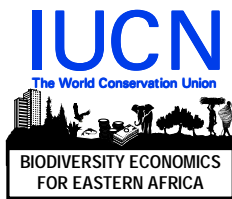

ECONOMIC TOOLS FOR THE MANAGEMENT OF MARINE PROTECTED AREAS IN EASTERN AFRICA

Lucy Emerton
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IUCN – The World Conservation Union
Eastern Africa Regional Office
PO Box 68200, Nairobi, KENYA
[*mail@iucnearo.org*](mailto:mail@iucnearo.org)



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Praslin Island, the Seychelles

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1. THE RELEVANCE OF ECONOMICS TO MARINE PROTECTED AREA MANAGEMENT

1.1 THE ECONOMIC BENEFIT OF MARINE PROTECTED AREAS

Economics is closely linked to marine conservation. Most importantly marine ecosystems provide basic support to economic activities by yielding raw materials, supporting and protecting natural and human systems and maintaining options for future economic production and growth – to households, to businesses, to governments and to the global community. Economic analysis helps to understand and quantify both the value of these benefits, and the costs associated with their loss, and thus provides a basic justification for marine conservation and protected area establishment.

1.2 ECONOMIC CAUSES OF MARINE DEGRADATION AND LOSS

Economic factors are also linked to marine degradation and loss. Production and consumption activities impact directly on marine ecosystems through using up non-renewable resources, converting resources and habitats to other uses and adding wastes and effluents to the air, land and sea. In turn a range of broader economic factors permit these activities to occur, including macroeconomic and sectoral policies, social and economic conditions. Economic analysis aims to identify these activities and to predict the underlying root causes of marine degradation and loss.

1.3 THE ROLE OF ECONOMIC TOOLS AND MEASURES

In line with these links, the successful operation of marine protected areas depends to a large extent on integrating economic concerns into their management. Unless marine protected areas make economic sense and generate benefits which are at least equal to any costs they incur, to all the groups who have the potential to influence them or upon whose economic welfare they impact, they are unlikely to be viable or sustainable. The successful establishment and maintenance of marine protected areas depends on ensuring that sufficient finance is available to run them, that stakeholder groups are provided with sufficient incentives to support conservation, and that the underlying economic threats to their integrity and status are overcome. Economics provides a range of tools and measures which can be used to address these issues of equity, efficiency and sustainability and to support marine protected area management, including:

- ❖ Demonstrating the high economic values associated with marine conservation and the significant and wide-ranging costs associated with marine degradation, and thus *justifying the establishment of marine protected areas* as a socially and economically desirable use of funds and resources for the government, the private sector and local communities;
- ❖ *Improving and rationalising marine protected areas management* by integrating business and economic concerns into conservation planning and practice;
- ❖ *Providing incentives for marine conservation* by ensuring that adequate economic benefits accrue from conservation and sustainable use to the groups who

have the potential to impact on marine resources and ecosystems through their economic activity;

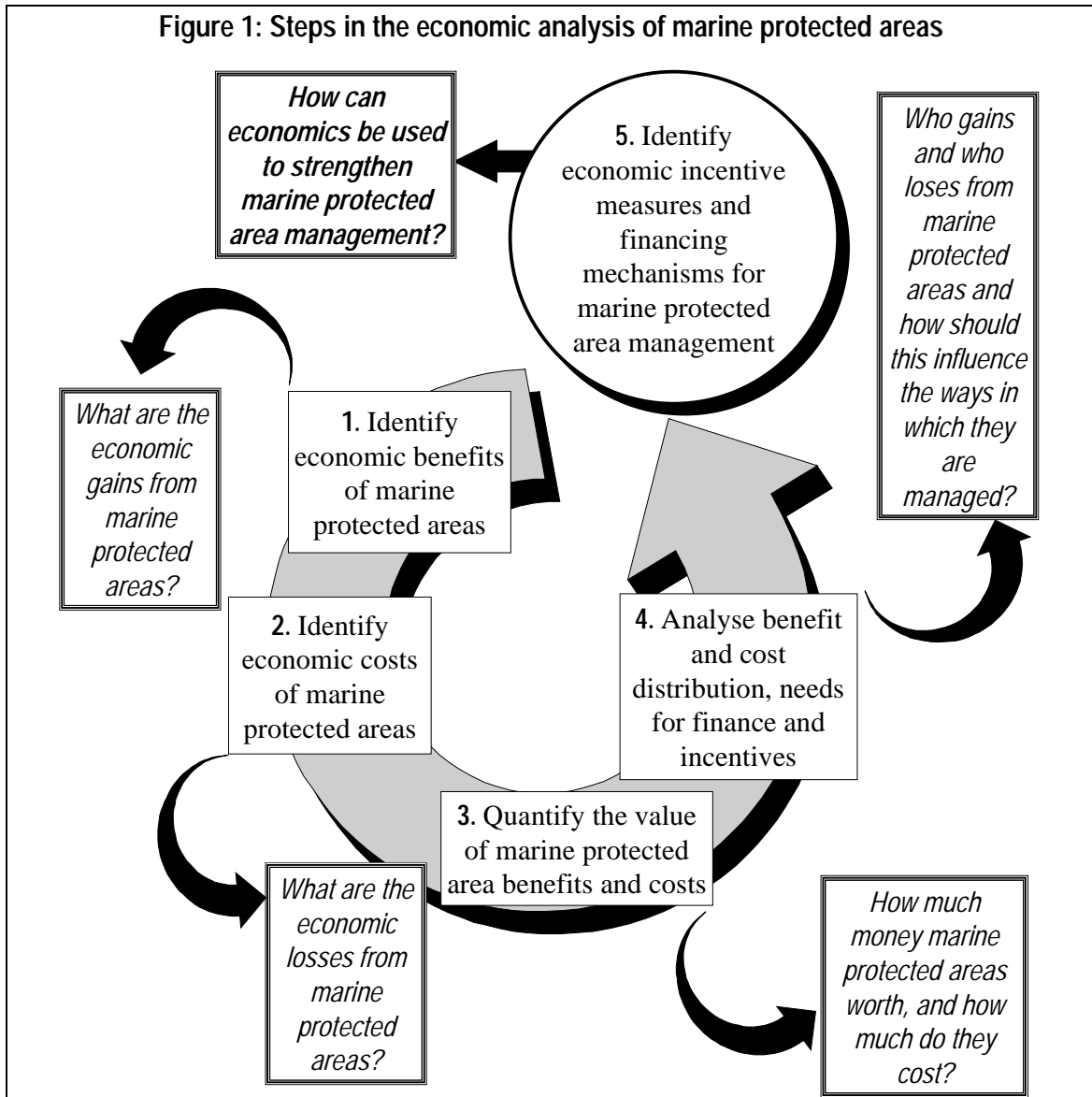
- ❖ ***Identifying sustainable sources of funding and financing mechanisms*** for marine conservation at community, private sector, government and international levels.

2. A FRAMEWORK FOR THE ECONOMIC ANALYSIS OF MARINE PROTECTED AREAS

There are five major steps in the economic analysis of marine protected areas:

1. ***Identify the economic benefits of marine protected areas:*** A first step in economic analysis is to define how marine protected areas contribute to economic activities. This information highlights the economic importance of marine conservation helps to provide a basic justification for marine protected areas as an economically, ecologically and socially desirable use of funds and resources.
1. ***Identify the economic costs of marine protected areas:*** A second step in economic analysis is to define the costs that will be incurred in establishing and running marine protected areas. This information helps to identify the physical and resource requirements for marine protected areas.
2. ***Quantify the value of marine protected area benefits and costs:*** A third step in economic analysis is to as far as possible quantify the benefits and costs associated with establishing and running marine protected areas. This information helps to identify and predict how much marine protected areas will be worth, and will cost, in monetary terms
3. ***Analyse benefit and cost distribution, needs for finance and incentives:*** A fourth step in economic analysis is to identify how the benefits and costs of marine protected areas are distributed between different groups. This information helps to identify who gains and who loses as a result of marine protected areas, how this will influence their operation, and to identify the needs and niches to set in place measures which will support marine protected area management by more equitably sharing their benefits and costs.
4. ***Identify economic incentive measures and financing mechanisms for marine protected area management:*** A final step in economic analysis is to identify the tools and measures which can be set in place to finance and provide incentives for marine protected areas. This helps to define a set of practical economic measures and tools which can be integrated into on-the-ground marine protected area management.

Figure 1: Steps in the economic analysis of marine protected areas



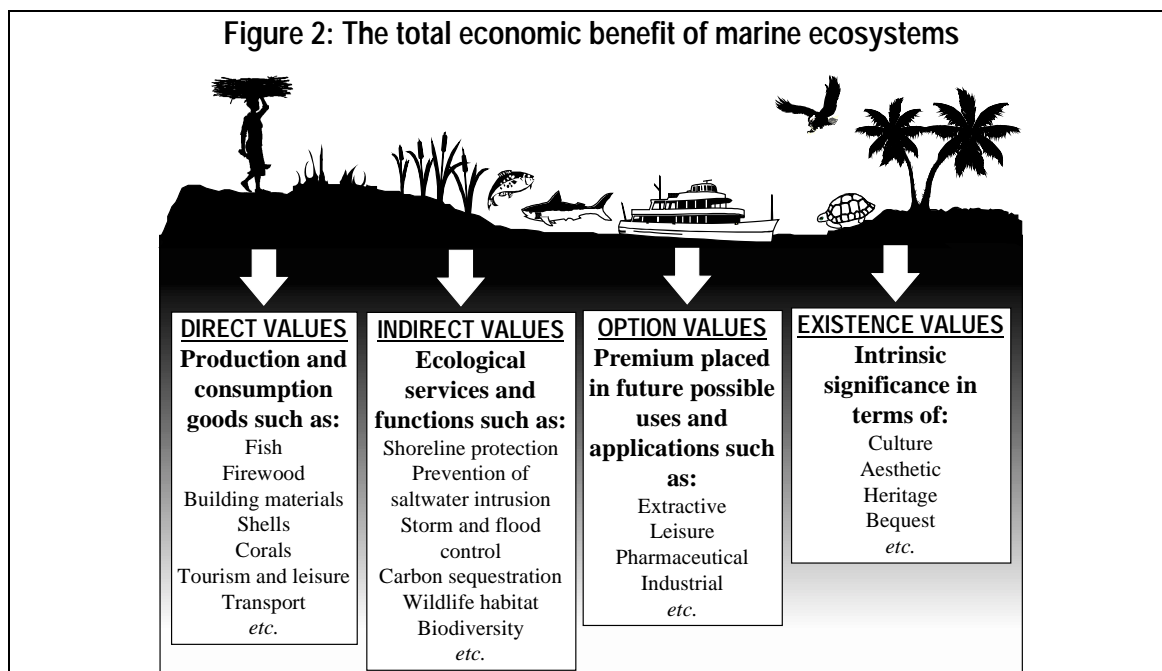
3. IDENTIFYING THE ECONOMIC BENEFITS OF MARINE PROTECTED AREAS

A first step in economic analysis is to identify the range of benefits which are associated with marine protected areas.

Marine ecosystems typically yield multiple economic benefits. These benefits present a major justification for their reservation as protected areas – because of their high value, marine and coastal zones need to be conserved if they are to continue to yield economic benefits, support human consumption and production opportunities and contribute to economic activity and growth in the future.

3.1 THE TOTAL ECONOMIC BENEFIT OF MARINE ECOSYSTEMS

Traditionally, both economists and decision-makers have tended to see the value of marine resources in terms of only raw materials and physical products, especially focusing on commercial fisheries activities. This narrow view of economic benefits has often acted to the detriment of the conservation marine ecosystems, because it under-represents their economic importance and value and ignores a large proportion of the goods and services they provide. Marine ecosystems generate economic benefits far in excess of just physical products.



In order to ensure that the full economic significance of marine ecosystems is taken into account, the concept of ***total economic value*** now forms the basis of most attempts to identify marine benefits. The total economic value of marine ecosystems is the sum of:

- ❖ **Direct values:** raw materials and physical products that can be bought, sold and consumed directly, such as recreation, foods, building materials, fuel and handicrafts which are obtained from marine ecosystems and the species found in them;
- ❖ **Indirect values:** services and functions provided by marine ecosystems which maintain and protect natural and human systems such as coastal protection, storm control, carbon sequestration and the provision of breeding grounds and habitat for marine fish, bird and mammal species;
- ❖ **Option values:** the premium placed on maintaining marine ecosystems and their component species for future possible uses, some of which may not even be known now, such as extractive and tourism opportunities, pharmaceutical and industrial applications;
- ❖ **Existence values:** the intrinsic value of marine to people, regardless of their direct use, including cultural, scientific, aesthetic, heritage and bequest significance.

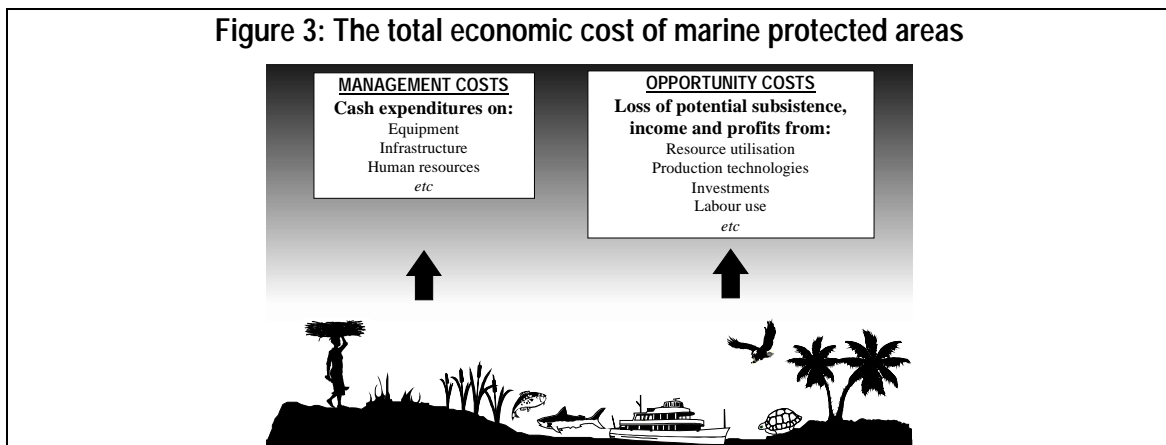
4. IDENTIFYING THE ECONOMIC COSTS OF MARINE PROTECTED AREAS

A second step in economic analysis is to identify the range of costs which are associated with managing a marine protected area.

Despite their clear economic benefits, establishing and maintaining marine protected areas is not cost-free. As is the case with any enterprise or business, consideration of the nature of these costs forms a vital part of marine protected area management.

4.1 THE TOTAL ECONOMIC COST OF MARINE PROTECTED AREAS

As is the case for benefits, the costs associated with marine protected areas have often tended to be underestimated by economists and decision-makers. The major focus has been on the direct investment and recurrent expenditures needed to establish and run protected areas in terms of infrastructure, equipment and staff. The fact that the presence of marine protected areas also entail costs because they preclude, diminish or interfere with other economic activities – and that the value of these costs generally far exceed direct management expenditures – has been largely ignored.



It is useful to apply a concept of *total economic cost*, so as to ensure that all the expenditures and losses arising from marine national parks are taken into account in economic analysis. The total economic cost of marine protected areas is the sum of:

- ❖ **Management costs:** direct physical expenditures on the equipment, infrastructure and human resources required to manage marine protected areas;
- ❖ **Opportunity costs:** land and resource uses which are foregone or precluded by protecting in marine areas and restricting the economic activities taking place in them, and the alternative income and profits which could have been generated by human, physical and financial resources had they been allocated elsewhere in the economy instead of being used to establish and run marine protected areas.

5. VALUING ECONOMIC BENEFITS AND COSTS

A third step in economic analysis is to identify the extent to which the costs and benefits associated with a marine protected area can be quantified, and to choose the most appropriate methods and collect the necessary information to enable them to be valued.

5.1 THE AIM OF VALUATION

The basic aim of valuation is to determine people's preferences – how much they are willing to pay for, or how much better or worse off they would consider themselves to be as a result of changes in the supply of, different marine goods and services. Valuation provides a means of quantifying the economic costs and benefits that accrue to different people from marine ecosystems, the economic costs arising from their degradation or loss, and the relative profitability of the different economic activities which take place in and around marine protected areas. Valuation helps to understand and predict the economic decisions and activities which impact on the status and integrity of marine protected areas.

Placing monetary values on marine benefits and costs puts them on an equal footing with other sectors of the economy. It allows marine values to be considered and incorporated, rather than ignored, when planning and management decisions are made – in the context of establishing and running marine protected areas as well as in other sectors of the economy which impact on them.

5.2 TECHNIQUES FOR QUANTIFYING DIRECT VALUES

As illustrated in Table 4 a range of methods can be used to quantify the direct values associated with marine ecosystems. Each has varying applicability, and choice of technique will be determined largely by the nature of each value being considered, available information and overall aims of valuation.

Figure 4: Techniques for quantifying the direct value of marine ecosystems and their applicability

Technique	Applicability
Market prices	Marine products which can be bought and sold directly
Prices of alternatives or substitutes	Marine products which have close substitutes which can be bought and sold
Costs of collection and preparation	Marine products whose collection and preparation requires marketed inputs
Contingent valuation	Marine products whose value is clearly perceived
Participatory valuation	Marine products with a high domestic or subsistence value
Travel costs	Marine tourism and recreation

5.2.1 Market prices and their limitations

The most simple and straightforward way of finding out the value of marine goods is to look at their market prices – what they cost to buy or are worth to sell. These prices reflect what people are willing to pay for them, the value that they place on them.

Collecting data about market prices, sales and purchases is a good way of quantifying the value of marine products which can easily be bought or sold – for example fish, shells, firewood, hotel charges or diving fees. This method can also be used to quantify the value of marine products which are used within the household – as long as they have a market, their price represents expenditures saved or potential to earn income.

Box 1: Using market prices to value Eritrean trade in marine species

A wide range of marine products in addition to fish are marketed locally and exported from Eritrea including turtle meat, sea cucumbers, sharks fin, shells and aquarium fish. Using the volumes of products collected and sold, and their market price, the total annual value of these sales was estimated to be in excess of US\$ 1.6 million.

(Source: Emerton and Asrat 1998)

Although market prices are undoubtedly a useful way of quantifying economic values, they are often difficult to apply to marine goods. A major problem is that many marine products have no market at all – for example those which are used for subsistence purposes only and never sold. In other cases market prices are distorted because of taxes, subsidies, monopolies or various other interventions and do not reflect the true value of marine products. Where no market exists for marine products, or where market prices are too distorted to be used, it is necessary to find alternative valuation methods. These are described in the paragraphs below.

5.2.2 Prices of alternatives or substitutes

Even where marine products have no direct market themselves, they often have close substitutes which can be bought and sold. For example if fish and meat from marine species were not locally available people might have to meet their protein requirements from purchased foods, bricks and tiles might be a substitute for coral, mangrove and thatch building materials, road transport might be an alternative to sea travel.

The prices of these substitute goods represent what it would cost to buy the next best alternative if marine products were not available. They can be used as a proxy for the value of marine goods because they reflect the amount of money that they are worth in terms of expenditures saved.

Box 2: Using substitute prices to value the use of coral for building on Mafia Island, Tanzania

Two forms of coral are mined around Mafia Island, Tanzania – coral rag from island sources, and living reef coral. Mafia's residents are entirely dependent on coral for building materials. The value of this coral can be calculated by looking at the price of substitute building materials – cement imported from the Tanzanian mainland – of US\$ 140/tonne.

(Source: Dulvy et al 1995)

5.2.3 Costs of collection and preparation

Even when marine products have no market prices, and no market substitutes, people spend time and other inputs collecting and preparing them. That people are willing to allocate scarce labour and other resources to obtaining marine products shows that they

place a value on them. Labour, equipment and other inputs used in the collection and preparation of marine products for sale or home consumption all usually have a price – either in market terms or in terms of the potential income which could be generated if they were allocated to other productive activities.

The labour and other costs spent collecting and preparing marine products for consumption can be used to estimate their worth. It represents the value of marine products in terms of foregone wages and income – the amount of cash which could have been generated if the time and other resources used for marine product utilisation had been allocated to other products or consumption items.

Box 3: Using collection and preparation costs to value subsistence fishing in the Zambezi Delta, Mozambique

Fishing forms an important source of income and household protein in Chinde District in the Zambezi Delta, Mozambique. As catches are highly variable, and most activities are carried out by small-scale artisanal fishers it is difficult to estimate directly fish production or values. The number of fishermen, and daily effort, is however known. If rural casual wage rates are some US\$ 1 per day, an equivalent of some 18,000 days per season worth US\$ 18,000, are expended on fishing activities in Chinde District.

(Source: adapted from Turpie, Smith, Emerton and Barnes 1998)

5.2.4 Contingent valuation

Even when marine goods are not marketed, people place a value on them. This value may simultaneously reflect many different attributes of marine resources and ecosystems including their consumption value, social and traditional significance – for example the perceived benefits of products such as construction materials, medicines and wild foods commonly combine utilitarian and cultural aspects. Contingent valuation methods have become one of the most widely-used techniques used to quantify environmental benefits which have no market and whose value simultaneously incorporates multiple components. As described below, they are also one of the only approaches which can be used to estimate the option and existence values associated with marine and coastal ecosystems.

Contingent valuation is not based on observed market behaviour or prices, but instead infers the value that people place on marine goods by asking them questions directly. They set up a hypothetical scenario where products could be bought or sold and elicit bids about how much people would be willing to pay to use or consume them, or how much compensation they would be willing to accept for the loss of their use. They ask questions such as “how much would you be prepared to pay for a licence to collect shells?”, “what charge would you be willing to accept to enter this marine park?” or “if coral reefs became badly degraded how much compensation would you need to be given?”.

Contingent valuation methods are a particularly good way of valuing marine products which have no market, are not consumed directly, or have strong cultural or traditional importance in addition to their actual use. They are also useful in cases where, even though market prices may exist, it is impossible to estimate the quantity of marine goods consumed.

Box 4: Using contingent valuation to assess willingness to pay for marine conservation in Batangas Bay, Philippines

A contingent valuation survey was used to assess the perceived conservation value of Batangas Bay in the Philippines, and the willingness of coastal dwellers to pay for this conservation. This included questions about the amount that householders would be willing to increase their garbage collection and sewage treatment payments so as not harm the marine environment, their willingness to pay fees to maintain fisheries resources and to contribute towards coral reef conservation. Results of the survey indicated people's willingness to pay for actions to conserve the marine environment – the value that they place on various attributes of Batangas Bay.

(Source Tejam and Ross 1997)

5.2.5 Participatory valuation

Contingent valuation usually elicits monetary bids from people in order to estimate marine values. People however frequently become suspicious when faced with a scenario involving payments, taxes or compensation. They will often under-quote the amount of money they would be willing to pay for marine goods if they fear that such charges may actually be made in the future, and over-quote the compensation they require if they think there may be a possibility of actually receiving payment. Additionally, many marine products are used within the context of rural subsistence economies where cash is not the main medium of local value. Cash-based contingent valuation is often an inappropriate method for valuing marine utilisation in developing countries.

Participatory valuation, although sharing some characteristics with contingent valuation, does not use cash amounts to express marine values. Instead it asks people to value marine products in terms of other locally important products or categories of value. It allows respondents to choose a numeraire for valuation which is a commonly used, marketed and valued product in the local economy – for example a sack of maize, a radio or a cow – and express the worth of different marine products in terms of this numeraire using PRA techniques such as ranking or proportional piling.

Box 5: Using participatory valuation to value marine and coastal products use in the Zambezi Delta, Mozambique

Marine and coastal resources form an important part of domestic subsistence and local livelihoods in the Zambezi Delta, Mozambique. The bulk of products are used within the household only, and are never bought or sold. Utilisation is also highly variable at different times of the year. Many uses are illegal, and some also have ritual or cultural significance, and knowledge is considered the preserve of specialist groups. For all these reasons it was necessary to use an indirect technique for valuation which would allow people to define values within the context of their own perceptions, needs and priorities rather than according to cash amounts. Whereas households proved reticent in the face of direct questioning, drawing and manipulating pictures of different marine and coastal activities was found to be a good means of stimulating discussion. These pictures were used to value utilisation. Because cash measures had little relevance in a subsistence economy such as the Zambezi Delta, it was necessary to find a numeraire for valuation which formed part of the local socio-economy, had wide significance as an item of value, and could be translated easily into a monetary amount. Fishing activities were most appropriate measure of local value. Picture cards depicting marine and coastal activities were laid out, each household then distributed beans as counters between these different activities. It was thus possible to measure the perceived value of marine and coastal products in terms of fish equivalents, and translate each into a cash amount based on the market value of fish.

(Source: adapted from Turpie, Smith, Emerton and Barnes 1998)

5.2.6 Travel costs

Marine ecosystems often hold a high value for tourists and local visitors as a recreational or leisure destination – for example for sailing, swimming, diving, snorkelling or bird-watching. Even when people do not pay a fee to enter or use marine areas for recreational purposes they expend time and money to visit them. These expenditures reflect the value that visitors place on them.

The travel cost method of valuation calculates the costs incurred in visiting and using marine ecosystems – for example including petrol, bus fares, labour time, accommodation and other charges. It then constructs a demand function relating visitation rates to travel expenditure, which expresses the extent to which people use marine ecosystems at different cost levels, and allows consumer surplus – the value received from marine ecosystems over and above what is actually paid – to be calculated.

Box 6: Using travel costs to value tourism in the Great Barrier Reef Marine Park, Australia

A total of over 21.5 million visitor nights are spent in the Barrier Reef region of Australia each year. The average cost per trip is A\$ 156 for domestic visitors and A\$ 1,121 for foreign tourists. If visitors spend an average of a week on the Barrier Reef, the total travel costs associated with the marine park may be nearly of A\$ 800 million a year.

(Source: adapted from Craik 1994)

5.3 TECHNIQUES FOR QUANTIFYING INDIRECT VALUES

As illustrated in Table 5 a range of methods can also be used to quantify the indirect values associated with marine ecosystems. Each has varying applicability, and choice of technique will be determined largely by the nature of each value being considered, available information and overall aims of valuation.

Figure 5: Techniques for quantifying the indirect value of marine ecosystems and their applicability

Technique	Applicability
Market prices and stated preference	Marine services which can be bought and sold directly, have substitutes which are marketed, or have a clearly-recognised economic value
Replacement costs	Marine services which can be replaced by artificial means
Effect on production	Marine services which are closely linked to other production activities
Damage avoided/preventive expenditure	Marine services which protect human systems and economic activities

5.3.1 Market prices and stated preference methods

Some of the techniques described above which use market prices or stated preferences to value marine products can also be applied to indirect values – to the ecological services and functions associated with marine and coastal ecosystems. They however rely on the existence of actual or substitute markets for marine services or on clear and demonstrable links between marine services and economic benefits – neither of which often apply.

Because of the indirect impact of marine services on production and consumption, as they typically have no market, and due to the fact that they generate wide-ranging off-site

economic benefits, it is usually necessary to find additional methods to value marine services. These are described in the paragraphs below.

5.3.2 Replacement cost

If marine services were no longer available it would sometimes be possible to replace them by alternative means – for example the shoreline protection function of coral reefs could be replaced to some extent by the construction of groynes and barriers. These replacement costs represent the value of marine services which can be at least partially replicated by artificial or technological means. They reflect expenditures saved by the presence of naturally-occurring marine and coastal ecosystems and their associated functions and services.

Box 7: Using replacement costs to value marine and coastal ecosystem shoreline protection functions of in Seychelles

Coral reefs, coastal marshes and mangroves all play an important role in shoreline stabilisation, erosion control, flood and storm protection on Mahé Island in the Seychelles. The value associated with these functions was calculated by applying a replacement cost approach. In the absence of marine and coastal ecosystem services it would be necessary to construct groynes and flood barriers to offset or prevent coastal erosion and damage to infrastructure, to a total cost of some US\$ 0.8 million a year.

(Source: Emerton 1997)

5.3.3 Effect on production

Marine services support other economic processes and activities – for example mangroves, by providing breeding habitat, support fisheries production. Where these other economic activities have a market value it is possible to look at the changes in production and consumption arising from changes in the status and integrity of marine ecosystems. These effects on production reflect the indirect contribution of marine ecosystems to economic output.

Box 8: Using effect on production to value services provided by the Anolis Lizard in the Greater and Lesser Antilles

The Greater and Lesser Antilles in the Caribbean rely heavily on the export of sugar cane, bananas and cocoa. The Anolis lizard plays an important part in pest control for these crops, because it feeds on insects. A reduction in the lizard population on the islands would require increased pesticide applications. The market price of lost agricultural output to pests in the absence of services provided by the Anolis lizard corresponds to about US\$ 670,000 for every 1% reduction in the lizard population, to a total maximum cost of US\$ 455 million.

Source: Narain and Fisher 1994)

5.3.4 Damage avoided and preventive expenditure

Marine services, as well as generating economic benefits, help to avoid economic costs – for example by minimising the impacts of storms and flooding or by protecting shorelines. Calculating the value of the damage which would occur as a result of the loss or irrevocable degradation of marine and coastal ecosystems –for example the costs of destruction to houses, roads, bridges and farms caused by storms and flooding – provides a way of valuing marine services in terms of losses avoided and costs saved.

Alternatively, marine services can be valued by looking at how much it would cost to set in place measures to prevent or mitigate the damages arising from their loss. For example flood control barriers might be needed to offset or prevent negative impacts associated with the loss of flood control services. All these expenditures represent the value of marine services in terms of costs saved.

Box 9: Using damage avoided to value carbon sequestration functions of coral reefs in Djibouti

By absorbing carbon, coral reefs in Djibouti help to mitigate the effects of global warming. Djibouti's coral reefs, with a surface area of at least 6.105 million m², are estimated to have a net primary productivity in excess of 2,500 g carbon/m²/year. With the costs of damage arising from global warming estimated at an average of US\$ 20/tonne, marine ecosystems in Djibouti may generate economic benefits of over US\$ 0.3 million a year in terms of global warming damage avoided.

(Source: Emerton 1998)

5.4 TECHNIQUES FOR QUANTIFYING OPTION AND EXISTENCE VALUES

It is extremely difficult to quantify marine option and existence values, largely because neither have a market or support directly production and consumption activities. Usually the only way to quantify option and existence values is to use some kind of method which calculates through indirect means people's stated or observed preference for marine ecosystems – for example by using contingent or participatory valuation, or by assessing the amount of money contributed from outside towards marine conservation. Both types of valuation methods have the disadvantage that they are usually difficult, costly and time-consuming to carry out. For this reason, despite their importance and significant economic worth, the option and existence values associated with marine ecosystems often remain unquantified.

5.5 TECHNIQUES FOR QUANTIFYING THE COSTS OF MARINE PROTECTED AREAS

As illustrated in Table 6, market prices and effect on production techniques have the most applicability to valuing the costs associated with marine protected areas.

Figure 6: Techniques for quantifying the indirect value of marine ecosystems and their applicability

Technique	Applicability
Market prices	Management costs
Effect on production	Opportunity costs, costs to other activities

5.5.1 Management costs

The direct costs of marine protected areas can be calculated by identifying the labour, equipment, infrastructure, vehicles and other investment and recurrent expenditures required for their management. In most cases these can all be valued at market prices.

Box 10: Using market prices to value the costs of managing marine protected areas in Kenya

The direct costs of conserving three of Kenya's Marine National Parks – Kisite, Malindi and Watamu – were calculated by analysis of the annual budgets of the Kenya Wildlife Service, the national agency responsible for their management. In total staff, equipment, infrastructure and maintenance costs for the three Marine National Parks were in the financial year 1994/5 equivalent to some US\$ 0.28 million at today's prices.

(Source: Emerton 1999)

5.5.2 Opportunity costs

The two main opportunity costs associated with marine protected areas are the income and subsistence losses arising from curtailing unsustainable resource utilisation activities within protected areas, and the cash expenditures and income and subsistence losses arising from modifying or limiting economic production activities upstream or inland from protected areas. All can usually be valued using effect on production techniques.

Box 11: Using effect on production to value the maximum local opportunity costs of Mafia Island Marine Park, Tanzania

In the course of planning for the establishment of a marine park around Mafia Island Tanzania the opportunity cost of curtailing local utilisation activities was valued using an effect on production approach. Surveys established that local marine resource use in the park area contributes income and consumption goods worth US\$ 0.27 million from finfishing, octopus fishing, coral for lime and building, shells and sea cucumbers million. Depending on the restrictions on local resource utilisation set in place, the opportunity costs of park establishment would comprise the loss of some of these values.

(Source: Andersson and Ngazi 1995)

5.6 LIMITATIONS TO VALUATION

Valuation is a useful tool for marine protected area management because it highlights a range of costs and benefits which have in the past often been ignored by planners, policy-makers and decision-makers. Valuation techniques however only provide tools which help to make better and more informed decisions about marine protected area management – they are not ends in themselves, and have a number of shortcomings and weaknesses. There are a number of methodological issues and limitations which should always be borne in mind when carrying out marine valuation:

- ❖ Marine valuation is usually, of necessity, *partial*. Most quantified estimates of the economic benefit of marine goods and services focus only on selected components of their value. They should be taken as a minimum estimate of the total economic value of marine ecosystems.
- ❖ The *reality of values* is sometimes limited. They are rarely “real” values and often do not exist in terms of concrete prices and income. Rather than definitive or binding figures, most values should be seen as indicative estimates which present a guide to what marine protected areas may be worth, for use in planning, decisions and policy. It is always important to make explicit the hypotheses, suppositions and assumptions which have been used in the course of marine valuation.

- ❖ The value of marine protected areas are ***unequally distributed*** between people and over time. Most valuation techniques do not take account of this differentiation or variability. Different people have different perceptions of the value of marine resources and ecosystems, and these may vary at different times. Economic valuation is usually based on a particular person's or group's conception of what a particular marine good or service is worth at a specific point in time. It is not necessarily universally valid, or extrapolable between different groups, areas, species or over time.
- ❖ The loss of marine resources and ecosystems can have ***irreversible effects*** including the complete collapse of human livelihoods, the permanent loss of consumption and production possibilities or the total extinction of wild species. The full risk or ultimate implications of these losses, or how the loss of one species or habitat may affect other resources or activities in the future, is not known. The final or knock-on effects of marine ecosystem degradation can never be fully quantified or reflected in economic valuation.
- ❖ Some marine benefits will always be ***unquantifiable and unmeasurable*** because the necessary scientific, technical or economic data is not available. Other aspects of marine valuation which relate to human life or religious and cultural significance involve ethical considerations, especially when they are used to argue that specific activities or particular people's needs are more desirable or important than others. It is impossible to value marine protected areas fully, and in some cases it should not even be attempted.

6. ANALYSING THE DISTRIBUTION OF BENEFITS AND COSTS, NEEDS FOR INCENTIVES AND FINANCE

A fourth step in economic analysis is to identify stakeholder groups to whom the costs and benefits associated with marine protected areas accrue, to identify who are the gainers and losers under the *status quo* and by how much and to highlight groups who need additional incentives, benefits or finance to be willing and able to support marine protected area, and those who are willing or able to contribute towards management costs.

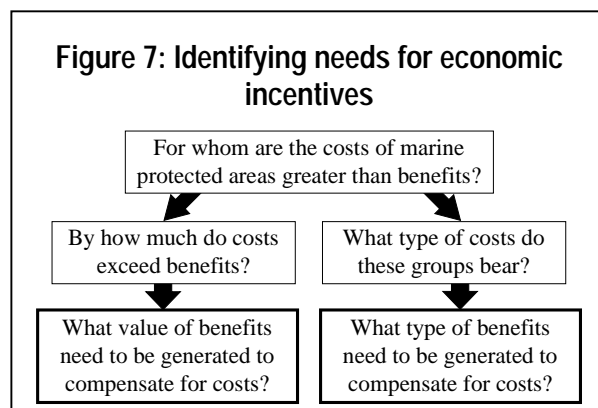
6.1 THE AIM OF DISTRIBUTIONAL ANALYSIS

The economic activities of various groups of stakeholders are impacted upon by, or themselves have the potential to influence, the status and integrity of marine protected areas. The costs and benefits of marine protected areas are unequally distributed between these groups – for example between government wildlife authorities, artisanal fisherfolk, hoteliers and tourists. The aim of analysing the distribution of benefits and costs is to see who, under the *status quo*, gains and loses from the presence of marine protected areas. This provides important information about the need to set in place additional and targeted economic incentives and financing mechanisms as part of marine protected area management.

The varying distribution of the costs and benefits of marine protected areas is not only inequitable, it has the potential to influence conservation. For example, if marine protected areas impose high livelihood costs on local villagers by preventing them from fishing and collecting marine resources, without benefiting them in other ways, they are unlikely to be prepared to support conservation. There is no reason why tourist operators or recreational visitors should be allowed free access to marine protected areas if they gain a high economic value from this, because they are in a position to pay for this use and profit.

6.2 MARINE PROTECTED AREA LOSSES AND THE NEED FOR INCENTIVES

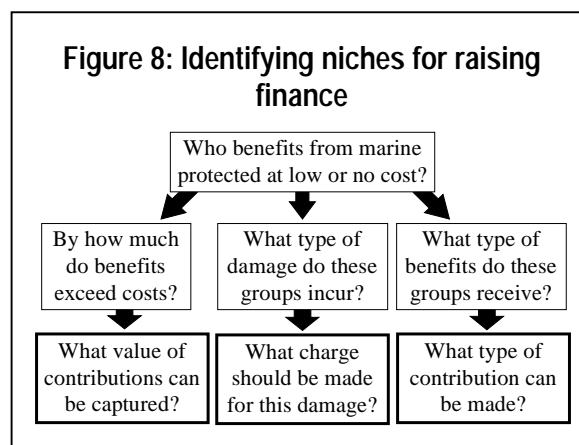
The groups to whom a greater cost is incurred from the presence of marine protected areas than the benefits that accrue to them have few incentives to support conservation because it makes little economic sense to them. They may also be financially unable to do so. As long as this is the case marine protected areas will be economically unviable and unsustainable. Identification of the groups who are net losers from the establishment of marine protected areas – for example local



fisherfolk or marine resource harvesters – highlights where there is a need to set in place measures which will generate additional finance and incentives, and indicates the value and form that these measures must take to compensate for costs.

6.3 MARINE PROTECTED AREA GAINS AND NICHES FOR RAISING FINANCE

Two main groups of stakeholders benefit from marine protected areas at low or no cost – those whose are permitted to utilise or profit from, and to degrade or pollute, marine environments without having to bear the full economic cost, or pay the full market price, associated with their economic activities. Because they do not bear the costs associated with their actions these groups are encouraged to treat marine protected areas as a free or cheap good which can be mined, depleted or over-used. They also



represent a potentially important source of untapped revenues. It is important to identify these groups – for example hoteliers, tourist boat operators, recreational visitors or industries who pollute the marine environment – and to quantify the costs of the damage they cause to marine protected areas or the value of the benefits they receive, so as to be able to enforce penalties for this damage or charges for this use. Economic analysis shows where the beneficiaries of marine protected areas can be encouraged to contribute towards costs – and where they can afford to do so. Identifying and quantifying marine protected area benefits which are received at low or no cost highlights niches for these groups to generate finance for, and share in the costs of, marine protected area management.

6.4 IDENTIFYING NEEDS AND NICHES FOR COST AND BENEFIT SHARING

Analysis of the distribution of marine protected area costs and benefits, by identifying gainers and losers and quantifying their gains and losses, presents a clear statement of needs and niches for the generation of finance and incentives. As well as defining the monetary value and funding needs for this compensation or payment, economic analysis points to the form in which cost and benefit sharing arrangements can be implemented.

7. INTEGRATING ECONOMIC MEASURES INTO PROTECTED AREA MANAGEMENT

A final step in economic analysis is to identify practical tools and measures which can be used to effect marine protected area financing and the provision of incentives, and to integrate these tools into management planning and practice.

7.1 THE AIM OF ECONOMIC MEASURES

A range of economic tools and measures can be incorporated into marine protected areas management. Their aim is to translate the findings of economic analysis into a set of practical, on-the-ground measures which can be used to overcome the economic forces driving marine degradation and loss, to ensure that marine protected areas are equitable, efficient and sustainable in economic terms and to strengthen and support they way in which they are managed. Economic measures basically operate in three areas:

- ❖ To ensure that tangible benefits accrue to the groups who bear the direct or indirect costs associated with marine protected areas, and thus to present them with positive economic incentives for conservation.
- ❖ To penalise people for carrying out economic activities which contribute to marine degradation to its full costs, and thus to either discourage them from damaging marine environments or to raise sufficient funds to protect against or reverse this damage.
- ❖ To capture a reasonable level of funds from the groups who benefit from marine protected areas at low or no cost and use these funds to cover the direct and indirect costs associated with the management of marine protected areas.

7.2 ECONOMIC INCENTIVE MEASURES FOR MARINE PROTECTED AREA CONSERVATION

A range of economic incentive measures can be used to ensure that people perceive an economic gain from contributing towards the conservation of marine protected areas. All have the basic aim of increasing the economic benefits generated by marine protected areas to a level which is commensurate with the costs they incur.

7.2.1 Property rights

Property rights deal with the fact that many groups, even when they have a major stake, interest or right in marine protected areas, are excluded from participating in their management by the absence of well-defined rights to do so. As long as people do not have a secure stake in marine protected areas, they will be precluded either from benefiting directly from their conservation or being forced to bear the implications of their degradation and loss. Property rights can take many forms, from outright ownership of a marine area, through rights to manage or utilise particular resources through to representation in management and decision-making bodies.

Box 12: Property rights in marine protected areas in St. Lucia

A collaborative management agreement has been established between government and a community institution with the capability of managing a marine protected area and administering a fee system. Fees raised will be placed in a separate government fund, which will make quarterly payments to the community institution for the management of the protected area.

(Source: Geoghegan 1996)

7.2.2 Resource utilisation

Permitting some level of resource utilisation can provide a powerful incentive for protected areas conservation, by providing a stake in the conservation of marine resources and ensuring that tangible benefits are generated by the presence of protected areas. This can either comprise the continuation of existing resource utilisation activities which are sustainable and do not damage marine environments or the provision of new types of resource utilisation as a direct compensation for unsustainable activities foregone and includes both consumptive and non-consumptive activities such as tourism, products harvesting and processing.

Box 13: Developing new utilisation activities and markets for marine products in the Bazaruto Archipelago, Mozambique

The Bazaruto Archipelago is one of Mozambique's most valuable marine areas, is rich in resources and is among the country's most vulnerable and fragile ecosystems. In order to ensure the long-term conservation of this marine area, a number of activities have been set in place which aim to stimulate sustainable use by local communities. These are focused on eco-tourism and artisanal resource use activities, which are being promoted specifically to compensate local villagers for the loss of land and fishing resources by the establishment of a National Park. Simultaneously a range of new activities are being introduced to villagers, including permaculture and vegetable farming projects, aiming to take pressure off marine resources.

(Source: Reina 1998)

7.2.3 Developing and improving markets

Developing new markets for marine products, and improving existing ones, both provides a means of raising the overall value gained from protected areas and of increasing the value-added to other activities as a compensation for marine activities foregone. As well as being applicable to marine goods – such as fish, coral, shells and recreational activities, developing new markets and charges for marine services and functions – such as support to fisheries production or the protection of shoreline settlements and developments – provide an innovative and potentially significant source of economic gain.

7.2.4 Fiscal and financial instruments

Fiscal and financial instruments both provide a means of channelling and distributing the revenues raised from marine protected areas. They aim to make funds available to the groups who bear the costs associated with marine protected areas. Fiscal instruments include a range of subsidies and differential taxes – for example to encourage investment in technologies and production processes which do not damage marine environments, or to develop of sustainable marine resource utilisation activities. Various forms of loans, grants

and funds can be made available as financial instruments to support marine conservation, both to support directly marine sustainable utilisation and conservation as well as to encourage the development of production and consumption activities as alternatives to those which damage marine environments.

Box 14: Financial instruments for marine protected area management in Kenya

Kisite Marine National Park and Mpunguti Marine National Reserve in Kenya face a number of financial constraints – the park headquarters retains insufficient funds to cover essential park management expenditures, private sector tour operators make few contributions – in cash or kind – to the costs associated with park management, and local communities reap few tangible economic benefits from the park. A model for financing has been proposed under which the park would be permitted to retain revenues earned, to tap into new and innovative private and international sources of funds and to share costs with private sector tour operators. It is envisaged that these revenues would be administered through a trust fund, controlled by government, private and community stakeholders, and used both to finance park management and to provide cash dividends to local fishing communities.

(Source: Emerton 1999)

7.3 RAISING FINANCE FOR MARINE PROTECTED AREA CONSERVATION

Marine protected areas traditionally rely primarily on three sources of finance for their operation – on tourism revenues, central government subventions and donor funding. All these sources provide an important means of financing marine protected areas, but are often neither adequate or sustainable – both donor and government budgets are extremely limited and often subject to competition from other sectors and investment needs, tourism is not always a viable option for marine protected areas and can be subject to unpredictable fluctuations. Various possibilities exist for raising finance for marine protected areas which can be used to supplement – or replace – these conventional funding mechanisms, which are in many cases more appropriate and sustainable. All have the aim of simultaneously encouraging sustainable use and conservation, discouraging economic activities which damage marine environments and raising funds for protected area management.

7.3.1 Charges, fees and markets

Where marine goods and services are being received freely or at low cost, fees can be established for their use and used to raise revenues. As well as initiating or raising charges, prices and taxes for the existing use of marine resources this can involve developing new markets and fees – such as for marine ecosystem functions or for new types of marine products and recreational activities, and initiating innovative forms of trading – for example by allocating franchises and concessions, tradable quotas and auctions in the use and provision of marine goods and services.

Box 15: Tradable fishing quotas in New Zealand

To reduce overfishing, the New Zealand government issued tradable catch quotas on all fish harvested, allocated to individual fishermen. Fees were charged for these quotas, which could then be sold back to the government or to other fishermen. The scheme achieved a number of objectives: it set fisheries catch at a maximum level, protected the resource, raised revenues, increased efficiency, made fishing allocations more equitable and was self-financing.

(Source: Panayotou 1994b)

7.3.2 Bonds and deposits

Bonds and deposits are a special form of market establishment which are targeted specifically at ensuring that economic developments do not cause damage to marine protected areas. They are product surcharges which shift the responsibility for marine degradation to individual producers and consumers by charging in advance for the possibility of economic activities causing damage to marine protected areas – for example on shipping, snorkelling and diving operations or coastal developments. Imposing a refundable bond or deposit on activities, to be paid before that activity commences, ensures that funds are available to offset or overcome any marine degradation and also present a clear incentive for developers to avoid causing damage occurring and thus reclaim their bond.

Box 16: Bonds for marine conservation in Seychelles

In the Seychelles refundable deposits are already levied successfully on the organisers of all public events for waste disposal and clean up. In the development of Seychelles' National Biodiversity Strategy and Action Plan it was suggested that such measures could be further extended and targeted to the tourist industry, including refundable beach waste deposits which can be offset against beach cleanup costs. In order to minimise on reef damage from boats, a refundable mooring fee could be set against mooring at designated buoys and anchoring points.

(Source: Emerton 1997)

7.3.3 Encouraging private investment and contributions

There are various ways in which the private sector can be encouraged to invest in, or contribute towards the costs of, marine protected areas, from both domestic and international sources. This can not only generate funds, it can increase public participation in marine conservation. For the private sector to be more fully engaged in marine protected areas, they must be made into an attractive and accessible investment opportunity. The provision of credit and development of private property rights, franchises and concessions in marine areas and resources can all encourage investment. Aside from direct use and enterprise, the private sector can also be encouraged to make charitable contributions or voluntary donations towards the costs of running marine protected areas, especially where they have a direct stake or interest in conserving marine ecosystems. Such donations can be attracted by a range of mechanisms such as allowing advertising and sponsorship deals, or providing tax relief on contributions.

Box 17: Encouraging private sector investment in Chumbe Island Coral Park

New environmental legislation in Zanzibar specifically allows for protected area management to be delegated to private entities. Chumbe Island Coral Park is managed by a company specifically formed for this purpose. Incentives for private investment were provided by the Government of Zanzibar by allocating a lease and management contract to this company. Particular project components were financed by several small donor funds available for private initiatives. Running costs are mainly covered by income generated.

(Source: Riedmiller 1998)

7.3.4 Tradable development and prospecting rights, offsets and credits

Tradable development and prospecting rights, offsets and credits are a way of financing for marine protected areas which combine the development of new charges and markets. All offer for sale particular attributes, goods or services associated with marine environments – for example in researching new developments and applications of marine genetic resources, in maintaining the pristine status of marine areas or in benefiting from the global environmental functions such as carbon sequestration which are associated with marine ecosystems. As well as taking the form of direct charges or payments, such arrangements can be offered as quotas, offsets or credits which can be traded on domestic or international markets – for example the purchase of coral reef sequestration credits by an industry whose activities release greenhouse gases, the preservation of a marine ecosystem by a land developer in order to offset developments made in a marine ecosystem elsewhere or the sale of shares in marine conservation to interested conservation agencies and non-governmental organisations.

Box 18: Tradable development rights in coastal Cyprus

Coastal areas of the Akamas Peninsula in north-west Cyprus have a high level of biodiversity, as well as containing several rare and endemic plant species. Part of the Akamas Peninsula has been zoned by the Government of Cyprus as a non-development area. So as to save costs in its conservation, raise funds and avoid conflicts with potential developers, a system of transferable development rights has been proposed. Under this scheme developers, rather than being compensated with cash for activities foregone, would retain their rights to development but not be able to exercise them on-site. Development rights could be traded for property in other areas, or sold to groups concerned with the conservation of the Akamas Peninsula.

(Source: Panayotou 1994a)

Box 19: Payments for coral reef species prospecting rights

A number of useful applications of coral reef species for medical and pharmaceutical applications have been discovered, and many more are under development – for example compounds against cancer, treatments for heart disease, sunscreens and bone graft substitutes. There is a high level of international commercial and industrial interest in this potential. In line with this interest Imperial Chemical Industries has acquired the rights to develop a number of reef pigments for use as sunscreens for humans, and in 1992 the Coral Reef Foundation entered into a five year contract worth US\$ 2.9 million for the supply of reef samples to the US National Cancer Institute for use in cancer and aids screening programmes.

(Source: Spurgeon and Aylward 1992)

7.3.5 International debt relief and compacts

Marine protected areas can be financed through tying the provision of donor funds to their establishment and support. Various approaches to debt relief, such as debt rescheduling, debt forgiveness, debt-for-equity and debt-for-nature swaps can be used as a means of simultaneously generating funds, increasing private and NGO participation in marine management and reducing national indebtedness. International compacts, rather than being linked to debt relief, usually involve a voluntary agreement made to engage in policy reforms or marine conservation in exchange for the transfer of financial or technological resources from international sources to support these reforms.

Box 20: The use of debt-for-nature swaps to fund Marine Parks in Jamaica

The Jamaica National Parks Trust Fund was established in 1991 and capitalised in 1992 with money from a debt-for-nature swap, under which a portion of the country's debt was purchased at below face value with cash provided by USAID, the Conservation Trust of Puerto Rico, the Smithsonian Institute, Fidelity Investments and The Nature Conservancy and redeemed against local currency. Additional contributions have also been received from domestic companies and individuals. The fund is managed primarily as an endowment trust, paying its expenses through investment income and leaving the principal untouched. Grants are made to two National Parks, including contributing to the operating costs of the Montego Bay National Marine Park.

(Source: IUCN 1994)

7.4 ENSURING THAT BENEFIT AND COST SHARING MEASURES ARE APPROPRIATE AND SUSTAINABLE

Identifying economic measures for marine protected areas and actually implementing them are two very different things. Not all of the potential sources of incentives and finance identified will be practically implementable, or will require modification so as to fit in with the real-world ecological, institutional, socio-economic and cultural characteristics of a particular marine protected area. Choosing the most appropriate and sustainable economic measures, and integrating them into on-the-ground marine protected area management always requires additional consideration of a number of issues and factors, including:

- ❖ Economic measures must be *politically, economically and practically acceptable at all levels* – within marine conservation agencies, central government, the private sector and local communities. Any measure which conflicts with the goals of these groups – for example by excluding stakeholders from participation in marine protected area management, by making people worse off or by contradicting wider social and economic ideologies – is unlikely to be appropriate or implementable in practice.
- ❖ Care must be taken in *targeting economic measures at particular groups*. Economic measures will have little or no impact unless they act on the groups who are affected by, or whose actions have the potential to influence, the status and integrity of marine protected areas.
- ❖ In the course of providing incentives for marine conservation through benefit-sharing mechanisms, care must be taken in *defining the nature of benefit to be provided*. Many attempts at benefit-sharing have failed because they do not provide

real and tangible economic gain, meet the needs and aspirations of the groups they aim to assist, or directly compensate for the costs that marine protected areas incur. Of particular danger is the assumption that the provision of broad rural development benefits at the community level – such as schools, water or other social infrastructure – will offset individual or household-level financial losses associated with marine protected areas, and make people any more willing or economically able to support marine protected areas.

- ❖ In the course of providing finance for marine conservation through cost-sharing mechanisms, care must be taken in ***defining the nature of cost to be provided***. Where groups cannot afford to contribute cash towards protected areas, direct charges and fees are unlikely to be a realistic way of sharing in the costs of protected area management. Cost-sharing mechanisms should be flexible and firmly based on people's ability to pay, and include the provision of contributions in kind as well as through cash payments.
- ❖ Economic measures should have attempt to ***minimise transaction, enforcement and participation costs***. They should be easy and cheap to implement for all the groups engaged in benefit and cost sharing, and for protected area managers. Any economic measure which is costly or difficult to implement or enforce – in terms of cash, time or other resources – runs the risk of failing.
- ❖ Economic measures should make efforts to ***avoid increasing the external dependency and decreasing the local or national sovereignty*** of the local communities, protected area managers and host countries associated with marine ecosystems. They should be based on strong considerations of maintaining independence and ensuring sustainability in marine protected area management.
- ❖ Economic measures must be ***consistent with, and supportive to, wider goals and activities specified in the management plan*** for a marine protected area. Their overall aim is to support marine protected area management, not to contradict or conflict with its aims and approaches.

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