Economic impacts of marine protected areas: A case study of the Mombasa Marine Park

I. Ngugi

P.O. Box 269 Uthiru, Nairobi, Kenya

ABSTRACT

The conservation of the marine environment is an integral part of the broader initiatives of environmental conservation in Kenya. A major motivation for the delineation of marine protected areas (MPAs) in Kenya has been the promotion of tourism and also the need to conserve marine biodiversity for posterity. However, the conservation of marine resources in Kenya has led to certain resource-use conflicts between national conservation agencies such as the Kenya Wildlife Service and local fishing communities. The study reported in this paper sought to examine the economic implications of the Mombasa Marine Park on a local fishing community, and thus provide an insight into the factors that lead to such conflicts.

In the study, catch-related variables pertaining to the marine protected area were found to be significant. At the same time, attitudes of local fishermen towards the establishment of the Park were found to be extremely negative. The reasons for this included park establishment procedures as well as the lack of alternative sources of income for the communities displaced from the area now managed as a marine park. This paper recommends that in establishing an MPA in a developing and demographically dynamic country like Kenya, conservation authorities must be well aware of and integrate existing traditional systems of resource use into modern management practice. This may be achieved through a multidisciplinary approach to the varied issues related to the establishment and management of MPAs. This approach should build the capacity for active resolution of any resource use conflicts that may arise.

INTRODUCTION

For centuries the oceans and seas have been a major resource base for humankind, especially as a source of food and transport opportunities. Together with the fact that coastal zones are among the regions of highest biological productivity on earth, high population densities have emerged in these zones—60% of humanity lived in coastal

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zones in 1992 compared with 50% in 1970 (Tolba and Elkholy, 1992). Previously, the resources of the marine ecosystems of the world have been regarded as openly accessible, with users' needs having a greater priority than the health of the environment.

In the 18th and 19th centuries, little attention was given to conservation of marine living resources as the sea was principally used for navigation, fisheries and periodically for warfare. Any claims on the sea that were made with intent at conservation were clearly an exception to the predominantly commercial outlook of the sea that prevailed at the time. The first attempt at placing some manner of control over the exploitation of marine resources became evident with the formulation of the three-mile limit of sea jurisdiction established by the British Parliament, with the passing of the Territorial Waters Act of 1878 and the Sea Fisheries Act of 1883. Though the declaration of this limit became accepted practice over the 19th century, it contributed to few conservation measures owing to the fact that the narrowness of the three-mile sea dimension made protection of marine living resources such as fur seals difficult to realise (Wilder, 1998).

The second half of the 20th century has seen increased realisation that it is impossible for humankind and the majority of the earth's life forms to thrive without healthy seas. Environmental degradation of the seas was initially highlighted in the 1950s and 1960s (Kelleher and Kenchington, 1991), leading to a gradual shift away from the perception that marine resources were 'infinite'. There was a growing realisation that apart from marine pollution, over-exploitation of marine resources was an equally that damaging process that sets into motion irreversible and sometimes synergistic destructive processes such as population decline, species extinction, impoverishment of genetic banks as well as alterations of trophic relationships.

In 1975 the IUCN International Conference on Marine Parks and Protected Areas held in Tokyo passed resolutions that paved the way for the establishment of marine protected areas (MPAs) as the popular mode of implementing marine protection (Kenchington, 1990). In Kenya, as in other parts of the world, marine parks are established for the main purposes of protecting biodiversity, as well as the promotion of tourism—traditionally one of the top three foreign exchange earners for the Kenyan economy. Over time, other roles of marine parks in the country should necessarily evolve to include education of the public regarding the importance of conserving marine biodiversity as well as the provision of research media for marine scientists (Chebures, 1989). In Kenya, marine fisheries forms a major component in employment and revenue generation for numerous coastal dwellers. Many of these are indigenous coastal peoples whose basic economic and social well being is linked to the exploitation and use of marine resources.

Many developing countries are increasingly experiencing socioeconomic stresses emanating from the discrepancy between the available resources and rapid population increase. The continued rise in populations is a major factor in the emergence of resource-use conflicts and environmental degradation. It has therefore become imperative for countries to continually seek avenues by which environmental protection

may be implemented and managed in a sustainable manner. The potential of 'ecotourism' —a practice that should necessarily contain ethics for environmentally responsible behaviour that at the same time strengthens the conservation ethic (Westerink, 1996)— as an important source of foreign exchange has been recognised by many developing countries, including Kenya. In this regard, the government of Kenya recognises the importance of protecting outstanding natural ecosystems, such as those found within the marine environment, for future generations. However, government policies in the marine realm, both for conservation and the promotion of tourism, have resulted in conflict and resentment from affected users of the areas placed under protection, mostly local fishing communities, which have been relegated to less lucrative fishing grounds during the enforcement of park rules and regulations. A conflict has thus unfolded between the need for natural resource conservation and that of managing the conserved resources in a way that does not impact negatively on the economic welfare of indigenous resource users.

Few studies in Kenya, and indeed in the East African region, have addressed themselves to an economic analysis of the impacts associated with marine conservation. In recognition of this deficiency, a study was conducted to examine the economic impact of marine conservation on a local fishing community at the Jomo Kenyatta Beach which is adjacent to the Mombasa Marine National Park.

Objectives of the study

The objectives of the present study were specifically to:
− assess the effect of a change in access to fishing rights on the income of local fishermen (a change represented by the changing levels of catch per fisherman and the number of fishermen);
− establish if there exists a direct relationship between tourism to the Marine Park and income of fishermen displaced from the park;
− evaluate the perceptions of the fishermen towards the existence of the Mombasa Marine National Park; and
− provide some recommendations and policy guidelines based on the findings of the above objectives.

STUDY AREA

Kenya was the first African country to establish marine protected areas, the Malindi/ Watamu Parks and Reserves established in 1968 (Chebures, 1989). The original motivation for their establishment was mainly the need to earn foreign exchange through tourism. Other parks and reserves have subsequently been set up in reaction to perceived problems such as the over-exploitation and destruction of marine habitats.

The study area for this paper was the Mombasa Marine Park. Though gazetted in 1986, it was not until towards the mid-1990s that park and reserve rules and regulations began to be strictly enforced. The objectives for establishing the park included preservation

of the marine habitat, revenue generation through tourism, education and scientific research. Both the park and reserve are government property. Located on the north coast of Mombasa town, the Park extends from the Nyali area to Mtwapa creek and has an area of 10km^2. This area falls within the broader Mombasa Marine Reserve, which covers 200km^2. The Park and Reserve areas include extensive coral reefs, a coral garden, a channel, some cliffs and a number of beaches which offer recreation to locals and tourists alike. The Park accommodates the main recreational site for Mombasa town residents at the public beach.

Visitor statistics show a drastic decline since 1997, attributable to factors such as poor infrastructure and periodic incidents of insecurity within the coastal region. At the same time a number of internal difficulties hamper the smooth management of the Park, such as lack of funds and insufficient well-trained staff.

The protection of marine resources is the responsibility of a national conservation body, the Kenya Wildlife Service (KWS). When the KWS implemented rules for the Mombasa Marine Park, part of the result was the immediate enclosure of an area previously regarded by fishermen as containing a 'common resource'. Enclosure and the associated prohibitions to entry and exploitation of the resource base have both been responsible for upsetting the previous pattern of use and exploitation and instead introduced a new system of resource management that is neither well understood nor accepted by traditional users. The local user community have felt deeply antagonised by the shift in the decision making power, together with the view that the new management system reflects only the interests of the conservation authority and not those of indigenous resource users (*The Ecologist*, 1993).

METHODS

Both quantitative and qualitative methods of inquiry were used. The quantitative aspect comprised analysis of secondary data on revenues from fish catches landed at the area adjacent to the marine park/reserve, the number of fishermen fishing in and around the marine reserve, the number of tourists visiting the Mombasa marine park as well as the catch per unit of effort data. The data were a monthly time series set beginning January 1991 through April 1998. Qualitative information was acquired with the help of a structured questionnaire that was administered in Kiswahili language to 30 fishermen from three fish landing sites. The aim of the qualitative analysis was to acquire an insight into the perceptions and attitudes of fishermen regarding the Park, its resources and the manner in which it was set up.

Statistical analysis was then carried out on quantitative data pertaining to variables chosen in the study to be explanatory or independent. The dependent variable is the revenue while the independent variables are catch per fisher/per unit effort (CPUE), tourists numbers in the park and number of fishermen. Analysing the statistical significance of each of the variables facilitates the drawing of inferences regarding the possible effect that a negative impact on some of the variables may have on the economic status of fishermen.

Quantitative data on the variables are analysed using a regression analysis that utilises the ordinary least squares (OLS) estimation technique. Since OLS assumes that variables are stationary, some unit root tests are first carried out on the data to ensure that variables indeed exhibit stationarity. The following is the general form of the equation estimated for the quantitative data in the study:

$$\mathbf{W_t} = \alpha_o + \alpha_1 X_{1t} + \alpha_2 \alpha_{2t} + \alpha_3 X_{3t} + \alpha_4 D_t + E_t$$

where:
α_o = Constant term
$\mathbf{W_t}$ = Revenue from fish sales
X_{1t} = Number of fishermen
X_{2t} = Number of tourists
X_{3t} = Catch per fisher/per unit effort
$\mathbf{D_t}$ = time dummy capturing the period of December 1995
$\mathbf{E_t}$ = Error term.

RESULTS

After applying the unit root tests, the dependent variable (on the left side of equation 1) becomes *change in revenue* (as opposed to revenue) while lagged values of this change in revenue become additional dependent variables (dependent/explanatory variables are located on the right side of the equation). Lagged values of the number of fishermen and the catch per unit effort are also added to the set of explanatory variables. These additions are incorporated into the above general equation to give the following final equation:

Drev = f (Constant, D $\mathbf{W_t}$ -1, D $\mathbf{W_t}$ -2, D $\mathbf{W_t}$ -3, D $\mathbf{W_t}$ -4, D $\mathbf{W_t}$ -5, X_{1t} , X_{1t} -2, X_{2t}, X_{3t} -1, X_{3t} -2, X_{3t} -5, D9512)

Table 1 presents the results obtained after a regression of the new equation/model is carried out.
The last column, titled 't-Prob', gives an indication of the level of statistical significance for each of the corresponding variables in the first column. Accordingly the variables with the highest degree of statistical significance (1%) are:
−   The first four lags of changes in revenue
−   The number of fishermen
−   The catch per unit effort
−   The dummy variable.

The number of tourists to the marine park has less significance than the other variables listed above, with significance standing at 5%. The R^2 value indicates that 89% of the dependent variable (i.e. change in revenue) is accounted for or explained by the independent variables.

Fishing revenues

The results suggest that past trends in revenues from fish catches are important in explaining current changes in revenue. However, the coefficients of the lagged changes in revenue bring to light an important observation that past increases in revenue do not necessarily

Table 1. Regression results of the new equation/model

Variable	Coefficient	SE	t-Value	t-Prob
Constant	-11940	11047	-1.081	0.284
D W_t -1	-0.54256	0.086392	-6.280	0.000
D W_t -2	-0.29723	0.063361	-4.691	0.000
D W_t -3	-0.26843	0.059422	-4.517	0.000
D W_t -4	-0.19782	0.061147	-3.235	0.002
D W_t -5	-0.085433	0.041158	-2.076	0.042
X_{1t} -2	-1748.5	254.68	-6.865	0.000
X_{2t}	5.8748	2.4346	2.413	0.019
X_{3t}	1469.5	88.206	16.660	0.000
X_{3t} -1	-658.67	162.23	-4.060	0.000
X_{3t} -2	-522.34	156.17	-3.345	0.001
X_{3t} -5	-314.64	90.315	-3.484	0.000
D9512	2.0657e+005	30402	6.794	0.000

R^2 = 0.892386.

always lead to increases in revenues in the following period. This is explained by the fact that no additional capital investment is done by fishermen. Together with a continued upward trend in inflationary pressures, the capital base, e.g. fishing gear becomes worse over time ultimately reflecting itself in reduced revenues. With the enhancement of park rules and regulations and the imposition of gear restrictions in the marine reserve, the situation is only made worse. Fishermen incomes are thus negatively affected by a change in access to certain fishing areas. Perhaps the situation would be different if the fish spillover from the marine park into the marine reserve were substantial.

Fishing is still an important activity to the now reduced number of fishermen in and around the Mombasa marine reserve, as indicated by the significance of number of fishermen and the catch per unit effort. The dummy variable captures an erratic increase in fish catch data, for example owing to the seasonal migration of fish species such as sardines.

Effects of tourism

Partly from the statistical analysis and from discussions with fishermen, the study found that there is no direct relationship between the number of tourists visiting the Marine Park and fish-derived income for fishermen. This is because fish catches from local fishermen do not find their way into the tourist centres located adjacent to the park. This is the area from which the majority of the tourists to the park come from. The reason why these places are not a market for the fishermen's catch is because the quantity and quality does

not meet the required standards. Any relationship that exists is indirect arising from the fact that tourists to the park (and therefore the hotels etc. in the area) lead to a certain increase in the area's 'local' money supply, which the local people tap mostly in the form of employment in tourist centres. The money earned may then be responsible for increasing the purchasing power of local people, and this enables them to purchase more goods, including fish caught by the local fishermen operating within and around the Marine Reserve.

Fishermen's perceptions

Detailed interviews with fishermen found that, on the whole, their attitude towards the Park's existence and management were negative. These attitudes developed as a result of the following factors:

– *Park inception.* Fishermen complained that not enough consultations were carried out between them and KWS. Accordingly, KWS was accused of surprising the fishermen with the demarcation of park and reserve boundaries, using force and intimidation to do so.

– *Compensation.* Not enough compensation or viable alternatives were presented to the fishermen after they were prohibited from fishing in the area taken up by the park. Gear restrictions were enforced in the adjacent marine reserve. According to them, this area contains the most lucrative fishing grounds. At the same time fishing gear is costly for the fishermen, the majority of whom have very limited financial resources. It has thus been impossible for them to replace worn out and inefficient gear with more sophisticated equipment that would enable coverage of greater sea distances to look for better fish catches.

– *Education and vocational status.* Most fishermen were discovered to be of significantly low educational and vocational status and still living within an extended family setup. This inevitably implies that fishermen have minimal or no opportunities for alternative employment.

DISCUSSION

It is now acknowledged by many that environmental conservation is an issue that can no longer be downplayed. At the same time, conservationists and governments have realised that economics and the protection of the environment can no longer be taken to be mutually exclusive aspects. To this end, if economics and conservation are to be non-mutually exclusive, there is need to answer the question of how the economic costs of conservation are to be met and by whom. Conservation authorities should conduct comprehensive pre-establishment studies geared towards assessing the value of the marine resources to be conserved. This is important because sites identified as prime areas for conservation are normally the most economically viable ones to local fishing communities.

Also vital are post-establishment studies that utilise techniques such as cash flow and risk analyses. These analyses help to create an understanding of the magnitude

and extent of the conservation costs that local communities have to bear such that in the medium to long term the possibilities of sharing conservation costs should be well investigated and eventually made a reality.

Since part of the conflict within a marine protected area revolves around the issue of property rights, it is essential for conservation authorities to be aware that certain traditional systems of resource use have existed in most areas for centuries. It is therefore prudent for these authorities to establish the least contentious ways of limiting the traditional freedoms pertaining to indigenous resource users, thereby helping to protect the property rights systems that may exist in such local communities. This can be achieved by the use of well conducted interdisciplinary studies that aim at gaining in-depth knowledge and also an all-round perspective of local communities around protected areas.

Accepting that negative reactions from the community of users are anticipated in establishing MPAs, more so in poorer countries, the challenge that exists for implementers of conservation is that of re-channelling that negativity into a more positive response for the project. From the planning stages, local people should be frequently consulted concerning the selection of the conservation site, the formulation of rules to govern the area as well as in the attempt to achieve a consensus regarding the rate at which the conservation project should be implemented. This latter aspect is vital in enabling affected communities like those of fishermen to acquire alternative sources of income such as may be found in tourism. Though acceptance may be difficult to achieve in the short run, it might be achieved by empowering local communities in ways that make them feel that they are partners in the conservation project. This in turn helps to sow the seeds for longer-term understanding and even appreciation for the project.

It should be the aim of the national government to assist (directly or indirectly) in providing an enabling environment that facilitates the strengthening of financial, managerial, technical and human resource capacities for conservation initiatives. This enables the conservation authorities to adequately deal with a myriad of issues pertaining to communities excluded from areas designated for conservation. The above capacities should necessarily help to create multi-institutional collaboration in order to avoid the duplication of conservation activities, increase efficiency and thereby avoid wastage of resources. In this way conservation institutions become better focused on project goals and activities.

An overlooked aspect of conservation in developing countries regards the collection and proper documentation of data over time. Lack of or insufficient data hinders progress in research. Data collection and management for a broad spectrum of marine resources, their uses and the various users should be an important goal for organisations involved in conservation work. However, data collection and management is a necessary but not sufficient condition for successful environmental conservation. Ultimately, it is the implementation and maintenance of sustainable coastal development programmes that will prove decisive in the achievement of successful marine conservation.

CONCLUSION

The delicate balance of people and resources within marine areas has frequently not received the attention it deserves. Indeed governments and local communities have been slow to grasp those crucial concepts that are needed to maintain the marine environment's monumental link in the ecological chain of life. Without proper planning and implementation, among the first groups of people to suffer economic losses as a result of marine conservation are fishermen. They suffer economic adversity through declines in incomes/revenues as well as through lost employment opportunities when they are excluded from a protected sea area. Declines in earnings are as a result of lower levels of individual and therefore total fish catches. In Kenya this has necessarily led to conflict between local fishermen and the national conservation organisation, the Kenya Wildlife Service.

The negative impacts of conservation, especially on fishermen, are mostly as a result of the lack of alternative economic opportunities for them. Factors negatively influencing fish catch levels such as gear restrictions contribute to a sizeable decline in fish catches from the adjacent marine reserve where a few fishermen are allowed to operate. Further, local fishermen negatively affected by the establishment of the marine park do not have enough technological and financial capacities to help them venture into more lucrative fishing grounds which are further out at sea. The only alternative left to them is to look for new horizontal fishing grounds which in many cases will have other fishermen operating in them. This invasion breeds conflict as initially those they find in the new fishing grounds reject the migrant fishermen. With time, however, the new fishermen get integrated into the group with the result that the average catch per fisherman drops.

It is imperative that conservation attempts be selective in the adoption and implementation of various conservation policies. At the same time, different marine ecological zones within a country need to be carefully studied as to their potential economic as well as social impacts if they do acquire protection status depending on the local issues involved. It is the local issues that ultimately determine the alternative opportunities that local people may have when protection is fully implemented. Additionally, conflict between users and conservation agencies, as in the case of the Mombasa Marine Park, is mostly as a result of information asymmetry, whereby local people are not clearly informed from the start about what conservation fully entails.

Conservation of the marine environment has therefore to enter a new management era in which good planning is not enough but has to be accompanied by legitimate implementation practices which have full knowledge of the conservation site and its dependants. The dependants in turn have a right to know and also an obligation to learn about the fundamental issues pertaining to conservation of the marine environment. If local resource users understand these issues, then conservation-related conflicts could be avoided if not greatly minimised so long as conservation organisations fully recognise the needs, endowments and also the rights of local communities dependent on the resources being conserved.

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