Available online at: www.mbai.org.in doi: 10.6024/jmbai.2014.56.1.01750s-04

# Application of spatial planning in establishing a system of marine protected areas for sustainable fisheries management in Vietnam*

**Nguyen Chu Hoi**
Vietnam National University, 334 Nguyen Trai street, Ha Noi, Vietnam.

*Correspondence e-mail: nchoi52@gmail.com

Received: 06 Dec 2013, Accepted: 30 Jun 2014, Published: 15 Oct 2014

Original Article

## Abstract

Marine protected area (MPA) is considered as an effective management tool to maintain the sustainability of marine waters and associated economic sectors, such as marine fisheries, tourism and related services. The national system of MPAs planning in Vietnam started in 1998 and was approved by the Government in May 2010. Key coastal and marine ecosystems like coral reefs, seagrass beds, mangroves, nursery and feeding grounds, important habitats of economically valuable species, endemic and threatened species are to be managed in the planned MPAs by 2020. In the planning process, an ecosystem-based marine spatial planning (MSP) approach has been applied. The approach has 6 key steps with associated thematic maps used as supportive documents.

By using this approach, 6 marine biodiversity zones and 9 high conservation clusters and habitats have been identified in the Vietnamese seas. The conservation potential sites for MPAs have been identified following IUCN criteria with advice from Vietnam's scientists. Based on the relative range of conservation potentials and MPA site profiles, a representative system of 16 MPAs with high conservative values has been listed and approved by the Prime Minister. It is the first national system of MPAs in Vietnam with 3 main categories: Marine Park, Species and Habitat Protected Area, and Aquatic Natural Resources Preserved Area. Some lessons learnt from the MSP approach application to establish the national system of MPAs in Vietnam are shared in the paper.

***Keywords:*** *Marine protected area, marine spatial planning, marine biodiversity zone and cluster, ecosystem-based approach.*

## Introduction

Vietnam is a maritime country with significant potential for marine fisheries development which is considered a high priority for the socio-economic development of the country (ADB, 1999; Hoi and Giao, 2005; Hoi and Quyen, 2005; Thang, 2005; Hoi *et al.*, 2007). In 2012, the fisheries sector greatly contributed to the national economy with over 6.1 billion USD of GDP value from exports (Hoi, 2012a). However, fisheries development activities and overfishing, and activities of other economic sectors and oil spills have caused pollution, loss of marine biodiversity, degradation of marine ecosystems and coastal habitat destruction (Thang, 2005; Hoi *et al.*, 2007). Therefore, beginning in 1998, the Vietnamese Government fostered the establishment and management of a national system of marine protected areas (MPAs) using an ecosystem-based marine spatial planning (MSP) approach and in 2003 prepared the strategy on protected areas management (Hoi, 2008).

**The views expressed in this paper are those of the author and do not necessarily reflect the views of any government.*

The approach has been applied through the main steps of the MPA system planning process and has proved an effective tool for the establishment and management of the national system of MPAs in Vietnam (Hoi, 2008; 2012a). The MPA system was approved by Vietnam's Prime Minister in May 2010 after over 10 years. The major reason for the delay was related to the lack of an institutional framework for MPA governance at the national level (Hoi, 2012b).

This paper synthesizes the process of the ecosystem-based MSP approach in planning the national MPAs system and some of the associated management efforts in Vietnam.

## Material and methods

An ecosystem-based MSP approach has been used following key steps in the national MPA planning process:

1 Defining the marine bio-geographical position of Vietnamese seas
2 Conducting marine biodiversity zoning
3 Identifying marine-island clusters with high conservation potential
4 Screening priority sites for conservation in each cluster
5 Selecting and listing the proposed MPA sites in a national system to submit to the Government for consideration and approval.
6 Developing management plan of each MPA site in the planned MPA system

The above planning process of the national system of MPAs is presented in Fig. 1.

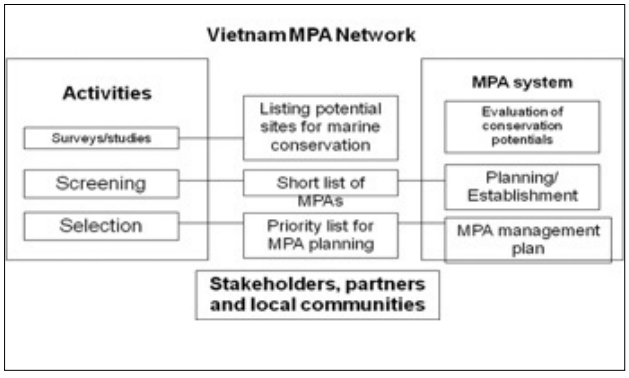


Fig. 1. Scheme of MPA screening and selection (Hoi, 2001a, b)

Following the above process, thematic maps (inputs) and maps of MPA sites (outputs) were prepared by using IUCN criteria and modified to suit Vietnam's situation (Hoi, 2008). In principle, the ecosystem-based MSP approach was used throughout the process of the MPA system planning with other supportive methods and spatial information maps.

## Results

### *Defining the marine bio-geographical position of Vietnam's seas*

To understand the bio-geographical position of Vietnam's seas, a bio-geographical classification was undertaken following Hayden *et al.,* and IUCN/CNPPA as given in Yet (2004) and Hoi (2008). Bio-geographically, the Vietnamese seas belong to the Indo-Polynesian province, marginal sea "C" in the bio-geographical classification system of Hayden *et al.*, and to zone No.13 of East Asia Sea in the classification system of IUCN/CNPPA (Yet, 2004; Fig. 2).

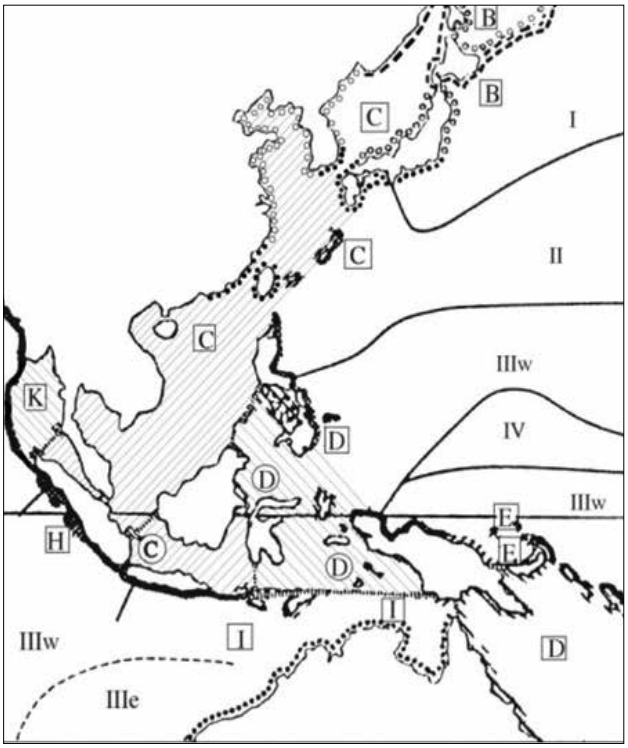


Fig. 2. Bio-geographical position of Vietnam's sea and adjacent marine waters by the classification system of Hayden *et al* (Yet, 2004) Note: A, B, C, D are coastal realms 1,2,3,4 are oceanic realms

### *Marine biodiversity zoning*

In order to interpret conservation potentials in the MPA system planning, a scheme of marine biodiversity zoning of the Vietnam's sea has been proposed by Yet (2004). The marine biodiversity zoning was made based on the following criteria: seawater temperature, marine currents, geological conditions, sedimentation regime, species biodiversity index, and structure of fauna and flora. These criteria were collected from existing and secondary sources, augmented with additional data from SCUBA diving (ADB, 1999; Hoi *et al.*, 2000; Hoi, 2008).

Based on the above criteria, the Vietnamese sea and adjacent marine waters were initially divided into the following 6 marine biodiversity zones (Yet, 2004): Zone 1 - Western waters of Tonkin Gulf (from Mong Caito Con Co island), Zone 2 - coastal waters of Mid Central (from Con Co to Varella Cape), Zone 3 - coastal waters of Southern Central (from Varella Cape to Vung Tau), Zone 4 - coastal waters of Southern East (from Vung Tau to Ca Mau Cape), Zone 5 - coastal waters of Southern West (from Ca Mau to Ha Tien of the Thailand Gulf) and Zone 6 -offshore waters.

## *Identifying marine-island clusters with high conservation potentials*

To facilitate the planning process, based on the islands' typology in coastal waters (An, 2008) and criteria such as marine habitat diversity, status of ecological systems, land/ sea-scapes and threats in each marine biodiversity zone, a scheme of the marine-island clusters with high conservative potential has been devised by National Assembly in 2003 (Hoi *et al.*, 2000). These clusters are considered as representative spatial units for priority options in the MPA planning process.

Nine high conservation potential clusters, including marine waters with islands, have also been identified (Hoi, 2008); for example, Co To-Dao Tran cluster, Ha Long-BaiTu Long bay cluster, Cat Ba-Long Chau-Bach Long Vi cluster, Hon Me islands cluster, Hon La-Con Co cluster, SonTra-Ly Son cluster, Nha Trang-Con Dao cluster, etc.

## *Screening priority sites for conservation in each cluster*

Based on information about marine conditions, surveyed data from SCUBA diving and socio-economic characteristics, the assessment of conservation potentials was initiated. The conservation potentials were identified following Catherine Cheung (for details, refer Hoi *et al.*, 2000) considering the relative range between total biodiversity of studied ecosystems and the threats at each site (Fig. 3).

After determining the relative range, the screening of priority sites for establishing MPAs was made by Govt of Vietnam and by National Assembly in 2003 following IUCN's 10 criteria and 8 supportive criteria of local importance (Hoi, 2001a,b). These are: (1) wildness, (2) biodiversity, (3) bio-geographic importance, (4) ecological importance, (5) economic importance, (6) social importance, (7) scientific importance, (8) national and global importance, (9) feasibility, (10) area (> 10,000 hectares), (11) high conservation potential, (12)

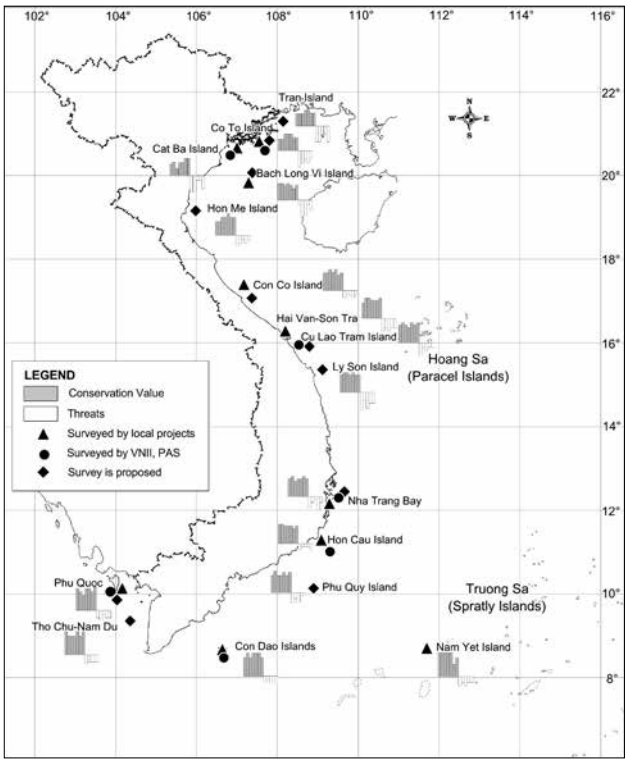


Fig. 3. Locations of biodiversity threats (Hoi *et al.*, 2000; Hoi, 2008)

potentials for long-term development of local economies, (13) international investments, (14) local governmental support, (15) participatory readiness of local community and stakeholders, (16) capacity to obtain financial investment, (17) possibility to develop MPA good practices at national or regional level, and (18) representativeness for a marine waters/ marine biodiversity zone or a marine-island cluster.

## *Selecting and listing of proposed MPA sites in national system to submit to the Government for consideration and approval*

Based on the above criteria, each screened MPA site was scored for prioritizing and preparing an MPA site profile (Hoi 2001a,b; Hoi, 2008). Basically, the MPA profile is an overview of the MPA site, including key information and identification of the MPA site boundary.

The contents of such profiles include: proposed MPA name and other names, number of bio-geographical and marine biodiversity zones, geographical location, legal status, conservation status, relief and hydrological conditions, biodiversity, conservation issues, other values and cited references. After that, the selected MPA sites were categorised according to the IUCN Guidelines of 1994 and Vietnam's Law of Fisheries, 2003.

The above-mentioned steps formed the pre-planning phase and the results of each step were mapped with the support of remote sensing/GIS technique. In the next phase, which was the planning phase,a first list of a representative system of 16 MPAs with high conservative values was selected based on the relative range of conservation potentials and the MPA site profiles (Table 1 and Fig. 4). The final report of the planning results, associated with the list of MPAs and a map of proposed MPA sites was submitted to and approved by the Prime Minister in 2010. It is the first national system of MPAs in Vietnam and was grouped in 3 of 6 IUCN/WCPA categories and integrated into the Vietnam Law of Fisheries, 2003). These categories are: Marine Park, Species and Habitat Protected Area, and Aquatic Naturally Resources Preserved Area. After approval, the national system of MPAs was officially established.

## *Developing management plan of MPA sites in the planned MPAs system*

The established MPAs in the national list were then moved into implementing the plan (post-planning phase). Once again, the MSP approach was applied to establish management zones according to function which is one of the key issues in the management plan for MPA site. The function zones were classified into different degrees of conservation and utilization: core zone, buffer zone (internal and external), ecological restoration zone and local community use zone (Fig. 5). Based on this zoning scheme and other input data, the management plan for the MPA site was prepared and approved by the authority (according to legal regulation). A MPA Management Board has been formulated to implement the management plan (Hoi, 2001a,b; Hoi, 2008).

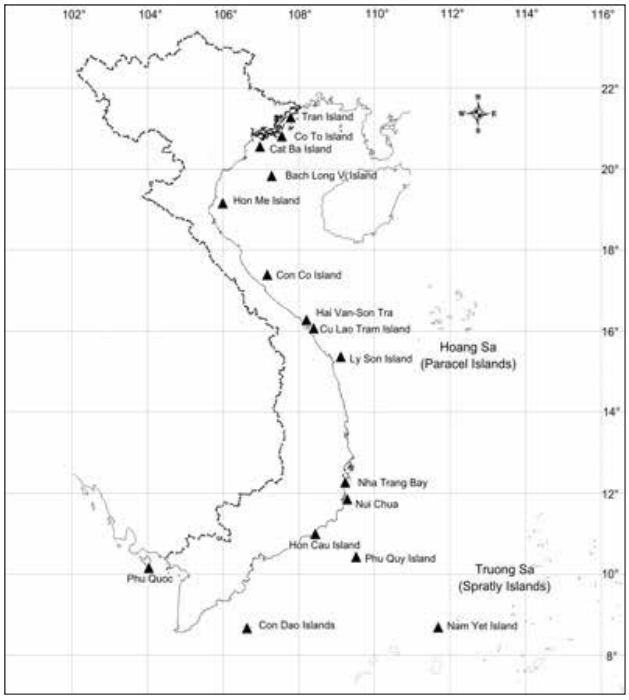


Fig 4. Planned system for MPAs in Vietnam towards 2020 (Govt. of Vietnam, 2010)

## Discussion

Table 1. The list of MPAs in Vietnam planned for 2020 year (Govt of Vietnam, 2010; Hoi, 2012b) Category I: marine park; Category II: species and habitat protected area; Category III: aquatic naturally resources preserved area

| No. | Name of MPAs/Province | Category (IUCN, Fisheries Law) | Total area/ sea area (ha) | Bio-geographical and marine biodiversity zone |
|---|---|---|---|---|
| 1 | Tran Island / QuangNinh | III | 4200/3900 | C-01 |
| 2 | Co To Island / QuangNinh | II | 7850/4000 | C-01 |
| 3 | Cat Ba/ Hai Phong | I | 20,700/10,900 | C-01 |
| 4 | Bach Long Vi / Hai Phong | III | 20,700/10,900 | C-01 |
| 5 | Hon Me / Thanh Hoa | III | 6700/6200 | C-01 |
| 6 | Con Co / Quang Tri | II | 2,490/2140 | C-01 |
| 7 | Son Cha-Hai Van/ ThuaThien-Hue | II | 17,039/7626 | C-02 |
| 8 | Cu Lao Cham / Quang Nam | I | 8265/6,716 | C-02 |
| 9 | Ly Son / Quang Ngai | III | 7,925/7113 | C-02 |
| 10 | NhaTrang Gulf/ Khanh Hoa | I | 15,000/12,000 | C-03 |
| 11 | Nam Yet Island / Khanh Hoa | II | 35,000/20,000 | C-06 |
| 12 | Nui Chua /NinhThuan | I | 29,865/7352 | C-03 |
| 13 | PhuQuy Island / BinhThuan | III | 18,980/16,680 | C-03 |
| 14 | HonCau/ BinhThuan | II | 12,500/12,390 | C-03 |
| 15 | Con Dao / Ba Ria-Vung Tau | I | 29,400/23,000 | C-04 |
| 16 | Phu Quoc / Kien Giang | II | 33,657/18,700 | C-05 |
| | Total area | | 270,271/169,617 | |


Fig 5. An example of a function zoning scheme in Nha Trang Bay MPA site Source: The report of Nha Trang bay MPA, 2009 (Hoi *et al.*, 2000)

The total area of the 16 MPAs is about 270,271 hectares, of which 169,617 ha are marine, including about 70,000 ha of coral reefs, 20,000 ha of seagrass beds, mangroves and nursery grounds of coastal and marine species. This also includes protection of 100 rare/unique species in the MPAs (Gov. of Vietnam, 2010; Hoi, 2012b).

Basically, the national system of 16 MPAs is representative of all ecological zones of Vietnam's seas. They are distributed in marine biodiversity zone 1 (6 MPA sites), zone 2 (3 MPA sites), zone 3 (4 MPA sites), zone 4 (1 MPA site), zone 5 (1 MPA site) and zone 6 (1 MPA site). However, in the clusters with high conservation potentials in Central and South Vietnam, there area fewer MPA sites than in North Vietnam (Hoi, 2012b).

Until now, only 5 of the 16 established MPAs have been effectively managed with defined function zones in which key habitats, ecosystems, ecological processes and fishery resources are conserved and restored. The remaining MPAs will be brought under management during 2014-2016. The Ministry of Agriculture and Rural Development (MARD) plays a role in the management of the MPAs, by covering main functions like development of a legal framework, technical support, promotion of international cooperation, supervision and control. MARD has appointed coastal provinces to be responsible for managing the MPA sites within their authority. The MARD is directly managing only the trans-boundary (inter-provincial) MPAs of special importance (Hoi, 2012b).

The establishment and management of the above established MPAs have contributed to sustainable fisheries development and implementation of the Millennium Development Goals (MDGs) in Vietnam (Hoi and Giao, 2005; Hoi and Quyen, 2005).The Nha Trang Bay MPA in Central Vietnam is considered to be the first site of such good practices. After 4 years, the operation of a few detrimental traditional fishing gears has been reduced, while fishery resources have been restored in the MPA site. The size and density of mussels and biomass of several other species have been increased. For people living in six fishing villages in the islands inside the Nha Trang MPA, alternative jobs have been provided (from fishing to eco-tourism), by providing glass bottom boats and diving opportunities for tourists. The livelihood of people who are living inside and around the MPA site has been improved in recent years.

These are the first lessons learnt from the application of an ecosystem-based MSP approach in MPAs system planning and management in Vietnam. The key ecosystems in the MPAs, if successfully managed, will contribute to creating restoration and spillover effects for each MPA as well as for the whole system. This process will also contribute to maintaining coastal and marine natural assets and their ecosystem service values - a natural foundation for Vietnam's blue marine economic development and therefore the livelihood of local communities (Hoi, 2012a).

The ecosystem-based MSP approach has been initially applied in all steps of the planning process of the national MPAs system in Vietnam. At present, the approach is incorporated into national policy and law, making it a strong tool for coastal and marine spatial governance and management in Vietnam. Recently, national guidelines on MSP have been developed and approved as technical assistance for MPA planning in particular and for sustainable marine fisheries and tourism development planning in general.

Most of the MPAs in Vietnam are located near-shore, which should be managed in an integrated manner for which ecosystem-based MSP is a strong supportive tool. Application of ecosystem-based MSP approach in MPA planning emphasises the need for systematic scientific data on biodiversity and a national database for each MPA site. These data should facilitate updating information in each planning cycle according to the above-mentioned criteria.

The 3 key programs have been implemented during the period 2006-2012 using about 1 billion USD, of which 40% is from government, 30% from international support, 20% from coastal provinces and 10% from local communities. The programs will be continued until 2015, including a survey of marine biodiversity and living resources in Vietnam's seas as a part of extended planning of the national system of MPAs, which is being prepared by MARD (Govt. of Vietnam, 2010; Hoi, 2012b).

## Conclusion

- The ecosystem-based MSP approach has been initially applied following 6 major steps under 3 planning phases to establish a national system of national MPAs in Vietnam.
- As most of the MPAs in Vietnam are located near-shore, they are subjected to a number of impacts from outside and within the MPA. Hence, they have to be managed in an integrated manner. Ecosystem-based MSP will become a strong support tool to help integrated MPA management in Vietnam.
- Thematic maps are key products of the MPA planning process under the ecosystem-based MSP approach and provide spatial information for decision-making to establish a national MPA system.
- It is necessary to have systematic data and a database of the criteria for the MPAs planning areas.
- The ecosystem-based MSP approach is a new concept in Vietnam and for some regions in Asia. Establishing a regional MSP partnership for supporting coastal and marine sustainable fisheries management is necessary to achieve long-term development and conservation goals.
- The ecosystem-based MSP should also be considered as an approach for the implementation of the mission of the Mangroves for the Future (MFF) initiative to ensure the success of future investments into coastal ecosystems throughout the region.

## References

ADB, 1999. A proposed plan for coastal and marine protected areas in Viet Nam. Final report of ADB/UNDP, Ha Noi.

An, L.D. 2008. Islands system in Vietnam's coastal waters: development potentials. Publishing House of Natural Science, Ha Noi.

Govt of Vietnam. 2010. Decision No. 742/QĐ-TTg dated 26 May 2010 on approval of Vietnam MPAs system planning towards 2020. Ha Noi.

Hoi, N. C. 2001a. Status and Mechanism of Marine Protected Areas Management in Viet Nam. *J. Mar. Sci. Tech.*, Tom 1, No.1/2001, Ha Noi.

Hoi, N. C. 2001b. Initiative Results of Screening Marine Protected Areas in Viet Nam. *J. Mar. Sci. Tech.*, Tom 1, No. 4/2001, Ha Noi.

Hoi, N. C. (Chief Editor). 2007. Fisheries policy of Viet Nam.Publishing House of Agriculture, Ha Noi.

Hoi, N. C. (Chief Editor). 2008. Planning of MPAs system in Viet Nam towards year 2020. Final Report preserving in MARD, Ha Noi.

Hoi, N. C. 2012a. Blue marine economy and MPAs system in Viet Nam. *MoP J. Sci., Technol. and Environ.*, 26, Ha Noi.

Hoi, N. C. 2012b. The status and management of the marine protected areas in Viet Nam. *J. Sci.*, Vietnam National University, Natural Science and Technology 28, No.4S (2012) Ha Noi, 77-86.

Hoi, N. C and H. N.Giao. 2005. National Marine Policy: A Vietnam Case Study. The report of the 2nd Global Conference on Oceans, Coasts and Islands. Lisbon, Portugal.

Hoi, N. C., N. D. Hoe and H. M.Tuong, 2004. Chapter III: Coasts and Seas of Viet Nam. In "*Viet Nam: the Life and Environment*". Publishing House The Gioi, Ha Noi.

Hoi, N.C. and C. L. Quyen, 2005. Fisheries sector report for identification of projects on improving coastal poor people livelihood, The draft of FAO. Ha Noi.

Hoi, N. C., D. N. Thanh and N. H.Yet, 2000. The scientific baselines of MPA system planning in Viet Nam.Published by IUCN Vietnam, Ha Noi.

Thang, N.V. 2005. Some policies and challenges for sustainable development of fisheries sector in *Viet Nam. J. Fish.,* 12 (2005), Ha Noi.

Yet, N. H. 2004. About marine biodiversity zoning in Viet Nam.The thematic report of the Project on planning of MPAs system in Viet Nam towards year 2020 which preserving in MARD, Ha Noi.