Improving Environmental Management to Enhance Natural Resource-based Livelihood Assets:
A case of Cu Lao Cham Archipelago, Vietnam

Nguyen Ngoc Phuoc, Nguyen Giang Thu and Ta Thi Thanh Huong

Cu Lao Cham (CLC) is an archipelago comprising eight islands some 18 km offshore from the ancient town of Hoi An in the eastern part of Quang Nam Province in central Vietnam (**Fig.1**). Coral reefs, sea grass beds, rocky shore, and sandy bottom are the important aquatic life habitats in the archipelago. The coral reefs and sea grass beds are the most productive ecosystems. Recognizing the importance of the area in terms of environmental and socio-economic considerations, the Cu Lao Cham archipelago with total area of 6719 ha including 165 ha of coral reefs and 500 ha of sea grass beds, has been developed into a marine protected area (MPA).

The National Plan on Environment and Sustainable Development (NPESD) and the Biodiversity Action Plan (BAP) of Vietnam promote the establishment and management of MPAs. Starting in 2000, the 15 representative MPA sites proposed by the Ministry of Science, Technology and Environment of Vietnam had been carried out, the corresponding management regulations formulated, and the first comprehensive MPA pilot site was established in Hon Mun. Meanwhile, the project "Support to the Marine Protected Area Network in Vietnam" was started in October 2003 with the assistance of the Danish International Development Assistance (DANIDA). Consisting of two sub-projects to address priority needs at both national and provincial levels, the project at the national level has developed the existing network of MPA sites through capacity development and strengthened policy and legal frameworks. At the provincial level, Cu Lao Cham in Quang Nam Province was developed as the second MPA site under the said project.

A recent assessment of the coastal resources around Cu Lao Cham MPA indicated severe over-exploitation, resulting in the decline in marine resources. Local inhabitants confirm that the once abundant resources have decreased mainly because of over-exploitation as high demand for live fish and the use of unsustainable fishing practices continue to prevail. Such alarming situation called for the urgent need to adopt appropriate resource management systems to protect the natural resources in the CLC MPA. Thus, community-based resource management has been introduced and is now being applied in the management of Cu Lao Cham MPA. Based on the premise that local populations have greater interest in the sustainable use of natural resources, such resource management system has been to some extent successfully implemented in the MPA. Results of the assessment showed that the management system introduced in the MPA enhanced local awareness of resource protection and management, reduced pressures on the ecological systems, and raised awareness and understanding of the local people of the links between natural resource management and improved local livelihood systems.

Enhancing Environmental Management System: A Case Study

The case study was conducted in Cu Lao Cham in 2007. It aimed to assess the progress of the improved management system and evaluate the status of the MPA. As also envisaged, the results could yield valuable lessons for the better management of the other MPAs in Vietnam. Specifically, the study was aimed at assessing the potentials of the local people particularly the women's group, in improving their natural resource-based livelihood assets through improved environmental management. The study also

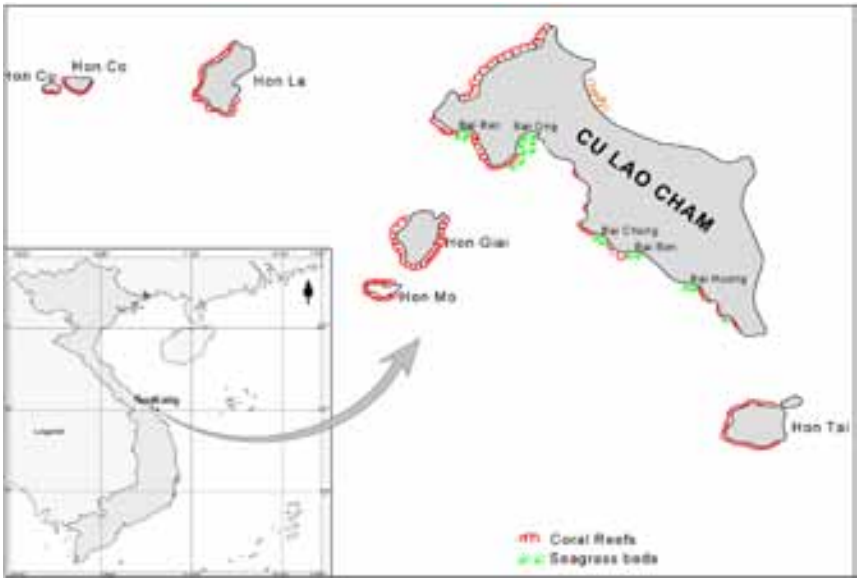

Fig. 1. Cu Lao Cham Archipelago, Qu□ng Nam Province, central Vietnam (Tuan *et al.*, 2006)

intended to evaluate how empowerment of the local people to manage their own resources could reduce environmental mismanagement and corruption that threaten their natural resources.

In order to have a good background on the status of the MPA in the CLC archipelago, a review of the studies conducted earlier in Cu Lao Cham Archipelago was carried out. The information for the review included the reports of two projects, namely: "Support to the marine protected area network in Vietnam" and "Sustainable Livelihoods in and around Marine Protected Areas".

Results of the review suggested the various measures to gather field data such as field visits, meetings with key informants, semi-structured and open-ended interviews, and focus group discussions. A major part of the field visits was the interview of the local people who had participated in the various vocational trainings that were conducted under the aforementioned projects. Identifying the gains and losses of alternative income generation schemes on the CLC was crucial, generating lessons and experiences that could be shared with the other poverty alleviation activities in coastal communities.

Participatory poverty assessment (PPA) and participatory rural assessment (PRA) methods were used to assess the state of the natural resources. For sustainable livelihood assessment, selected households took part in the focus group discussions where open-ended questions were asked and brainstorming for ideas was carried out.

Two livelihood assessment sessions were conducted, one in Bai Lang village and other in Bai Huong village which targeted two groups, namely: the diving households and the coracle-only fishers. The groups were selected based on the results of the most recent livelihood survey conducted by the CLC MPA office. Focus group discussions were designed to identify the local people's needs and obtain their ideas on livelihood options based on the available natural resources. Opinions in terms of inputs and support required, markets, and the constraints to development, were also drawn from the respondent groups. This was meant to encourage the respondents to take active part in the needs assessment sessions and to stimulate the community to think critically about potential alternative income generation opportunities in the CLC archipelago. In order to cross check as well as confirm the results, interviews were conducted with representatives from key government departments with knowledge of the CLC community and local livelihoods, and who have been involved in the country's various alternative income generation processes.

Perceptions of local populace on the natural resources

Hon Bien (area: 1549 ha) is located in the largest island of the archipelago, with two villages: Bai Lang with 2500 inhabitants and Bai Huong with 450 inhabitants. Cu Lao Cham inhabitants are highly dependent on the natural resources for their livelihood. Fishing, hand collecting, diving and trading different types of seafood products are the main sources of income for the CLC inhabitants.

The degree of the level of dependence was established using the socio-economic background of the CLC communities. The results showed that the local inhabitants have an average experience of 20 years in jobs related to fishing. The high level of dependence on the natural resources has been transferred to the young generation; it is common to find more than one generation in the same fishing boat. There are no other activities considered by local inhabitants as alternatives to reduce such high level of dependence.

The CLC inhabitants did not seem to be aware of their high level of dependence on the natural resources. This is in spite of their complaints that there had been significant decrease of about 75% in the abundance of the aquatic products during the past two decades, specifically in 2004 to 2005. The locals also reported that some species have almost disappeared while some existing species are quickly declining in number and decreasing in harvestable size. They also cited that on the average and depending on the species, there has been a decrease of 70-90% compared to the status 20 years ago, 50-70% about 10 years ago and 30-50% compared to the trend in 2004. The local inhabitants admitted that this decrease could be caused by over-fishing or illegal fishing activities. The reports also suggested that sustainable livelihoods in and around Cu Lao Cham archipelago are intimately

associated with the sustainable management of the whole country's marine resources, especially the fishery resources. The study therefore suggested that it is important to make the local inhabitants understand that sustainable growth of the fisheries must be anchored on the protection of coastal and marine habitats.

Assessment of the current situation of resource exploitation and management

Cu Lao Cham is an important fish landing area and its waters as fishing grounds of Quang Nam Province. Different fishing activities including hookah air diving, purse seine and gill net, light fishing, drift nets, long line and trap are commonly used in CLC archipelago, with a variety of marine organisms being harvested (**Table 1**). The most commonly exploited marine resources are fish, cuttlefish, squid, shrimp, lobsters, gastropods and clams, of which groupers, lobsters, sea cucumbers, and gastropods are harvested year around while pelagic resources such as cuttlefish, tunas, mackerels, anchovies are seasonally caught with peak season from December to April.

The Vietnam-Denmark Cooperation project had identified the Cu Lao Cham MPA as an example of how lack of environmental protection had caused a decline in the islands' marine resources and biodiversity. In this connection, the study confirmed that such situation has greatly affected the islands' poorer households that depend heavily on fishing around the islands for subsistence. Enforcement of laws and regulations seemed to be ineffective. The other communities felt powerless to deal with such a situation, which would likely impact on the future generations (LMPA document). For example, dynamite fishing and the use of chemicals to catch live fish are still practiced although these have been banned during the last several years.

While the Cu Lao Cham archipelago is heavily over-exploited by local villagers, "outsiders" mostly coming from nearby mainland villages in Quang Nam Province and Quang Ngai, Da Nang, and Phu Yen Provinces also fish in the CLC fishing grounds. While some fishing activities could be for subsistence, the active market for live fish in nearby restaurants and export markets in mainland Vietnam had induced the over-exploitation status of the CLC resources (LMPA document).

Fishing pressures by large fishing boats and small vessels, using various fishing methods including trawl, fixed semi-permanent nets, light fishing with lift/push nets, purse seine with/without lights, hookah air diving with/without poisons, hook and line, and barrier nets, have tremendously increased. Although trawling is mostly conducted in offshore areas, it still poses danger to the coral reefs and especially the juveniles of demersal species. Hookah air diving with or without poisonous chemicals has been continuously used in the area during the last decade to catch live groupers and lobsters. Recently, post-settled and juveniles of tiger lobsters have been harvested by the local hookah divers to be utilized as seedstocks for the lobster cage culture in the mainland. The under-sized lobsters caught could pose potential serious reduction of the lobster resources in the CLC archipelago. Other marine resources on the coral reefs are also heavily exploited and many commercially species have been declared as rare, endangered or critically endangered levels. In fact, four species of living organisms in Vietnam had already been listed in the IUCN Red List of Threatened Animals (IUCN 1993).

Table 1. Main fishing activities and marine resources collected in Cu Lao Cham

Fishing activity	Fishing season	Main marine organisms caught
Hookah air diving	Year round	Groupers, sweetlips, top shells, triton shells, giant clams, lobsters, ornamental fish and live corals
Net (gill net, purse seine, drift net)	Year round	Sweetlips, snappers, cardinal fish, coral breams, anchovies, rabbit fish, scads, travellies, jacks
Light fishing	December - April	Anchovies and cuttlefish
Long line	December - April	Cuttlefish and fish (tunas, mackerels)
Trap	December - May	Cuttlefish and fish

There is also an urgent need to increase the awareness among external users of MPA's, particularly the tourism and commercial shipping sectors. Physical impacts from commercial shipping plus marine pollution from ship wastes may not be visible but dredging and construction activities of the fishing port in the Cu Lao Cham potentially affected the health of nearby coral reefs. The absence of any port waste reception facilities (garbage and wastes are discharged without pre-treatment), is just among the threats to the marine habitats in the CLC. Moreover, the Cu Lao Cham MPA is also negatively impacted by the discharges of two rivers; Thu Bon River in the south and Han River in the north have brought about increasing erosion of the coastline, sedimentation, and accumulation of waste discharge.

Local livelihood systems

There are a number of different livelihood activities in Cu Lao Cham archipelago, all of which are dependent on the marine resources (**Box 1**). The three main income levels in the CLC archipelago are shown in **Box 2**. Based on the livelihood-income analysis, the three main disadvantages that could contribute to the difficulty in achieving livelihood development in the CLC archipelago had been identified as follows:

- ***Poor skills.*** Producers of fish sauce, mushroom, and processed seafoods could not sustain their production as they are often confronted with technical problems, resulting in the unstable quality of their products. There is therefore a need for further training of the local people on the proper methods and skills in processing as this is considered suitable and feasible for further development in the island as an alternative source of income for the local populace.

Box 1. Livelihood activities in Cu Lao Cham archipelago

Hand collecting: Collection of mollusks from the intertidal zone is usually done on foot or using small boat, also called a coracle, in different sites in the archipelago. Collectors normally do the work alone or in small groups of 2 or 3 persons. The mollusks are collected from rocks using simple tools like hammer and chisel or knife. Improvised oxygen masks are also used if the situation requires swimming in deeper waters for the mollusks. Collection is done at low tide which is usually one day after full moon and in the first few days of new moon, thus collection could be done only about 5-10 days a month and few hours per day. The main season is during summer (March-August or April-July) when the weather is good and the demand for mollusks by tourists is also good. For the other times of the year, the hand collectors have to look for other jobs.

Three layer net fishing: The 3-layer net is used during the winter months (October-February or December-April) when the sea is too rough for other types of fishing such as diving or using the surround lift net. The fishermen go to sea everyday during the fishing period alone or group of up to 3 persons per boat. The 3-layer net is positioned near the bottom of the sea which is about 20 m to 1 km from the shore, with depths that vary from 10 to 60 m. In general, the two outside layers of the net have a mesh size of 44 cm on the diagonal and the inside net layer with mesh size of 12 cm on the diagonal. The fishing time varies since fishers could sometimes stay fishing the whole day from 4 AM to 3 PM or sometimes only a few hours at night from 5 to 9 PM. When the sea is rough (January-February) the net is put far offshore (1 km) during the day, otherwise during March-April, the net is put 100 m from shore and left for 24 hours. Also, when a net is newly made it is put further away from the shore (coral and rocky areas) but as it gets older it is set closer to the shore.

Surround lift net fishing: The surround lift net is used during the summer months (May to November sometimes as early as February) and set all around the CLC archipelago at distances ranging from 100 m to a few km from the shore and at 15-60 m depth. The fishing activity is carried out 5 PM to 6 AM, 15-25 days/month. The surround lift net has a small mesh size on the diagonal which is 1-3 cm, which gets smaller at the bottom, sometimes 12 mm or sometimes even as small as 5 mm on the diagonal. About 100-200 m long and 15-20 m high, the surround lift net is positioned at the surface in a U shape with the mouth of the net about 35 m wide. One or two boats operate the net involving 5-10 persons per boat using neon lights to attract the schools of fish.

Diving: Since there are no professional divers in Bai Huong village with equipment, this activity is carried out only in Bai Lang where there are about 20-30 fisher-divers, diving around the CLC archipelago (Hon La, Hon Kho, Hon Dai, Hon Lao, Hon Tai and Hon Mo) in the coral and sea grass areas about 50 m up to 3 km from Bai Lang. Diving is done all year round except during very bad weather. At 200-300 m from the shore the water is up to 45 m deep, but in winter the divers stay closer to the shore and at shallower depths of 10-15 m. Diving is done 5 days a week or 20 days a month.

Long line hook fishing: This activity is carried out 12 months a year by 40-50 boats in Bai Lang as there are no long line hook fishermen in Bai Huong. The boat is about 10 m long with 11-21 HP engines. About 3-6 fishers are in a boat (approximately 200 long line hook fishers are in Bai Lang). They go fishing east of Hon Lao up to 40-60 km offshore in March-June, for about 15-20 days a month. A trip usually lasts 3 days as it can take 5 hours to reach their fishing ground. From July to February when winds are stronger, the fishers stay close to the island about 200 m from the shore. Only one type of hook is used each time but the smaller hooks are used to catch the bait on the first day, which is usually cuttlefish. The length of the line can be 3-10 km and the distance between the hooks depends on the hook, which can be 2 m, 4.5 m or 45 m so about 70-2000 hooks are used at one time.

Fish purchasing: Fishers from CLC sell high value fish to dealers in Bai Lang and Bai Huong, which include those collected from coral reefs such as cuttlefish, grouper, parrotfish, swimming crab, mackerel, and lobster. If the fish are alive, these are kept in a small cage in the sea but if already dead, the produce is kept in ice containers. Lobsters are usually kept alive in a small container with seawater and provided with compressed air bubbles. The dealers also act as money lenders offering loans to fishers to buy equipment and the fishers could pay them back with fish.

Trading: This is carried out by women everyday at Hoi An market, working from early morning until the fish are sold by about 2 PM. The husbands of some market sellers are fishers in the CLC area, e.g. using the surround lift net and trawl net or some are owners of boats that mainly collect mollusks. In cases when the aquatic products are bought directly from the fishermen at cost, the sellers could make more profit. Some sellers buy directly from the dealers in the CLC while others buy from the collecting boats at the mouth of the estuary or at the Hoi An market.

Box 2. Three main income levels of CLC archipelago inhabitants
1. The low-income people are those working in fishing boats as laborers and the hand collectors. The incomes of these workers are often augmented by doing different jobs to get enough wages to support their families. Fishing with three-layer net is also an important source of income. In Bai Huong, 100% of the people use the 3-layer net and these fishers represent the working class of the CLC archipelago. With only little income, they could not invest in boats and equipment, and live in modest conditions in simple houses often rundown and almost empty with no furniture. The average earnings per person could be around 50,000-100,000 VND per day, working between 10 and 25 days per month. The income level could range from 12,000,000 to 30,000,000 VND/year.
2. The intermediate income level includes the owners of fishing boats and long line hook, the surround lift net fishers as well as the divers. For the divers and surround lift net fishers, 3 layer net fishing represents an important alternative source of income during winter when the weather is bad. These people represent the entrepreneur class of the CLC archipelago, investing money in boats and equipment with the hope to transform initial investments into good profit. They live in good houses, sometimes just built or freshly decorated, with furniture inside. The average earning per person is about 150,000-300,000 VND per day, working between 10 and 30 days per month, thus the income level could range from 30,000,000 to 60,000,000 VND/year.
3. The high-income people are the dealers, who are the people with money, offering loans to the fishers and divers. The dealers represent the trading/investors class. Dealers lend money in exchange for favorable seafood products and prices. They have good houses with furniture and electrical appliances. Considering the high risk taken by the dealers in delivering live animals to customers in Hoi An or Danang, therefore their profit could only be 3-5% out their initial investment. Their income level could range from 60,000,000 to 120,000,000 VND/year.

- ***Inadequate market channel.*** As the CLC archipelago is far from the mainland and with difficult transport system especially during the stormy seasons, prices of production inputs could increase and preservation of fishes could be difficult to undertake. This weakens the competitiveness of products from the archipelago compared with similar products sold in the mainland's local market. For example, the CLC-produced fish sauce could be twice as expensive as the low quality but cheaper fish sauce produced in the mainland.
- ***Lack of an effective system for livelihood support.*** Poor fishing households lack adequate financial resources to take up any new occupation. This is a crucial issue to resolve in any livelihood support mechanism in the MPAs that is developed in cooperation with local governments and other stakeholders. It should therefore be addressed at the planning stage of the assistance program.

Gender issues

In the typical fishery-based economy of Cu Lao Cham MPA, boys and men have greater opportunities for education and employment in the fishing industry than girls and women. The schools and health clinics in the CLC archipelago have limited facilities and staff. There are only six teachers and one doctor for almost 4000 inhabitants, as it has always been difficult to attract well-qualified teachers to the remote islands (LMPA document).

When families have to bear the additional costs of sending their children to schools by boat or sending sick relatives to the mainland for treatment, inevitably girls and women are less favored than boys and men. It is particularly difficult for young women to receive further education and good employment opportunities especially if it involves going to the mainland. Consequently, many young women remain at home to help support the family through housework, net mending, fish processing, feeding livestock, etc. Old women are the most vulnerable group and have to depend on subsistence activities such as gathering and selling firewood.

The role of MPA establishment in poverty alleviation and gender equality

The principal objective of establishing MPAs is to instill in the minds of fishers living in and around MPAs the need to redirect their activities towards more sustainable fishing practices. The Cu Lao Cham MPA project has limited short-term impact on poverty alleviation in terms of improvements in local living conditions through habitat protection, diversification of resource utilization and community development support. In the long-term however,

an improved marine environment could be achieved. The establishment of the CLC MPA was envisaged mainly for the recuperation of the biological losses over time in order to improve fishery production. As planned, alternative income generation was made part of the establishment of the CLC MPA, mainly feeding into the poverty reduction objectives of the project.

On the gender issues, the Quang Nam MPA project works closely with the Women Union to compile and share experiences with other women's groups. The women in Cu Lao Cham are also engaged in fishing activities, although most of them operate in the shallow nearshore waters. A few women have their own fishing equipment. In collaboration with the Fishermen Union, Women Union, and Youth Union, the MPA project helps increase the awareness and understanding of the women's group in marine resource protection and the role of the MPA in enhancing sustainable harvesting as alternative to destructive fishing practices. The MPA project also enhances the active participation of women and young people in the promotion of the MPA, especially through environmental education in schools, and environment and health training for local women. Finally, it raises awareness regarding the planning, implementation and sustainable management of the targeted marine areas as well as the potential harmful impacts to the marine resources.

Opportunities for ecological tourism

The CLC archipelago has great potentials for ecotourism development. However, with various advantages come the corresponding concerns (**Box 3**). The increasing number of tourists visiting Cu Lao Cham has already put pressure on the resources while the number of local restaurants in Bai Lang selling marine aquatic delicacies has increased. Meanwhile, the increased demand for limpets has led to the increasing number of hand collectors. Aside from limpets, the other species being heavily targeted are the turban shells. In some places around the Cu Lao Cham islands the abundance of limpets and turban shells has drastically gone down. Tourism could provide an alternative source of income especially for those who are dependent in fishing. But it could also have adverse impacts on the aquatic resources.

Community-based management in Cu Lao Cham MPA

The local communities in Cu Lao Cham archipelago have been involved in the management of the MPA through an integrated management system. The management plan developed for Cu Lao Cham MPA was grounded on a community-based management approach. Capacity development for the Cu Lao Cham management board has also been initiated in the areas of operational planning,

Box 3. Advantages and concerns on Cu Lao Cham as ecological tour destination

- The CLC archipelago has beautiful landscape and rich biodiversity in its terrestrial and marine ecosystems. The forest on Hon Lao has a diverse flora and fauna with birds, butterflies, reptiles and other terrestrial life. CLC also has beautiful beaches, and the coral reefs are in good condition. In addition to the diverse and abundant natural resources, CLC also has charming and distinguished historical, cultural and religious life which can be gleaned from various temples, pagodas and archaeological relics. Rather isolated from the mainland, the CLC archipelago has had least adverse effects from the fast growing economic development and urbanization, hence it is potentially a wonderful get-a-way destination for domestic and international travelers.
- The coral reefs and the aquatic biodiversity around the CLC islands also make the archipelago a potential place for diver-tourists. In fact, two commercial dive centers have been established, and that it has been estimated that a kilometer of coral reef could be worth up to 1.2 million USD in terms of the corresponding services and provisions. However, currently the two commercial dive operations do not have any contact nor any form of commitment with the communities on the island. There should be a regulation requiring every diver-tourist to pay certain fees to the local communities for the protection of the coral reefs. More particularly, regulation must be imposed for the diver-tourists to avoid putting too much pressure on the reefs as otherwise this can be deleterious to the habitats being protected under the MPA system.
- A visiting Danish student during his field trips in 2005 and 2006 stressed that the CLC MPA has the potentials to become an attractive destination for many forms of eco-tourism such as student field courses on environmental education, marine and terrestrial biology, archaeology, cultural studies, tourism development, and other scientific activities. However, even if the main island (Hon Lao) can be reached within 20 minutes by fast boat from Hoi An, but the frequency of these trips is weather dependent. A regular high speed boat operated from Da Nang which could accommodate 30 persons/trip was stopped in 2006 because there were few visitors. There are only few boats operating everyday including a regular ferry service carrying mostly local residents, supplies, freight and mails as well as tour groups and individual travelers on day-excursions including dive trips. The tours are operated by entrepreneurs from the mainland but not by the islanders.
- Poor infrastructure is another major obstacle for the island tourism development. Electricity is cut off during the day time and could only serve the island from 6 to 10 PM. A garbage collection system is temporarily operating in Bai Huong but there is none for the rest of the main residential island. Waste is being disposed of in the forest, by open burning or buried on beaches or left along the shores or dumped at sea.
- Tourism services are at low level. Although there are six guest houses on the CLC islands (3 in Bai Lang; 1 each in Bai Ong, Bai Bim and Bai Chong), the guest houses have few rooms and the facilities are at basic levels and of low quality, so that visitors do not want to spend nights in the island.
- The presence of a big military base in the CLC for security and national defense requires that civilians can only get access within a radius of 200 m above and below the sea. This limits the recreational activities, particularly adventure-related and natural tourism. Some foreign visitors reported of having experienced difficulties in obtaining permission to visit the island.

with focus on meeting specific vulnerability and poverty reduction targets, and gender equality objectives.

The establishment of the CLC MPA plays a very important role in protecting the ecosystems and as such it would only be successful with the active participation of local communities in all the steps from the planning stage until the implementation of the various activities. Considering that many local inhabitants are not aware of their high dependencce on the natural resources, their participation in the MPA gives them the opportunity to be responsible in resource management and to actively look for alternative options to improve their livelihoods and income.

Issues and Concerns

A conservation network has been established with four units at the villages in CLC in order to support the patrol activities as well as to raise awareness on the MPA. The units were formed by the peoples' committee with members working for and receiving payments from the MPA project. Such arrangement provides confusion as to how the units could be effectively managed and under which administrative mechanism the units would operate. Most members of the units are mostly government officers and do not represent the fishing communities. However, most of the unit members were engaged in the MPA community development in the first stages of the MPA so they would be familiar with the concept of an MPA, had worked with the communities and must have already gained their trust. A good management system for the units would have improved the effectiveness of the implementation of a community-based model for MPA management.

Support has also become considerably less for the CLC MPA club which was established in 2003 by the MPA project comprising people from Tan Hiep commune. The establishment of MPA club in Cu Lao Cham archipelago plays a very important role in enhancing the responsibilities of local inhabitants in resource management as well as their participation in other social activities. Thus, the members of the MPA club were chosen to comprise the heads of villages, and were mainly responsible in promoting, encouraging and launching environmental protection campaigns. The club also provides opportunities for local inhabitants to share their opinions on how to improve the effectiveness of the environmental management systems of the Cu Lao Cham MPA.

The Club has contributed largely and effectively at the local level as major facilitator of all the MPA related activities. But there has not been a clear management mechanism and financial incentive for the Club in its three years existence under the MPA project. However, it can also be gleaned that the Club members' ability and awareness in conservation activities had been greatly enhanced. In spite of such constraints, the Club continues to be responsible for other important tasks such as facilitating the implementation of the MPA Management Board activities, conducting vocational training courses, and managing the Visitors Center. In order to fully acknowledge the roles and ability of the MPA club, the members should be provided the necessary support including the possibility of establishing a policy on reward system and other financial incentives for the Club to improve its performance. The initial budget to fund the community-based management units could be sponsored by the LMPA component, and funds could be subsequently allocated for this purpose from the tourism revenues more particularly from the income of the Visitors Center.

A volunteer network was also set up in CLC community comprising volunteer students from regional universities. The network has been helping the MPA office with the on-site field surveys and in interviewing local people to get feedbacks and comments on the implementation of the MPA. The global volunteer network (GVN) also re-opened its English classes with new volunteer teachers and with courses that have been adjusted based on the facilitators' recommendations. These are steadily progressing and should be fully supported by the MPA Project.

Conclusion and Recommendations

The CLC MPA has been divided to three zones, namely: the restricted zone (the core zone), recovery zone, and the development zone. Protection activities for the restricted and recovery zones are aimed to maintain the large ecosystem for ecological tourism and for fisheries in the development zone. In an effort to fully understand the importance of MPAs, local inhabitants voluntarily participate in guarding and patrolling the restricted zones as well as in preventing illegal and other forms of resource exploitation in the development zone.

Various environment-friendly livelihood activities are being promoted in the development zone. Ecological tourism is one of the development strategies in the CLC MPA, providing significant income for local inhabitants through the different types of environmental services. Cultural activities supporting the ecological tourism also play important roles in community development in Bai Lang and Bai Huong villages. Thus, the development of different livelihood activities is expected to reduce pressure on the marine resources and alleviate poverty among the local inhabitants. Based on the results of the study, it can be deduced that community-based resource management is appropriate for the sustainable development of the CLC MPA. The CLC MPA has enhanced local capacity through

the people's active participation in social activities, which helped in poverty alleviation in coastal villages.

Lessons from the community-based resource management system in Cu Lao Cham archipelago could be adapted for establishing new or managing other existing MPAs in Vietnam. Recommendations for the establishment of MPAs, based on the study, include the following:

- The establishment of MPA should strongly emphasize in reducing the vulnerability of poor families living in small fishing communities.
- Communities are encouraged to take full and active involvement in the management of the MPA through community-based organizations, integrated management and feedback mechanisms.
- MPAs should be focused on increasing awareness and understanding of marine resource protection and the role of the MPAs in enhancing sustainable livelihoods.

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About the Authors

Nguyen Ngoc Phuoc is the Vice-Dean of the Faculty of Fisheries, Hue University of Agriculture and Forestry, 102 Phung Hung, Hue, Vietnam. Email: n2phuoc@gmail.com

Nguyen Giang Thu is the Vice - Director of the Science, Technology and Environment Department, Ministry of Agriculture and Rural Development, 2 Ngoc Ha, Hanoi, Vietnam. Email: giangthu@gmail.com

Ta Thi Thanh Huong is a PhD student at the University of Manitoba, Winnipeg, Manitoba, Canada. Email: tahuong@gmail.com

Reducing the Impacts of Fishing Activities on Coastal and Marine Environments in the Southeast Asian Waters: A Regional Synthesis

Worawit Wanchana, Bundit Chokesanguan and Virgilia Sulit

Many traditional fishing activities have been found to induce negative impacts on the coastal and marine environments as well as on the resources. In an effort to assess the extent of such impacts, SEAFDEC convened in January 2009 a workshop to address the concerns on the need to improve the designs and use of fishing gear in order to address the impacts of using such gear on the coastal and marine environments as well as mitigate sea turtle by-catch in fisheries. This article includes the initiatives of the Southeast Asian countries in reducing the impacts of fishing practices on the marine environments and resources.

Concerns regarding the effects of fishing on the marine and coastal environments have been seriously discussed worldwide. Guided by the policy framework on sustainable fisheries for food security, the Southeast Asian Fisheries Development Center (SEAFDEC) in collaboration with the SEAFDEC Member Countries and other relevant organizations had been "working towards the conservation and rehabilitation of aquatic habitats essential to enhancing fisheries resources" (Para 9: Resolution on Sustainable Fisheries for Food Security for the ASEAN Region 2001). In this regard, SEAFDEC has been promoting the development and adoption of responsible fishing gear and practices in the Southeast Asian waters that aim to minimize the impact of fishing to the coastal and marine environments (SEAFDEC, 2000 and SEAFDEC, 2003). Such initiatives by SEAFDEC have been demonstrated through the implementation of various activities that include a number of R&D activities on turtle excluder devices (TEDs), Juvenile and Trash Excluder Devices (JTEDs) as well as human capacity building on topics related to the use of selective fishing gear and devices and promotion of the concept on fisheries refugia (SEAFDEC, 2006).

Moreover, minimizing the incidental catch of threatened marine species such as sea turtles, dolphins and other species which could be included in CITES Appendix 1 and 2 is