not an end in itself. For development planners, it is a means to inject income into remote rural economies. To many in the travel industry, on the other hand, it represents ''an opportunity for diversification in an overly competitive tourist market" [6]. Whatever else the ecotourist is, he/she is also a "paying customer who must be pleased and appeased" [61].

Is ecotourism merely a novel 'saleable' label for what travelers and their agents have been doing all along? Or is it "a new alternative for sharing cultures and ecosystems based on. . noble objectives" [18]? As an arena in which "corporate tenets and conservationist ideals are interwoven' [47], ecotourism may continue to elude concrete definition. However, analysis of the benefits and costs of tourism in general and of ecotourism in particular may provide some perspective on whether a more environmentally and socially benign type of travel has emerged and can offer communities a unique opportunity for sustainable development.

ISSUES IN ECOTOURISM AND RESOURCE CONSERVATION

OTA's exploratory definition of ecotourism ("leisure activities, requiring travel to an area restricted from development by policy, by virtue of a difficult environment, or by difficult access, centering on a visitor's interaction with nature") focuses on the kinds of destinations its clientele prefer. Crowded beach resorts hold little appeal for those seeking a true nature-based experience. On the other hand, difficult to reach areas, protected areas such as public parks and private reserves, offer ecotourists a good chance of encountering wilderness and wildlife. Since these areas will feel most of the impacts of the ecotourist industry, the following discussion focuses largely on them.

Globally, protected lands doubled in size between 1972 and 1982 [28] and now amount to some 175 million hectares [34].[5] The designation of marine protected areas has lagged somewhat behind terrestrial park development, but this situation is changing rapidly. Many tropical island countries have begun to include development of marine packs in their national strategies for tourism, and for sustainable development generally [20]. Most nations and territories of the wider Caribbean Basin have established coastal or marine parks or reserves, though nearly 80 percent are only 20 years old [37]. Canada's Department of Fisheries and Oceans considers marine protected areas integral to its strategy for sustainable development of the Canadian arctic. The United States established what was then the world's largest marine sanctuary in the Florida Keys in 1990, in response to already high levels of tourism and other development pressures believed to be degrading delicate reef ecologies [57]. The eleventh National Marine Sanctuary, larger than the State of Connecticut and larger than any national park in the lower 48 States, was established off Monterey, California in 1992 [16].

Even though protected area designation is often just such a response to damage already done, in other cases protected areas may owe their existence to ecotourism [7]. Insufficient data exist to confirm a real cause/effect relationship between tourism and this form of nature protection, but a link is widely presumed to exist, and is cited as one of the major benefits of the nature tour industry. This rationale may be the only means of countering efforts to develop these resources for near-term profits—that ''economic value must be assigned to ecological resources if these are to be conserved" [10].

Conservationists and economic planners are finding that ecotourism, and the revenues it is expected to generate, can provide an economic rationale for even debt-ridden governments to promote natural resource conservation and wildlife protection policies [51]. The Kenyan "visitor attraction value" of a single lion has been estimated at $27,000 per year; that of a herd of elephants at $610,000 per year [31]. Throughout the Caribbean, ecotourism is being considered as a strategy and incentive for preserving forest resources. Just as nature tourism highlights the ''continued economic value of a live animal as opposed to the one time economic value of a dead one" [53], it also seems to confirm that "the trees are not as valuable as the forest" [23].

But what is to protect such areas and their wildlife from tourists? What are the costs of establishing and managing protected areas, and of opening them to visitation?

[5] Because of the existence of ''paper parks'' that are shown on development plans but receive little actual protection, these data may overrepresent the true extent of resources receiving protection from development pressure.

Besides the initial costs of land acquisition, which can be very high for large-scale parks, social costs may be involved in the establishment of publicly owned protected areas. There may be strong opposition from landowners that must be relocated [28], or from individuals whose traditional rights to resource use are infringed on. Long-term costs are also involved in sustaining parks and other protected areas, particularly if public support for protected status is lacking. If hotels and other infrastructure are located within parks, the costs of maintenance constitute a further public expense. (See app. A for a summary of costs and benefits of establishing protected areas.)

Even ecotourism requires basic services and infrastructure, and even ecologically minded tourists consume resources and generate waste. In great enough numbers they can destroy the very environments they so highly value and traverse the globe to see. Yellowstone National Park provides an example of what could happen to increasingly popular ecotourism destinations in developing countries. At Yellowstone, crowds have increased so dramatically that the nature experience many seek is no longer readily available and natural ecologies are threatened [7].

Even nonconsumptive activities like whale- and bird-watching can take a toll on wildlife. Nests have been trampled, eggs destroyed, and brooding birds harried from their roosts by tourists hoping for a closer glimpse or more intimate photo of rare birds; whales have been disturbed both by the numbers and excessively close approaches of tourist boats tracking and following them. While some animals (e.g., certain bird species) benefit from increased human presence, most do not, and overall species diversity can decline as visitor numbers increase in a wildlife area.

The potential benefits of conserving unspoiled ecosystems and of developing an ecotourism industry based on these and other wild areas in many cases may outweigh the environmental and social costs entailed-particularly if effective efforts are made to plan for and manage visitors and if tourism is responsive to the cultural traditions and economic needs of local populations. The benefits of linking conservation to tourism have not yet been fully realized [7], in part because so many national parks are fairly new and many parks have been designed for species protection without considering tourism access or accommodation [4]. Finally, many benefits associated with ecotourism are also difficult to measure in that they are not market-exchanged commodities. The value of conserving rather than developing an area can easily be underestimated as a result [14].

Nonetheless, conserving the 'enviromnental amenities' of a region and ''advancing regional development through tourism' are increasingly considered interdependent aims [12]. From a purely commercial perspective, a system of legally protected areas has been called an "essential prerequisite for ecotourism. ' A business person ''will not invest in land or promotion. . .if there is no guarantee a site will be there in 10, 15 or 20 years" [68].

Regardless of whether they were created specifi cally to attract and accommodate ecotourists, parks and protected areas commonly yield multiple qualitative benefits, including watershed protection and wildlife preservation, as well as appeal to ecotourists [12]. Ecotourist revenues, in turn, may be vital to park upkeep, hence sustainability.

Ecotourists may contribute more than money to park systems they visit. They often volunteer time and labor as well, either formally or as informal ''rangers' who can report on poaching, fries, or other problems they witness [7]. The potential to engage ecotourists in formal work programs and projects probably has not been tapped to a significant degree. "The only thing holding back vast numbers of ecotourism volunteers is that most organizations are unprepared to handle temporary short-term assistants who are willing to pay their own way" [61].

Ecotourism can also contribute to the economic development of regions surrounding parks, often to a greater degree than mass tourism. Like other forms of tourism, ecotourism generates employment. The birding tourism industry in particular is apt to use local guides and accommodations [52], and may provide a model for maximizing ecotourism benefits to local economies.[6]

6 For those that define ecotourism to include consumptive activities, hunting and fishing may be models of ourism that requires few amenities and uses local guides and accommodations.

The opportunity to educate tourists and populations local to the ecotourism destination is of special relevance to parks and other protected areas [8]. By their very presence, tourists help make local populations aware and appreciative of the uniqueness and importance of their environment [22;51]. Formal, park-sponsored educational programs and publications can inform park visitors-whether from overseas or a bordering town or village-about an area's landforms and biota and the importance of preserving them. Protected areas thus can play a vital role in the growth of a conservation ethic [20].

The paying customers on whom the tourism industry is founded and thriving are also potential voters, taxpayers, and leaders [61]. Once these individuals are exposed to pristine natural areas, and educated about their importance and vulnerability, they may help build constituencies to lobby for resource conservation [63].

At its best, ecotourism is hoped to be "a way of integrating natural resource preservation with the needs of rural populations surrounding protected areas' [7]. Thus, with ecotourism becoming a major travel phenomenon, ''now is the time to build on its strong points and work to defray its destructive elements" [58]. However, this is no easy task, in part because the costs and benefits associated with ecotourism may not be directly comparable. ' 'Analyzing and quantifying the tradeoffs between development and conservation is difficult because ecological costs are less visible, accrue more gradually, and are harder to quantify than economic benefits' [55].

Issue:

CebaUos-Lascurain warns that too strong an emphasis on the economic benefits of park tourism "can lead decisionmakers to believe that parks are created for economic gain" [10]. If expected gains are not realized, they may try to maximize economic returns with improper means ''or even begin to look at other uses for the land. " Should parks and other protected areas be managed to maximize economic benefits? If so, how should this be done (e.g., by soliciting higher visitor rates and/or entrance fees; voluntary or automatic conservation project support built into certain tour packages; a tax on ecotour operators who bring clients to the park)?

Issue:

Even if entrance fees, local accommodation taxes, and other tourism revenue-generating means are implemented, few funds are funneled back into protected area maintenance. Through what system can revenues be devoted to protected areas to cover operating needs such as management salaries, infrastructure development and maintenance, resource monitoring and management, and disaster recovery reserves?

Issue:

Emphasizing revenue generation from parks and protected areas commonly is seen as conflicting with local access to part of a nation's heritage or public resources [7], even to the extent that charging entrance fees to such areas has been called elitist. Some destinations now charge "tiered" entrance fees, in which local residents may be charged substantially less than foreign visitors. Should local residents be required to pay tourist prices for entry into publicly owned protected areas? If not, how should differential rates be determined? Alternately, should recreational areas be set aside for local use and prohibited from or not advertised to tourists? If so, should these be publicly owned or should incentives be provided to private resource holders?

ISSUES IN ECOTOURISM DEVELOPMENT AND MANAGEMENT

Whether tourism is beneficial or destructive to a locale's natural resources, aesthetics, social fabric, or economy; whether it fulfills the goals and expectations of the traveler; and whether it can be sustained, depends on many factors, including the ecological and cultural attributes of the locale itself, how many tourists visit, and for what activities/ purpose(s). "There can be no a priori assumptions about the goodness of tourism" [36].

It is widely recognized that tourism entails both benefits and costs, advantages and disadvantages. (See box B.) On the plus side, tourism earns foreign exchange, generates employment, and attracts capital for infrastructure development. Through these and other "multiplier effects" it can contribute to economic diversification as well as growth [7;17].

On the negative side, tourism is often considered an unstable source of income, subject to widely

Box B—Potential Benefits and Costs of Tourism

Benefits	costs
Economic/financial	
. Foreign revenue for country	. Increased local cost-of-living
• Funds for region (e.g., taxes)	• Seasonality of income or employment
• Attraction of outside investment for local infrastructure/services	. Unstable market
* Diversification of local income	• Cost of enforcement/administration
* Service employment opportunities	• cost of training (guides, managers, etc.)
* Support employment opportunities (e.g., agriculture, fisheries, handicrafts, cottage industry)	• Liability of service providers
. Development of export markets for local products/foods, etc.	
• "Development pole" or "honeypot" multiplier effects	
Political	
* Maintenance of populations in political boundary areas	. Exposure of global public to antihumanitarian activities
. Maintenance of future development options	
Cultural/social	
• Exposure to new lifestyles	• Disruption of culture
Maintenance of traditional knowledge/ products	• Loss of traditional knowledge
	. Degradation of local products
	• Enhanced Iocal expectations due to exposure to affluent visitors
	Increased out-migration
Environmental/conservation	
• Incentives/funds for park/resource management	• Resource degradation due to numbers or activities of tourists
• Incentives/funds for resource management research	. Resource degradation due to increased local demands
. Incentives/funds for natural history research	• Resource degradation due to unsuitable facility/ infrastructure development
* Improved environmental education	. Resource degradation due to improper waste management
Accelerated development of an environmental ethic	

SOURCE: Office of Technology Assessment, 1992.

fluctuating demand scenarios; local economies that rely heavily on tourist dollars can be severely disrupted by a sudden decline in tourist arrivals. A healthy tourist industry can divert labor from other economic activities, sometimes to their detriment. Tourists may consume disproportionate quantities of local resources; for example, the average tourist in Barbados consumes eight times the amount of water as the average resident [48]. In some cases, tourism deprives local people access to the very beaches and other resource areas they traditionally have used for economic or leisure activities [17]. Mass tourism can actually compromise the economic well-being of local peoples by elevating the cost of living and price of land.

Tourism's impacts on the natural environment may be even more severe than its economic and

cultural impacts. Because water has traditionally attracted tourists, water resources and nearshore habitats are often the most severely affected. Much of the toxic waste discharged into recreational waters represents (motorboat) engine crankcase drainage [29]. Construction of roads, airports, hotels, and other tourist infrastructure has led to increased siltation and degradation of nearshore habitats (mangroves, reefs) in many parts of the world. Wastes generated by tourists often overwhelm local sanitation systems, and place further burdens on these ecosystems.[7] Anchor scars and shallow sea bottoms denuded by propeller wash have added widespread and long-lasting adverse impacts to the marine environment of the Virgin Islands National Park [46].[8] Heavy tourism in the Outer Banks of North Carolina has adversely altered the ecology of the barrier islands in a dramatic fashion [11].

Small islands and very poor countries, in general, may face greater costs and enjoy fewer benefits from tourism. These areas tend to have less infrastructure than most destinations and are more dependent on imported goods, foreign labor, and capital to support tourists [17;60]. Such areas also may be unable to devote sufficient resources and skilled personnel to planning and monitoring tourism development. Further, small tropical islands may be particularly at risk from poorly planned tourism development, because the environment is easily degraded and "even moderate tourism development can have a proportionately large impact" [56].

The most sensitive ecosystems are often the most intensively developed for tourism because of their innate attractiveness and limited suitability for other economic uses. Examples include early successional-stage coastal ecosystems characterized by unstable substrata (e.g., dunes, marshes); alpine and other montane habitats where climate retards self-recovery and growth of disturbed vegetation; and landscapes with shallow, nutrient-deficient, or very wet soils [63].

Some analysts argue that coastal and marine tourism requires a stronger governmental involvement than other forms of tourism, citing four primary reasons:

1. reliance on public common property resources such as the ocean and coastal environment,
2. direct competition between tourists and local populations for use of the resources,
3. high degree of risk to people and property from natural hazards, and
4. complex and dynamic nature of coastal and ocean environments that make impacts difficult to predict.

> Preferably, well in advance of specific coastal developments, the policy body of government should adopt a full set of understandable, clearly written, coastal policies and supporting environmental regulations which then need to be uniformly and firmly enforced as part of a comprehensive environmental management program. Decisionmaking on specific projects should be done as part of an open, fully accessible public process involving discussion, debate, decisionmaking, and an appeals process. . .Second, a document should be prepared by the government to accompany major decisions on such projects outlining in clear and understandable language the expected costs (direct and indirect), adverse effects, and dislocations, as well as the promised benefits. This document, in effect, would be a combined environmental and socioeconomic impact statement, and would represent the expectations upon which this project was approved. Government should have the responsibility to use the document in its monitoring program and to compare the results with what has been predicted [26].

Issue:

Management of the coastal zone commonly is conducted by a multiplicity of government organizations at local, State or provincial, national, and even international levels. How best should responsibili-

---

7 However, creative handling of problems such as excess quantities of human waste may produce new educational and revenue-producing resources. For example, a tertiary sewage treatment plant, designed to return cleaned wastewater to the Everglades National Park, relies on an "eco-pond." The high nutrient levels in the shallow wastewater receiving pond attracts a high density and wide diversity of wildlife that visitors may observe from an observation deck. Thus, the "eco-pond" has "transformed 'pollution' into a valuable 'resource' which benefits wildlife" [48].

8 protective measures suggested to prevent such impacts include: 1) placing mooring buoys for anchorage of large boats, 2) designating "no anchoring" or "anchoring' areas confined to mud and sand bottoms, 3) disseminating educational materials (e.g., maps) on where and how to anchor, and 4) penalizing people for damaging marine resources [46].

ties be apportioned and coordinated? How can commercial interests and nongovernmental organizations be incorporated into decisionmaking processes?

Where tourists lodge, and in what kinds of accommodations, can determine visitor impact on local environments and economies to a significant degree. Ecotours are presumed to avoid high-rise hotels or resort enclaves that cater to mass tourism. The ideal, according to a World Wildlife Fund report, is "simple accommodations built of traditional materials by local people" [7]. Not only do such accommodations tend to have low environmental impacts, but tourism contributes most to regional development "through the use of as many local materials, products and people as possible" [7]. However, concentrated facilities may be more suitable to manage higher densities of visitors near sensitive areas.

Tourist lodging may be sited within or outside of protected areas. While tourists can enjoy a more intimate nature experience if they are accommodated within protected areas, this may be detrimental to the goal of conserving wilderness. By banning any development in certain core regions of parks (e.g., the most ecologically sensitive, or critical areas for wildlife), and concentrating infrastructure and visitor presence in ''outer shells," or less sensitive park zones, adverse environmental impacts might be reduced [3].

An alternative approach, requiring public/private cooperation, is to site privately owned and run visitor infrastructure outside of and peripheral to protected areas. In some cases, private reserves located adjacent to national parks provide visitor infrastructure as well as extend the effective protected area. The potential role of private reserves and other holdings in nature tourism, education, and conservation has not been adequately evaluated, but may be considerable: the number of visitors to private reserves in developing countries increased steadily throughout the 1980s (from 60,000 in 1980 to 230,000 in 1989) [1].

Issue:

The World Resources Institute suggests that nature tourism is a promising arena for the kind of public/private partnership needed to promote sustainable natural resource use [66]. Such a partnership can take many forms, with varying degrees of government involvement; these may range from park-based tourist facilities managed by private groups to public park management by private sector companies [31]. What forms might work best in what countries or resource areas? What is the government's role in tourism, which historically has been a private sector concern [35]? How might the private sector be incorporated in a strategy of sustainable development and conservation, normally the concern of governments?

Issue:

How can local involvement in conservation and ecotourism promotion/management be fostered and sustained? What level of local participation is appropriate, for example, what balance should be sought between ensuring a labor force for traditional occupations and providing employment for local peoples in tourism? How can local fishing, agriculture, and construction industies be used more fully in ecotourism? Can markets for local products be expanded beyond onsite consumption (e.g., air-frieighting perishable goods to tourism-generating markets on tourist flights)?

PLANNING TO MINIMIZE ADVERSE IMPACTS

Many issues and concerns surrounding ecotourism can be addressed through effective planning. Planning, in its broadest sense, is organizing the future in order to reach certain objectives [24]. The planned approach to tourism development emerged as tourism itself grew to become a significant socioeconomic activity in the 1950s, and plans for tourism development now figure in the overall development strategies of many regions and countries. The meaning and concerns of tourism planning, however, differ today from those of the past, when efforts generally focused on ensuring adequate accommodation and transportation infrastructure, and on tourism promotion. By the 1980s, tourism planning began to address other objectives as well, including the prevention and control of tourism's negative environmental and sociocultural impacts [24].

Governments today generally use planning to guide the growth and direction of tourism in order to derive its benefits and to avoid serious environmental or social consequences of the kind that befell certain parts of the Caribbean and Mediterranean

regions in the post World War II period of rapid tourism growth. Unplanned mass tourism damaged natural environments and communities in both regions [24]. In part because of such lessons learned from the past, planning now focuses much more than it used to on the concept of the sustainable development of tourism.

This concept, which is increasingly recognized as a needed feature of development planning in general, is considered essential to ecotourism planning. It calls for careful resource analyses and development controls to prevent degradation of natural or cultural environments. It contrasts with the 'marketed' approach to planning—that of providing whatever facilities and services tourists may demand-in giving first priority to preserving the ecological and social integrity of tourism areas. Visitor facilities are designed and visitor use organized to fit into the environment as unobtrusively as possible [24].

Planning for ecotourism differs from planning for either tourism or conservation alone, in that it requires "active planning for the preservation of (natural) areas and planning to meet the needs of the ecotourist and. . local landowners. " Planners also must account for the fact that ''resource conservation efforts for and in combination with ecotourism are somewhat different from other more 'purist' resource conservation efforts. . .in that they must accommodate a substantial 'use' component" [28]. Further, planners must bring to planning a knowledge of economics, marketing, the needs of particular types of tourists [2], and of "best practices" that have been implemented around the world [68].

Such a planning approach clearly requires a different philosophy about protected areas than has prevailed in the past. These areas traditionally have been managed 'as if they were islands of ecological righteousness (in) a vast sea of human corruption. " Replacing this management style is a more integrated approach, ''whereby protected areas are seen as an integral part of the socioeconomic fabric of the region where they are located" [38].

Unfortunately, few parks have well-defined planning processes focused on ecotourism development and management [41]. Integrated planning for tourism and conservation may be particularly difficult for small countries, which often have limited planning capacity and expertise of any kind. Currently available planning techniques, moreover, are not particularly well adapted to the problems of small countries, where social and physical constraints to development possibilities may be more severe than in larger countries [cf:60].

Nonetheless, communities can potentially benefit from several broad guidelines for ecotourism planning. Inskeep, for example, iterates several successive steps essential to the process [24]. These include:

1. study preparation (the decision to proceed with a tourism planning project and initial organization of that project);
2. determination of development goals and strategies; surveys and inventories to characterize the natural and sociocultural features of a potential tourism area, as well as any tourism development already present;
3. integrated analysis and synthesis of the information gained;
4. formulation of the development policy and physical plan;
5. recommendations on project elements;
6. implementation of the plan and recommendations; and
7. monitoring/feedback followed by any needed adjustments.

Planning for ecologically and socially responsible tourism probably has the greatest potential for success if it is based on recognition that different development sectors are interrelated (i.e., if a systems approach is taken), and if it is done incrementally, from general (international/national) to more specific (community/resort) levels, with continuous monitoring and feedback on the effects of previous decisions and development, as well as analysis of new trends [24]. The recently revised Parks Canada policy, which "provides an integrated and comprehensive statement of broad principles to serve as a guide for future initiatives and for more detailed policy statements on specific areas" [24], exemplifies such an approach.[9]

[9] Parks Canada divides protected areas into five use zones, following a continuum of objectives frOm primarily preservation to intensive public use. Level I are Special Preservation Areas containing unique, rare, or endangered species. Level II comprises areas with specific natural history themes and allows access for widely dispersed hiking and primitive camping. Level III are Natural Environment areas with limited motorized access in the periphery and well-maintained trails and simple campsites. Level IV Recreation Areas are easily accessible developments with such facilities as boat ramps and ski hills. Level V are the most densely developed areas, commonly containing park administration and centralized visitor support [39].

Many authors have called for coodinating ecotourism/ conservation planning with overall regional development strategies. In this way tourism sector objectives can be developed more effectively [24] in accord with these broader strategies [38]. For countries sharing a common water basin (e.g., Caribbean, Mediterranean), coordinating regulations may be particularly important to sustaining a tourism industry.

> Nations are naturally loath to put themselves at a comparative disadvantage by tightening regulations on coastal water use of the seas generally. International standards are desperately needed. This is particularly apparent in the Caribbean where 17 nations dependent on tourism as one of their chief industries have widely varying standards on water use for tourism and sewage disposal. . .Until nations and individuals really recognize that "we all live downstream" from someone or some other nation, political will may be absent [45].

Conversely, pressures for increased market share among areas sharing like resources make it difficult to coordinate environmental standards or tourism development. This may be particularly difficult in coastal and marine tourism 'where political boundaries do not demarcate lakes or seas" [45].

At the local level, tourism planning should be based on an integrated analysis of many factors, including the area's infrastructure and transportation capacities, climate, physical and ecological features; local economic activities and employment patterns; and sociocultural milieu and attitudes. Account should be taken of the need for added infrastructure (housing, roads, and other transportation networks) and expanded local services, including health care and education for those attracted to an area by new tourist-related employment. Major opportunities and constraints for tourism development are derived from the integrated analysis of these factors, combined with market studies and carrying capacity determinations [24].

Carrying capacity analysis, one of the most widely used tools in tourism planning, is a basic technique for determining upper limits of visitor use, beyond which critical thresholds are crossed and environmental damage is highly likely to occur [24;49]. A more comprehensive approach to carrying capacity analysis in planning would consider not just physical/biological limits to growth but also management-based and socioeconomic and psychological constraints [24;63]. Thus, an area's carrying capacity for tourism may be exceeded when environmental damage occurs, when tourist arrivals can no longer be accommodated by existing or planned housing and transportation infrastructure, when visitors are no longer welcomed by indigenous populations, or when tourists themselves feel overcrowded by other tourists.

Although the concept of carrying capacity may provide a useful way of thinking about planning by focusing attention on an environment's finite capacity to absorb development [49], no standard methods of determining carrying capacity exist—approaches range from subjective interpretations to complex computer modeling techniques. Moreover, managerial actions such as engineering, design, rules, and regulations that may avert unacceptable impacts mean that an area can have many carrying capacities, depending on which ones are implemented and to what extent they are maintained [50].

Many planners have abandoned planning approaches based on maximum allowable use estimates to ones that consider "tolerable" levels of visitation that can be sustained over time [7]. One such technique, termed the Limits of Acceptable Change (LAC), is designed for iterative analysis of conditions and reconsideration of objectives, and has been recommended for application in marine settings [50]. Briefly, the 10 steps of LAC are:

1. Clearly define management objectives.
2. Define issues and concerns (nationally, regionally, locally).
3. Define and describe "Opportunity Classes" (or potential use zones).
4. Select indicators of resource and social conditions.
5. Inventory existing resource and social conditions (baseline status).
6. Specify standards for each Opportunity Class.
7. Identify alternative Opportunity Class allocations.
8. Identify management actions and costs for each allocation.
9. Evaluate (e.g., for responsiveness to concerns and relationship to regional considerations), and select alternative.
10. Implement and monitor (and change management actions if necessary).

The fisheries concept of Optimal Sustainable Yield (OSY) may be a useful model for Optimal

Sustainable Use (OSU) of marine protected areas. A comprehensive approach to planning might allow for mariculture activities to take place on a sustainable basis in such areas. Indeed, multiple use is a management and planning concept of special interest to ecotourism, although, in some cases, planners may conclude that multiple use is not appropriate for certain areas [20].

A variety of techniques can be used to plan and manage visitor presence in a given area so that tourism remains environmentally and socially sustainable. Strict controls over visitor presence and behavior in tourism areas is one approach. Conservation zoning is a more flexible planning approach that distributes visitor uses over abroad area and, in some cases, prohibits any use of certain sectors. For example, parks may be planned such that certain core areas-those that provide ecologically critical wildlife habitat, that contribute significantly to watershed protection, or that otherwise carry special environmental significance-are sequestered from any use or development. Surrounding buffer zones may be designated for extensive uses only (e.g., wilderness hiking, primitive camping), with intensive uses such as tourist infrastructure development concentrated in well-designed complexes located in the outer shell of a protected area [4;5;24]. Planning to distribute visitor use more widely to relieve tourism hot spots has been done at the regional and national as well as the local (e.g., park) levels [39].

Two relatively recent developments have significant repercussions for tourism planning. One is recognition that local involvement is essential to successful planning related to resource use and conservation. "However well intentioned, plans imposed from above are liable to generate social conflicts or to contain technical errors" [15]. Local involvement can aid planning in several ways. For land-use planning, the "contingency valuation method," a means of documenting the value (actual and perceived) of protected areas to local communities has been used [44]. A relatively new approach to planning-the participatory action research methodology—is being tested in some areas, including Madagascar's Ranomafana National Park. This methodology invokes local participation in ''studying, discussing and devising strategies' for ecotourism development [42].

The second development—information technology—is revolutionizing modern planning [24]. Computer-based techniques are applicable to tourism planning at all stages, from initial evaluation of alternative development scenarios to final impact analyses. Computer-based Geographical Information Systems (GIS), for example, integrate various types of information about the environment and resources, and can aid planners in identifying areas suitable for specific uses. Integrated surveys of natural resources can help identify potential national park areas in the first place [12]. Use of information technologies extends beyond planning as well-as projects get underway, their environmental results and impacts must be monitored, and critical databases updated. GIS can assist in these efforts [43].

Impact Monitoring

Environmental impact assessments analyze what the environmental effects of a given activity (e.g., tourism) are or will be against some base level. Such analysis is difficult for a number of reasons. First, baseline data on resource attributes and status are lacking or inadequate in many cases. Second, other land uses may predate tourism and their environmental effects may be difficult to isolate from those of tourism. Third, spatial and temporal discontinuities complicate impact analyses. For example, the impact of tourism on species diversity of a coral reef may be evident only after years of study and monitoring [63].

Ecological monitoring studies include three basic research components: 1) baseline/inventory studies, 2) specialized management impact studies, and 3) ongoing systems studies. (In some cases, very informal monitoring based on the observations of long-time residents of an area can supplement these [8]). Long-term environmental monitoring is a kind of "systems study" whereby insights are gained on how ecosystem components interact and how the entire system functions over time [20].

In the case of marine areas, several water-quality, biological, and oceanographic parameters can be monitored to assess tourist impacts; for example, filter-feeding shellfish accumulate pollutants in their tissues that can be regularly tested, allowing their use as "indicator species" of water pollution. Similarly, indicator species are monitored in U.S. National Forests in an attempt to identify levels of adverse impacts on ecosystems [59]. While expensive and time-consuming, such monitoring programs can be of great value to impact studies as well

as short-term investigations for specific management needs. Over time they will yield a database useful for determining causal relationships. Experiences at different protected areas can be compared if standard regional protocols for research and monitoring are developed and disseminated [20].

Along with environmental parameters, visitor use patterns should be monitored to determine how and where tourism is taking place in a park. Monitoring tour operators, tourists, and changes in activities can provide significant information; merely tabulating arrivals is not sufficient-where people go, how long they stay, what they do, and how many others they travel with are all factors relevant to management [41]. The economic activities of tour operators can also provide insights into tourism impacts at specific protected area sites [8].

Issue:

Continually collecting information on environmental conditions can be costly and time-consuming, potentially preventing adequate monitoring of impacts. Indicators, whether natural parameters or species' characteristics, commonly are used as an index of conditions too difficult, inconvenient or expensive to measure directly [59]. However, relying on a select few indicators may lead to ignorance of the breadth and extent of impacts. Poor selection of indicators, insufficient knowledge of species' biology, or of their response to different forms of stress, can mislead investigators into believing that an ecosystem is healthy when nonindicator species are stressed. What guidelines are required for selection of indicators and training of investigators to monitor and analyze changes in their status for different ecosystems? How often should analyses be conducted for different ecosystems? How can results be incorporated into management decisionmaking? How can management changes be incorporated into the indicator status analyses?

Issue:

One suggestion to reduce the cost of ecological monitoring and provide information for research on species behavior is to gather information directly from visitors to protected areas. For example, visitors to Tanzania's Serengeti National Park are asked to log in sightings of specific species, such as the increasingly rare wild dog, including their number, location, time of day, and behavior. Log books are prominently displayed at each tourist accommodation, and information is provided to researchers who work to gain a better understanding of the needs of that species. By what other means can monitoring information be provided by visitors or their guides? Should guides be required to keep logbooks on species sighted? On behavioral or ecological changes noted? How should such information be aggregated and verified for accuracy?

Impact Mitigation

Options that have been used or suggested for mitigating the negative impacts of ecotourism and for maximizing its contributions to rural development and environmental protection include regulatory (and voluntary) controls on the numbers, activities, and movements of visitors within protected areas; consumer education and awareness; environmentally and socially sensitive siting of tourist infrastructure (within or bordering on parks); reliance, whenever possible, on local labor and materials for visitor lodging, and on use of other local products (food, crafts) to serve visitor needs; accommodation, to the extent possible, of traditional rights and resource use in protected areas; increased local involvement in decisionmaking at all levels; and private-sector participation in nature tourism and conservation.

Often it is the sheer number of visitors, rather than their activities per se, that threatens an area's ecology. Many parks have placed limits on the number of tourists annually permitted entry based on analysis of visitor carrying capacity. This has been defined as the 'maximum level of visitor use an area can accommodate with high levels of satisfaction for visitors and few negative impacts on resources' [7]. Difficulties arise, however, because carrying capacity is a probabilistic concept, not a directly measurable attribute. It cannot be determined in a precise way and ultimately depends on value judgments. Often the best guide is a "common sense analysis of relevant factors, for example, a scenic rock outcrop can tolerate a higher level of visitation than the nesting site of a rare bird species. It is probably wise frost to monitor impacts associated with modest projections of carrying capacity [27].

Limiting visitors does not necessarily prevent adverse impacts, which are often affected by more complex parameters, for example, distribution of use, type of user group, individual party sizes, and the environmental durability of the area [41]. Im-