

# An Analysis of the Philippines' Marine Fishery Management based on the PSIR Framework and Implications for Vietnam

Vũ Thanh Hương\*

*Faculty of International Business and Economics, VNU University of Economics and Business,  
144 Xuân Thủy, Cầu Giấy, Hanoi, Vietnam*

Received 30 October 2012

**Abstract.** Marine fishery resource management is a great concern of numerous governments because this resource contributes considerably to socio-economic development and provides from a huge ecosystem goods and services to the world. However, the alarming over-exploitation, marine environmental degradation and conflicts between stakeholders in the fishery sector all over the world has urgently required a more efficient approach to manage marine fishery resources. This paper argues that ecological economics is a suitable approach to address the issues of marine fishery resource use and management. In particular, the paper will focus on biological and economic aspects of marine fishery resources that must be taken into consideration in designing fishery policies. The paper then examines the marine fishery management of the Philippines based on the Pressure-State-Impact-Responses (PSIR) framework. The paper recommends that the Philippines' government should construct a more appropriate marine fishery legal framework and take into consideration economic incentive programs and market-based instruments. Through the case study of the Philippines, some implications will be drawn out for Vietnam for an efficient and sustainable marine fishery management.

*Keywords:* Marine fishery management, Philippines, Vietnam, Pressure-State-Impact-Responses Framework, PSIR.

## 1. Introduction

Marine fishery resources have become an important topic at a large number of world development conferences. This is because around 60% of the world's ocean is outside the control of individual countries or belongs to the world (Iversen, 1996). Another reason is that the marine fishery resource plays a vital economic, social and environmental role and considerably contributes to world development and hunger eradication. In addition, the fishery

resource provides employment, nutrition and ecosystem services to a large proportion of the world population.

Being an archipelago, the Philippines has an exceptionally diverse marine fisheries resource. However, the revolution in fishing techniques including destructive fishing methods, the open-access exploitation of and increased demand for marine fisheries have led to a sharp decrease in the Philippines' fish stock, loss of biodiversity, deterioration of the marine ecosystem and conflicts between stakeholders. These changes in turn adversely affect human lives such as reducing an important source of protein and reducing the quality of life of the

---

\* MA., Tel.: 84-977917656  
E-mail: huongvt@vnu.edu.vn

population. These changes also have negative impacts on national economic growth and the sustainable development of fisheries (Kahn, 2005; Neiland, 2006). The same situation can be observed in Vietnam's fishery sector (Ministry of Natural Resource and Environment, 2010; Vu Thanh Huong, 2006).

This paper argues that the environmental, socio and economic impacts of overexploitation of marine fishery resources requires an efficient management of this resource, in which ecological and economic aspects of the fishery resource must be incorporated. Therefore, this paper aims at examining how an ecological economics approach can be used to manage the marine fishery resource and focuses on the Philippines where the catch of fisheries plays a vital role in the economy but has been vulnerable as a case study to illustrate this approach. This paper concludes with some suggestions for the Philippines and implications for Vietnam to efficiently manage and maintain flows of goods and services supplied by the fishery resource towards sustainable development.

## 2. Ecological economics-interactions between the economy and ecosystem

Common and Stagl (2005) state that the overlap between the economy and ecosystem is so-called ecological economics. Put another way, ecological economics deals with how the economic and ecological systems interact. Even though the structure and functions of the economic and ecological systems are completely different, these systems are not separate. The economic system is only a subsystem of and is dependent on the ecosystem (Wills, 2006). For instance, the ecosystem provides inputs such as land, water, fuel and wood for the economic system to operate (Costanza, Cumberland, Daly, Goodland, and Norgaard, 1997). However, it is human activities such as agriculture, energy use, manufacturing and the arms race that change the ecosystem, of which economic

activities are the main activities (Field & Field., 2002). Therefore, economic activities depend on natural resources supplied by the environment to create goods and services but at the same time create environmental problems that in turn affect the economy. In short, the economic and ecological systems are interdependent and this interaction is the basis for introduction of ecological economics (Figure 1).

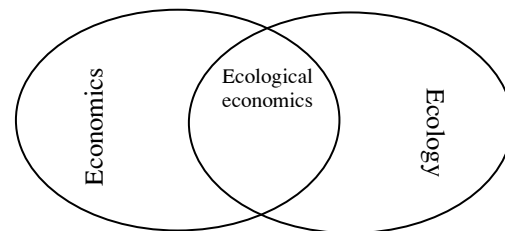


Figure 1: Ecological economics  
Source: Common and Stagl (2005).

Because the economy and ecosystem are interdependent, the study of economics and the study of ecology should be incorporated to solve environmental and resource problems. Ecological study may be adequate to describe these problems, but it does not involve analysis of human activities. Economic study deals with how the scarce resources should be allocated and enables us to understand and evaluate the impacts of economic activities on the ecosystem. The determination of optimal allocation of resources calls for understanding of both economic behaviors and the whole ecosystem (Kahn, 2005). Therefore, ecological economics can be viewed as an appropriate approach to deal with environmental and resource problems, in which economic theories and models are utilized to find out the optimum resource allocation.

## 3. A framework of Marine Fishery Resource Management

### *Marine fishery resource and fisheries sector*

The marine fishery resource is a part of the marine ecosystem and defined as the stock of

marine living organisms and their habitat (Clay, Cowx, Evans, and Gayanilo, 1999).

The Marine fisheries sector can be divided into capture and culture fisheries (Murray, Leonard, Bestari, and Tucker, 2006). The former, which will be discussed in this paper, includes the capture of wild fish and other living animals in seawater. The latter is the farming of aquatic animals and plants - also called aquaculture.

Iversen (1996) classifies capture fisheries into three types: commercial, subsistence and recreational fisheries. He argues that there is a really clear distinction between commercial and recreational fisheries based on the objectives of capture. Commercial fishermen aim at seeking profit while recreational ones participate in fishing because of numerous reasons such as satisfying their need for a hobby or reducing stress - without profit motives. The third type of capture fisheries, that is subsistence or artisanal fisheries, can be considered as an intermediate type between commercial and recreational fisheries. This is because artisanal fishermen catch fish to feed their families and then sell the unused catch or they may be engaged in fishing to serve their own interests or as a hobby.

***Biological and economic characteristics of marine fishery resource***

The marine fishery resource is renewable because the resource can grow in time and has reproductive capacity. One important feature related to a renewable fishery resource is the reproductive rate. If the rate of harvest is persistently higher than the reproductive rate,

the fish stock will decrease and become extinct (Common and Stagl, 2005).

Kahn (2005) states that the growth of fish can be described as a logistic function. Figure 2 reveals that initially, the growth rate increases with increase in fish population. However, after  $X_2$ , the growth rate starts to decrease and eventually falls to zero when the population reaches the maximum level of  $K$ . This situation can be explained by biological factors. When the fish population increases, competition for resources increases and diseases also grow. Point  $K$  is regarded as the biological equilibrium or carrying capacity of the environment. More importantly, when the growth rate ( $G$ ) is equal to harvest rate ( $H$ ), the growth function is exactly the harvest function. As a result, the point  $X_2$  is considered the maximum sustainable harvest or yield that can be attained when the harvest rate  $H_2$  is exactly the same as the growth rate  $G_2$  (Common and Stagl, 2005).

The analysis of growth function suggests that the fishery resource is renewable but also destructible. Therefore, it is of great importance for policy makers to understand the biological characteristics in general and the growth rate or fish population in particular to identify maximum sustainability. Then, based on the maximum sustainable yield, the government can determine correct resource pricing and avoid misallocation of the country's resource into the fisheries sector. In other words, biological factors have important implications for fishery management.

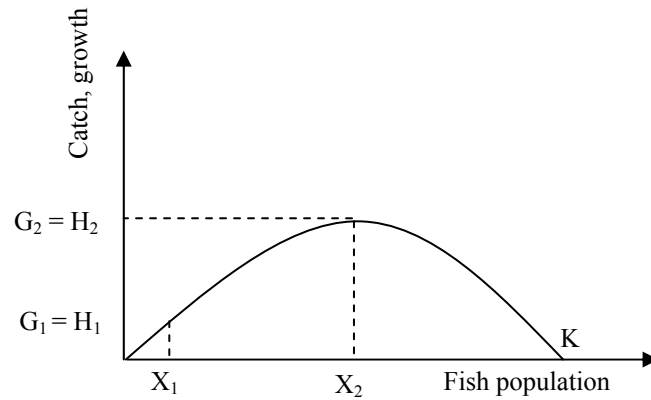


Figure 2: Growth function of fish resource  
 Source: Common and Stagl (2005), Kahn (2005).

Besides biological characteristics, the economic feature of fisheries resource, as common property, is also of increasing importance for the design of fishery management policies. In open-access fisheries, anyone can freely harvest the fish stock whenever he pleases. He can decide on how may fish to catch, where to catch, what fish to catch and what type of gear to use. He is concerned about his own private costs rather than the cost imposed on others when fish becomes scarce. As a consequence, the amount of fish actually harvested will be higher than the socially efficient amount. The fish stock will promptly be depleted or the tragedy of the commons will occur (Field & Field., 2002).

Figure 3 describes the tragedy of the commons in fisheries. The optimal level of fishing is at point  $x$  where  $MC$  is equal to  $MR$ . At point  $x$ , fisherman will earn the area  $wabc$  more than employees in an alternative industry. Therefore, workers in the alternative industry will be induced to enter the fisheries sector until the earning of fishermen and workers in alternative industry are the same. As a result, the open - access number of fisheries are  $z$  - that is, higher than the social optimal number  $x$  (Gordon, 2002). The tragedy of common fisheries requires government intervention in defining property rights to reduce fishing effort and attain an efficient social outcome.

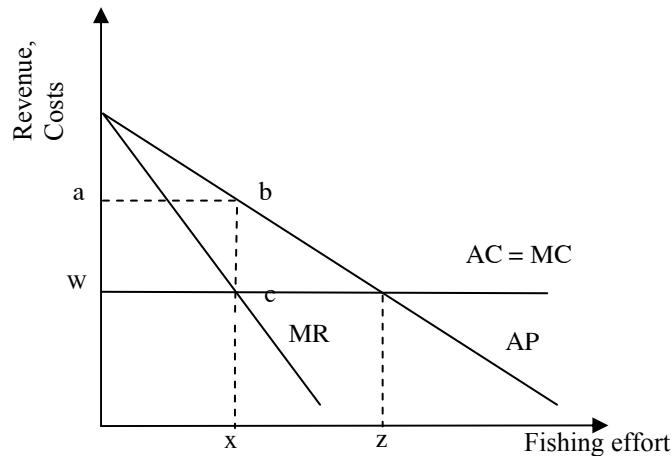


Figure 3: The tragedy of the commons in fisheries  
 Source: Gordon (2002).

In summary, the fact that the fisheries resource is common property has led to overexploitation of fish stock. As a result, fishery regulations are required to control the harvest rate so that it does not exceed the reproduction rate and limit the access to the resource. However, it is noted that management of the fisheries resource must be based on both economic and ecological knowledge about fishery resources. Gordon (2002) highlights the importance of ecological economics in fishery management when he states that research on fishery resource utilization during the last 50 years has not been adequate because the research has been based merely on biological knowledge rather than economic characteristics of the fishing industry (Gordon, 2002).

***A framework for marine fishery management***

A framework for fishery management based on the PSIR approach is shown in Figure 4, which suggests that fishery management and regulation should be designed based on taking into consideration how pressures from human activities (such as fishing effort) and ecosystem pressures (like environmental changes) impact fishery ecosystem states. In addition, how fishery ecosystem changes (for example growth rate, fish age, and structure) affect human activities and the ecosystem as a whole must also be considered. The above approach can be put into place only if policy makers or fishery managers incorporate knowledge about the biotic, abiotic and human components of the whole ecosystem and their interactions with fishery management (Arancibia and Munoz, 2006). Fishery regulations can be divided into two types including open-access regulations and limited entry techniques.

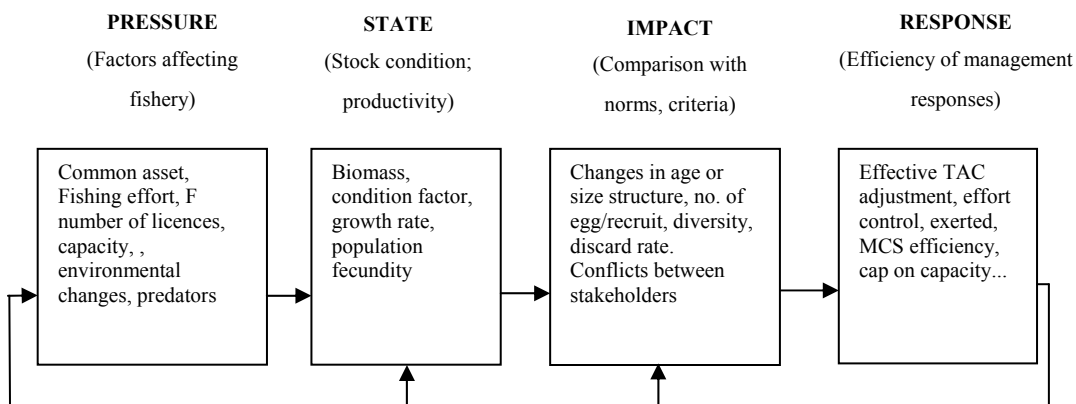


Figure 4: PSIR approach to fishery management

Source: Caddy (2004).

Note: TAC: Total Allowance Catch; MCS: Monitoring, Control and Surveillance; F: Fishing mortality.

Most fishery regulations are based on open-access techniques that aim at biological regulation. This type of regulation targets keeping fish populations at a given level, theoretically at the sustainable maximum yield  $X_2$  shown in Figure 2, by imposing restrictions on how, which, when, where and how many fish may be caught (Kahn, 2005). For example, the method of fishing can be regulated by limiting boat size, gear type or the length of nets. The limits on fishing can also be the

minimum size of fish to be caught or the seasons or areas in which no one is allowed to have access to the fishery resource (Iversen, 1996). When considering effects of open-access regulations, two opposite effects must be carefully taken into account. This is because on the one hand, these regulations are designed to cause inefficiency because more resources are required to harvest a given amount of fish. Typically, the fishing cost grows and the unprofitable fishermen would do better to leave

the industry, resulting in a decline in fishing efforts. On the other hand, these regulations can also result in improvements in the fish population that in turn tends to lower catch costs.

The latter type of regulations, limited entry techniques, has recently been paid more attention and tries to address the problems of common resource, “over-fishing, overcrowding and overcapitalization”, in fishing activities to attain the maximum sustainable yield. These regulations can be categorized into three main forms: taxation, output controls and input controls. For instance, taxation is imposed based on the maximum resource rent the fishery can generate. A recent approach is the individual transferable quota in which each fisher is assigned a part of the total allowable catch through auction, lottery or past catch. Input controls can be implemented by imposing restrictions on the number of boats operating on a certain fishing ground (Iversen, 1996; Kahn, 2005; Meany, 1987). The result of a limited access regulation is that the private fishing cost increases but in a manner the social welfare may increase.

It can be said that efficient management of the fishery resource can only be attained based on appropriate fishery regulations. However, one difficulty in designing regulations is that information about optimum sustainable yield or impacts of over-fishing on the ecosystem and human activities is asymmetric. Another difficulty is that many countries, especially developing countries like the Philippines and Vietnam, have insufficient resources to put such regulations in place. Finally, no regulations can completely solve the problems of open-access fisheries. Therefore, the cooperation between economists and ecologists is of great importance in supporting governments to determine feasible and efficient fishery policies.

#### ***Overview of the marine fishery sector in the Philippines resource***

##### *Marine fishery resource*

Table 1: Marine fishery resource of the Philippines

<b>Item</b>	<b>Areas</b>
<i>1. Total marine territorial water area</i>	2,200,200 sq. km
- Coastal	266,200 sq. km
- Oceanic	1,934,000 sq. km
<i>2. Shelf areas (Depth 200m)</i>	184,600 sq. km
<i>3. Coral Reef Area</i>	27,000 sq. km
<i>4. Coastline</i>	17,460 km

*Source:* Bureau of Fisheries and Aquatic Resources (2003).

The Philippines is an archipelago in Southeast Asia and is made up of around 7101 islands with a long coastline of around 17,460km, and a large shelf and coral reef areas (Table 1). In addition, the Philippines’ waters “contain some of the world’s richest ecosystem” and it also has an “exceptionally high diversity of marine life”. Therefore, it is not surprising that the Philippines’ fisheries sector has been one of the major sectors in the world. The country ranked 6<sup>th</sup> in the world among leading fishing countries in 2009 with a total production of 5.08 million metric tons of fish, crustaceans, mollusks, and aquatic plants (including seaweeds). The Philippines’ production constituted 3.12% of the total world production of 162.8 million metric tons, whereas Vietnam’s total fisheries production in 2009 was around 4.83 million metric tons. Vietnam ranked 7<sup>th</sup> after the Philippines (Bureau of Fisheries and Aquatic Resources, 2010).

In the Philippines, the marine sector is divided into two sectors including aquaculture (culture) and capture. The capture fisheries sector in turn can be divided into two sub-sectors including municipal and commercial. Municipal fisheries are small-scale capture fisheries operated without vessel or with vessel less than three gross ton within 15km from the coastline. In contrast, commercial fisheries use boats more than three gross ton and can operate only outside of municipal water or beyond the

15km limit. Recreational fishing is not developed in the Philippines (Barut and Garvilles, 2009).

*Socio, economic and environmental importance of marine fishery resources*

In the Philippines, the fisheries sector plays a vital socio-economic and environmental role. The sector contributes about 4% to the country's annual GDP and 19% of gross value added in agriculture, fishery and forestry. In 2010, the total volume of fisheries' production reached around 5.2 million metric tons and was

valued at about 221.05 billion pesos. Of this total amount, the aquaculture fisheries subsector contributed the highest value of about 82.86 billion pesos or 37.5 %. Next was the municipal fisheries subsector with a total production of 77.74 billion pesos. Total fish caught by marine fishermen was valued at 70.2 billion pesos while inland fisheries production was valued at 7.54 billion pesos. The commercial subsector contributed 60.46 billion pesos or 27.3% to the total fishery output (Table 2) (Bureau of Fisheries and Aquatic Resources, 2010).

Table 2: Value of fish production  
(Unit: billion pesos)

Year	Aquaculture	Municipal	Commercial	Total
2010	82.86	77.74	60.46	221.05
2009	81.50	75.38	58.70	215.58
2008	81.67	70.97	63.17	215.81
2007	61.60	62.21	54.74	180.55
2006	55.67	59.15	48.55	163.37
2005	49.17	49.95	47.27	146.39
2004	44.82	45.67	48.35	138.85
2003	37.20	40.66	42.00	119.87
2002	35.42	38.16	39.68	113.26
2001	36.63	34.22	36.09	106.94

Source: Bureau of Fisheries and Aquatic Resources (2003, 2010).

The fishery sector also provides employment for a large proportion of the population, especially for those living in the coastal areas. In 2010, the industry directly created jobs for around 1.6 million fishermen, of which the municipal fisheries sector accounted for about 1.3 million while the commercial and aquaculture sectors added some 16,497 and 226,195 employed, respectively (Table 3) (NAST, 2011).

Moreover, the fisheries sector is also a source of export that brought about USD 803 million for the Philippines compared to USD 524 million in 2003, with the leading export

commodities including tuna, seaweed and shrimp (Table 3). The foreign trade performance of the country in fisheries sector registered a surplus in the period 2003 - 2010.

Table 3: Fisheries contribution to employment creation in the Philippines (persons)

Items	2003	2010
Total	990,872	1,614,368
1. Aquaculture	258,480	226,195
2. Municipal	675,677	1,371,676
3. Commercial	56,715	16,497

Source: Bureau of Fisheries and Aquatic Resources (2003, 2010).

Table 4: Fisheries contribution to foreign trade in the Philippines

Items	2003		2010	
	Quantity (Metric tonne)	Value (USD million)	Quantity (Metric tonne)	Value (USD million)
Export	202,016	524.0	220,992	803.0
Import	150,533	79.0	202,157	187.2
Balance	51,483	441.0	18,835	615.8

*Source:* Bureau of Fisheries and Aquatic Resources (2003, 2010).

The fisheries sector is also a major source of nutrition. Israel (1999) states that fisheries provide around 75% of the total animal protein requirement of the country, which is higher than the total amount of protein of both poultry and livestock combined. In 2003, a Filipino person annually consumes 38kg of fish (Bureau of Fisheries and Aquatic Resources, 2010), accounting for 11.7% of total food intake.

The marine resource does not only play an important socio-economic role but also provides vital ecosystem services. Bebet et al. (2005) point out that the two most important ecosystem services provided by the marine resource is the huge source of wave energy form the ocean and the capacity to absorb disposal from human activities. For instance, in 1995, it is estimated that the marine resource has brought USD 428 million worth environmental waste disposal services to the Philippines.

The analysis of the Philippines' marine sector revealed that the capture sector plays a vital role in its economy and deserves a holistic approach of management. The same situation can be observed in Vietnam, where capture sectors contributes around 60% of total marine production.

#### **4. Analysis of Capture Marine Fishery Management in the Philippines under the PSIR Framework**

Under the PSIR framework, design of efficient fisheries regulations and policies must be undertaken based on analysis of Pressure, State and Impacts of the sector. Therefore, this paper will analyze the above -mentioned factors before drawing out policy implications for the Philippines and also for Vietnam.

#### ***Pressures from human forces and environmental changes***

The Philippine fishery sector has experienced an adverse fluctuation due to pressures from both human forces and climate changes.

The most obvious pressure is the increasing fishing effort in the Philippines fisheries sector over time. Actually, as the number of fishers and boats increases, fishing technologies are more developed and illegal fishing with destructive fishing methods are more common. Fishing effort has witnessed sharp increases for both small pelagic and demersal fisheries over the 1965-1985 period (Israel, 1997). Green et al. (2003). It is also worrying that after 1985, commercial fishing effort continued growing and reached 2.09 million HP in 1997 – that is 45% above the optimum level of 1.14 million HP. Therefore, it is unavoidable that the fish population of the Philippines is under pressure of increasing fishing effort (NAST, 2011).

More seriously, even more effort has been spent on catching. The total number of fish per unit of effort has steadily decreased, indicating the severe situation of over-fishing. CPUE for both small pelagic and demersal fisheries experience a downward trend over the given period. A survey of six coastal provinces in the Philippines for the hook-and-line type shows that CPUE is sharply declining to 3.1kg/unit of effort in 2000 from more than 40kg in 1940 (Bebet et al., 2005; Green, White, Flores, Carrecon, and Sia, 2003; NAST, 2011). The declining CPUE is therefore another pressure on the Philippines' fisheries sector and a potential reason for conflicts between stakeholders.



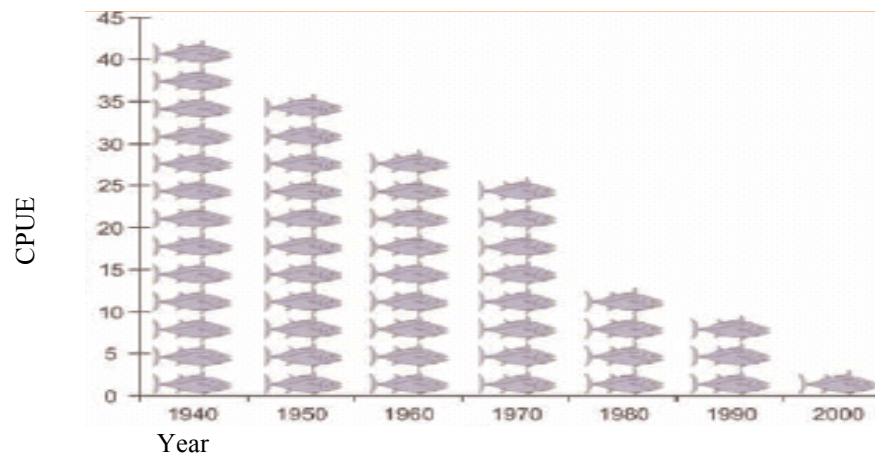


Figure 5: Decline in average CPUE in six provinces in the Philippines  
 Source: Green et al. (2003).

Pressure on the fisheries sector also originates from the proliferation of other industries such as agriculture, industry, tourism, oil and gas exploration, minerals and mining. For example, agriculture discharges residuals from livestock, poultry and fertilizers into coastal waters, contributing to the deterioration of the fisheries habitats. In addition, most of the coastal areas adjacent to industrial and urbanized areas in the Philippines are increasingly polluted by hazardous industrial wastes and domestic wastewater that leads to fish kills. The development of tourism in the Philippines also threatens the coastal areas. In fact, tourism increases sewage and may lead to the physical alternation of the marine ecosystem for tourist users. It is also a supplementary reason for the over-fishing to meet tourists' demand.

Increasing population and demand for fishery products is considered a pressure for the marine fishery resource as well. According to estimates by the National Statistic Office of the Philippines (2000), the Philippines has experienced a high annual population growth rate of 2.36% in the period 1995-2000, reaching more than 76 million in 2000. The NSO also estimates that if this growth rate continues, the Philippine population will double in 29 years. Admittedly, this rapid growth of population,

together with the increasing price of exported fishery products has accelerated the demand for these types of products and put more pressure on the marine fishery resources of the country.

Besides human activities, environmental changes are great threats to fisheries resources. For example, Bebet et al. (2005) announced that the annual surface temperature has slightly increased over the Philippines by 0.5 degrees Celsius from the 1980s, resulting in a 6% decrease in rainfall. In addition, the sea level has risen by 20 to 40 centimeters in Manila since the 1960s with unusual weather patterns such as unusual typhoons, red tides and meteorological disturbances. It is undeniable that these adverse changes will have negative impacts on fisheries habitats such as water quality and temperature. These changes in turn result in increasing diseases and loss of biodiversity and negatively affect human activities (Bureau of Fisheries and Aquatic Resources, 2010).

#### **State and impacts**

The above-mentioned pressures on fisheries resources have led to negative impacts on the Philippines' economy, society and the environment as well.

*Firstly*, pressures on fishery resource has led to over-capitalization in the fisheries sector which implies that resources devoted to the

fisheries sector can be used more efficiently in other economic sectors. In other words, the costs of efforts spent on the fishery sector are not appropriately estimated, resulting in the misallocation of resource in the fisheries sector and low productivity. Even though there has been a growing fishing effort, the volume and value generated by the Philippines' fisheries sector has fluctuated and decreased to just 1% in 2009 and 2010.

As a consequence, despite the growing fishing effort, fisheries production has grown at a slower rate than total GNP and crop production over the last two decades. For this reason, the share of fisheries production in the national GNP has been declining from 5% in the late 1990s to 4% recently. In addition, from being the world's 4<sup>th</sup> largest fish producer in 1985, the Philippines is now 7<sup>th</sup>. Therefore, it can be said that over-capitalization has severely occurred in the Philippines' sector and requires government regulations to reallocate the country's resources.

*Secondly*, the over-fishing in municipal water has worsened poverty among municipal fishermen. One reason is that an increasing number of municipal fishermen must increase their fishing effort to compete with each other in municipal waters. The result of that is the decline in CPUE or lower productivity of municipal fishermen. For example, according to Bebet et al. (2005), the annual catch of municipal fishers has decreased by 30% compared to that of 1991. That lower productivity causes their living quality to continue decreasing over time. Bebet et al. (2005) state that their annual incomes are only a half the national level. In the Philippines, municipal fishers are regarded as the poorest of the poor in society and are in a vicious circle. This means that because of poverty, they try to catch more. More fishing effort worsens the overexploitation and in turn causes low productivity and deteriorated income for the municipal fishers.

*The third impact* is the social conflicts between stakeholders. The conflicts arise

between municipal and commercial fishers, municipal and commercial fishers and between fishermen and environmentalists. The conflict between municipal and commercial fishers is of great concern. As stated previously, according to Local Government Law, municipal fishers have the exclusive right to harvest in municipal water within 15km from the shoreline. This means that commercial fishers can only operate beyond 15km. However, in reality, a lot of commercial boats are not adequately equipped. As a result, they choose to illegally operate in municipal waters rather than in the permitted areas. With more efficient fishing gear, their illegal operation worsens the existing lower productivity and poverty of municipal fishers (FAO, 2011).

*Fourthly*, the decline in fish stock, loss of diversity and degradation of the environment are unavoidable results of increased fishing effort, over-exploitation and destructive fishing methods. In fact, it is estimated that over the period 1998-2001, the fishing rate in the Philippines was 30% higher than the natural producing capacity of fish stock. Many important species such as sea turtles, sea snakes, whales and dolphins are under serious threat. Some species, such as whale sharks and coral reefs are threatened with extinction. More seriously, in some heavily exploited areas such as Manila Bay and Samar Sea, large, long-lived and high-value fish are caught. The remaining fish are small, immature, short-lived and of low-value. As a consequence, the reproduction capacity of fish will be negatively affected, the fish stock will eventually decline and loss of biodiversity will occur. It is undeniable that these adverse changes will in turn negatively affect the marine ecosystem process, because the marine ecosystem can only smoothly and properly function if it consists of a wide variety of species, of different sizes and ages (FAO, 2011; Green, White, Flores, Carrecon, and Sia, 2003).

Among the above problems, environmental degradation and poverty among municipal

fishermen are regarded by the Philippines' government as the most serious and urgent ones. This means that the objectives of the sector are not merely to raise output but to move towards sustainable development of the marine fishery resource and alleviate poverty in the coastal areas. This guideline is of great importance for the government in making fishery regulations.

#### ***Policy responses***

The diversity of the marine fishery resource and the above-discussed complicated pressures and impacts call for an integrated management in which the cooperation between government organizations, between economics sectors, and participation of the community in protecting the marine fishery resource are of great importance. Thus, over the last two decades, the Philippines has put great effort to construct legislative regulations and to encourage the community to participate in fishery preservation.

The Philippines has issued several laws associated with the fishery resource such as the 1991 Local Government Code, the 1998 Fisheries Code, the 2001 Wildlife Conservation and the Marine Pollution Decree. Among these legislative documents, the Fishery Code enacted in 1998 can be regarded as the primary law on fisheries management. This law is important because it clearly recognizes that conservation and protection of fishery resources towards sustainable development is a key objective of the Philippines. In addition, it covers comprehensively policy instruments used in fishery management.

The Fishery Code acknowledges that correct resource pricing is vital to determine accurately the fees imposed on fishing activities. The correct price must reflect the true value of resource rent and is constructed based on maximum sustainable yield. In addition, accurate pricing helps to correct the existing resource misallocation to the fishery sector and to avoid over-fishing. However, it is noted that determination of the correct maximum sustainable yield is not an easy task. It requires

understanding of both economic and biological aspects of the marine fishery resource.

Delineation of property rights for municipal fishers is also mentioned in the Fishery Code. More specifically, it stipulates that municipal fishers are entitled to operate within 10km from the shoreline, whereas commercial fishers are banned. This stipulation is necessary because it limits the access to municipal waters that have already been over-exploited. However, this regulation is still controversial. This is because this regulation is contradicted by Local Government Law, which stipulates the municipal water is between 0 and 15km. For this reason, conflicts between commercial and municipal fishers arise between 10 and 15km and over-fishing is worse in this area.

Command-and-control instruments are determined in the Fishery Code. One important provision is the monetary rate for penalties for some violations such as illegal fishing, use of destructive fishing methods and even aquatic pollution. However, the problem is that in practice, this regulation is not effective because fishery activities are not adequately observed, especially in off-shore areas.

Moreover, the Fishery Code mentions economic incentives and disincentives such as effluent fees, user fees and negotiable permits (Israel and Roque, 1999) in the fishery sector. However, one controversial point is that this regulation only applies to the aquaculture sector rather than the commercial and municipal sectors whose harvested quantity and values are really considerable.

From the above analysis, it can be seen that the Fisheries Code mentions both open-access and entry-limited techniques. However some regulations of this Code such as correct pricing of the natural resource only stops at the theoretical ground, and some are controversial. The question is how to implement it in practice and how to improve its enforcement. In addition, the Fishery Code does not pay much attention to correcting problems in the existing licensing system except for low license fees.

For instance, the current licensing system has not imposed limits on the number of licenses and vessels that can register. Furthermore, under-registration of vessels is common with only around 25-30% of vessels holding licenses (Bebet et al., 2005). Therefore, in reality, the licensing system has little effect to reduce the problems of open-access problems but is a tool to merely generate state revenue.

Besides setting up the legal framework, the Philippines' government implements projects to establish marine sanctuaries around islands such as Apo, Gilutongan and Mabini. These sanctuaries contribute to the development of tourism, raise revenue for local communities and also attract the participation of community stakeholders in protecting the marine environment. For instance, the Apo Island Marine Sanctuary has attracted Silliman University into its project. A staff of researchers and students of the university has enthusiastically become involved in providing substantial research and support to protect the sanctuary. Often, the local community has the right to be involved in planning and implementing sanctuary projects. Marine sanctuaries also bring higher yields and incomes for local fishermen and at the same time raise local awareness about preserving the marine system for sustainable development. The reason for the success of these sanctuaries is largely their community-based approach.

However, it is noted that not all sanctuaries are successful because illegal fishing and pollution from adjacent areas reduce benefits from sanctuary projects.

Another program is retraining and employment. These programs are designed to support fishermen who want to change their jobs. These programs are highly appreciated because under the strategy to reduce fishing effort, there will certainly be some unprofitable fishermen who will leave the industry and change to other employment.

#### ***Conclusion and recommendations***

The marine fishery resource plays a vital role in the economy, contributes to eradicate

hunger and is a source of employment and nutrition, especially for a developing and archipelagic country like the Philippines. In the Philippines, however, this resource has been under great pressure from both human and natural forces. These pressures have led to overcapitalization and over-fishing that in turn causes a decline in fish stock, loss of biodiversity, degradation of the marine environment and socio-economic loss.

The Philippines' government has gradually applied an ecological economics approach to regulating the marine fishery resource and has tried to solve open-access problems. However, these efforts are inadequate and therefore needed strengthening. Based on the analysis of pressures, impacts and responses, this paper suggests some recommendations for the Philippines and policy implications for Vietnam, a country that has been observed to cope with similar conditions, pressures and impacts as the Philippines.

#### *Application of a market-based instrument*

Individual Transferable Quota is increasingly used in many countries in the world and has proven to be efficient in managing fishing effort. Therefore, it is required that the two governments should take into consideration this instrument. Auctions for conservation projects for marine fishery resources such as marine sanctuary projects should also be considered.

#### *Legal framework*

It is urgent to determine the correct resource price. Based on this price, the governments can strengthen the existing weak licensing system. For instance, the government can clarify the number of licenses granted and the number of vessels operating in the fisheries sector. In addition, the government should determine the license fee based on resource rent to avoid resource misallocation. This implies that it is necessary for the government to raise the license fee applied to commercial fishermen. In addition, the government should re-determine the boundary of municipal waters. The determination will affect the delineation of

property rights, incomes and existing conflicts between municipal and commercial fishermen. Therefore, the government should rely on both scientific and economic information to make the appropriate decision. More importantly, coordination between government levels and agencies in implementing legislation and strengthening of law enforcement is of great importance.

#### *Economic incentive, social and environment programs*

The governments should pay more attention to incentive programs for fishermen who are volunteering to change to other jobs and strengthen their efforts to propagandize and educate local communities about preserving the marine environment. Projects on preserving the marine environment should also be encouraged and supported. In addition, marine sanctuaries should be widened and established in all coastal areas. R&D on the marine fishery resource should be enhanced to facilitate policy makers.

In conclusion, it can be said that management of natural resources is required to rely on both ecological and economic aspects, especially for a resource that plays a vital socio-economic and environmental role but at the same time has a great deal of open-access problems, like the marine fishery resource.

#### References

- [1] Arancibia, H., Munoz, H. (2006), "Ecosystem Based Approach - A Comparative Assessment of the Institutional Response in Fishery Management within APEC Countries: The Case of Demersal Fisheries" (No. 206-F5-01.1). Concepcion: Chile: Asia Pacific Economic Cooperation.
- [2] Barut, N. C., Garvilles, E. G. (2009), (No. WCPFC-SC5-AR/CCM-19): Western and Central Pacific Fisheries Commission.
- [3] Bebet, G., Heijden, A. V., Jiterdra, S., Sy, C. M., Josefo, T., and Maya, V. G. (2005). "Philippines Environment Monitor 2005: Coastal and Marine Resource Management", Pasig, Philippines: World Bank.
- [4] Bureau of Fisheries and Aquatic Resources (2003), "Fisheries resources". Retrieved 20/09, 2006, from <http://www.bfar.gov.ph/>
- [5] Bureau of Fisheries and Aquatic Resources (2010), "Philippine Fisheries Profile". Diliman, Q.C.: Bureau of Fisheries and Aquatic Resources, the Philippines.
- [6] Clay, P., Cowx, I., Evans, D., Gayanilo, F. (1999). "Guidelines for the Routine Collection of Capture Fishery Data". *FAO Fisheries Technical Papers*, 382, 150.
- [7] Common, M., Stagl, S. (2005), *Ecological Economics: An Introduction*. New York: Cambridge University Press.
- [8] Costanza, R., Cumberland, J., Daly, H., Goodland, R., Norgaard, R. (1997), *An Introduction to Ecological Economics*. Boca Raton, Fla; St. Lucie Press.
- [9] FAO (2011), "Fishery and aquaculture country profile: the Philippines".
- [10] Field, B. C., Field, M. K. (2002), *Environmental economics: an introduction* (3 ed.). New York: McGraw-Hill/Irwin.
- [11] Gordon, S. H. (2002), "The Economic Theory of a Common - Property Resource: The Fishery. In L. G. Anderson (Ed.)", *Fisheries economics: Collected essays* (Vol. 1). Aldershot, England; Burlington, VT: Ashgate.
- [12] Green, S. J., White, A. L., Flores, J. O., Carrecon, M. F., Sia, A. E. (2003), *Philippines Fisheries in Crisis: A Framework for Management*. Cebu, Philippines: Department of Environment and Natural Resources.
- [13] Israel, D. C., Roque, R. M. G. R. (1999), *Toward the Sustainable Development of the Fisheries Sector: An Analysis of the Philippine Fisheries Code and Agriculture and Fisheries Modernization* (No. 99-01). Makati, Philippines: Philippines' Institute for Development Studies.
- [14] Iversen, E. S. (1996), *Living Marine Resources: Their Utilization and Management*. New York: Chapman and Hall.
- [15] Kahn, J. R. (2005), *The Economic Approach to Environmental and Natural Resources* (3 ed.). Mason, Ohio: Thomson/South-Western, c2005.
- [16] Meany, T. F. (1987), *Resource Rent, Common Property and Fisheries Management: an Economic Perspective*. Paper presented at the Symposium on the Exploitation and Management of Marine Fishery Resources in Southeast Asia, Darwin, Australia.
- [17] Ministry of Natural Resource and Environment (2010), "Report on national environment for the year 2010: An overview of Vietnam's environment". Hanoi, Vietnam: Ministry of Natural Resource and Environment.
- [18] Murray, B., Leonard, K. R., Bestari, N., Tucker, H. (2006), *The fisheries policy* (No. SST: REG 2006-07): ADB.

- [19] NAST (2011), "NAST Leads Discussion on Marine Fisheries Sector Key Issues". Retrieved 1/6, 2012, from [http://www.nast.ph/index.php?option=com\\_content&view=article&id=254:nast-leads-discussion-on-marine-fisheries-sector-key-issues](http://www.nast.ph/index.php?option=com_content&view=article&id=254:nast-leads-discussion-on-marine-fisheries-sector-key-issues)
- [20] Neiland, A. (2006), Fishing for Coherence: Fisheries and Development Policies. United Kingdom: OECD Publishing.
- [21] Vu Thanh Huong (2006), "Impacts of Trade Liberalization on Vietnam's Fishery Export". In T. U. o. Agriculture (Ed.), *Food, Agricultural and Environment in the new century*. Tokyo, Japan: Tokyo University of Agriculture Press.
- [22] Wills, I. (2006), Economics and the Environment: a Signalling and Incentives Approach (2 ed.). Crows Nest, NSW: Allen & Unwin.

## Phân tích quản lý hải sản ở Philippines dựa trên mô hình PSIR và một vài hàm ý cho Việt Nam

Vũ Thanh Hương

*Khoa Kinh tế và Kinh doanh Quốc tế, Trường Đại học Kinh tế, Đại học Quốc gia Hà Nội,  
144 Xuân Thủy, Cầu Giấy, Hà Nội, Việt Nam*

**Tóm tắt.** Quản lý nguồn lực hải sản thu hút sự quan tâm của nhiều quốc gia, vì nguồn lực này đóng góp đáng kể vào sự phát triển kinh tế, xã hội cũng như cung cấp các hàng hóa, dịch vụ sinh thái cho thế giới. Tuy nhiên, sự khai thác quá mức, sự xuống cấp của môi trường biển và sự xung đột giữa các nhóm lợi ích trong ngành thủy sản trên toàn thế giới đòi hỏi cần phải có một cách tiếp cận hiệu quả hơn để quản lý nguồn lực hải sản. Bài viết cho rằng kinh tế sinh thái là cách tiếp cận phù hợp để giải quyết các vấn đề hiện nay trong sử dụng và quản lý nguồn hải sản. Bài viết sẽ tập trung vào các khía cạnh về kinh tế và sinh thái của nguồn lực thủy sản, đồng thời phân tích quản lý nguồn lực thủy sản của Philippines dựa trên mô hình PSIR (Sức ép - Thực trạng - Tác động - Phản ứng). Theo đó, Chính phủ Philippines cần xây dựng một khuôn khổ pháp lý phù hợp hơn và cân nhắc đến các chương trình tạo ra động lực kinh tế cũng như các công cụ quản lý dựa trên nguyên tắc của thị trường. Thông qua việc phân tích trường hợp điển hình của Philippines, một vài hàm ý cho Việt Nam sẽ được rút ra nhằm giúp Việt Nam quản lý nguồn hải sản hiệu quả và bền vững.