

# Marine Protected Areas and the Benefits of their Establishment

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## ABSTRACT

*Marine Protected Areas (MPAs), conservation and fisheries management tool, come in various sizes and shapes, and fulfill various purposes. They are established for purposes of protection, restoration and preservation of: biota, ecosystem and ecological processes, and include recreational, educational and cultural purposes. Steps in the establishment of MPAs, their benefits and effectiveness have been highlighted. Current and profitable trends as seen in the establishment of Network of MPAs have been reported also. It has been noted that there is much benefit in using MPAs as management and conservation tool for natural aquatic resources, yet less areas have been demarcated for these purposes in comparison to the vast aquatic ecosystem potential for such uses. When the factors militating against successful MPAs establishment such as funds for establishment and sustainable management, in-situ training, local capacity building and requisite biological and ecological data are addressed; and stakeholders fully engaged, the benefits derived there from would be tremendous.*

**Key Words:** Marine Protected Areas, Fisheries management.

## INTRODUCTION

The term Marine Protected Areas (MPAs), a biodiversity conservation and fisheries management tool refers to aquatic areas with no human interference; or areas with compatible or non-harmful human activities. The level of interference or human activities, however, is as categorized by the International Union for the Conservation of Nature (IUCN), the oldest international conservation instrument. In the US, the five different categories of protection or varied degree of interference are (i) No access (ii) No Impact (iii) No take (iv) Zoned with No Take Area (v) Uniform multiple use [National Marine Protected Areas Centre (2007)

The idea of demarcating areas for conservation and protection purposes is not new, since agriculturists had been practicing this on land. In Cochrane (2002), a more comprehensive definition of MPA was given as a "protected marine intertidal or subtidal area, within territorial waters, Exclusive Economic Zone (EEZ) or in the high seas; set aside by law or other effective means, together with its overlying water and associated flora, fauna, historical and cultural features. It was also explained, following this definition that such demarcated areas provide degrees of preservation as stated above for important marine biodiversity and natural resources such as, a particular habitat (e.g a mangrove or a reef) or species, or sub-population (e.g spawners or juveniles) depending on the degree of use permitted.

Uses of MPAs, whether for scientific, educational, recreational, extractive (fishing inclusive) or other purposes are usually regulated or strictly prohibitive. The explanation of MPAs, as given by World Wide Fund for Nature in Eastern Africa Marine Ecoregion, WWF EAME (2004), brings out the various types of marine areas with protection to include marine reserves, sanctuaries and marine parks, with a further explanation that each of these varied forms can mean different things in different countries. For example, in Kenya in Natural marine parks fishing or extraction of any kind is prohibited while recreation is allowed, but in Tanzania, Marine parks are left for a wide range of uses including fishing. While Marine Reserves permit non-destructive fishing in Kenya, such reserves in Tanzania are no-take areas.

Currently, the trend is for the formation of network of MPAs, be it at local, national, regional or at global level (ICES, 2007). WWF EAME (2004) reviewed the status of MPA in Kenya, Tanzania and Mozambique and their present status. The migratory nature of most aquatic biota must have informed the call for the formation of network of MPAs. The usefulness of networking according to ICES (2007) is evident in the reduction of impact of fishing on marine ecosystem.

Network of MPAs has been established within the three East African countries of Tanzania, Kenya and Mozambique. In the European Union, this network is to be carried out through the establishment of two types of protected areas viz; Special Protected Areas (SPA) for birds as established by the Birds Directive (79/409/EEC); and Special Areas of Conservation for habitats and species, which is being established

through the Habitats Directive (92/43/EEC), the designations of which are supposed to be completed by 2008 (ICES CIEM, 2007; Roberts, 1995).

The essence of network of MPA within the EU states is that they will serve as management tool to improve fish stock productivity for optimized yields, with an eventual conservation benefit to the environment.

## **2.0 HISTORY AND BACKGROUND OF MPAs**

Concerns about the destruction of marine biota and ecosystems was recognized, as early as in the fourteen century and this resulted to the banning of certain types of dredging in Britain and trawling in Flanders. Through out the sixteenth and seventeenth centuries different types of trawling were also banned, and trawling was taken as capital offence in France. The rationale behind these prohibitions were the preservation of vulnerable fishing grounds.

It is the greater awareness amongst the various users of the aquatic ecosystem that has led to the need to demarcate certain areas as marine protected areas. Marine protected areas have been established in many regions of the world.

## **3.0 Sources of Inputs Into MPA Establishment**

The novel approach in contemporary management issues of participatory principle, in which the varied stakeholders need to make inputs right from the planning stages so that the set objectives for the project would be suitable to all interest groups should be most suitably applied for the establishment of an MPA. Dalton (2005) and Lunguist (2005), have also reported on the need to involve the public in planning and establishment of MPAs. The implication is that sources of inputs into the processes leading to the establishment of MPA should include scientific sources, fishers and other stakeholders in agriculture, flood control, power generation, tourism, mining, transport and land development e.g. urban and industrial development.

### **3.1 Scientific Sources:**

This would involve the use of Geographic Information System (GIS) and remote sensing to identify areas which are of utmost significance, for the fishery resources such as usual schooling and shoaling areas; spawning, breeding and nursery grounds; and migration routes, either for food or reproduction. Ecological and biological data from research by the fisheries scientist are very important as they form the base for most of the management decisions that have to be taken both for implementation and monitoring purposes. The scientist is important as the one to ensure the recognition of links in the various processes of establishing MPA, which include: identifying needs (identify e.g. threatened/rare or imperiled species, habitats, hydrologic cycles and processes); setting management objectives, planning, designing and evaluation of the MPA.

### **3.2 Fishers:**

Artisanal fishers usually have information on niches and habitats of fish species during particular phases of their growth; hence their input should be sought for through interactive discourse.

### **3.3 Varied Stakeholders:**

The needs, goals, contribution and position of the varied resource users and stakeholders should be sought for before formulating management objectives, while the ability of scientists to make all stakeholders realise the usefulness of MPA should lead to agreement for its establishment. The need to seek for mutual agreement in the designing and establishment of MPAs should be paramount since it pays off more than force would (Cochrane, 2002).

## **4.0 ESTABLISHMENT OF MARINE PROTECTED AREAS**

### **4.1 BENEFITS FROM MPAs**

The extent of benefits from established MPAs depend on factors such as size of the designated area, location and permanence, as well as the level and nature of protection provided. It should be noted that the functions of a protected area is dependent on the objectives and goals set down from its inception and which are usually reflected in the management objectives for the site, either for organism or ecosystem.

While some types of MPAs provide protection to a particular species or two or a habitat, others offer a more comprehensive protection to a full range of species, habitats and ecological processes, with more

effective outcomes. However, because, no one MPA can meet all conservation, preservation and protection needs, it is good that the MPAs in a region should include many different types, and hence the wisdom of forming network of MPAs at various levels. Furthermore, the proposed MPA should be designed and managed to meet specific conservation and management objectives; meaning that the size, shape and protective measures all need to be selected accordingly (Ocean Conservancy, 2001).

Observed benefits from Marine Protected Areas therefore include:

- Improving fish yield of surrounding ecosystem or environment Steffanson and Rosenberg (2006), thereby contributing to ecological sustainability and conservation.
- Concentrating fish population e.g. through the use of artificial reefs.
- Avoiding the collapse of capture fisheries.
- Increase of biomass, average size of animals and reproductive output Shirai and Harada (2003), since the animals attain larger sizes (Roberts, 1995).
- It can also be used to distinguish changes in the fish or animal population caused by the fishing activity. This can be achieved through comparison of size and trajectories of fish population within or outside of the MPA.
- Contribution to a nation's economic health through new or enhanced opportunities for tourism and recreation (National Marine Protected Areas, 2007).
- Contributes to a nation's economy through lowering harvest variation and improving the fishery rent (Greenville and MacAulay, 2006).
- Conservation of biodiversity, thereby greatly reducing the chances of species extinction, imperilment or succession.
- Conservation of natural ecosystems so that succeeding generations will not only read of the characteristics of such communities of plants and animals but be able to appreciate them for themselves.
- Restoration of lost ecological biotypes, populations, communities, abiotic factors of the environment, habitats and rare species.
- Preservation of unique habitat or rare species.
- MPA is one of the biophysical management measures to implement the Ecosystem Approach to Fisheries Management as declared within the FAO Code of Conduct for Responsible Fisheries and the Precautionary Approach to Fishing Operations.
- Establishment of reference point for scientific studies for research and education (Ocean Conservancy, 2001).
- They lead to the separation of conflicting users of the ecosystem (Ocean Conservancy, 2001).
- Ensuring protection of ecological processes essential for ecosystem functioning (WWF EAME, 2004).
- Establishment of MPAs would make the establishment of Monitoring, Control and Surveillance (MCS) unit compulsory since the effectiveness of MPAs can only be noticed through feedbacks from the MCS unit.
- (MPAs) prevent pollutants from being generated and distributed from such protected areas through regulation of land practices adjacent to the marine environment. Restrictions within such marine environments can deter marine dumping or discharges, including disposal of wastes; dredge spoils and exchange of ballast water from commercial vessels.
- Generally MPAs should offer resilience on the overall ecosystem within its range. It can also happen that terrestrial components can be attached to coastal protected areas and as such can limit or prohibit coastal development and shoreline alteration.
- MPAs mitigate losses in genetic diversity caused by over exploitation, Hauser *et al.* (2002) and this is through retaining high densities of large and older fish species as is the experience with the *per*, *Pagrus auratus* in New Zealand.

#### 4.2 SALIENT POINTS TO NOTE IN ESTABLISHING MPAs

Some of the questions that should be answered or points to note during the planning stages of establishing MPA include;

- Whether products from MPAs can effectively and efficiently replenish the areas next to the MPA which are open to fishing activities.

- And also, whether an MPA would suffice for the management of several species concurrently, or that the proportion of area to be set aside for the MPA would be adequate.
- And whether the biology of the species varies much to warrant the choice of different sizes and locations for the MPA. It is only if such specifications can be determined that profits accruing from such projects can be maximized.
- It should also be noted that availability of a monitoring unit is vital to the eventual establishment and effectiveness of MPAs.
- It is also good to know that several MPAs forming a network would be more effective especially since dispersal of eggs and larvae by currents ought to be considered. As such MPAs of 10-100s of kilometers have been advocated, this will ensure good species, habitats and biogeographical Representation.
- It should be noted that the biology and ecology of target organisms play important role in the design and implementation of MPA and are a point of focus in the pre-and post-evaluations to be carried out for the MPA establishment. The prominent place of fisheries in the evaluation exercises cannot be overlooked because of its dual nature of being a valuable natural resource and an indicator of the conservation status of the aquatic ecosystem.
- There is the need to take into consideration parasitism in the biological conservation of the hosts of organisms (Sasal, *et. al.*, 2004).
- Walson *et al.* (2002) observed in their study that the response of biomass and catch to MPA size depended on the length of time. In all the groups of organism that were simulated, the increases recorded only after 10 years proved that the greater the biomass exchange rate across the MPA boundary, the larger the MPA required to increase biomass levels. It may also be noteworthy to include, according to Vermeij (1993), regions of high productivity within marine environments, so that such areas can be protected from over exploitation and habitat destruction.

#### 4.3 STEPS IN ESTABLISHING MPAs

Legal instruments, (Fernandez and Castilla 2005) are needed to back up the establishment of Marine Protected Areas. Such instruments include the 1995 FAO Code of Conduct for Responsible Fisheries, the Precautionary Approach to Fishing Operations, 1982 United Nations Convention on Law of the Sea (UNCOS) and other regional, national, State or local laws in the various parts of the world. The Bird and Habitat Directives mentioned earlier are ready examples.

Establishing MPA is a task usually preceded by

- Identifying the necessity and usefulness for establishing such MPAs.
- Establishing specific objectives and goals for the MPAs, which is through consultation with various stakeholders concerned with the usage of the ecosystem.
- Using the specified goals and objectives to design the MPAs.
- Development of the Management approach for evaluating the effectiveness of the MPAs.
- Evaluating the MPA so that adaptive management can be developed through the feedbacks from the Monitoring, Control and Surveillance (MCS) unit.

According to FATHOM (2007), the law that enforces the creation of MPA should also include mechanisms for their evaluation.

Varied management approaches can be employed within a designated MPA so that the objectives and purposes for its establishment can be met (FATHOM 2007).

#### 4.4 CONSIDERED FACTORS IN EVALUATING THE EFFECTIVENESS OF MPAs.

These include:

- Understanding scales and rates of ecological processes such as population growth, larval dispersal and recruitment events.
- Design (e.g. the number, size and location of the MPA) and network of MPAs.
- Adequate and accurate information on the magnitude and distribution of fishing effort and effect of MPA establishment on it.
- The quality (i.e. timing, duration and extent) and understanding of design of the developed program and usefulness in evaluating effectiveness of the set objectives.

#### 4.5 Established MPAs and Their Present Position

Effectiveness of proposed MPAs must occupy a central place when proposing the establishment of MPAs, success of which lie heavily on the entire hub of management and enforcement.

The effectiveness of MPAs has been recorded in Tanga in East Africa where increase in commercial fish species has been recorded both within the closed and open reefs as a result of management, and reduction in dynamite fishing [WWF EAME (2004)]. Such increases have also been reported in Menai and Misali, all in East Africa. Kermadec Island, the largest marine protected area in New Zealand waters was established because of the concern to protect the black-spotted grouper from over-exploitation. The achievement of this goal is seen by the fact that populations of this fish species are still seen within the MPA (FATHOM, 2007).

Also, establishment of MPAs in New Zealand resulted in the increase of New Zealand snappers (predator on sea urchin which graze subtidal rocky reefs); and the reef community shifted from rocky barrens void of kelps to a kelp-dominated community.

Many and different types of MPAs have been designated in the Gulf of Maine in USA; their effectiveness and the need to enhance same led to the recommendation in 2001 to form a network of MPAs along the whole stretch of the Gulf of Maine in USA (Ocean Conservancy, 2001).

Reports of the Evaluations of the management effectiveness of marine protected areas and protection of coral reefs in the Caribbean highlighted 285 identified parks, 6% of which were effectively managed, 13% rated as partially effective in management, while about half were ranked as having inadequate level of management, hence offering no protection to the target reef resources. It was also reported that the management effectiveness of one-third of the 285 protected reefs were unknown, the causes of which must have been due to deficiency in human and financial resources, (Burke *et al.*, 2004). Over all, only 20% of the reefs were within MPA and just 5% located within MPAs having effective or partially effective management. The criteria used to assess the effectiveness of the MPAs were

- (i) existence of management activity
- (ii) existence of a management plan, availability of resources and extent of enforcement.

Lipej *et al.* (2003) working on the coastal fish diversity in three marine protected areas and one unprotected Area in the Gulf of Trieste (Northern) Adriatic, attributed the higher densities of *Symphodus cinereus* and *S. roissali* (fish species) in the protected area to the extended and densely vegetated infra littoral belt of the Debelirtic area, rather than to the protection status. For Stefansson and Rosenberg (2006), benefits in the use of MPAs are optimized when catch and effort controls for a long-term yield are employed for managing marine resources.

In support of the use of Marine reserves, Halpern (2002), reported that higher average values of density, biomass, average organism size, and diversity inside reserves (relative to controls) reach mean levels within short periods of 1-3 years; with values being consistent across reserves in all ages to 40 years. Côté *et al.* (2001) in meta-analyses from published literature for 19 marine reserves noted that marine protected areas enhance species richness consistently with variable effect on fish abundance.

#### 4.6 Factors militating Against Successful Establishment of MPAs

In as much as the literature on the huge benefits from setting up MPAs is voluminous and still growing, Frascchetti *et al.* (2002), listed factors militating against its effectiveness as lack of funds.

Lack of fund: fund is the number one limiting factor, Burke *et al.* (2004) noted that lack of long-term financial support that ensures sustainability are common reasons for failure. Other factors include lack of support from local community which can usually be traced back to, neglecting to involve them (Community members) from the planning and establishment stages; and which may also hinder them from reaping the financial, social and protection benefits of the project.

Deficiency in technologically capable hands is a factor while lack of awareness concerning importance and benefits accruable from such development programs have important roles to play too. In Baelde (2005), the challenges faced in the use of MPA in Australia had much to do with the opposing principles and practices between conservation and fisheries management. Specifically there was poor cooperation between fisheries and conservation agencies because conflicts arose from allocation of fishing rights by fisheries agencies and loss of such rights through MPA establishment. Other specific problems observed in Australia included non-inclusion of fisheries expertise in conservation planning, inadequate single-species/single-issue approach to fisheries management and re-allocation of resources between user groups through spatial zoning.

According to Lunquist and Granek (2005), challenges in marine conservation planning have to do with government instability and the consequent effect on ineffective monitoring and enforcement of management objectives, especially in developing nations. Others include inability to transfer knowledge to the local community members, absence of or inadequate in situ-training, local capacity and existing infrastructure. Besides, inaccessible and unavailable or outdated science, both in developed and developing nations were also militating factors.

#### 4.7. MPA Establishment: The Case of Nigeria

Nigeria is endowed with extensive coastline and sheltered mangrove belts. According to Spalding *et. al.* (1997), the area of Nigeria mangroves is estimated at 10,515 km<sup>2</sup> the fourth in the world behind Indonesia, Brazil and Australia (Nandy and Mitra, 2004).;

In most countries in the world where mangroves exist, restoration and conservation schemes are in place to ensure the sustainability of these resources and other biodiversity. For instance, Indonesia with the largest mangrove area (42, 550km<sup>2</sup>) has about 64 MPAs, Malaysia with 6,412km<sup>2</sup> has 40 MPAs, while Vietnam with only 1,100km<sup>2</sup> of mangrove area has 22 MPAs (Nwosu, 2005). Unfortunately, Nigeria has no MPA, and is not engaging in constructive mangrove restoration programmes. There is no nationally designated marine Park in Nigeria.

The lack of MPA, loss of mangroves due to overlogging, coastal and industrial development coupled with environmental degradation in Nigeria's Niger Delta, contribute to a large extent to the decline in wild fish stocks in the Gulf of Guinea. It is estimated that 60% of fish caught between the Gulf of Guinea and Angola breed in the mangroves of the Niger Delta (Bassey, 1999). A case for the urgent establishment of MPA, marine parks and sanctuaries in Nigeria, especially in the Niger Delta, which has been declared a key zone for the conservation of the Western Coast of Africa on the basis of its extraordinary biodiversity, is hereby made.

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