sta	Incr	Decr	Incr	Incr	Incr
22	Incr	Incr	Incr	Incr	Incr	Incr	Sta	Incr	Incr	Incr
24	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
25	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Sta	Incr	Incr
26	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
27	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
28	Incr	Incr	Sta	Incr	Sta	Incr	Decr	Sta	Incr	Incr
29	Sta	Incr	Incr	Sta	Sta	Sta	Decr	Incr	Sta	Incr
30	Sta	Sta	Sta	Sta	Decr	Sta	Decr	Incr	Sta	Incr
31	Decr	Sta	Decr	Decr	Incr	Sta	Decr	Incr	Incr	Sta
32	Incr	Sta	Sta	Sta	Sta	Sta	Decr	Incr	Sta	Incr
33	Incr	Sta	Sta	Decr	Sta	Sta	Decr	Incr	Incr	Incr
34	Incr	Incr	Sta	Incr	Incr	Incr	Sta	Incr	Incr	Incr
35	Incr	Incr	Incr	Decr	Sta	Incr	Sta	Sta	Sta	Incr
36	Sta	Incr	Incr	Sta	Sta	Incr	Sta	Incr	Incr	Sta
37	Sta	Incr	Incr	Incr	Incr	Incr	Incr	Incr	Incr	Incr
38	Sta	Sta	Sta	Sta	Sta	Sta	Sta	Sta	Sta	Sta
39	Decr	Incr	Incr	Decr	Decr	Sta	Decr	Incr	Sta	Sta
40	Incr	Incr	Incr	Decr	Sta	Sta	Decr	Sta	Incr	Incr
41	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Sta	Incr
42	Incr	Incr	Incr	Incr	Sta	Incr	Decr	Incr	Incr	Incr
43	Incr	Sta	Sta	Sta	Sta	Incr	Decr	Incr	Incr	Incr
44	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
45	Incr	Unkown	Unkown	Unkown	Incr	Incr	Unkown	Incr	Sta	Incr
46	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
47	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr	Incr	Incr
48	Incr	Incr	Incr	Incr	Sta	Incr	Decr	Incr	Incr	Incr

49	Incr	Incr	Incr	Incr	Sta	Sta	Decr	Incr	Incr	Incr
50	Incr	Incr	Incr	Sta	Sta	Incr	Decr	Incr	Incr	Incr
51	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
52	Incr	Incr	Incr	Sta	Sta	Incr	Decr	Incr	Incr	Incr
53	Incr	Unkown	Unkown	Unkown	Sta	Incr	Incr	Incr	Sta	Incr
55	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
56	Incr	Sta	Sta	Sta	Sta	Incr	Decr	Incr	Incr	Incr
58	Incr	Incr	Incr	Incr	Incr	Incr	Decr	Incr	Incr	Incr
59	Incr	Incr	Unkown	Unkown	Incr	Incr	Decr	Incr	Incr	Incr
60	Incr	Unkown	Unkown	Unkown	Sta	Sta	Decr	Incr	Incr	Incr

Appendix 4: The conflicts between the people in the same communities, in different communities and in different occupation.

Informant	Conflicts in Trao Reef communities	Conflicts inside and outside of Trao Reef	Conflicts between the fishermen with other partners	Which issue do your prefer to answer in interview: 1) Only costs 2) Both of costs and Benefits
1	Decr	Decr	Decr	1
2	Decr	Decr	Decr	1
3	Decr	Decr	Decr	1
4	Decr	Decr	Decr	1
5	Decr	Sta	Decr	1
6	Decr	Decr	Decr	1
7	Incr	Decr	Decr	1
8	Decr	Decr	Decr	1
9	Sta	Sta	Sta	1
10	Sta	Sta	Sta	1
13	Sta	Sta	Sta	1
15	Sta	Sta	Sta	1
16	Unknown	Unknown	Unknown	1
17	Unknown	Unknown	Unknown	1
18	Unknown	Unknown	Unknown	1
19	Decr	Decr	Decr	1
20	Sta	Sta	Sta	1
21	Decr	Decr	Decr	1
22	Decr	Decr	Decr	1
24	Decr	Sta	Decr	1
25	Decr	Sta	Sta	1
26	Decr	Decr	Sta	1
27	Decr	Sta	Sta	1
28	Decr	Decr	Decr	1
29	Decr	Decr	Decr	1
30	Decr	Decr	Decr	1
31	Decr	Decr	Decr	1
32	Decr	Decr	Decr	1
33	Decr	Decr	Decr	1
34	Decr	Sta	Sta	1
35	Unknown	Unknown	Unknown	1
36	Unknown	Unknown	Unknown	1
37	Decr	Decr	Decr	1
38	Unknown	Unknown	Unknown	1
39	Decr	Decr	Decr	1
40	Sta	Sta	Sta	1
41	Sta	Sta	Sta	1
42	Decr	Sta	Decr	1
43	Decr	Decr	Decr	1
44	Decr	Decr	Decr	1
45	Sta	Sta	Sta	1
46	Decr	Decr	Decr	1
47	Decr	Sta	Sta	1

48	Decr	Sta	Sta	1
49	Decr	Sta	Sta	1
50	Sta	Sta	Sta	1
51	Decr	Decr	Decr	1
52	Decr	Decr	Decr	1
53	Decr	Sta	Sta	1
55	Decr	Sta	Sta	1
56	Decr	Sta	Sta	1
58	Decr	Decr	Decr	1
59	Decr	Sta	Sta	1
60	Unknown	Unknown	Unknown	1

Appendix 5: QUESTIONNAIRE

Date:

Part 1: General information

1. Interviewee name : Age:
Male Female
2. Address:
Hamlet Commune..... District Province.....
3. How many years have you been living here?years.
4. Main income of your family from:
Fishing Fisheries processing Fish trade and service
Fisheries aquaculture Breeding/Cultivating Others.....
5. Please estimate the percentages of family income from all of fisheries - related Jobs (fishing, aquaculture, service, etc.)
Less than 25% From 25 to 49% 50%
From 51% to 74% From 75 to 99% 100%

Part 2: The co-management information

6. Have there been any management activities in Trao Reef before IMA (now is MCD), 2001?
Yes No
7. If “Yes” , which is activity below:
 Training in order to increasing awareness of fishermen
 Monitoring, controlling, and surveillance in fishing in Trao reef area.
 Livelihood
 Total above activities
8. The co-management area was built by:
 The needs of local community Private organization
 Government I do not know
9. In personal idea, do you know the necessary of establishing co-management in Trao Reef?
Yes No
10. Were there any groups/associations which operated in this area?
Yes No
11. Did you participate in that groups/associations?
Yes No
- Please tell the name of this group/association
12. Did these groups/associations operate successful?
Efficiency Inefficiency
- If inefficiency, why?

Part 3: Participation in Co-management

13. Now, who make management decision in Trao Reef?
Government Resident Both
14. Before establishing Co-management area, who made decision in managing and regulations in Trao Reef?
Government Resident Both

15. Have you participated any activities in Co-management area from beginning to now?

Yes No

If “Yes”, Which are activities?

- Survey and choose the area
- Training
- Propaganda
- Make related documents
- reservation activities
- Controlling and protection
- Monitoring
- Livelihood
- Others

.....

16. Did you have any suggestion/propose to local government and other stakeholders to solve the difficulties in implementing the activities in Trao Reef?

Yes No

Did you pleasure with this solution? Yes No

If “No” , why?

Part 4 : Co-management efficiency

17. In your opinions, how the establishing co-management area affects in below fields?

		Worse	Unchanged	Better
1	Environment in co-management area			
2	General fisheries resources			
3	High value species			
4	Local species of fish			
5	Size of fish			
6	Scope and status of ecosystem			
7	Volume of violation cases (exterminated fishing, capture in restricted areas, ...) in CM area.			
8	Living standard of Residents in Local			
9	Job opportunities			
10	Awareness of residents in general about environment, ...			
11	The behavior in associating among stakeholders.			
12	Residents’ knowledge of policy and laws			

18. Now, which funds do the co-management system rely on?

Community Government Other stakeholder

Do you willing to contribute for maintaining the implementation of the model if it’s funds rely on other stakeholder or Government,

Yes No

Which ways do you choose to contribute by:

Labor Money Assets

19. Your proposals to improve the efficiency of co-management area:

.....

Thank you for your answers!