Benefit-Cost Analysis of Tourism Development and Sustainability in the Malacca Straits

GEF/UNDP/IMO
Regional Programme for the Prevention and Management
of Marine Pollution in the East Asian Seas

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MISSION STATEMENT

The primary objective of the Global Environment Facility/United Nations Development Programme/International Maritime Organization Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas is to support the efforts of the eleven (11) participating governments in the East Asian region to prevent and manage marine pollution at the national and subregional levels on a long-term and self-reliant basis. The 11 participating countries are: Brunei Darussalam, Cambodia, Democratic People's Republic of Korea, Indonesia, Malaysia, People's Republic of China, Republic of the Philippines, Republic of Korea, Singapore, Thailand and Vietnam. It is the Programme's vision that, through the concerted efforts of stakeholders to collectively address marine pollution arising from both land- and sea-based sources, adverse impacts of marine pollution can be prevented or minimized without compromising desired economic development.

The Programme framework is built upon innovative and effective schemes for marine pollution management, technical assistance in strategic maritime sectors of the region, and the identification and promotion of capability-building and investment opportunities for public agencies and the private sector. Specific Programme strategies are:

- Develop and demonstrate workable models on marine pollution reduction/prevention and risk management;
- Assist countries in developing the necessary legislation and technical capability to implement international conventions related to marine pollution;
- Strengthen institutional capacity to manage marine and coastal areas;
- Develop a regional network of stations for marine pollution monitoring;
- Promote public awareness on and participation in the prevention and abatement of marine pollution;
- Facilitate standardization and intercalibration of sampling and analytical techniques and environment impact assessment procedures; and
- Promote sustainable financing mechanisms for activities requiring long-term commitments.

The implementation of these strategies and activities will result in appropriate and effective policy, management and technological interventions at local, national and regional levels, contributing to the ultimate goal of reducing marine pollution in both coastal and international waters, over the longer term.

Dr. Chua Thia-Eng
Regional Programme Manager
GEF/UNDP/IMO Regional Programme
for the Prevention and Management
of Marine Pollution in the East Asian Seas

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The Malacca Straits Demonstration Project is coordinated by Mr. S. Adrian Ross, Senior Programme Officer, GEF/UNDP/IMO Regional Programme Office, Manila.

Executive Summary

This study focuses on the economic analysis of benefits and costs of management actions for resource preservation and pollution prevention, particularly those affecting tourism. This, in turn, will affect the total economic value of natural and environmental resources in the Malacca Straits. As a first exercise towards valuation of recreational benefits provided by the coastal and marine resources in the Straits, the benefits transfer method (BTM) is adopted, wherein the values of consumer surplus derived in various studies are 'transferred' and adjusted. The benefit and cost estimates of the management options considered in this study are, likewise, adopted from other studies. Although the legitimacy of the benefits transfer procedure is still subject to academic debate, BTM was utilized (due to time and budget constraints) for the estimation of indirect, option and non-use values. The results of this study, therefore, present broad orders of magnitude of potential net benefits, which may be sufficient to make an opinion about the advisability of a project or program. The values can then be used as inputs to policy-making.

Most analyses of tourism emphasized the revenues and employment generated by this industry. Marine tourism, however, involves intensive utilization of environmental and natural resources in the coastal zone. Because ecosystem services are not fully quantified in markets, they are often given little weight in policy-making. A review of literature shows consumers to be sensitive to environmental conditions, and may appreciate the quality and availability of attributes, such as pristine beaches and coral reefs, sewage treatment, water and air pollution, together with basic economic conditions, such as price. Recreational activities are made possible by a detailed tourism infrastructure and the continuous growth of the tourism industry results in critical changes in the natural and human systems in the coastal zone. Thus, tourism growth has both positive and negative impacts. Uncontrolled tourism policy can lead to the loss of benefits gained by maintaining the quality of the resources, and can also intensify the multiple-use conflicts within the coastal and marine ecosystems.

The management programs considered in this study are coral reef protection (e.g., limiting the number of divers to ensure that carrying capacity of the coral reefs is not exceeded), setback zoning for beaches to allow natural coastal processes and vegetation growth to occur, and pollution prevention. The economic analysis shows positive net present values (NPVs) for the coral reef protection and beach zoning programs, even when different discount rates are used. Moreover, large NPVs indicate the acceptability of these policies. Other management programs, such as pollution reduction and beach nourishment, also show large potential benefits in terms of changes in consumer surplus resulting from the implementation of these programs.

Introduction

BACKGROUND

This study is part of the Malacca Straits Demonstration Project, an initiative which is being implemented by the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas. One component of this project involves economic analyses of the benefits and costs of various management actions for pollution control and prevention in the Straits of Malacca. In particular, this study will focus on the management options for the protection of coastal and marine resources, which will have impacts on tourism development and sustainability, and the corresponding benefits and costs generated by this sector. Tourism comprises the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes (World Tourism Organization, 1995). Marine resources, such as finfish, shellfish and coral reefs, can be an important element of a tourism destination.

SIGNIFICANCE OF ECONOMIC AND ENVIRONMENTAL VALUATION OF TOURISM

Tourism is an invisible export with the unique characteristic that the purchasers of its 'products' have to travel to a foreign destination in person to consume them (Lea, 1988). Tourists may be prepared to travel long distances if the destination is worth the time, trip and expense, and if suitable accommodation is available. Some types of tourism are defined in terms of the characteristics of destination, e.g., jungle tourism, natural areas travel, wilderness tourism, marine tourism, safari tourism, whereas others address the type of impacts, e.g., appropriate tourism, low-impact tourism, responsible tourism, sustainable tourism (Ecotourism Working Group, 1995). There are limits to the extent that various tourism activities individually or in combination could be exercised in a satisfactory manner (OECD, 1993).

Marine tourism can be defined as tourism related to the marine environment and its natural and cultural resources. It makes use of or 'consumes' both onshore and offshore coastal resources. The most fundamental activity is the enjoyment of the environmental and social scene. Most marine tourism takes place in the coastal zone—along the shorelands and in the water immediately adjacent to the shoreline; it occurs indoors and outdoors, as recreation, sport, leisure and as business (Miller and Ditton, 1986). Activities in coastal waters include swimming, windsurfing, water skiing, boating and fishing. These activities are made possible by a detailed tourism infrastructure, and the continuous growth of the tourism industry consequently results in critical changes in the natural and human systems in the coastal zone. For example, marinas and the reclamation of shallow coastal waters to build housing and tourist establishments can degrade coastal environments. Specific tourist activities also take place on coral reefs, which with their unique marine life require special care to ensure their longer-term viability (OECD, 1993). Hence, the private and public sector economics of tourism needs to be recognized, planned, monitored and regulated. Sustainable development is based on the maintenance of the pristine quality of marine resources and the islands. The alternative of uncontrolled tourism policy ensues in haphazard expansion of the tourism industry, further intensifying multiple-use conflicts within the coastal and marine ecosystem. Thus, tourism needs to be evaluated in terms of both market and non-market benefits and costs it generates.

Most analyses of tourism emphasize the revenues and employment generated by this industry as well as the possible detrimental changes in the natural environment. The implications for social systems have gone largely unstudied (Miller and Ditton, 1986). Moreover, decisions regarding activities and developments in the coastal area have traditionally been based on informal judgment or just financial analysis, thus, an optimum management strategy will not result (King, 1995). An efficient policy requires that the additional benefit from using the resource is equal to the additional cost of using or producing the resource. This requires information on the private and social costs and benefits in order to estimate an explicit tradeoff, i.e., benefit-cost analysis.

Two of the many important tradeoffs that are part of tourism development involve choices made between national and regional economic programs, and between the welfare of diverse interests whose uses of coastal resources compete (Miller and Ditton, 1986). The issue of *economic efficiency* usually arises as a result of the use of coastal resources for alternative activities, i.e., the 'opportunity cost'. Since resources are limited, they should be used in activities where the *net economic returns* are the greatest. Net economic returns or net benefits are considered here as net of all costs, including environmental and other social costs.

Objectives of this Study

This study aims to appraise the costs and benefits of tourism development and sustainability in the Straits of Malacca. This is related to the marine pollution prevention and management of the Straits. The basic concern is to place monetary values on the benefits and costs of these management programs, which affect tourism activities, which, in turn, will have an impact on the *total economic value* of the environmental resources in the Straits. Benefit-cost analysis looks at the monetary value of the benefits and compares them with the costs of a policy. The management options considered here are: (a) setback zones for beach enhancement and protection and (b) coral reef protection. The benefits include the tourism revenues (marketed) and recreation benefits and other indirect benefits (non-marketed). The costs are the direct costs involved in the development of tourism infrastructure and beach and coral reef protection. The costs involved in terms of the welfare loss are indicated by changes in consumer surplus as a result of pollution and degradation of the coastal and marine resources. The latter costs (loss in consumer surplus) can be interpreted, however, as potential benefits (increase in consumer surplus) that can be gained from pollution reduction programs.

Scope and Limitations

This report discusses the various approaches to the estimation of the total economic value of coastal and marine resources and tourism activities in the Straits of Malacca, and reviews the different studies pertaining to marine tourism and recreation done within the region and elsewhere. Only a few studies on valuation of tourism and recreation in this region have been conducted. While some benefits may be easy to value, such as tourist receipts, other benefits, such as biodiversity, nonconsumptive benefits and future values are more difficult to analyze (Conrad, 1980). Moreover, while resource economists have studied the effects of water quality changes on recreation, there is a paucity of literature on the demand for recreational beach and marine services, and on valuation of the beach itself, especially in tropical areas.

As a first exercise towards valuation of recreational benefits provided by the coastal and marine resources in the Straits, the benefits transfer method (BTM) is adopted, wherein the values of consumer surplus derived in various studies are 'transferred' and adjusted. The benefit and cost estimates of the management options considered in this study are likewise adopted from other studies. The total benefits include both the direct benefits as indicated by tourism revenues as well as non-marketed benefits from tourism activities, i.e., potential benefits to be gained by maintaining these resources. It is assumed that changes in the quality of resources will be reflected in changes in the consumer surplus. Although the legitimacy of the benefits transfer procedures is still subject to academic debate, BTM was still utilized (due to time and budget constraints) for the estimation of indirect, option and non-use values in order to present broad orders of magnitude of potential net benefits, which can then be used as inputs to policy-making.

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[1] Beach and coral protection has other benefits, such as increased fishery production, but this study will focus on the impacts (benefits and costs) of these management options on tourism. These other benefits have to be quantified also to get the *total economic value* of the beach and coral reef resources.

Conceptual Framework and Methodology

THE PLACE OF TOURISM IN DEVELOPMENT

Tourists are those travellers who stay for a day, overnight or more primarily for the purpose of leisure and visiting friends and particular sites. Figure 1 shows the categories of travellers and tourists.

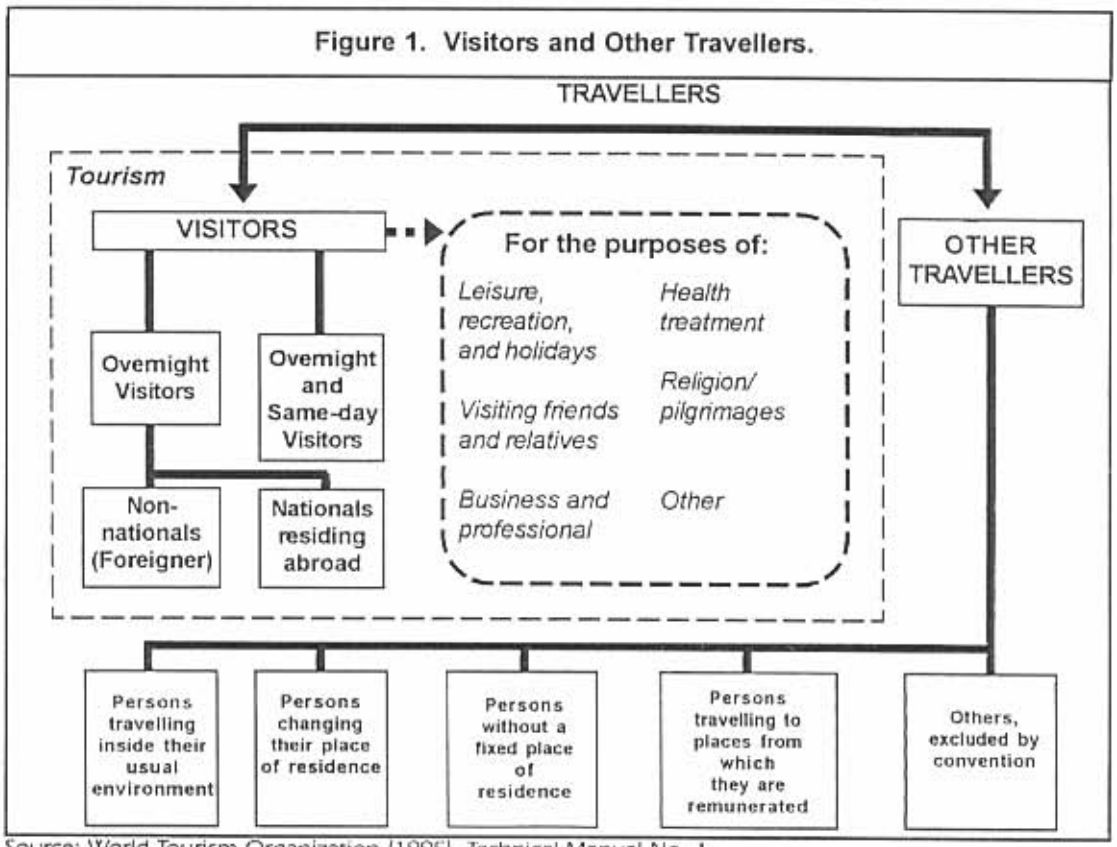


Figure 1. Visitors and Other Travellers.

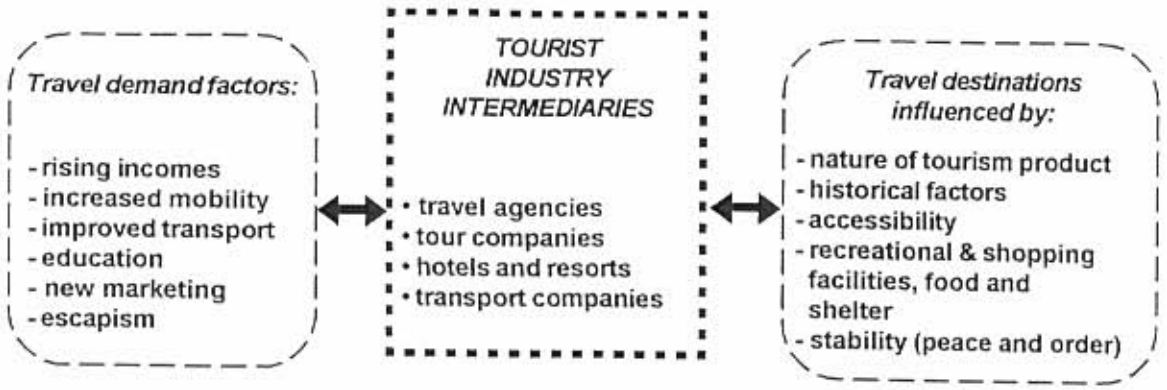
Source: World Tourism Organization (1995), Technical Manual No. 1.

The number of tourist arrivals is related to the increase in income which, in turn, increases the demand for leisure, as well as to prices, accessibility and uniqueness or quality of attractions in the tourist destinations. Figure 2 illustrates the elements of tourism industry and influences on the market. The contribution of tourism to the development of the area depends on whether its impacts produce positive net benefits, which can be sustained over time or not. This sector makes use of economic and environmental assets, and provides many benefits and costs that are important to society. Revenues from tourism have been increasing, and infrastructure investments related to tourism are paying off. However, most environmental services are not quantified, in the sense that they are not bought and sold in markets. For example, the quality of biodiversity in coral reefs is not usually monetized, but people value this as can be gleaned from studies/surveys measuring their willingness to pay (WTP) for the continued existence of these natural resources.

Benefits of Tourism

Nature tourism (or ecotourism) is accompanied by local, regional, national and global benefits. The private benefits associated with nature tourism are the financial returns received by those providing tourism services, while social benefits can be described as any gains in social welfare, either direct or indirect, or whether financial in nature or non-monetary

Figure 2. Primary Elements of Tourism Industry.



Source: Lea (1988).

(Sherman and Dixon, 1991). Table 1 enumerates some of the benefits that accompany ecotourism. On the economic development side, tourism can bring employment opportunities. On the environment side, tourism can provide conservation benefits, and this type of benefit should also be incorporated into decisions about land use.

Impacts of Tourism

This section presents the various economic, social and environmental impacts of tourism, illustrating the need for institutional framework and regulatory policies to mitigate the negative impacts and to sustain the positive ones.

Table 1. Benefits of Nature Tourism.

1. Watershed values	
· erosion control	· regulation of stream flows
· local flood reduction	
2. Ecological processes	
· soil formation	· fixing and cycling of nutrients
· global life support	· circulation and cleansing of air and water
3. Biodiversity	
· gene resources	· species protection
· ecosystem diversity	· evolutionary processes
4. Education and research	
5. Consumptive benefits	
· timber	· non-timber forest products (e.g., edible plants,
· wildlife products	herbs, medicines, rubber)
6. Non-consumptive benefits	
· aesthetic	· spiritual
· cultural/historical	· existence value
7. Future values	
· option value	· quasi-option value

Source: Sherman and Dixon (1991).

(a) Sociocultural impacts

Tourism development and land use plans should consider the consequences on both human and environmental systems, and recognize the role and rights of indigenous communities. The following are some of the negative and positive sociocultural impacts noted in areas that are recently opened to tourism and other economic activities:

- displacement of human population
- changes in culture, norms, moral behavior
- increased pressures on religious places, shrines
- loss of artefacts in museums or in archaeological sites
- renaissance of traditional festivals and increased demand for traditional arts
- development of market for local crafts

(b) Environmental impacts

Table 2 summarizes some of the potential direct and indirect negative impacts of tourism development, especially if management policies do not consider the environmental costs of unregulated development.

Table 2. Major Potential Impacts of Tourism on the Natural Environment.

Impact	Potential Consequences
Floral and faunal species composition	• disruption of breeding habitats • killing of animals through hunting • killing of animals to supply goods for souvenir trade • destruction of vegetation through gathering of wood or plants • trampling and damage of vegetation by feet and vehicles • change in the extent and/or nature of vegetation cover through clearance or planting to accommodate tourist facilities
Pollution	• water pollution through discharges of sewage, spillage of oil • air pollution from vehicle emissions, combustion of fuels for heating, cooking and lighting • noise pollution from tourist transportation and activities
Erosion	• compaction of soils causing increased surface runoff and erosion • change in risk of avalanche occurrence • damage to geological features (e.g., caves) • damage to river banks
Natural resources	• depletion of groundwater and surface water supplies • depletion of fossil fuels to generate energy for tourist activity • change in risk of occurrence of fire • overexploitation of biological resources (e.g., overfishing) • change in land for primary production • change in hydrological patterns
Visual impact	• facilities (e.g., buildings, car park) • litter • sewage, algal blooms

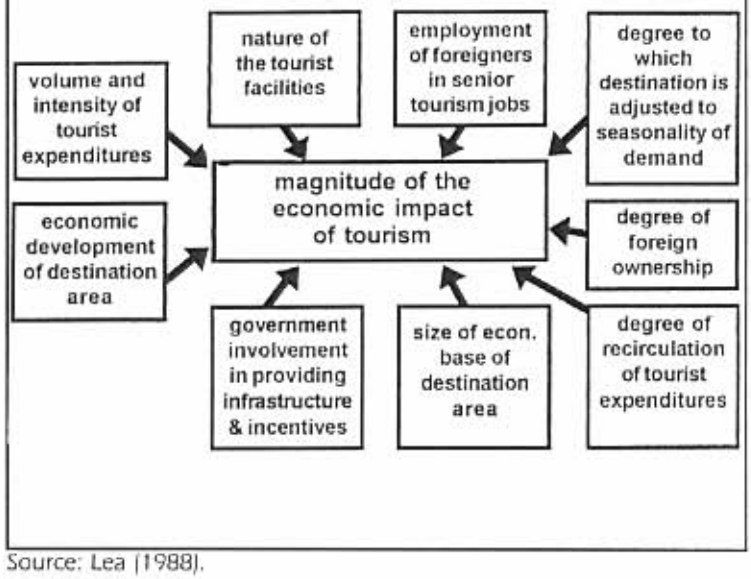
Source: Hunter and Green (1995).

(c) Economic impacts

Usually, the "lasting" benefits of tourism are the employment generated in the area, the development of roads and other infrastructure to accommodate the tourism industry, and the multiplier effects of tourist expenditures. In areas with major tourism industry, this sector has become a major source of tax revenues and foreign exchange and contributor to the local output. The magnitude of the economic impact, however, is affected also by the

volume of imports used as inputs in the development and operations of the tourist facilities, the percentage of local people employed, the degree of foreign ownership and tax incentives given. The major factors that contribute to the degree of tourism's economic impact are illustrated in Figure 3.

Figure 3. Factors Governing the Economic Impact of Tourism.



Source: Lea (1988).

CONCEPT OF BENEFIT-COST ANALYSIS

Benefit-cost analysis is the popular technique for evaluating public expenditures and policies for a non-marketed commodity, such as water and marine resources. Where market failure exists, benefit-cost analysis, using shadow prices for the non-marketed impacts, will aid in preventing wasteful usage of resources. Benefit and damage estimation involves placing monetary values on the gains and losses from an economic activity. Valuation is part of the process of correcting economic distortions in the market place.

The focus of this approach is on economic *efficiency*, i.e., the existence of project benefits in excess of total social costs (land, labor, capital and environmental impacts) both of which are discounted by an appropriate rate of discount. This conventional approach has been criticized, however, for the reason that economic efficiency is not the only criterion by which projects should be appraised. Thus, regional development and income distribution have become the other objectives which direct public intervention in water and coastal resources management. The multidimensionality of the policy objectives has resulted in both the conceptual and operational difficulties in quantitative optimizing. For the purpose of this paper, it is assumed that the efficiency criterion (positive present value of net benefits) be first met.

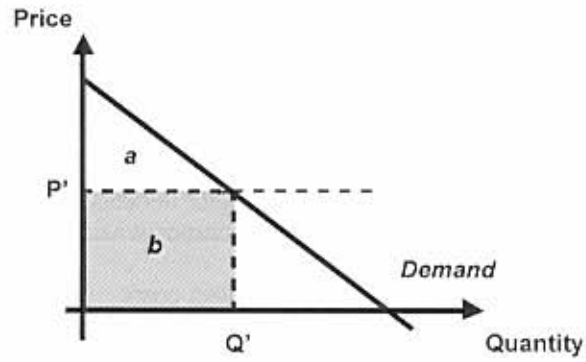
Measuring Benefits and Costs

The concept of *benefit* refers to the amount that a rational and informed user of a publicly-supplied good or service would be willing to pay to avail of the benefit or to avoid the damage. The benefits from natural resource use can be categorized as marketable and non-marketable. Marketable benefits can be characterized as tradable and tangible. Their values, therefore, can be easily estimated using market prices. On the other hand, non-marketable benefits are those where there is an absence of markets, and shadow prices have to be estimated. The environmental benefits provided by marine resources, such as beaches and coral reefs, include many non-marketable goods and services, resulting in the undervaluation of these resources if these non-monetary benefits are not accounted for in project and/or policy evaluation.

The concept of *consumer surplus* is significant in the measurement of social benefits. It is the maximum sum of money which a consumer would be willing to pay for a certain amount of a good, less the amount actually paid. The market price is usually an inadequate index of the true value of a good, thus, benefits cannot be calculated from a simple "price times quantity" process, but through the estimation of the whole area under the demand curve. Likewise, society's maximum valuation for a given quantity of good corresponds to the entire area under the market demand curve for the good in question. In Figure 4, the total direct benefits from consuming the amount Q' is the sum of the monetary benefits (which is also the total expenditures) as shown by square **b**, and the consumer surplus as indicated by triangle **a**.

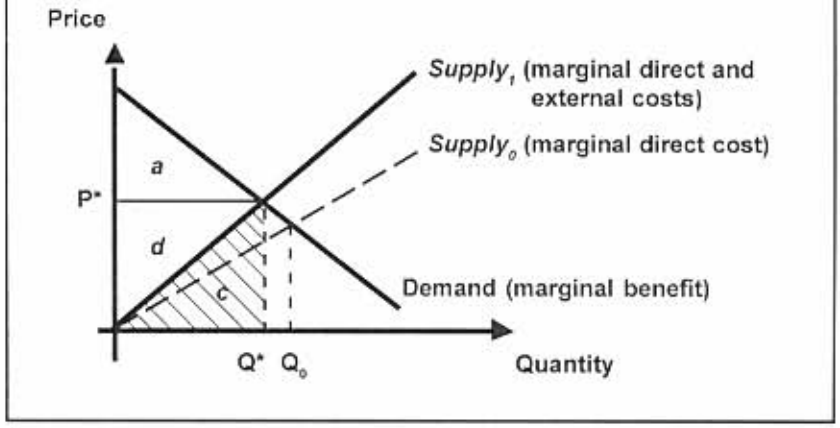
The opposite of benefit estimation is damage assessment or the monetary valuation of the losses to society from environmental deterioration. Economic costs represent the foregone value of goods and services displaced by a project or program as well as

Figure 4. Total Benefits.



external damages that accompany the use of resources. As distinguished from the accounting stance, the economist's concept of cost takes into account both the normal and the opportunity costs. The cost of extraction or resource use involves not only the direct costs incurred from the use of such inputs like labor, materials and capital, but also the other external costs, such as the *user* or *depletion cost*, and the cost of externalities, e.g., expenditures for treatment, pollution prevention, replacement and preservation. Industries, such as shipping, dredging, oil and gas production, as well as discharges of effluents from industries, households and hotels, have impacts on the marine environment. These impacts must be valued as well to get the total costs involved. In Figure 5, the area under the supply curve, $Supply_1$, is the total direct and external costs. Thus, the *net benefit* from consuming the optimal quantity of the resource, Q*, is shown by triangles **a** (consumer surplus) and **d** (producer surplus).

Figure 5. Net Benefits.



Economic Analysis (Benefit-Cost Analysis)

(a) Net present value (NPV):

The most commonly used formula in project analysis is that used in the computation of the net present value (NPV). It determines the present value of net benefits (that is, benefits less costs) by discounting the streams of benefits and costs back to the beginning of the base year (year 1).

$$NPV = \sum_{t=0}^{T} \frac{(B_t - C_t)}{(1 + r)^t} > 0$$

where **r** is the discount rate, **t** is time or year, **T** is the number of years involved in the economic time horizon, B_t is the benefit in year t, C_t is the cost in year t, and Σ is the summation sign that indicates the sum of some function, which in this case, is over some period of time. The appropriate time horizon for a project depends on the following factors: (1) the expected useful life of the project in terms of yielding the outputs and the associated economic benefits for which the project is designed and (2) the level of the discount rate used in the economic analysis (Dixon and Hufschmidt, 1986). The discount rate is the tool used to compare and weigh benefits and costs that occur at different points of time, and to get the present value of the benefits and costs yielded by the project. The discount rate factor, which is chosen exogenously, acts progressively to reduce the present value of outputs or benefits obtained in future years. Hence, the lower the discount rate, the longer the economic time horizon. Moreover, all prices used in the analysis are real or constant (dollar) prices; thus, the discount rate should not reflect inflation. Benefits and costs are defined as the difference between what would occur with and without the project. A positive value for NPV indicates that benefits from the project are greater than costs over time.

(b) Benefit-cost ratio (BCR):

The *benefit-cost ratio* is a simple derivative of

the net present value criterion. This ratio compares the discounted value of benefits with the discounted value of costs. A BCR of less than 1 means that the project generates losses from an economic point of view.

$$\text{If BCR} = \left[\sum_{t=0}^{T} B_t/(1+r)^t\right] / \left[\sum_{t=0}^{T} C_t/(1+r)^t\right] > 1,$$

then NPV > 0

Environmental Analysis

The following are major criteria to be taken into account in the design and formulation of environmentally sound projects (Abaza, 1993):

- project should meet the needs of current generation without compromising the ability of future generations to meet their needs ("sustainable development")
- project should lead to development without destruction and should not disrupt ecological systems—activities leave level of environmental quality intact
- where applicable, project should lead to conservation of natural habitats, forests and species; reverse deforestation; reduce acidification and hazardous wastes; introduce sustainable water management schemes
- project should incorporate costs of mitigation of any negative environmental impacts
- project should be designed to introduce or increase understanding of local population leading to the conservation and protection of the environment

Traditionally, only the direct project benefits and project costs are accounted for in project evaluation. The expanded approach results in combining both economic and environmental analyses. This approach includes the external and environmental improvement benefits (plus the benefits from environmental protection), as well as the costs of external and/or environmental damages and of environmental control measures, being careful not to double count the latter (Dixon and Hufschmidt, 1986). Thus, the economic analysis is done from the standpoint of society's welfare, wherein social opportunity costs and benefits from various policies or projects are reflected. The following equation expresses the approach in another way:

$$NPV = B_d + B_e - C_d - C_p - C_e$$

where NPV = net present value
B_d = direct project benefits
B_e = external (and/or environmental) benefits
C_d = direct project costs
C_p = environmental protection costs
C_e = external (and/or environmental) costs

All items on the right-hand side are discounted to present values. To get the values for the external benefits and costs, the environmental effects of the project must first be identified. Secondly, these effects have to be quantified (in physical terms), and then the quantified changes have to be valued or given monetary values. The actual economic analysis or comparison of benefits and costs is conducted after the monetary valuation of important environmental effects has been accomplished. The objective of this exercise is to find the policy which will maximize society's net benefits over time.

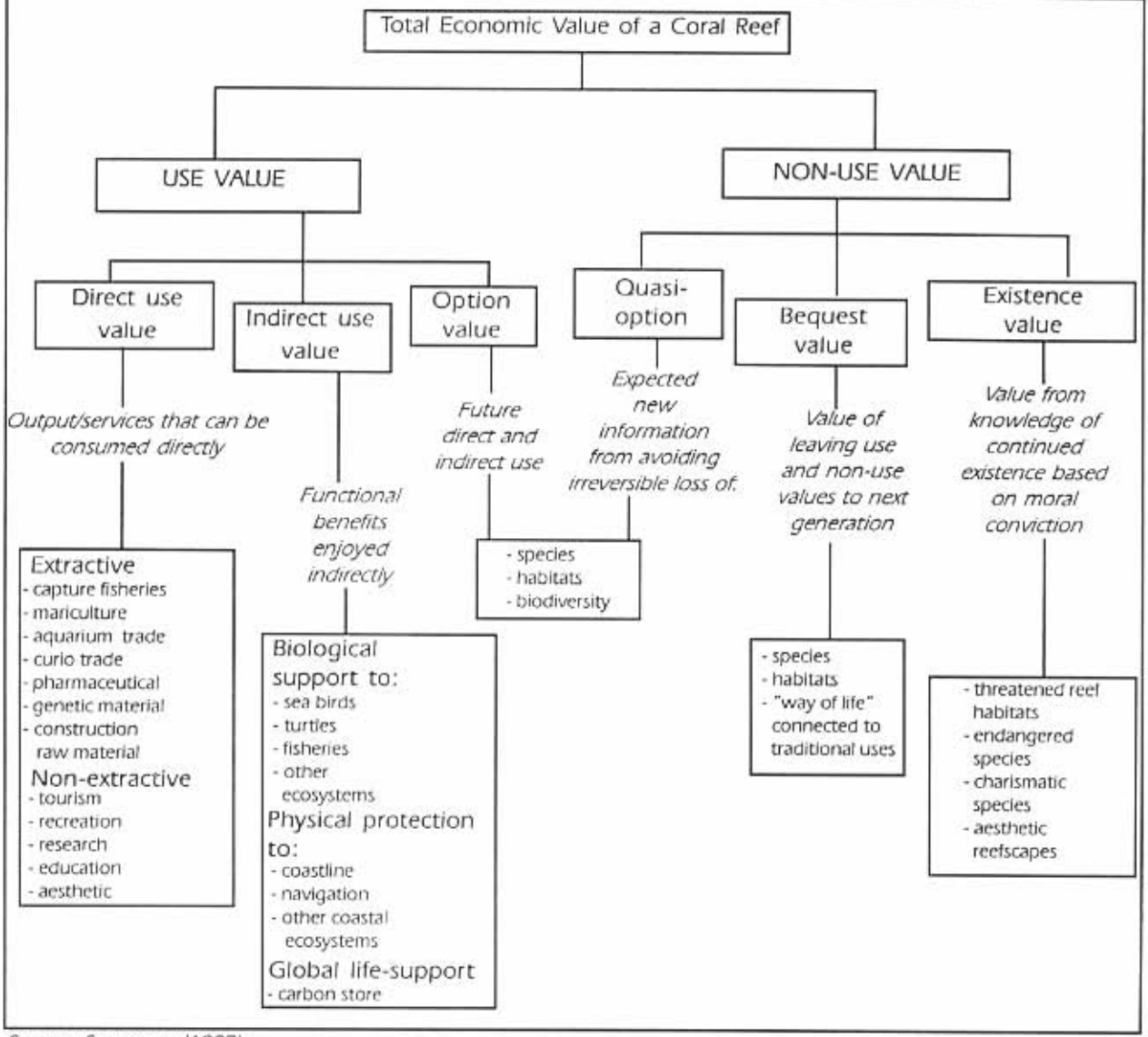
TOTAL ECONOMIC VALUE

Conceptually, the *total economic value* (TEV) of a natural resource or environmental service is the amount of resources, expressed in common units of money that society would be worse off if the natural resource or environmental amenity were lost. It consists of (i) use value (UV) and (ii) non-use value (NUV). *Use values* may be broken down further into the direct use, indirect use and the option value (potential use value). The direct use values that can be derived from coastal and marine resources include the *net* benefits from fishery, recreation and tourism, while indirect use values include benefits of carbon sequestration, erosion and flood control, etc. Hence, the net benefits of tourism are just a component of the total economic value of coastal and marine resources. The *option value* is the willingness to pay to maintain the natural resource weighted by the probability that the resource will be used at some future date. One major category of *non-use value* is *existence value*. It arises from the satisfaction of merely knowing that the asset exists, although the valuer has no intention of using

it. The value derived from non-uses, however, depends on the number of the people, their awareness of the natural resource (e.g., coral reef), their level of information, and their preferences for the resource and its characteristics (Universitetet I Bergen Senter for Miljø- og Ressursstudier, 1994). Figure 6 illustrates the economic values attributed to the environment, using coral reef as an example.

economic value of environmental service provided by coastal and marine resources can be inferred from (1) private willingness to pay for the 'service' provided by the resource and (2) external benefits from the resource or service. In addition to a consumer's preference or the individual's willingness to pay for provision of tourism and recreational services, the other external benefits have to be considered. For

Figure 6. Total Economic Value of a Coral Reef.



Source: Spurgeon (1992).

The whole concept of economic value is founded on willingness to pay (or accept), which implies conscious preferences for uses or non-use characteristics of the ecosystem (Universitetet I Bergen Senter for Miljø-og Ressursstudier, 1994). The

example, individual or household's decision to avail of clean beaches, seawater, etc., and access to recreational facilities and parks will also benefit other people. Thus, some of the value of the benefits is not captured in the valuation of private willingness to pay.

There are many techniques that can be used to derive estimates of willingness to pay, some of which are briefly discussed below. These are the techniques used in conducting the monetary valuation of environmental effects resulting from various policies or projects.

(a) *Revealed preference.* The basic idea underlying this approach is that information about willingness to pay is already implied by the amounts households or individuals are actually paying.

(b) *Contingent valuation.* This technique involves obtaining values people would place on hypothetical services that are not currently offered. The problem with this approach, however, is that the interviewees might respond strategically. They will understate their willingness to pay if they believe that their response will affect prices but not the availability. On the other hand, they will overstate if they think that their response will affect the availability of the service or amenity, but not the price.

(c) *Opportunity cost-of-time.* This focuses on the time spent on the activity of interest, and estimates the value of time that would have been available for other activities. The travel cost method is one approach to estimate the value of recreational sites.

(d) *Hedonic pricing.* The concept behind this approach is that when making a decision to buy or rent a house or an apartment, households will consider the value of the available services (water, clean air, location, etc.) associated with the housing unit. This approach econometrically estimates the value of the specific attribute of a good that is sold only as a bundle of these attributes.

BENEFITS TRANSFER METHOD APPROACH

Careful and detailed data collection to establish values can be costly and time-consuming. It would not be feasible to conduct new research to analyze the benefits of every policy and regulation to improve the environment. The suggested method for this project is the benefits transfer method (BTM), and this is sometimes employed to reduce costs. This approach involves taking an estimate of the economic value of a similar environmental impact from an existing study (most commonly done in the US and Europe where the literature is more abundant), and transferring it to a new context, assuming that the existing value can be used as an approximation. A correction factor is sometimes employed to adjust the economic value of the impact in the new location or the site of policy interest.

There are three main approaches to benefit transfer: (a) transferring mean unit values; (b) transferring adjusted unit values and (c) transferring demand or benefit functions (Navrud, 1996). The first approach, which is the easiest, assumes that the well-being experienced by an average person at the original study site is the same as that which will be experienced by the average person at the policy site. The second approach adjusts the unit values to consider the conditions at the policy site. Meta analysis has been used to synthesize research findings where the results from each study are treated as a single observation. The resulting regression equations explaining the variations in unit values can then be used together with the data collected on the explanatory variables in the model that describes the policy site to construct an adjusted unit value (Smith and Karou, 1990; Walsh et al., 1992; Navrud, 1996).

In the third approach, instead of transferring unadjusted or adjusted unit values, one could transfer the entire demand function estimated at the original study site. To implement this, one has to find a literature, for example a contingent valuation study with the willingness-to-pay equation, take the estimates of the parameters or the coefficients of the explanatory variables, collect data on the explanatory variables from the policy site and reestimate the equation.

Most valuation studies, including the benefits transfer method are less than ideal in the sense that better estimates could have been obtained if more time and money were available. Benefits transfer methods, however, can be useful in policy contexts where rough economic benefits may be sufficient to make a judgment regarding the advisability of a policy or project, and provide policy advice in a timely manner, subject to the resource constraints (Navrud, 1996). Valuation encourages consistency in decision-making, and can frequently serve the goal of demonstrating that natural environments matter (Pearce and Turner, 1992). Unless the value of natural resources is

expressed in monetary units, it will continue to be assigned a zero value, which may leave these resources open for overexploitation.

Limitations and Data Requirements

The problem with the "unadjusted mean unit value" approach is that persons in the policy site may not value recreational activities in the same way as the persons in the original study site on which the unit values are based. Thus, the values may have to be adjusted to reflect conditions at the new policy site. The following differences have to be taken into account in the adjustment process: differences in change in environmental quality, differences in policy or regulations creating such changes, socioeconomic profile of households, and the availability of substitute goods and services or amenities. The nationality of the respondents in the original study has to be identified, and data on the national income (e.g., GDP per capita), prices, foreign exchange rates, and socioeconomic characteristics of the individuals or households will be required. Likewise, the profile of the tourists, the tourism amenities (e.g., type of hotels, recreational facilities, beach quality, condition of coral reefs, parks) and the geographic extent of the affected population at the policy site will also be requisite information. Regional factors (such as the range and quality of substitute recreation sites) and site-specific factors (such as the amount of congestion at a given recreation area) that affect individuals' valuation of and demand for recreation sites have to be accounted for (Krupnick, 1993).

The benefits transfer method requires the following steps to be undertaken: (a) find existing studies where the benefit or demand relationship has been estimated; (b) look for the relevant values of the explanatory variables used in the original equation for the policy site; (c) determine the extent of the market or the geographic area over which households will benefit from the change in and/or preservation of environmental quality; (d) substitute the values of the explanatory variables to calculate the benefits at the policy site and (e) calculate total discounted value.

Review of Literature on Coastal and Marine Tourism

Payne (1993) presented the tourist arrival activity and expenditure patterns, tourism infrastructure, resort and other development plans, and tourism organization and marketing in Indonesia, Malaysia, Singapore and other Asian countries as well as Australia and New Zealand in the southern Pacific for the period 1990-1992. The tourism statistics in Indonesia, Malaysia and Singapore are presented in each of the country's Tourism Profile (see Tables 15 to 19) as well as in their respective Development Plans (see Tables 20 and 21). The direct use values can, therefore, be derived from these statistics.

For the indirect and non-use values, the benefits and costs have to be derived from various studies. Many of the studies reviewed in this paper provide valuation estimates for specific recreation activities and recreation. The value measures in these studies have been obtained by utilizing either travel cost model of recreation demand, contingent valuation method (CVM) survey or the random utility model (RUM) of the choice of recreation activities and sites. A number of studies also provide measures of the values of changes in qualitative characteristics of these sites. For beaches, the available evidence suggests that pollutants, such as oil, and potential threats to human health, such as faecal coliform bacteria and PCB contamination are important attributes. The values per person per day for changes in these attributes may be relatively small, but given high participation rates in beach activities, aggregate values can be large (Freeman, 1995). Thus, there are important public policy issues surrounding recreation and tourism activities.

Beach Use

Bell and Leeworthy (1990) conducted a survey between January and November 1984 in Florida, and the tourist population (out-of-state) interviewed was restricted to those 18 years and above. All coastal beaches were treated as a single site, and a variation of the travel cost model was utilized to estimate the average consumer surplus per person. The typical air-arriving tourist travelled 1,300 miles to the beach site while auto-arriving tourists travelled almost 900 miles. The mean level of income was $37,078 and the average beach days were 4.672. Both the time cost of travel as well as the beach quality variable were not included in the study. The average consumer surplus per visit to Florida was $235, while the *unbiased* estimate of consumer surplus per beach day amounted to **US$33.91 per person**. There are some conceptual problems with the model, particularly the implicit price of a beach day as an endogenous variable, because of the dependence of the price on the individual's choice of a place to stay, price of hotel/motel, preferences for restaurants and spending on food, etc. (Freeman, 1995).

Leeworthy and Wiley (1991) estimated the consumer surplus per person per day for visits to the Island Beach State Park on the New Jersey coast. The authors utilized a standard travel cost model. Various consumer surplus figures were reported for different functional forms, ranging from **$24.74** to **$30.67** for the linear functional form and from **$17.76** to **$26.88** for the semi-log form.

In Europe, some UK results broadly suggest a "clustering" of value estimates in the range of £10 to £25 per household per annum in the context of river quality improvements and loss of beach and coastal recreation and amenity (Pearce and Turner, 1992). Table 3 presents some of the valuation studies in the UK.

In a more recent study, King (1995) utilized the CVM to estimate the user value associated with a recreational beach in England. The majority of visitors could be divided into the following groups: (1) promenade users; (2) attraction users; (3) beach recreationalists and (4) water users. The mean willingness to pay for recreational beach use among visitors was **£1.65** in the total sample and **£1.79** among the non-zero bidders (Table 4).

Coral Reef and Marine Parks

One of the possible impacts resulting from the establishment of marine parks is the loss of livelihood from fishing. Vogt (1996) aimed to assess tourism as an additional source of income for fishing communities since the core area of the Apo marine reserve is a no-fishing zone. Apo Island, which is located in Negros Oriental in the Central Visayas, Philippines, is a volcanic island covering only 72 ha with a

Table 3. Environmental Valuation Studies in the UK (£ per household or person per year, unless otherwise stated).

Study	Valuation	Method
Turner and Brooke (1988)		
• *coastal amenity*	15	CVM, local users
	18	CVM, non-local users
Harley and Hanley (1990)		
• *nature reserves*	1.2–2.5 per visit	CVM user values
	2.0–3.5	Travel cost, user values
FHRC (1988-89)		
• *beach amenity*	14–18	CVM, user values
Willis and Benson (1987)		
• *nature reserves*	46–251/ha/yr	Travel cost, all users
	4–34/ha/yr	Travel cost, wildlife, visitors only
	25/ha/yr	CVM, non-use value
• *forest recreation*	1.9 per visit	Travel cost, user value

Source: Pearce and Turner (1992).

Table 4. Willingness to Pay for Recreational Beach Use (£).

User Type	Total Sample		Sample Size	Non-zero Bidders	
	Mean	Median		Mean	Median
Resident	2.02 (1.31)	2.00	58	2.21 (1.20)	2.00
Day visitors	1.61 (1.21)	1.50	34	1.83 (1.13)	1.50
Staying visitors	1.67 (1.12)	1.50	75	1.77 (1.07)	1.50

Note: Standard deviations in parentheses (£).
Source: King (1995).

Table 5. Financial Benefits of Tourism in Apo Island.

	Average no.	US$/day	US$/yr
Fishing community			
boat transfers to Apo	2	38	14,038
selling souvenirs, etc.		12	4,212
new jobs in resort	4	13	4,660
Resort and dive base owner			
accommodation beach hut	3	58	21,058
hill top	1	19	7,019
restaurant	7	81	29,481
dive base		12	4,212
Dive tour operators	3	115	42,115
Scientists/environmental groups	*(no valuation done)*		

Source: Vogt (1996).

total population of 460 people whose main source of income is fishing. The marine environment offers an interesting spectrum of activities such as dolphin and whale watching, dive trips to coral reef reserves as well as bird watching in mangrove forests. As presented in Table 5, the author estimated the gross financial revenues or direct benefits from tourism in Apo Island.

Cesar (1997) analyzed the tourism benefits of coral reefs in Indonesia over a 25-year period, using a discount rate of 10%. Around 30% of tourism was linked to coral reef tourism. The gross revenue of small-scale tourism per km of coastline is about US$550/yr, and assuming a 60% profit margin, the net direct revenue would be $330/yr. Thus, for the low scenario, the net present value (NPV) was estimated to be $3,000/km^2 of coral reef. On the other hand, the high scenario had a net present value of $503,000/km^2 of coral reef. The following are the assumptions he used in this study: (a) the value of tourism function is zero in areas with no tourism potential; (b) its net present value is $6,000/km of coastline in areas with some tourism and (c) its net present value is $1 million/km of coastline with major tourism.

Riopelle (1995) determined the total economic value of the coral reefs in West Lombok as the sum of the NPVs of each of the economic activities related to the reefs. Lombok is in the Indonesian province of West Nusa Tenggara. Tourism in Lombok was virtually non-existent in the 1960s, but it currently contributes to 16% of total GNP of the island. Table 6 shows the total economic value of the coral reefs at various discount rates. With environmental projects, the discount rate is always an issue. The range of 8% to 12% reflects the concerns of both the environmental proponents (who want a lower discount rate) and the financial analysts (who use higher discount rates, which are based on market interest rates, because of scarcity of funds). The NPVs are all positive, indicating huge benefits from coral reefs; however, the net benefits over time are greatest when the discount rate used is 8%.

In the island of Saba, user fees of **$1** per dive are collected from scuba tour operators. Saba, a volcanic island and part of the Netherlands Antilles, has a population of 1,200 people on its 12.5 km^2 area. The Saba Marine Park includes the entire coastal environment, with primary emphasis on marine tourism, particularly, scuba diving and snorkeling (Sherman and Dixon, 1991). There are no figures given for the willingness to pay of divers, which could be useful for comparison with the user fee and estimation of the consumer surplus.

Dixon et al. (1994) described the benefits and costs associated with dive tourism as well as willingness to pay for park protection in the case of the Bonaire Marine Park (BMP). Bonaire is an island with an area of 288 km^2, located in the Caribbean Sea. The link between the production of ecological and economic benefits was considered, and the limits to increasing use were identified. Apparent threshold stress was found to be from 4,000 to 6,000 dives/site/yr, resulting in an annual carrying capacity of the coral reefs in BMP at around 190,000 to 200,000 dives/yr. The main categories of benefits included in the financial analysis are gross revenues accruing to the private sector and BMP user fees. Since there are a few other attractions on the island, a decrease in the level of

Table 6. Total Economic Value of Coral Reefs of West Lombok (US$).

Uses and Functions	NPV at 8%	NPV at 10%	NPV at 12%
Coral reef fisheries	6,846,645	5,477,316	4,564,430
Marine tourism	*57,684,372*	*23,508,993*	*2, 040,818*
rent from hotel	50,578,711	17,824,464	(2,696,290)
rent from diving and snorkelling	7,105,661	5,684,529	4,737,107
Mariculture	28,409,091	22,727,273	18,939,394
Aquarium fish collection	6,943,182	5,554,545	4,628,788
Souvenir manufacturing	negligible	negligible	negligible
Coral sand mining	not available	not available	not available
Coastal protection	905,000	905,000	905,000
Biodiversity	not estimated	not estimated	not estimated
Total	100,788,000	58,173,127	31,078,430

Source: Riopelle (1995).

protection and degradation of the marine resource would result in loss of both ecological and economic benefits. Employment of locals (although this should not be a benefit in the strict sense as this is a cost of production) is the most lasting 'benefit' since alternative employment opportunities are rather limited. The financial returns from park-based recreation also contribute to tax revenues of the Island Government. The direct costs associated with the establishment, subsequent rehabilitation and initial operation of the BMP are estimated to be approximately $518,000, and the annual recurring costs are about $150,000. Table 7 presents the various benefits and costs associated with the BMP.

Table 7. Revenues and Costs Associated with the Bonaire Marine Park (US$ million).

Revenues	
Direct revenues	
Diver fees (1992 estimate)	0.19
Indirect (private sector) gross revenues	
Hotels (rooms/meals)	10.40
Dive operation (including retail sales)	4.80
Restaurants, souvenirs, car rentals, etc.	4.70
Local air transport	3.30
Subtotal	23.20
Costs	
Costs of protection	
Direct costs (establishment, initial operation, rehabilitation)	0.52
Annual recurring costs	0.15
Indirect costs	?

Source: Dixon et al. (1994).

About 92% of the respondents agreed that the user fee system for park protection in Bonaire is reasonable, and would be willing to pay the proposed fee of $10/diver/yr. Approximately 80% of those surveyed said that they would be willing to pay at least $20/diver/yr, 48% would be willing to pay at least $30/diver/yr and 16% would be willing to pay $50/diver/yr, yielding an average value for WTP of **$27.40**. The consumer surplus ($17.40) can be estimated as the difference between the amount they are willing to pay for the service and the actual amount they paid for, which is the $10 fee instituted in 1992.

Leeworthy (1991) estimated a standard travel cost model of the demand for visits to the John Penekamp Coral Reef State Park and Key Largo National Marine Sanctuary in Florida, USA. Consumer surplus per person per day varied according to the functional forms used, and ranged from **$223** to **$886** for the linear functional form and from **$637** to **$3,448** for the semi-log form. These figures are quite high because the park and reef are unique resources. In another study, the weighted average of consumer surplus per diver for the 1992 level of reef quality in a small coral archipelago off the coast of Central America was estimated by Pendleton (1993) to be about **$256**. This figure is within the range of values obtained by Leeworthy (1991), using the linear functional form.

Mangroves and Coastal Resources

Tables 8 and 9 illustrate the values ascribed to mangrove and wetland ecosystems. One can note the wide disparity of per hectare values, especially when biodiversity values are considered (Universitetet I Bergen Senter for Miljø-og Ressursstudier, 1994).

Incorporating Quality Attributes

One example of ecosystem-linked impact is the case of the Bacuit Bay area in northern Palawan, Philippines, an island famous for its beautiful scenery, abundant fish life and clear water. Resort operators and local artisanal fishermen have been working together to protect the bay's coral and fish population. A third industry, logging, is causing a major source of conflict. In this steep watershed with highly erosive soils, logging results in substantial erosion of that soil, which is deposited directly into the bay. The sediment destroys the coral, which reduces the dependent fishery, and clouds the water. Both diving and fishing industries suffer as a result.

Gross revenues were estimated for the three industries. A logging ban was estimated to produce over $75 million in revenues over a ten-year period from the thriving tourism ($47 million) and fishing ($28 million) industries. On the other hand, continued logging would generate $13 million in logging revenues over the same ten years, but would result in major decreases in tourism revenues (to $8 million) and fishery income (to $13 million). Thus, the 'cost' of continued logging would be the loss of about **$40 million** in gross revenues over the ten-year period (Hodgson and Dixon, 1988; Sherman and Dixon, 1991).

Table 8. Economic Values Placed on Tropical and Subtropical Wetland Systems.

Type of Resource/ Location	Value (US$/ha/yr)	Comment	Study
Complete wetland			
Philippines	6,990	• forestry, fishery, and other products	World Bank (1989)
Forestry products			
Fiji	9		Lai (1989)
Other wetland products			
Louisiana, USA	30	• pelts	Costanza et al. (1989)
Fishery/aquaculture			
Fiji	160	• artisanal and commercial	Lai (1989)
Florida West, USA	88	• marginal productivity value, commercial	Bell (1989)
Thailand	24,000-39,000	• residual rent	Baker and Kaeoniam (1986)
Recreation			
Louisiana, USA	110	• gross economic value (consumer surplus + expenditures)	Bergstrom (1990)
Florida West, USA	197	• marginal output of recreational services	Bell (1989)
Storm protection			
Louisiana, USA	17-57		Faber (1987)
Louisiana, USA	317		Costanza et al. (1989)
Capturable biodiversity			
Indonesia	1,500	• imputed from WTP surveys	Ruitenbeek (1992)

Source: Universitetet I Bergen Senter for Miljø-og Ressursstudier (1994).

Table 9. Economic Values Placed on Mangrove Systems.

Type of Resource or Product	Location	Date	Value (US$/ha/yr)
Complete mangrove ecosystem	Trinidad	1974	500
	Fiji	1976	950-1,250
	Puerto Rico	1973	1,550
Forestry products	Trinidad	1974	70
	Indonesia	1978	10-20 (charcoal and chip)
	Malaysia	1980	25
	Thailand	1982	30-400
Fishery products	Trinidad	1974	125
	Indonesia	1978	50
	Fiji	1976	640
	Thailand	1982	30-100 (fish)
			200-2,000 (shrimps)
Recreation, tourism	Trinidad	1974	200

Source: Hamilton and Snedaker (1984).

Bockstael et al. (1989) utilized two models, namely CVM and travel cost and provided two independent estimates of the value of water quality in beach use, swimming and/or other water activities in the Chesapeake Bay. In the component using CVM, the calculated mean WTP for those who used the bay for recreation was **$159**, and for those who had not used the bay, the mean WTP was **$50**. The travel cost model was used in the second component of this study to calculate the WTP for a 20% improvement in water quality (or a 20% reduction in nitrogen and phosphorus). The WTP amounted to **$80** per household. A varying-parameter travel cost model was used in the third component to estimate benefits to boaters for a 20% reduction in nitrogen and phosphorus concentrations. The average estimate was $6.2 million per year, or about **$78** per boater.

Carson and Mitchell (1993) conducted a study in 1990 to estimate the benefits of water quality. Using the corrected series of bids, the respondents were willing to pay $106 annually for maintaining boatable quality water, $80 more to reach the fishable minimum water quality level, and an additional $89 to move from the fishable minimum quality to a national minimum of swimmable quality water, for an adjusted mean total of **$275**.

Feenberg and Mills (1980) used the random utility model (RUM) to estimate the value of improving certain water quality characteristics at 29 beaches in the Boston area. A reduction in oil to a maximum of 10 mg/100 ml resulted in a benefit per person per year of **$108**.

Likewise, Bockstael et al. (1987) utilized a random utility model (RUM) to analyze beach use in the Boston area, and calculate benefits per trip and per person for a season for reduction in water pollutants. The data came from a survey of households conducted in 1974. This data set was also used by Feenberg and Mills (1980). Concentrations of oil, chemical oxygen demand (COD), and faecal coliform bacteria significantly affected the choice of a beach to visit. Table 10 shows the results of this study. The aggregate values were calculated by the authors using 2.63 million people over age 18, as reported in Feenberg and Mills (1980). The closest comparison between the results of these two studies is for a combined 10% reduction in oil, total bacteria and color. Feenberg and Mills found a value of **$3.23**/person/yr for their change, while Bockstael et al. (1987) found a value of **$10.48** for their change.

King (1995) applied the CVM to assess the economic benefits of improved water and beach quality associated with the prevention of oil pollution in a recreational beach in England. The mean WTP for a reduction in the frequency of oil spills was **£1.41**.

McConnell (1986) estimated the impact of polychlorinated biphenyl (PCB) pollution on the economic value of three urban beaches (East, West and Fort Phoenix) on New Bedford Harbor in Massachusetts. The estimated annual 'damage' per household aware of PCBs ranges from **$3.57** for the East-West Beach to **$4.10** for the Fort Phoenix beach.

Silberman and Klock (1988) conducted a CV study to estimate the value of a beach nourishment program that would result in wider beaches. The study area was a 12-mile stretch of ocean beach in northern New Jersey. One sample of beach users interviewed was asked their WTP for a daily pass to that beach, and the sample mean WTP was **$4.57**. Another sample was given descriptions of results of beach nourishment programs and shown pictures. The mean WTP to visit improved beaches for this group was **$4.95**.

In the study of Silberman et al. (1992), two CVM surveys were designed to measure the *existence value* of beach nourishment from Sea Bright to Ocean Township, New

Table 10. Benefits of Reduction of Water Pollutants in Beaches.

Quality Change	$ per Trip	$ per Season	Aggregate Value ($)
10% reduction in oil	0.14	2.65	6.9 million
10% reduction in COD	0.33	7.31	19.3 million
10% reduction in faecal coliform	0.06	0.52	1.4 million
30% reduction in oil	0.55	12.86	34 million
30% reduction in COD	0.80	19.73	51.9 million
30% reduction in faecal coliform	0.33	7.87	20.7 million
30% reduction in 3 pollutants —all beaches	1.38	33.23	87.5 million
30% reduction in 3 pollutants —8 downtown beaches	0.75	16.12	44.4 million

Source: Bockstael et al. (1987).

Table 11. Summary of Existence Value Bids.

	Total Sample				Non-zero Bidders	
	Mean ($)	Median ($)	Sample Size	Percent Zero Bidders	Mean ($)	Median ($)
On-site survey						
Will use beach	15.21 (20.91)	10.00	1,177	35.5	23.59 (21.92)	20.00
Will not use beach	9.34 (16.04)	0	754	55.6	21.02 (18.28)	20.00
Telephone survey						
Do not use now, will use in the future	19.65 (38.37)	10.00	83	38.6	31.98 (44.00)	20.00
Do not use now nor in the future	9.51 (17.49)	0	138	60.1	23.87 (20.67)	20.00

Note: Standard deviations in parentheses ($).
Source: Silberman et al. (1992).

Jersey. Following the use value questions, the respondents were asked to place a value on the existence value of beach nourishment, whether or not they would use the beaches themselves. Table 11 presents a summary of existence value bids. Sample mean WTP ranges from **$10** to **$20**.

The values obtained by Silberman and Klock (1988) and Silberman et al. (1992) are lower compared to the range of values found by Leeworthy and Wiley (1991) due to differences in site quality. The beaches in New Jersey studied by Silberman and Klock were suffering from erosion and in need of beach nourishment projects. Leeworthy and Wiley, on the other hand, studied the Island Beach State Park, which has recreational facilities. Moreover, there may be anchoring bias in the response to the CVM questions used by Silberman and Klock since the payment vehicle they used was an increase in the price of admission to the beach (Freeman, 1995). This could also be the reason why King (1995) also obtained values for England that are lower in order of magnitude. Some of the respondents/bidders objected to the concept of a ticket charge, arguing that beaches are a public good and pollution control and cleanup is the responsibility of the government (King, 1995). Nevertheless, investments in beach protection and enhancement, which can be costly, can be better evaluated by comparing the costs with the benefits as shown by the values in these studies.

MANAGEMENT OPTIONS

To avail of the marketed and non-marketed benefits well into the future, the coastal and marine resources must be protected or managed now. In choosing the site for a tourist development, for example, it is crucial that that there are setback guidelines and regulations. The desire to be as close to the water as possible can create environmental problems if the relevant planning authorities do not have clear policies for tourism development, are not familiar with the requirements for coastal ecosystem protection, sediment dynamics, and the importance of landscape and habitat protection (OECD, 1993). A setback is defined as an area or a broad littoral border left free of any physical modification, such as buildings, and reserved for natural vegetation growth. Setbacks are important because they allow for natural coastal processes to occur uninterrupted and ensure both physical and visual access to the coastline (Sullivan et al., 1995). Although some resort developers consider setbacks as impediment and decrease the establishment's attractiveness to tourists, the land between the beach and the resort can be enhanced to provide other attractions. The major objectives of setbacks are:

- protecting life and property against erosion and storm surges
- minimizing public investment in coastal protection
- protecting and enhancing the scenic value of coastal environments
- minimizing use conflicts among various types of activities taking place in the coastal zone
- ensuring public access to and along the coast
- maintaining consistency among national and regional laws and plans
- ensuring consistency between national level goals and environmental objectives

- protecting vulnerable coastal habitats, such as sea turtle nesting grounds
- providing buffer zones around coastal archaeological, historical and cultural sites.

For compatibility of coral reef protection and tourism activities, particularly diving, the threshold stress level must be determined and the carrying capacity must be established as had been done in Bonaire Marine Park (Dixon et al., 1994). This could mean a decrease in revenues for diving operators, but in the long run, such revenues will be maintained rather than lost. Exceeding the carrying capacity can result in loss in coral reef biodiversity.

MPP-EAS (1998) prepared a cost-benefit analysis for habitat conservation in the Malacca Straits. One of the direct benefits of regulating habitat usage is the continued recreation and tourism benefits (Table 12). This study shows that, rather than selecting between the extremes of strict preservation and uncontrolled development, the balanced usage of coastal and marine resources for both economic and ecological functions is pivotal to their sustainable management.

Table 12. Estimated Benefits and Costs of Beach and Coral Reef Protection.

Management Option		Value (US$/ha/yr)
a) Beach: Setback zone		
Benefits:	Tourism	5,127.160
	Economic activities	3,723.290
Costs:	Investment cost	3,627.471
	Annual cost	133.040
	Maintenance cost	130.001
b) Coral reef protection		
Indonesia		
Benefits:	Coastal protection	19,176.85
	Coral reef fisheries	7.13
	Biodiversity	15.00
Costs:	Mitigation cost	5.75
	Fisheries	10,336.30
Malaysia		
Benefits:	Ecotourism	249,912.21
	Biodiversity	28.01
	Research	91.08
	Erosion prevention	34,871.75
	Carbon storage	240.00
	Coral reef fisheries	7,751.04
Costs:	Ecotourism:	
	Investment cost	115,189.98
	Annual cost	4,224.67
	Maintenance cost	4,115.77
	Coral reef fisheries	10,336.30

Source: MPP-EAS (1998).

Tourism Sector in Indonesia, Malaysia and Singapore

The Malacca Straits Environmental Profile describes the status of development for various coastal resorts and beaches found along the Straits, including certain socioeconomic contributions and impacts on the environment (Chua et al., 1997). The areas that have been identified as the important coastal tourist spots along the Straits of Malacca are shown in Table 13.

Table 13. Major Tourist Spots.

Country	State/Province	Tourist Spot
Indonesia	Riau Province, Sumatra	Batam Island - Nongsa Beach Bintan Island - Trikora Beach
Malaysia	Kedah	Langkawi Island Pasir Hitam and Kuah Pantai Merdeka Pavar, Segantang, Kala and Lembu islands
	Penang	Penang Island: Batu Feringgi, Teluk Bahang Gurney Drive and Padang Kota Seberang Perai: Pantai Bersih
	Perak	Pangkor Island: Pasir Bogak Pulau Pangkor Laut Lumut: Pantai Teluk Batu
	Selangor	Pantai Morib
	Negeri Sembilan	Port Dickson
	Malacca	Tanjung Bidara Pantai Kundor Pantai Klebang Pulau Besar
Singapore		East Coast Resort Area Changi Resort Area Pasir Ris-Loyang Resort Area Sentosa Island

Source: Chua et al. (1997).

Indonesia comprises an archipelago of 17,500 islands, stretching from Sumatra in the west to Irian Jaya in the east. This country therefore offers visitors tropical beaches, rainforests, and one of the most diverse flora and fauna in the world. It also offers historical sites, such as Borobodur. Likewise, Malaysia has become an important tropical vacation spot due to moderate prices, typical tropical climate, abundant beaches, mountainous and rainforested parks, and clusters of historical and colonial towns. Singapore, as a tourist destination, offers the same tropical climate, theme parks, resort complex at Sentosa, shopping centers, together with a reputation for safety and cleanliness. It has a joint venture with Indonesia in the development of Bintan island in Indonesia as a major resort complex.

IMPACTS OF TOURISM

Among the direct impacts of tourism in these countries are the revenues derived from this sector. From 1982 to 1995, the number of annual arrivals in Indonesia increased by a record level of almost 630% from 592,000 in 1982 to 4.3 million in 1995. For Malaysia, the number of annual arrivals increased from 2.5 million in 1981 to 7.3 million in 1995, or an increase of 189% for this period. The number of annual

arrivals to Singapore more than doubled from 3 million in 1985 to 7 million in 1995.

The tourism receipts in Indonesia increased by 127%, from $2.1 billion in 1990 to $5.2 billion in 1995. Tourism in Malaysia is the third major foreign exchange earner. Revenues (from tourism) increased from $1.7 billion in 1990 to $3.9 billion in 1995 in Malaysia. For Singapore, tourism revenues account for about 7% of GDP and about 6% of total exports of goods and services. There was an increase from $8.3 billion in 1990 to $11.7 billion in 1995 in Singapore. The tourist arrivals and receipts are shown in Table 14.

Table 14. Tourist Arrivals and Revenues.

	1986	1987	1988	1989	1990
INDONESIA					
Visitor arrivals	825,035	1,060,347	1,301,049	1,625,965	2,177,566
Total revenues (US$ million)					2,105.29
SINGAPORE					
Visitor arrivals	3,191,058	3,678,809	4,186,091	4,829,950	5,322,854
Travel exports/tourism receipts (US$ million)	3,847.9	4,506.2	5,275.5	6,448.9	8,325.4
As % of services exports	20.9	20.7	19.9	20.1	21
As % of total imports of goods and services	5.9	5.7	5	5.5	6.2
MALAYSIA					
Visitor arrivals	3,217,462	3,358,983	3,623,636	4,846,320	7,445,908
Total revenues (US$ million)	647	712	768	1,035	1,664
Total revenues (RM million)	1,669	1,795	2,012	2,803	4,500

	1991	1992	1993	1994	1995
INDONESIA					
Visitor arrivals	2,569,870	3,064,161	3,403,138	4,006,312	4,324,000
Total revenues (US$ million)	2,522.01	3,278.19	3,987.56	4,785.26	
SINGAPORE					
Visitor arrivals	5,414,651	5,989,940	6,425,778	6,898,951	7,137,255
Travel exports/tourism receipts (US$ million)	7,872.0	904,603.0	10,120.9	10,930.2	11,653.0
As % of services exports	18.8	20.8	21.3	20.4	18.9
As % of total imports of goods and services	5.5	6.1	6	5.5	5.2
MALAYSIA					
Visitor arrivals	5,847,213	6,016,209	6,503,880	7,064,000	7,322,000
Total revenues (US$ million)	1,557	1,804	1,968	3,189	3,910
Total revenues (RM million)	4,283	4,595	5,066		

Sources: Dept. of Tourism, Posts and Telecommunications. Statistical Report on Visitor Arrivals to Indonesia (1989, 1990, 1991,1992,1993,1994).
Malaysian Tourism Promotion Board. Annual Tourism Statistical Report (1989,1990,1991,1992,1993,1994)
Singapore Tourism Promotion Board. Singapore Annual Report on Tourism Statistics (1991,1992,1993,1994, 1995,1996).
World Tourism Organization. Compendium of Tourism Statistics (1994,1995).

There is uncertainty concerning projected tourist arrivals in the next few years. The haze that clouded parts of Indonesia, Malaysia, Philippines and Singapore drastically affected arrivals in 1997 due to health concerns. Air arrivals fell sharply as low visibility due to the haze resulted in flight cancellations. Tourism is the second most affected sector as shown in Table 15. Moreover, arrivals from within ASEAN declined due to the weakening economic conditions, exacerbated by the regional currency crisis.

Table 15. Haze '97—The Cost (millions of US dollars*).

Damage	Indonesia	Malaysia	Singapore	Total
Short-term health	924.0	8.0	3.7	935.7
Industrial production	U/DA	157.4	N/NA	157.4
Tourism	**70.4**	**127.4**	**58.4**	**256.2**
Airline and airport	17.6	0.2	0.4	18.2
Fishing	U/DA	16.2	N/NA	16.2
Cloud seeding	U/DA	0.8	N/NA	0.8
Total	1,012.0	310.0	62.5	1,384.5

Notes: * - at July 1997 exchange rates of US$1 = 2,500 rupiah, 2.5 ringgit, S$1.4
U/DA - unknown or data unavailable; N/NA - negligible or not applicable
Not included: All losses directly caused by fire (plantations, forests, biodiversity, CO_2 emissions, etc.). Other haze-related damage: long-term health, loss of life, reduced crop productivity, etc.
Source: Economy and Environment Program for Southeast Asia, and World Wide Fund for Nature (1998).

Tourist Profile

For Indonesia, the visitor arrival statistics are based on the collection and processing of embarkation and disembarkation cards from the Directorate General of Immigration, and published by the Department of Tourism, Posts and Telecommunications. Likewise, the embarkation/disembarkation cards, which visitors arriving in Malaysia and Singapore are prescribed to complete, serve as the source of statistics on visitor arrivals.

• Visitors according to country of residence

In terms of source markets, about 76% of all foreign visitors to Indonesia in 1995 came from the Asian and Australasian (Oceania) region, and 39% of these were from within the ASEAN block. The countries within the Asian-Australasian region are also the main countries of origin of visitors to Malaysia in 1995 (90%). About 77% are from within ASEAN. About 79% of the number of arrivals to Singapore in 1995 were also from the Asian-Australasian region, with ASEAN accounting for 31% of the visitors. Strong economic performances and consumer confidence among ASEAN countries contribute to the increases in tourist arrivals in Indonesia, Malaysia and Singapore. The double-digit growth momentum from Northeast Asian markets, such as Taiwan, South Korea and China, reflected greater affluence and preference for leisure travel as status symbol. Table 16 shows the visitor arrivals, by country of residence, for the period 1990-1995.

• Purpose of visit

Purpose of visit refers to a motivation of the trip, the reason in the absence of which the trip would not have taken place (World Tourism Organization, 1995). Holidaymakers account for more than half of all the visitors to Indonesia, Malaysia and Singapore (Table 17). Although there has been a 62% increase in the number of visitors going to Indonesia for vacation, percentage-wise, it has declined from 81% in 1990 to 66% in 1995. This is due to the significant increase of business visitors by 381% for the same period.

• Length of stay

Tourists tend to stay longest in Indonesia (average of 11-12 days) and about 4-5 days in Malaysia and 3 days in Singapore (Table 17). By country of origin of visitor to Indonesia and Malaysia, long-haul visitors from Europe, North America and Australia tend to stay the longest while visitors from Southeast Asia tend to stay for the shortest period of all. The decline in the average length of stay in Singapore was due to the increasingly combined visits to neighboring destinations, such as Malaysia and the islands of Batam and Bintan in Indonesia.

• Average expenditure

The average per capita daily expenditure of visitors to Indonesia increased from $82 in 1990 to

Table 16. Visitor Arrivals, by Country of Residence ('000).

	1990	1991	1992	1993	1994	1995
INDONESIA	2,178	2,570	3,064	3,403	4,006	4,324
From						
Asia and Oceania	1,551	1,943	2,327	2,518	2,955	3,291
ASEAN	849	1,082	1,225	1,341	1,519	1,692
Other Asia/Pacific	702	861	1,102	1,177	1,436	1,599
Europe	484	482	562	660	799	794
UK	92	101	118	133	162	161
US	101	101	125	155	169	160
MALAYSIA	5,446	5,847	6,016	6,504	7,064	7,322
From						
Asia and Oceania		5,432	5,849	6,501		6,753
ASEAN	5,495	4,155	4,516	4,883	5,427	5,638
Other Asia/Pacific	1,186	1,012	916	966	1,074	1,115
Europe	455	421	344	373	401	404
UK	196	167	142	155	167	168
US	146	105	79	86	102	105
SINGAPORE	5,323	5,415	5,990	6,426	6,899	7,137
From						
Asia and Oceania	3,978	4,143	4,595	4,918	5,353	5,659
ASEAN	1,443	1,680	1,811	1,940	2,141	2,190
Other Asia/Pacific	2,535	2,463	2,784	2,978	3,212	3,469
Europe	944	888	958	1,020	1,017	966
UK	297	275	303	311	302	287
US	261	254	288	307	344	346

Sources: Dept. of Tourism, Posts and Telecommunications. Statistical Report on Visitor Arrivals to Indonesia.
Malaysian Tourism Promotion Board. Annual Tourism Statistical Report.
Singapore Tourism Promotion Board. Singapore Annual Report on Tourism Statistics.

$108 in 1995. Almost half of all tourist expenditure was accounted for by accommodation and meals, and about a quarter by local transportation and sightseeing. In Malaysia, the average per capita daily expenditure was about $52.36 for the period 1990-1995. Shopping accounted for about one-sixth and one-fifth of tourist expenditure in Indonesia and Malaysia, respectively. In Singapore, the average per capita daily expenditure increased from $261.5 in 1990 to $386.5 in 1995.

- Distribution of visitors by location/port of entry

The percentage of tourists entering Indonesia through the ports of Polonia (in Medan) and Batam increased from 10% to 30% (Table 18). About 36% of foreign visitors to Malaysia stayed at hotels/resorts in the Island Resorts (Langkawi, Pangkor, Port Dickson), Penang and other West Coast towns (Table 19).

TOURISM DEVELOPMENT PLANS

Current development of beach resorts needs to be compared to selected planning standards for these resorts in order to assess the sustainability of tourism development along coastal areas. Wong (1991) enumerates the planning standards, and controls to be considered. Some of these control measures are based on the experience of the atolls in the Maldives, e.g., limit of one resort in uninhabited islands, holding all resorts and their companies responsible for providing nonpolluting refuse and wastewater disposal, and non-interference of tourism with the local industries, such as fishing and agriculture. Blommestein (1987) also discussed the environmentally sound development of tourism in the Caribbean. In Saba and Bonaire Marine Parks, diver fees are collected. Wong (1993) examined the development and nature of tourism on the islands off the East and West Coasts of Peninsular Malaysia, and discussed the tourism-

Table 17. Visitor Profile.

	1990	1991	1992	1993	1994	1995
INDONESIA						
Purpose of visit ('000)						
Vacation	1,767	2,128	2,520	2,534	2,894	2,864
Business	284	326	400	753	1,006	1,367
Others	127	116	143	116	106	93
Length of stay (days)	11.82	11.84	11.08	10.66	10.33	11.15
Ave. per capita daily expenditure ($)	81.79	82.89	96.56	109.92	115.63	108.44
MALAYSIA						
Purpose of visit ('000)						
Vacation	3,648.8	3,917.5	4,024.7	4,377.2	4,732.9	4,905.7
Business	361.0	361.0	385.0	396.7	423.8	439.3
Others	1,624.3	1,624.3	1,606.3	1,730.1	1,907.3	1,976.9
Length of stay (days)		4.6	4.8			
Ave. per capita daily expenditure ($)	47.06	57.78	62.97	64.38	36.60	45.37
SINGAPORE						
Purpose of visit ('000)						
Vacation	3,312	3,133	3,519	3,752	4,024.00	3,965.00
Business	1,023	1,020	1,064	1,145	1,240.00	1,321.00
Others	988	1,262	1,407	1,529	1,635.00	1,851.00
Length of stay (days)	3.3	3.26	3.14	3.0	2.95	2.89
Ave. per capita daily expenditure ($)	261.5	258.14	295.26	324.93	351.62	386.54

Sources: Dept. of Tourism, Posts and Telecommunications. Statistical Report on Visitor Arrival to Indonesia.
Malaysian Tourism Promotion Board. Annual Tourism Statistical Report.
Singapore Tourism Promotion Board. Singapore Annual Report on Tourism Statistics.

Table 18. Visitor Arrivals, by Port of Entry, Indonesia, 1982 - 1994.

Port of Entry	1982	1983	1984	1985	1986	1987	1988
A. Soekarno-Hatta	324,039	344,105	360,542	364,693	385,665	465,358	537,594
B. Ngurah Rai	152,953	167,064	187,135	202,421	233,484	296,338	351,509
C. Polonia	59,875	66,451	71,889	74,195	74,298	86,105	103,877
D. Batam		21,416	42,038	60,161	84,475	145,627	227,980
E. Other Ports	55,179	39,819	39,306	47,881	47,113	66,919	80,089
Total	592,046	638,855	700,910	749,351	825,035	1,060,347	1,301,049

Port of Entry	1989	1990	1991	1992	1993	1994
A. Soekarno-Hatta	630,602	845,101	844,789	978,487	991,412	1,181,541
B. Ngurah Rai	425,838	476,440	567,628	740,806	885,749	1,048,901
C. Polonia	120,794	129,014	151,315	169,946	185,151	188,562
D. Batam	359,497	578,333	606,837	678,086	745,382	900,466
E. Other Ports	89,234	148,678	399,301	496,836	595,444	686,842
Total	1,625,965	2,177,566	2,569,870	3,064,161	3,403,138	4,006,312

environment relationships and issues specific to them. The present pattern of island tourism varies widely from the more developed and established island resort of Penang to the emerging resorts in Langkawi and Tioman, and chalet development on some islands off Johore and Terengganu. Some of the negative impacts of tourism in these areas are enumerated below:

- uncontrolled development

  => pollution (due to increasing number of motorized boats, untreated sewage, solid waste)

- displacement of local residents
  => resettlement
  => foregone fishing activities

- erosion

Under the Indonesian Sixth Five-Year Plan, about seven core policies are to be adopted to stimulate further foreign visitor arrivals into the country. One of these is to increase and improve the quality of the tourism product and tourism-related services, such as the emphasis on ecotourism tours, hunting and fishing vacations (Payne, 1993). The budgetary allocations for tourism and environment in the Indonesian Plan (Repelita VI) are shown in Table 20. In the Sixth Malaysian Plan, the overall thrust for the tourism sector is to expand and diversify the tourism base. A number of historical sites have been selected for preservation/restoration. Special attention is also to be given to natural resource conservation, particularly in the highland and island resorts, marina parks, forest reserves, wildlife sanctuaries and tropical rainforests (Payne, 1993). Table 21 shows the allocation and actual expenditures for tourism in the Fifth, Sixth and Seventh Malaysian Plans and the program components.

The tourism revenues in these countries more than offset their respective governments' expenditures allocated to the tourism and environment sectors. For Indonesia, the combined government allocation for tourism and environment for the year 1994-95 was about $162 million (using the exchange rate of US$1 = Rp2,500) while the tourism revenue for 1994 was $4,785.26 million. For Malaysia, the expenditure for tourism for the period 1991-95 was $1,397.5 million (using the exchange rate of US$1 = RM2.5), but the tourism revenue for this period already amounted to $12,428 million.

Table 19. Destination of Guests in Malaysia, 1988-1993.

Locality	1988			1989		
	Domestic	Foreign	Total	Domestic	Foreign	Total
Kuala Lumpur	*1,372,037*	*704,029*	*2,076,066*	*1,644,639*	*969,344*	*2,613,983*
Pulau Pinang/Penang	*690,201*	*409,924*	*1,100,125*	*1,091,455*	*706,733*	*1,798,188*
Beach area	281,398	222,561	503,959	465,502	384,710	850,212
City area	408,803	187,363	596,166	625,953	322,023	947,976
Other West Coast Towns	*2,378,854*	*697,864*	*3,076,718*	*2,897,874*	*984,894*	*3,882,768*
Kangar						
Alor Setar						
Ipoh						
Seremban						
Malacca/Melaka	363,979	176,624	540,603	536,133	276,931	813,064
Johor Bahru/Johor	777,235	215,299	992,534	971,952	285,864	1,257,816
Petaling Jaya/Subang						
Selangor	210,287	102,989	313,276	252,331	144,186	396,517
Kedah (excl. Pulau						
Langkawi)	119,615	6,041	125,656	123,493	6,103	129,596
Perlis	23,859	650	24,509	29,164	1,102	30,266
Perak	489,150	59,410	548,560	522,947	100,570	653,517
Negeri Sembilan	67,716	9,858	77,574	83,742	8,621	92,363
Pahang (excl. resorts)	327,013	126,993	454,006	348,112	161,517	509,629
Mersing						
Other East Coast Towns	*274,443*	*79,380*	*353,823*	*325,855*	*76,001*	*401,856*
Kuantan/Kelantan	113,323	23,200	136,523	161,488	30,197	191,645
Dungun						
Kuala Terengganu	161,120	56,180	217,300	164,407	45,804	210,211
Kota Bahru						
Hill Resorts	*703,600*	*350,079*	*1,053,679*	*969,419*	*501,575*	*1,470,994*
Island Resorts	*231,092*	*75,874*	*306,966*	*359,044*	*108,488*	*467,532*
Tioman Island						
Langkawi Island						
Pangkor Island						
Port Dickson	88,805	15,284	104,089	111,130	23,689	134,819
Total Peninsular Malaysia	5,650,218	2,317,150	7,967,368	7,288,286	3,347,035	10,635,321
Sabah	258,968	97,633	356,601	342,548	58,372	400,920
Sarawak	2 12,951	47,326	260,277	217,435	54,090	271,525
Kota Kinabalu						
Kuching/Santubong						
W.P. Labuan/F.T. Labuan						
Total East Malaysia	471,919	144,959	616,878	559,983	112,462	672,455
TOTAL MALAYSIA	6,122,137	2,462,109	8,584,246	7,848,269	3,459,497	11,307,766

Table 19. Destination of Guests in Malaysia, 1988-1993 (continued).

Locality	1990			1991		
	Domestic	Foreign	Total	Domestic	Foreign	Total
Kuala Lumpur	*1,666,800*	*1,041,449*	*2,708,249*	*824,749*	*1,298,531*	*2,123,280*
Pulau Pinang/ Penang	*1,494,330*	*773,362*	*2,267,692*	*668,835*	*955,086*	*1,623,921*
Beach area	447,540	295,245	742,785	110,807	391,102	501,909
City area	1,046,790	478,117	1,524,907	558,028	563,984	1,122,012
Other West Coast towns	*3,394,543*	*1,242,644*	*4,637,187*	*1,693,850*	*1,032,017*	*2,725,867*
Kangar				21,749	669	22,418
Alor Setar				170,123	7,775	177,898
Ipoh				359,799	46,447	406,246
Seremban				42,219	36,859	79,078
Malacca/Melaka	540,427	277,249	817,676	284,695	251,967	536,662
Johor Bahru/Johor	1,143,131	383,335	1,526,466	652,978	355,167	1,008,145
Petaling Jaya/Subang				162,287	333,133	495,420
Selangor	357,146	219,378	576,524			
Kedah (excl.Pulau Langkawi)	151,161	7,561	158,722			
Perlis	26,290	1,642	27,932			
Perak	713,974	225,139	939,113			
Negeri Sembilan	13,035	20,020	133,055			
Pahang (excl. resorts)	349,379	108,320	457,699			
Mersing						
Other East Coast towns	*487,315*	*134,320*	*621,635*	*681,392*	*227,652*	*909,044*
Kuantan/Kelantan	211,347	54,949	266,296	285,165	128,420	413,585
Dungun				27,895	8,956	36,851
Kuala Terengganu	275,968	79,371	355,339	198,340	23,820	222,160
Kota Bahru				169,992	66,456	236,448
Hill Resorts	*887,239*	*464,129*	*1,351,368*	*562,836*	*531,893*	*1,094,729*
Island Resorts	*667,707*	*280,098*	*947,805*	*421,474*	*415,854*	*837,328*
Tioman Island				15,676	151,480	167,156
Langkawi Island				215,219	176,844	392,063
Pangkor Island				90,672	57,616	148,288
Port Dickson	130,838	24,162	155,000	99,907	29,914	129,821
Total Peninsular Malaysia	8,597,934	3,936,002	12,533,936	4,853,136	4,460,933	9,314,081
Sabah	426,702	136,940	563,642			
Sarawak	360,495	97,972	458,467			
Kota Kinabalu				262,744	133,162	395,906
Kuching/Santubong				182,917	110,032	292,941
W.P. Labuan/ F.T. Labuan						
Total East Malaysia	787,197	234,912	1,022,109	445,681	243,194	688,855
TOTAL MALAYSIA	9,385,131	4,170,914	13,556,045	5,298,797	4,704,127	10,002,924

Table 19. Destination of Guests in Malaysia, 1988-1993 (continued).

Locality	1992			1993		
	Domestic	Foreign	Total	Domestic	Foreign	Total
Kuala Lumpur	*944,929*	*1,532,999*	*2,477,921*	*1,087,428*	*1,857,171*	*2,944,599*
Pulau Pinang/Penang	*570,909*	*1,335,123*	*1,906,032*	*644,378*	*918,961*	*1,563,339*
Beach area	106,011	263,319	369,330	-	-	-
City area	464,898	1,071,804	1,536,702	-	-	-
Other West Coast towns	*1,264,578*	*861,405*	*2,125,983*	*1,735,116*	*1,059,998*	*2,795,114*
Kangar	24,858	2,688	27,546	24,194	5,007	29,201
Alor Setar	148,514	22,499	171,013	173,857	88,476	262,333
Ipoh	284,593	72,076	356,869	275,079	63,970	339,049
Seremban	48,136	21,455	69,591	103,164	39,220	142,384
Malacca/Melaka	253,840	334,343	588,183	303,233	328,332	631,565
Johor Bahru/Johor	399,747	162,625	562,372	706,619	261,311	967,930
Petaling Jaya/Subang	104,890	245,719	350,609	107,467	238,237	345,704
Selangor	-	-	-	-	-	-
Kedah (excl. Pulau Langkawi)	-	-	-	-	-	-
Perlis	-	-	-	-	-	-
Perak	-	-	-	-	-	-
Negeri Sembilan	-	-	-	-	-	-
Pahang (excl. resorts)	-	-	-	-	-	-
Mersing	-	-	-	41,503	35,445	76,948
Other East Coast towns	*552,827*	*306,555*	*859,382*	*617,048*	*314,881*	*931,929*
Kuantan/Kelantan	183,339	155,422	338,761	235,833	172,082	407,915
Dungun	24,613	38,261	62,874	23,517	41,879	65,396
Kuala Terengganu	183,430	40,324	223,754	167,921	27,598	195,519
Kota Bahru	161,445	72,548	233,993	189,777	73,322	263,099
Hill resorts	*482,064*	*550,538*	*1,032,602*	*668,127*	*587,292*	*1,255,419*
Island resorts	*578,915*	*631,161*	*1,210,076*	*618,779*	*695,538*	*1,314,317*
Tioman Island	64,133	209,311	273,444	29,224	92,869	122,093
Langkawi Island	171,284	233,481	404,765	354,492	500,439	854,931
Pangkor Island	196,005	129,908	325,913	91,165	56,422	147,587
Port Dickson	147,493	58,461	205,954	143,898	45,808	189,706
Total Peninsular Malaysia	4,394,222	5,215,823	9,610,045	5,370,878	5,433,851	10,804,727
Sabah	-	-	-	-	-	-
Sarawak	-	-	-	-	-	-
Kota Kinabalu	239,244	135,890	357,134	259,984	114,481	374,465
Kuching/Santubong	293,281	104,396	397,677	204,828	85,531	290,359
W.P. Labuan/F.T. Labuan	-	-	-	82,753	29,264	112,017
Total East Malaysia	532,525	240,286	772,811	547,565	229,276	776,841
TOTAL MALAYSIA	4,926,747	5,456,109	10,382,851	5,918,441	5,663,127	11,581,568

Table 20. Government Development Expenditure for Tourism and Environment (Rp million).

Sector	Annual National Budget (1994/95)	Total During Repelita VI (1994/95-1998/99)
Tourism	48,730	325,380
Environment	356,880	2,639,000

Source: National Development Planning Agency, Indonesia.

Table 21. Development Allocation for Tourism, 1985 - 2000 (million ringgit).

Program	Fifth Plan (1985-1990)		Sixth Plan (1991-1995)		Seventh Plan (1996-2000)
	Allocation	Expenditure	Allocation	Expenditure	Allocation
Preservation of national/ historical heritage	1.5	0.7	41.1	24.8	45.5
Tourist accommodation	2.0		169.8	161.7	64.3
Cleanup and environmental programs	2.5	2.5	51.9	46.7	65.1
Cultural product development	2.5	2.5	120.6	67.6	181.2
Facilities and infrastructure	79.2	76.7	331.0	231.8	280.0
Others	52.8	49.7	31.9	26.4	60.8
Total	140.5	132.1	746.3	559.0	696.9

Source: Seventh Malaysia Plan.

Benefit-Cost Analysis

The condition of beaches and coral reefs in the Malacca Straits is described in the Malacca Straits Environmental Profile (Chua et al., 1997). The entire east coast of Sumatra has natural beaches, and the built-up areas (ports, residential and industrial estates, tourist resorts) represent only a small portion of the beach area. In Singapore, natural beaches are narrow, while artificial beaches, found along the east coast of the main island, are created from coastal land reclamation. In Malaysia, the known beach resorts are found in Pangkor Laut Island, Langkawi and its southern islands, Port Dickson, Pulau Land Tengah (Blue Coral Island) and Tioman Island. The coral reefs along the Malacca Straits are in fair condition due to sedimentation, fishing intensity, etc., although tourist activities have so far not contributed much to the stress (Chua et al., 1997).

Valuation of natural and environmental assets has implications on policy-making. As shown in the review of studies on beach and marine recreation and tourism, large benefits can be derived by protecting or regulating the use of coastal and marine resources. One concept in recreational planning is the idea of carrying capacity, which has been applied to coastal tourism since the early 1960s (Wong, 1991). Two policies are considered here: coral reef protection and setback zoning for beach areas, and a 20-year time horizon is adopted for the benefit-cost analysis. Discount rates of 5%, 10% and 15% were used for sensitivity analysis. Lower discount rates are preferred for environmental projects while higher discount rates are preferred by financial analysts to reflect market rates for investment and working capital.

The first policy involves the limitation of the number of divers as determined by the coral reef carrying capacity. For implementation of this policy, coral reef areas may have to be divided into zones according to the different uses. These include biological zones where ecosystems, habitat and genetic diversity are protected; fisheries management zones where particular fish stocks are monitored and catch levels are controlled; tourism management zones where recreational uses that are consistent with the carrying capacity of the area are allowed and scientific research zones where ecologically-sound research is allowed in relatively undisturbed, pristine areas (Kenchington and Hudson, 1984). Among the most important determinants of coral reef carrying capacity are the size and shape of the reef as well as the composition of coral communities. Furthermore, different activities have far-reaching consequences. Coral, shell and aquarium fish collection and spearfishing selectively deplete populations of target species. Visible damage to corals from anchors and poison and blast fishing is also conspicuous. The level of experience of snorkelers and divers is another factor that determines carrying capacity (Western, 1986). In the case of the Bonaire Marine Park, the threshold level was determined in terms of the number of dives that can be allowed per coral reef site per year (Dixon et al., 1994).

The second policy involves the provision of adequate buffer zones between development and existing shorelines. In Indonesia (for example, Nusa Dua in Bali), development controls for coastal tourism include a setback line of 100 m from the waterline for all construction as well as proper sewage outlets to ensure that beaches and marine life are not affected (Wong, 1991). Setback zones protect life and property against erosion and storm surges, preserve vulnerable coastal habitats, such as sea turtle nesting grounds, and enhance the scenic value of coastal areas.

TOURISM REVENUES

The paramount direct benefits of both policies that are considered in this paper are the tourism revenues and consumer surplus. Table 22 shows how tourism revenues from beach use in the Straits of Malacca are derived. Tourists spent about 27% of their stay in the beach, particularly for swimming (Kechic, et al., 1991). The estimated tourism revenues amount to $777,265,242. To obtain the per hectare value for the Straits of Malacca, each country's tourism revenues were divided by the number of hectares of beach area, and weighted according to the percentage share of each country's beach area to the total beach area in the Straits. There are also other economic activities along the beach, such as seafood restaurants. Without setback zoning, erosion rates would be increased, necessitating investments in shoreline protection, such

Table 22. Tourism Revenues from Beach Use, 1995.			
	Indonesia	Malaysia	Singapore
Number of tourists	1,167,480	2,928,800	3,965,000*
Purpose (% - vacation)	66%	67%	
Length of stay (days)	11	4.8	
Daily expenditure	108.4	45.37	386.54
Activity (% - swimming)	27%	27%	27%
Gross revenue ($)	248,072,782	115,382,063	413,810,397

* This figure refers to the number of tourists going to Singapore for vacation.

as seawalls and dikes, and eventually resulting in higher operating and maintenance costs. Losses in revenues can also occur as tourists go to other beach sites.

Revenues from diving activities in the coral reef sites are derived by assuming that the number of divers is limited to 5,000 dives per site[1] to maintain carrying capacity, and that the average daily expenditures amount to $175[2]. There are 10 sites with coral reefs in the Indonesian portion of the Straits of Malacca and 5 sites in the Malaysian part of the Straits. The total area of coral reefs in the Straits is about 6,532.12 ha (MPP-EAS, 1998). The estimated revenues from divers amount to $42 million or about $6,429.77 per hectare of coral reefs in the Straits. Without the coral reef protection in place, a reduction in the life span of the coral reefs or degradation in the biodiversity of the reefs may result, thus affecting potential revenues. The consumer surplus will also be affected by changes in the quality of the coral reefs and beach areas.

CONSUMER SURPLUS

Valuing tourism benefits signifies measuring not just the direct monetary benefits, such as tourism revenues, but also the surplus that these natural resources would generate to individuals and to the local economy if the environment and natural resources were efficiently managed and correctly priced for the tourist population. There are also non-marketed goods and services that these resources furnish. These nonmonetary benefits have not been traditionally quantified, leading to the undervaluation of these resources and the lack of regulatory policies, and resulting eventually in resource degradation.

Since most environmental attributes do not have specific markets in which prices and quantities can be readily measured, the absence of markets implies the need for alternative valuation methods. The most well-known are the travel cost, hedonic pricing and contingent valuation methods (CVM). The various estimates of willingness-to-pay (WTP) and consumer surplus (per person per day) derived from studies on recreational demand by tourists were adopted in this study and are presented in Table 23. For lack of studies done in the area, Bell and Leeworthy's (1990) estimated consumer surplus was adopted in this paper as this figure is assumed to reflect the consumer surplus of tourists going to tropical beaches. In doing the benefits transfer method (BTM), we have to choose benefit values from sites that are close to or similar in quality with the study site. The consumer price index (CPI) is used to adjust the consumer surplus figure to real or constant price for the year under consideration (1995). Using the value of $49.73 as the value of the consumer surplus per person, the aggregate consumer surplus amounts to $293,515,407 for the three countries (Table 24). The weighted average consumer surplus on a per hectare basis is about $1,234.82/ha/yr. For coral reefs, we choose Pendleton's (1993) estimated consumer surplus of divers in Central America. Adopting the value of $277.93 as the adjusted consumer surplus value per diver, and 80,000 divers per year, the aggregate consumer surplus is estimated to be around $22.2 million/yr or $3,403.86/ha/yr.

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[1] For lack of information on actual carrying capacity of the coral reefs in the Malacca Straits, this is adopted from the case of the Bonaire Marine Park, wherein the threshold stress level is between 4,000 and 6,000 dives per site (Dixon et.al., 1994).

[2] Diving expenditures consist of the following (Asian Diver, 1998); (a) two-tank boat dive with weights and divemaster (RM 100-180 per diver); (b) accomodation (RM 150-250 per person); (c) scuba gear rentals (RM 30 per day) and (d) speed boat transfer (RM 60-75 per person). A diver stays an average of three days per visit.

Table 23. Valuation of Recreational Benefits from Coastal and Marine Resources.

Study	Value	Method	Place	Year Survey Was Conducted
Beach use				
(a) Bell and Leeworthy (1990)	$33.91	TCM (C.S. per day)	Florida, USA	1984
(b) King (1995)	£ 1.78	CVM	England	1993
(c) Leeworthy and Wiley (1991)	$24.74- 30.67	TCM (C.S. per day, linear fn.)	New Jersey, USA (Island Beach State Park)	
	$17.76-26.88	TCM C.S. per day, semi-log fn.)		
(d) Pearce and Turner (1992)	£ 14-18	CVM	UK	1988-89
(e) Pearce and Turner (1992) (coastal amenity)	£ 18	CVM (non-local users)	UK	1988
(f) Silberman and Klock (1988)	$4.57	CVM mean bid per day)	New Jersey, USA	1985
Coral reef and marine park				
(g) Dixon et al. (1994)	$27.40	CVM	Bonaire Marine	1991
	$17.40	C.S. per dive	Park (Caribbean)	
(h) Leeworthy (1991)	$ 223 – 886	FCM (C.S. per day, linear fn.)	Florida, USA	1985
	$637-3,448	TCM (C.S. per day, semi-log fn.)		
(i) Pendleton (1993)	$256	C.S. per day	off the coast of Central America	1992
Incorporating quality attributes				
Beach use and swimming				
(j) Bockstael et al. (1987)	$10.48	RUM	Boston, Mass. USA	
(k) Bockstael et al. (1989)	$159	CVM (users)	Maryland portion	
	$50	CVM (non-users)	of western shore	
	$80	TCM	of Chesapeake, USA	
l) Feenberg and Mills (1980)	$3.23	RUM	Boston, Mass., USA	
(m) King (1995)	£ 1.41 (+1.78)	CVM	England	1993
(n) McConnell (1986)	$3.57	TCM	East - West Beach, New Bedford, Mass.	
	$4.10	TCM	Fort Phoenix New Bedford, Mass.	
(o) Silberman et al. (1992)	$10-20 (median) $9.34-31.98 (mean)	CVM existence value	New Jersey, USA	1985
(p) Silberman and Klock (1988)	$4.95	CVM	New Jersey, USA	1985
Boating				
(q) Bockstael et al. (1989)	$78	TCM	Chesapeake Bay, USA	1988

Table 24. Consumer Surplus for Beach Use.			
	Indonesia	Malaysia	Singapore
Number of tourists	1,167,480	2,928,800	3,965,000*
Purpose (% - vacation)	66%	67%	
Length of stay (days)	11	4.8	
Activity (% - swimming)	27%	27%	27%
Consumer surplus ($)	$49.73	$49.73	$49.73
Aggregate consumer surplus ($)	113,806,821.3	126,470,134.2	53,238,451.5

* This figure refers to the number of tourists going to Singapore for vacation.

INDIRECT BENEFITS

The main indirect benefit to be derived from setback zoning for beach is shoreline protection, and letting natural vegetation to occur. This would also ensure the safeness of the resorts, thereby guaranteeing that those revenues from tourism and related economic activities would continue. For coral reefs, the indirect benefits are maintenance of biodiversity, contribution to research and prevention of erosion. These indirect benefits of the two management programs are included in the economic analysis because of their impacts on tourism. The figures used for the values of the indirect benefits as well as the costs were adopted from MPP-EAS (1998).

Table 25. Benefits and Costs of Coastal Resource Management (in US$/ha/yr).		
Coral reef protection		
Direct benefits:	Tourism	6,429.77
	Consumer surplus	3,403.86
Indirect benefits:	Biodiversity	15.00[1]
	Research	91.08[2]
	Erosion prevention	34,871.75[3]
Costs:	Ecotourism	
	Investment cost (in year 1)	115,189.98[2]
	Annual cost	4,224.67[2]
	Maintenance cost	4,115.77[2]
	Mitigation cost	5.75[4]
Beach: setback zone		
Direct benefits:	Tourism	4,874.82
	Consumer surplus	1,234.82
	Related economic activities	3,320.22
Indirect benefits:	Shoreline protection	34,871.75[3]
Costs:	Tourism:	
	Investment cost	108,353.72[5]
	Annual cost	3,973.98[6]
	Maintenance cost	3,909.25[6]

[1] Sasekumar et al. (1998)
[2] University of Malaya (1988); MPP-EAS (1998)
[3] Hiew and Lim (1994); MPP-EAS (1998)
[4] MPP-EAS (1998)
[5] Soedarma et al. (1992); MPP-EAS (1998)
[6] Directorate General of Tourism (1988); MPP-EAS (1998)

ECONOMIC ANALYSIS

The benefits and costs of the two management options are shown in Table 25. The economic analysis shows positive net present values (NPVs) while the benefit-cost ratios (BCRs) are all greater than one, even when different discount rates were used. Moreover, large NPVs indicate the acceptability of these policies (Table 26).

Table 26. Summary of Results of the Benefit-Cost Analysis (US$/ha)			
Management Program	Discount Rate		
	5%	10%	15%
Coral reef protection			
NPV	339,247.88	195,259.42	113,058.23
BCR	2.55	2.05	1.68
Setback zone for beach			
NPV	276,885.21	160,242.32	93,846.84
BCR	2.01	1.74	1.51

POTENTIAL BENEFITS FROM POLLUTION AND EROSION REDUCTION SCHEMES

When incorporating quality attributes, the values range from $20 million to $1.8 billion[3]. The pollution and erosion reduction schemes provide large benefits, particularly to tourists (and to local users as well), and can, therefore, be used to justify such programs. Existence values for beach nourishment are positive for several reasons: bequest motives, benevolence toward relatives and friends who use the beach, sympathy for people and animals affected by beach erosion, feelings of responsibility to preserve environmental resources, such as a beach, and altruism (Silberman et al., 1992). Table 27 indicates the potential gains to be made from maintaining natural areas.

Any program involving conservation or economic activity resulting in the deterioration of coastal resources should consider the tourism benefits that their present status provide to the local/regional economy. Beaches are similar to other environmental resources since they are a limited resource subject to possible destruction due to pollution and erosion. It should be pointed out that tourism involves intensive utilization of environmental attributes and natural resources, and tourists/consumers appreciate the quality and availability of particular characteristics, such as clean beaches, landscapes, air quality and sewage treatment. For example, any loss of coral reef and water quality, and reduction in the fish population would result in divers shifting their demand to other islands competing for the same market, and the loss of this market would be very difficult to replace with other visitors (Dixon et al., 1994).

Table 27. Potential Benefits.	
Program	
10% reduction in oil, coliform bacteria and color	$64.0 million
20% reduction in nitrates and phosphates	$906 million
reduction of polychlorinated biphenyl (PCBs)	$44.4 - 51 million
beach nourishment (to mitigate erosion effects)	$61.6 - 256.9 million

[3] These aggregate values were estimated by multiplying the adjusted consumer surplus per person, resulting from pollution reduction and beach nourishment programs (Table 23), by the same variables used in estimating the aggregate value of consumer surplus from beach use by tourists (Table 24).

Conclusion

Each of the valuation techniques and the corresponding estimates have serious drawbacks, and may not reflect the 'true' and/or full social value that these resources provide. There are also questions on the appropriateness of adopting the values derived in various studies, and extrapolating them to the Malacca Straits. Thus, further research into the willingness to pay of the affected population or tourists in these countries to preserve and protect coastal and marine resources is still needed to improve the accuracy of the results. For example, surveys can be conducted to gather information on actual expenditures and the consumer surplus enjoyed by tourists who avail of the direct nature and environmental service provided by these resources. The values estimated in this study, however, provide some order of magnitude of the likely impacts of resource management, and can help in the assessment of the cost-effectiveness of investing in beach and coral reefs protection, pollution control and resource conservation. Investments in beach enhancement and pollution control can be costly, but inclusion of the benefits—both market and non-market—that can result from such investments can be used to justify programs for conservation, pollution prevention, cleanup and restoration.

Environmental quality and state of natural resources, together with price, service quality and accessibility influence consumer choice. On the other hand, production decisions, such as provision of tourism infrastructure (hotels, resorts), can also have effects on the conditions of the environment and natural resources. Thus, tourism has both positive and negative impacts. Regulated tourism development, however, can reduce or mitigate the negative impacts. As shown in the benefit-cost analysis of policies toward beach zoning and coral reef protection, the costs involved in implementing these policies are less than the tourism and recreational benefits that will be gained from maintaining biodiversity and the state and quality of coastal and marine water and resources. Moreover, large benefits, as shown by potential changes in consumer surplus as a result of pollution reduction and beach nourishment programs, are shown in this study.

To conclude, comparing the monetary benefits with existing data on government expenditures for tourism, restoration costs and other costs involved in resource protection/management, as well as deriving the non-monetary use and non-use values that might be reduced or lost, would provide a more accurate assessment of the true social value of coastal and marine resources in this region. The large NPVs derived in this study indicate the 'profitability' of undertaking management programs for the protection of these resources. Any change in water, beach and coral reef quality can result in losses of potential tourism revenues (as well as the other direct and indirect benefits) as tourists shift to other destinations.

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APPENDIX TABLES

Appendix Table 1. Coral Reef Protection.

	0	1	2	3	4	5	6	7	8
BENEFITS		44,811.46	44,811.46	44,811.46	44,811.46	44,811.46	44,811.46	44,811.46	44,811.46
Direct benefits									
Tourism		6,429.77	6,429.77	6,429.77	6,429.77	6,429.77	6,429.77	6,429.77	6,429.77
Consumer surplus		3,403.86	3,403.86	3,403.86	3,403.86	3,403.86	3,403.86	3,403.86	3,403.86
Indirect benefits									
Biodiversity		15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Research		91.08	91.08	91.08	91.08	91.08	91.08	91.08	91.08
Shoreline protection		34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75
COSTS	115,189.98	8,346.19	8,346.19	8,346.19	8,346.19	8,346.19	8,346.19	8,346.19	8,346.19
Tourism									
Investment cost	115,189.98								
Annual operating cost		4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67
Maintenance cost		4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77
Mitigation cost		5.75	5.75	5.75	5.75	5.75	5.75	5.75	5.75
NET BENEFITS	(115,189.98)	36,465.27	36,465.27	36,465.27	36,465.27	36,465.27	36,465.27	36,465.27	36,465.27
DISCOUNTED NET BENEFITS									
5% discount rate	(115,189.98)	34,728.83	33,075.07	31,500.07	30,000.07	28,571.49	27,210.95	25,915.19	24,681.13
10% discount rate	(115,189.98)	33,150.25	30,136.59	27,396.90	24,906.27	22,642.06	20,583.69	18,712.45	17,011.32
15% discount rate	(115,189.98)	31,708.93	27,572.98	23,976.51	20,849.14	18,129.68	15,764.94	13,708.65	11,920.56

Appendix Table 1. Coral Reef Protection (continued).

	9	10	11	12	13	14	15	16	17
BENEFITS	44,811.46	44,811.46	44,811.46	44,811.46	44,811.46	44,811.46	44,811.46	44,811.46	44,811.46
Direct benefits									
Tourism	6,429.77	6,429.77	6,429.77	6,429.77	6,429.77	6,429.77	6,429.77	6,429.77	6,429.77
Consumer surplus	3,403.86	3,403.86	3,403.86	3,403.86	3,403.86	3,403.86	3,403.86	3,403.86	3,403.86
Indirect benefits									
Biodiversity	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Research	91.08	91.08	91.08	91.08	91.08	91.08	91.08	91.08	91.08
Shoreline protection	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75
COSTS	8,346.19	8,346.19	8,346.19	8,346.19	8,346.19	8,346.19	8,346.19	8,346.19	8,346.19
Tourism									
Investment cost									
Annual operating cost	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67
Maintenance cost	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77
Mitigation cost	5.75	5.75	5.75	5.75	5.75	5.75	5.75	5.75	5.75
NET BENEFITS	36,465.27	36,465.27	36,465.27	36,465.27	36,465.27	36,465.27	36,465.27	36,465.27	36,465.27
DISCOUNTED NET BENEFITS									
5% discount rate	23,505.84	22,386.51	21,320.49	20,305.23	19,338.31	18,417.44	17,540.42	16,705.16	15,909.68
10% discount rate	15,464.83	14,058.94	12,780.85	11,618.96	10,562.69	9,602.45	8,729.50	7,935.91	7,214.46
15% discount rate	10,365.71	9,013.66	7,837.96	6,815.62	5,926.63	5,153.59	4,481.38	3,896.85	3,388.57

Appendix Table 1. Coral Reef Protection (continued).

	18	19	20	NPV	BCR
BENEFITS	44,811.46	44,811.46	44,811.46		
Direct benefits					
Tourism	6,429.77	6,429.77	6,429.77		
Consumer surplus	3,403.86	3,403.86	3,403.86		
Indirect benefits					
Biodiversity	15.00	15.00	15.00		
Research	91.08	91.08	91.08		
Shoreline protection	34,871.75	34,871.75	34,871.75		
COSTS	8,346.19	8,346.19	8,346.19		
Tourism					
Investment cost					
Annual operating cost	4,224.67	4,224.67	4,224.67		
Maintenance cost	4,115.77	4,115.77	4,115.77		
Mitigation cost	5.75	5.75	5.75		
NET BENEFITS	36,465.27	36,465.27	36,465.27		
DISCOUNTED NET BENEFITS					
5% discount rate	15,152.07	14,430.55	13,743.38	**339,247.88**	**2.55**
10% discount rate	6,558.60	5,962.36	5,420.33	**195,259.42**	**2.05**
15% discount rate	2,946.58	2,562.24	2,228.04	**113,058.23**	**1.68**

Appendix Table 2. Setback Zones for Beach Areas.

	0	1	2	3	4	5	6	7	8
BENEFITS	-	44,301.61	44,301.61	44,301.61	44,301.61	44,301.61	44,301.61	44,301.61	44,301.61
Direct benefits									
Tourism		4,874.82	4,874.82	4,874.82	4,874.82	4,874.82	4,874.82	4,874.82	4,874.82
Consumer surplus		1,234.82	1,234.82	1,234.82	1,234.82	1,234.82	1,234.82	1,234.82	1,234.82
Economic activities		3,320.22	3,320.22	3,320.22	3,320.22	3,320.22	3,320.22	3,320.22	3,320.22
Indirect benefits									
Shoreline protection		34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75
COSTS	108,353.72	7,883.23	8,340.44	8,340.44	8,340.44	8,340.44	8,340.44	8,340.44	8,340.44
Tourism									
Investment cost	108,353.72								
Annual operating cost		3,973.98	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67
Maintenance cost		3,909.25	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77
NET BENEFITS	(108,353.72)	36,418.38	35,961.17	35,961.17	35,961.17	35,961.17	35,961.17	35,961.17	35,961.17
DISCOUNTED NET BENEFITS									
5% discount rate	(108,353.72)	34,684.17	32,617.84	31,064.61	29,585.34	28,176.52	26,834.78	25,556.93	24,339.94
10% discount rate	(108,353.72)	33,107.62	29,719.98	27,018.16	24,561.96	22,329.06	20,299.14	18,453.77	16,776.15
15% discount rate	(108,353.72)	31,668.16	27,191.81	23,645.05	20,560.92	17,879.06	15,547.01	13,519.14	11,755.77

Appendix Table 2. Setback Zones for Beach Areas (continued).

	9	10	11	12	13	14	15	16	17
BENEFITS	44,301.61	44,301.61	44,301.61	44,301.61	44,301.61	44,301.61	44,301.61	44,301.61	44,301.61
Direct benefits									
Tourism	4,874.82	4,874.82	4,874.82	4,874.82	4,874.82	4,874.82	4,874.82	4,874.82	4,874.82
Consumer surplus	1,234.82	1,234.82	1,234.82	1,234.82	1,234.82	1,234.82	1,234.82	1,234.82	1,234.82
Economic activities	3,320.22	3,320.22	3,320.22	3,320.22	3,320.22	3,320.22	3,320.22	3,320.22	3,320.22
Indirect benefits									
Shoreline protection	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75	34,871.75
COSTS	8,340.44	8,340.44	116,694.16	8,340.44	8,340.44	8,340.44	8,340.44	8,340.44	8,340.44
Tourism									
Investment cost			108,353.72						
Annual operating cost	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67	4,224.67
Maintenance cost	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77	4,115.77
NET BENEFITS	35,961.17	35,961.17	(72,392.55)	35,961.17	35,961.17	35,961.17	35,961.17	35,961.17	35,961.17
DISCOUNTED NET BENEFITS									
5% discount rate	23,180.89	22,077.04	(42,326.42)	20,024.53	19,070.98	18,162.83	17,297.94	16,474.23	15,689.74
10% discount rate	15,251.05	13,864.59	(25,373.15)	11,458.34	10,416.67	9,469.70	8,608.82	7,826.20	7,114.73
15% discount rate	10,222.41	8,689.05	(15,560.29)	6,721.40	5,844.70	5,082.34	4,419.43	3,842.98	3,341.72

Appendix Table 2. Setback Zones for Beach Areas (continued).

	18	19	20	NPV	BCR
BENEFITS	44,301.61	44,301.61	44,301.61		
Direct benefits					
Tourism	4,874.82	4,874.82	4,874.82		
Consumer surplus	1,234.82	1,234.82	1,234.82		
Economic activities	3,320.22	3,320.22	3,320.22		
Indirect benefits					
Shoreline protection	34,871.75	34,871.75	34,871.75		
COSTS	8,340.44	8,340.44	8,340.44		
Tourism					
Investment cost					
Annual operating cost	4,224.67	4,224.67	4,224.67		
Maintenance cost	4,115.77	4,115.77	4,115.77		
NET BENEFITS	35,961.17	35,961.17	35,961.17		
DISCOUNTED NET BENEFITS					
5% discount rate	14,942.61	14,231.06	13,553.39	**276,885.21**	**2.01**
10% discount rate	6,467.93	5,879.94	5,345.40	**160,242.32**	**1.74**
15% discount rate	2,905.85	2,526.82	2,197.24	**93,846.84**	**1.51**

OTHER RELATED TITLES

- Benefit-Cost Analysis of Habitat Conservation in the Malacca Straits. MPP-EAS Technical Report 18.
- Manual on Economic Instruments for Coastal and Marine Resource Management. MPP-EAS Technical Report 19, 89 p.
- Coastal and Marine Resource Valuation for the Malacca Straits. MPP-EAS Technical Report 24.
- Marine Pollution Prevention and Management in the East Asian Seas: A Benefit-Cost Framework. MPP-EAS/Info/99/193, 33 p.

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