Journal of Coastal Development
Vol. 1, No. 2, February 1998: 81-96

ISSN : 1410-5217

SUSTAINABLE MANAGEMENT OF MARINE TOURISM: SOME ECONOMIC CONSIDERATIONS *)

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ABSTRACT

Marine tourism is a rapidly growing phenomenon world-wide. Concerns arise that important marine resources, such as coral reefs, are used sustainably for recreation and other pursuits. A number of possible management strategies exist that might contribute to such result should considers the followings:

- *property-rights;*
- *user-pays;*
- *regulation;*
- *education and code of conduct;*
- *permanent moorings;*
- *socio-economic research.*

It is also clear that no one management strategy will ensure that Indonesia's significant coral reef and other marine are conserved and used in sustainable fashion. Rather, a judicious blend of the use of economic instruments and concepts, regulation, education, and "site-hardening" (e.g. by use of moorings) is required to ensure that marine tourism is sustainable.

Key words: marine-tourism, coral reef, management.

I. INTRODUCTION

The ideas and suggestions presented in this paper result from four years of research into the management of marine tourism in Australia, with a particular focus on the use of so-called "economic instruments" in such management. That work has been based to a substantial degree on using recreational scuba diving for case studies. There are three reasons for using diving as the basis of the research.

*) *Presented in the Indonesian Tourism and Marine Ecology Symposium, Jakarta, 1996.*

First, scuba diving is a rapidly growing recreational pastime in many parts of the world, and particularly in attractive sub-tropical and tropical locations. For example, the Professional Association of Dive Instructors (PADI) commenced operations in 1967 when they issued 3,226 dive certifications. By the end of 1995 PADI had issued 6.2 million certifications world-wide, with 680,263 issued in 1995 alone. This is a little more than half of total certifications issued internationally. In Australia, participation in recreational scuba diving really only began to grow in the late 1970s, but there are now 700,000 domestic divers and more than two million individual dives each year in Australian waters. Of most interest for this Symposium is that the dive market which is set to boom is that in South-East Asia, including Indonesia, Thailand and the Philippines (Hamdi, 1995).

Second, recreational scuba divers make extensive use of the underwater environment and are in close contact with it. Questions remain about the cumulative damage caused by divers, particularly at coral reef sites. This issue is revisited later in the paper.

Third, there has been relatively little research into the impacts of recreational divers on the marine environment. Again, this point is revisited briefly in a later section of the paper.

In the following sections of the paper some economic concepts are considered in relation to managing marine tourism, including issues about public goods, the open access nature of the marine environment, the economic return (referred to by economists as "economic rent") from marine tourism activities, the role of economic instruments such as user-pays and transferable property rights, and the roles of socio-economic and ecological research. The place of marine protected areas (MPAs) is briefly discussed, and a small number of case-studies presented.

II. SUSTAINABILITY - TOURISM AND THE ENVIRONMENT

Tisdell (1991) advanced the proposition that tourism can destroy tourism in two ways: (a) crowding may reduce the total benefits and deter some tourists from visiting an area; and (b) tourist activities and facilities to cater for those tourists may destroy or partially destroy the assets that attracted tourists in the first place. Sustainable use of tourism resources requires that such outcomes do not arise. In the case of recreational use of coral reefs, many types of impacts might occur, but three potential impacts are particularly important:

(a) the destruction and/or loss of marine flora and fauna through, for example, the elimination of habitat;
(b) degradation of underwater landscapes through excessive use; and
(c) congestion at popular sites.

Much of the discussion about the relationship between tourism and the environment has been couched in terms of sustainable use of resources, and it is

instructive to use ecologically sustainable development as a framework for considering that relationship.

The aim of ecologically sustainable development (ESD) is to achieve development that meets the needs of the present generation and improves the quality of life without diminishing the ability of future generations to meet their needs, while maintaining the ecological processes upon which life depends (McKercher, 1993). According to Barbier (1987), sustainability has economic, biological and social dimensions (Figure 1), all of which are important in tourism development and management. Similarly, Mathieson and Wall (1982) used the three environmental categories of economic, social and physical factors in their review of research into the impacts of tourism on the environment.

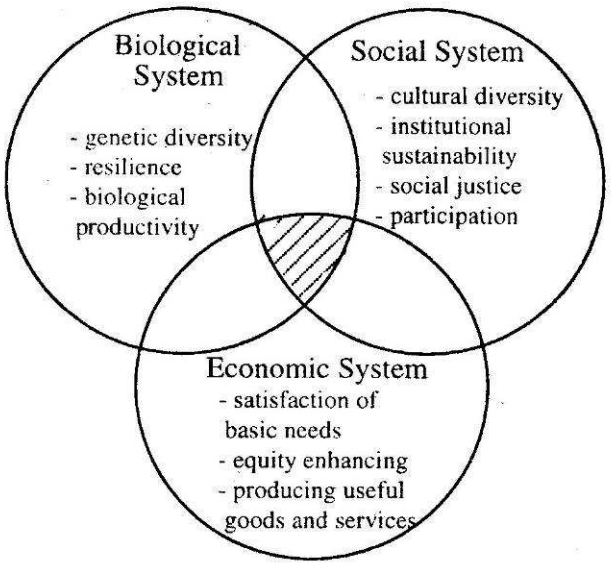

Figure 1. Dimension of sustainable resource use and development

(Adapted from Barbier, 1987, p 104.)

Buckley (1994, p. 661) proposed the following four main links between tourism and the environment:

(i) components of the natural environment form the basis of a marketable tourism destination or product;

(ii) management of tourism operations so as to minimise or reduce their environmental impacts;

(iii) contributions, either material or economic, of tourism to conservation; and,

(iv) attitude of tourists towards the environment and environmental education of clients by tourism operators.

Buckley therefore illustrated that the environment is important to each component of the tourism industry – markets and products, management, financial and economic aspects (including contributions to management), and consumer behaviour. These aspects of nature-based tourism underpin the ideas presented in the following sections of this paper. This focus is based on recognition that the natural environment is the foundation of the tourism industry.

III. THE ECONOMIC NATURE OF MARINE TOURISM RESOURCES

A number of the economic features of the natural environmental assets on which much tourism relies are important. First, as pointed out by Tisdell (1991), the nature of the ownership – the so-called "property rights" – governing use of those resources is critical to their conservation. Many environmental goods are open access in nature, meaning that anyone has access to them[1] and, if such free access goods are valuable for direct use such as in tourism, then they may be over-exploited. As Tisdell (1991) explained, the more valuable such goods become the more likely it is that they might be over-used, damaged and, in the extreme, even brought to extinction.

The danger for environmental assets is that, because of free access, they might be seen to have low or even zero value. The economic contributions of nature tourism are not normally differentiated from the economic return from tourism overall (Lindberg, 1991) and so may not be apparent. However, potential environmental impacts, loss of amenity, and reduced economic value of recreational sites arise due to what economists call "market failure". Distorted markets occur in natural areas where prices do not reflect the true value of the good in question. For example, Dixon and Sherman (1990) pointed out that many of the benefits of protected natural areas, such as ecological, biological or aesthetic values, are subject to market imperfections. Because there is no "environmental price" to be paid by consumers who reap the benefits of, say, a pristine coral reef, then the reef is made available at an inefficiently cheap (possibly zero) price and may, subsequently, be overused and degraded. Yet it is clear that environmental assets do have significant economic value given that consumers are willing to trade some of their wealth to access or consume those resources.

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[1] *The open access problem is often referred to as the "tragedy of the commons", although common property ownership is, strictly, different to open access. For example, customary owners of resources often own those resources "in common", and this may have certain advantages in terms of management.*

A third important economic feature of goods such as marine tourism assets – coral reefs and so on – is that they are "public goods". This relates also to the open access nature of these goods. Public goods are those where, if one person is supplied with the good, it is not possible to exclude others from using it also. That is, these goods are quite different to private goods that are bought and sold in normal markets.

This relates, importantly, to who owns assets such as coral reefs. Normally, they are not privately owned, although in many countries customary owners will retain control of them. If marine resources are public goods, an important question arises as to who appropriates the economic returns (economic rent) from those goods. For example, if private operators run tours to coral reefs, they typically meet the private costs of so doing, but not any social costs such as damage to the reefs. They also retain the profits from their operations. Yet the goods are owned by the whole community. Therefore, there is a strong argument that the whole community should receive some of the economic benefit; and there is also a strong argument that the consumers – the divers and other tourists who are using the reefs – should pay something to do so and, in particular, should meet any costs of environmental damage and/or environmental management.

It is concluded, therefore, that a need exists to consider the property rights associated with natural areas such as coral reefs so as to overcome open access problems, that the wider community, as the "owners" of those reefs, should benefit from their use, and that the users should contribute to the management and maintenance of them.

IV. MANAGEMENT OF MARINE TOURISM ATTRACTIONS

There are a large number of possible management approaches to the environmental protection of natural resources that are used for tourism and recreation. These may, for convenience, be grouped under the following four (overlapping) headings:

1. direct regulation (often described as command-and-control);
2. establishment of protected area status (such as marine and national parks);
3. use of concepts such as carrying capacity; and
4. the application of economic instruments.

4.1. Regulation

James (1993) noted that governments have relied heavily in the past on direct regulations to achieve environmental objectives. While such regulations have been generally effective in meeting those objectives, James (1993), Australian Bureau of Agricultural and Resource Economics (1993), Turner, Pearce and Bateman (1994) and most economists writing in this area have argued that prescriptive regulations tend to be inflexible, impose high costs on the community, and result in inefficient resource use.

The advantages of regulation are that it introduces certainty into the decision making framework, and that it can provide government with a high level of control on the behaviour of those using the resource. Regulation is also normally easy to understand and explain to both policy makers and consumers alike. Miller (1993, p. 193) illustrated the attraction of this approach in stating, "For the public sector to develop coastal and marine tourism policies, it will be necessary to create new laws and regulatory regimes."

Alder and Haste (1995) described the use of regulation in marine tourism in a case-study of the management of the "Cod Hole" which is a small area of coral reef in the Cairns Section of the Great Barrier Reef Marine Park. While similar to literally hundreds of other reefs in the Great Barrier Reef system, the Cod Hole is internationally famous for the presence of giant potato cod, discovered in 1972. Alder and Haste described the development of use of the Cod Hole by fishers, divers and other tourist boat operators, along with the history of regulatory provisions for the site.

In wrapping up their case study, Alder and Haste arrived at three principal conclusions. First, the management of the Cod Hole is a "classic example of reactionary management, [and] a history of increasing statutory regulations have proved to be of limited effectiveness in resource protection at the site" (p. 435).

Second, they concluded that self-regulation by users "shows promise for the long-term benefits to the site" (p. 435). The authors emphasised the importance of devolving some decision making responsibilities to users such as charter boat operators, thereby interrupting the cycle of reactive management.

Finally, Alder and Haste stated that, despite the implementation of a number of management initiatives over the past 10 - 15 years, "none have been broad and flexible enough to quickly adapt to changes in the levels of use, types of operators, and demands for access by commercial users" (p. 427). In a situation of rapid growth in use of a natural area, regulation has failed to deliver desired management outcomes.

4.2. Protected Areas

Stewart (1993) argued that marine conservation regimes are one important management tool available to governments concerned about the impact of tourism activities on natural resources. Further, Stewart suggested that by using such regimes governments are able to choose the combination of preservation and development principles that reflect an area's capacity for tourism. Finally, Stewart argued that management based on conservation areas provides the foundation for the very notion of sustainable tourism development.

The purposes for establishing marine (or terrestrial) protected areas are, of course, far wider than simply the management of tourism and recreation. The World Conservation Union (IUCN) has been carrying out a program to promote the establishment and management of marine protected areas

(MPAs) around the world and, in 1995, released a four-volume compendium of recommendations for such a system (Kelleher, Bleakley and Wells, 1995). The conservation of marine biodiversity is the prime reason for the establishment of a world-wide system of MPAs. At the same time, the use of marine protected areas for recreation has grown, with many sites experiencing increased demand for the recreational services accessed at those sites (Davis and Harriott, in press). This has served to raise concerns about the capacity of agencies to manage growth in tourism activities and the potential impacts on natural areas that might accompany that growth. For example, Whitehouse (1993) stated that one of the four strategic issues facing Australia's Great Barrier Reef Marine Park Authority (GBRMPA) was that of managing continued significant growth in tourism and visitor numbers, while also ensuring those visitors realise a quality experience without degrading the natural resources of the park.

The declaration of protected status for important marine areas is, however, an extremely useful step in the direction of better conservation management of those areas. Such declarations provide an institutional setting that can be used by government agencies to establish, enforce and monitor management requirements, including those relating to tourism. But, simply declaring an area to be "protected" does not guarantee protection – the capacity to police, monitor and manage such an area must also be in place; and this has financial implications. The questions of where the money will come from and who should pay must be addressed.

4.3. Carrying Capacity

The carrying capacity concept is based on a question of "how much use is too much?" The concept of carrying capacity, as originally developed and used, referred to the number of people and/or animals that could use a resource without causing "unacceptable impacts" (Resource Assessment Commission, 1993). That is, it was focused on determining the maximum population density that could be supported in a given area without causing environmental degradation. The principal contemporary use of the carrying capacity concept is in the management of outdoor recreation.

It is apparent that carrying capacity is a well accepted idea and one which is conceptually appealing. Clark (1990) commented, however, that regardless of the logic of the approach or of how good individual models are, carrying capacity has largely been ignored by environmental agencies. Even though it has been used to some extent in controlling visitor loads in national parks, as well as in controlling range herds, Clark complained that it is hard to find a good example of a government, anywhere in the world, limiting coastal/marine tourism according to environmental carrying capacity. If, as is normally argued, the purpose of carrying capacity is to promote long-term sustainable use of a resource, then it must be asked why management agencies have been so reluctant to implement strategies based on the concept.

Part of the explanation lies in the fact that it is so difficult to measure carrying capacity in both terrestrial and marine ecosystems. It is difficult also to apply the concept in the field. These difficulties led the Resource Assessment Commission (1993) to conclude that its main strength is that it helps managers think in a structured way about resource problems, user activities and experiences, and ecological constraints; and it may also be valuable in community education and awareness raising. Other advantages noted by the Resource Assessment Commission include the fact that the conceptual framework provides a basis for analysing the interaction between human activity and the environment, helps focus attention on the environmental costs of overuse of resources, and may help identify thresholds in terms of user satisfaction and environmental degradation.

The use of carrying capacity is revisited briefly in section 5.3 of this paper.

4.4. Economic Instruments

James (1993) noted that there are three areas of application for economic instruments – management of pollution, management of natural resources, and management of environmental amenity. The management of pollution includes user charges for the treatment and disposal of waste. This application might be important in respect of recreational and other areas when effluent is being discharged into those areas or when discharges from tourist vessels are important.

The management of MPAs and activities such as recreational diving is relevant in the case of the other two applications. Coral reefs are "biologically renewable natural resources" (James, 1993, p. 10) subject to overuse and degradation as a result of access by recreational divers and other consumers. Similarly, management of environmental amenity may relate to the protection of natural attractions, along with management responses designed "to ensure that congestion does not become a serious problem and that the maximum carrying capacity for recreation and other activities is not exceeded" (James, 1993, p. 11). Such management responses could include user pays fees such as entry fees to national parks.

Economic instruments such as user fees have, however, been little used in the management of recreation resources, and particularly in the case of marine recreation. Performance bonds and the Environmental Management Charge (EMC), used in the Great Barrier Reef Marine Park, are examples of such instruments. The EMC has, until very recently, been at a level of $1 per person for all visitors on commercial vessels in the Park (i.e., private users do not pay the levy), with the money collected returned directly to research and management in the Park. In the August 1996 budget the Australian Government increased the EMC to $6, although at the time of writing this paper there were ongoing negotiations between government and industry about this charge. Importantly, the proposed increase of $5 per user day is to be returned to consolidated revenue. In turn, the government

will provide funds to the Marine Park Authority to continue their management work. It is suggested, however, that this is not a good approach to management of an important MPA. Users should, undoubtedly, contribute to the costs of management, but the funds they provide will be most effectively used if returned directly and specifically to management[2]

James (1993) noted that such fees, where they are used, are not imposed to facilitate rationing of resource use, to reduce congestion or to minimise resource degradation. Rather, they represent an administrative charge designed to help cover management costs and, in the case of the Great Barrier Reef, to partially fund research being undertaken in the Reef Co-operative Research Centre. Therefore, economic instruments have not been used to effect changes in demand at a site, to influence the distribution of tourists between sites, or to pay for environmental damage or rehabilitation. They have also not, in general, been used to provide an economic return to the wider community.

In relation to the use of economic instruments, at least two further issues arise. First, the objectives of management need to be clear. Usually, they will be couched in broad terms relating to the desire to manage the use of natural resources in an ecologically sustainable manner. Specific objectives might include restricting numbers of users at a site, thereby minimising congestion and possible environmental damage. They might relate also to the appropriation of some or all of the economic return from the use of a public good.

Second, such objectives raise the question of how they might best be achieved. In the case of user charges, the level of charges that are imposed will be critical. In the case of, say, transferable rights to use a site, market mechanisms could be used (e.g., an auction of rights) to distribute property rights amongst operators who, in turn, decide the level of charges on their clients. However, given that user charges might be used for resource management purposes, the question of the price charged is very important. OECD (quoted in Butteriss, 1995) noted that "few price instruments are set high enough to have important incentive effects" (p. 14) and that "resource payments are low with the implication of substantial subsidies to the users" (p. 16). These general comments could apply to marine tourism. One contribution that economics can make in this context is to value environmental assets such as marine tourism sites. Environmental valuation has been the focus of considerable effort by economists in recent years, and can provide information that is useful in deciding on matters such as the appropriate level of user charges.

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[2] *While this will allow most effective use of the money collected, it is at odds with the suggestion to redistribute economic rents right across the community.*

Finally, it is noted that the application of economic instruments to the management of coastal and marine resources is more likely to be effective when some form of identifiable property rights are in place. For example, such instruments might be applied in marine protected areas that are "owned" and managed by a management agency, while they would be difficult to apply in a situation of complete open access. Similarly, there might be advantages in selling limited property rights to tourism operators, and making those rights transferable, thereby providing operators with the incentive to conserve what is then, for them, a capital asset.

V. CASE-STUDIES

5.1. Whale Sharks in Ningaloo Marine Park

Since the early 1980s whale sharks have been known to congregate in the waters of Ningaloo Marine Park off the coast of Western Australia. Lent (1995) noted that Ningaloo Marine Park is the only readily accessible place known in the world where whale sharks can be counted on to appear annually in large numbers.

Consequently, a tourism industry based on snorkelling with whale sharks has developed in the area. The management of the industry is the responsibility of the Western Australian Department of Conservation and Land Management (CALM). Management of the industry was, at least initially, reactive rather than proactive. In 1993, the first year of dedicated shark viewing charters, licensing was under the Wildlife Conservation Act, requiring an Animal Interaction Licence. Licensing was of vessels, was on an annual basis, involved an application fee of $50, and applications were processed on the basis that 'everyone should be seen to be treated equally', meaning that no applications were rejected.

User fees were not imposed for individual divers in 1993, but in January 1994 CALM announced a fee of $15 per diver which would cover the cost of running their surveillance vessel during the whale shark season (i.e., the fee was an administrative fee). The operators reacted to this fee not because they were against diver-fees, but because it had been introduced after they had completed their marketing and forward-sold a number of package holidays. A fee of $7 per diver was eventually implemented for the 1994 season.

In 1995 licences were issued to individuals, with licence holders required to nominate a vessel. Fifteen licences were issued to individuals, with these licences covering a three-year period. Licence holders were required to pay a deposit of $750 each year, while a charge of $15 per adult and $7.50 per child (under 16) came into force. The deposit is deducted from the total user fees payable in a season, and represents the minimum annual charge payable by operators. Again, the fee is an administrative charge designed to cover CALM's management costs. The fee has, however, been made transparently obvious to users, with each diver being

issued with a souvenir quality validation pass which incorporates a statement about the level and use of the fee charged. This is a very important point, and recent research by the author indicates that consumers are: (a) happy to pay the fee provided that the funds raised are dedicated to management of and research into the whale shark industry; and (b) most would be happy to pay a significantly higher fee, again provided that the funds are used to manage the industry in a sustainable fashion.

Two other issues arise. First, while licenses are for three years, tourism operators have little security of tenure – that is, their property rights are very limited – and tend not to make long-term investment decisions relating to their operations. Second, the licences are not transferable, as they would be with a greater degree of property rights, yet economists would argue that efficient use of the resource requires that transferability exists. At the same time, limited regulation will always be required because of the 'public good' nature of the resource, while increased self-regulation and management by the industry players is desirable. As the present three-year licensing period enters its last year (1997) an excellent opportunity will arise to review the approach to management. A wide range of possibilities will be able to be canvassed, including the desirability or otherwise of further regulation, greater use of industry self-regulation and, hopefully, further consideration of the use of economic instruments such as partially limited and transferable property rights.

Finally, as a result of research and recommendations by the author and some colleagues from James Cook University, changes to regulations, such as the move from one-year to three-year licences, and the required distance divers must stay from whale sharks, have been made by CALM . These results show the importance of socio-economic research, in addition to scientific research, to the management of marine tourism activities.

5.2. Damage Inflicted by Divers

Harriott, Davis and Banks (in press) conducted underwater surveys of divers in four locations off the east coast of Australia to ascertain if they inflicted measurable damage on the underwater environment. In summary, it was found that:

(a) a very small proportion of divers (less than five percent) inflicted significant damage, but these small number of divers caused very considerable impacts on the environment;

(b) most divers inflicted minimal or no damage; and

(c) the main cause of damage was accidental fin strikes from divers with poor buoyancy and other diving skills.

Rouphael and Inglis (1995), in separate underwater surveys in the Great Barrier Reef Marine Park, found almost identical results.

One management strategy that immediately suggests itself is to improve the diving skills and environmental

awareness of recreational divers, in particular by way of appropriate pre-dive briefings. Furthermore, it is suggested that a diver code-of-behaviour, clearly displayed on vessels and in dive shops, should be developed.

Boat anchoring is, however, the most damaging aspect of activities such as recreational diving, and the provision of boat moorings in heavily dived sites should be given the highest priority by management agencies. Furthermore, strategies should be sought to ensure that the users of those moorings contribute to their cost of installation and maintenance.

The sustainability of diving at particular sites depends both on the number of divers accessing those sites, and on the capacity of the ecosystem to regenerate and recover from any damage incurred. Environmental monitoring programs are needed in heavily dived locations so as management agencies may be able to detect environmental change before damage levels become critical and, perhaps, non-recoverable. At the same time, more needs to be known about the determination of human carrying capacities in marine areas.

Both direct and indirect management strategies might also be adopted in an effort to prevent environmental damage by divers in MPAs. Direct approaches include "no-touch" regulations and strict controls on the numbers of divers accessing particular sites. Indirect approaches could include the establishment of transferable property rights, consisting of a limited number of permits which allow use of those sites. Any such approaches need also to be supported by codes of conduct amongst operators and divers, along with diver education programs.

Finally, short term socio-economic research will provide information that can be used by management agencies to develop management strategies for user groups such as recreational scuba divers. Information on perceptions of crowding, reduced amenity values, and the economic value of popular dive sites (reflecting the willingness to pay to protect and use those sites) can be gathered both quickly and relatively cheaply. Such information will be of substantial benefit to the managers of MPAs. Conversely, while biological information is critically important, evidence of ecological impacts will take longer to collect, is affected by natural perturbations and is, therefore, of a more long term nature. In heavily used locations managers might not have the luxury of being able to wait until the required scientific information is available before taking needed action on user levels and activities. A precautionary approach, based on socio-economic information, is likely to be a sound interim strategy.

5.3. Carrying Capacity Studies

Dixon, Scura and van't Hof (1993), in a seminal study of recreational diving in marine protected areas, found that the upper limit, or carrying capacity, of dive sites in Bonaire Marine Park in the Netherlands Antilles, to be about 5,000 individual dives per site per year. While the uncertainty about the use of

the carrying capacity concept remains, this was the first attempt to place a quantitative guideline on the use of marine tourism resources used for activities such as recreational diving.

Hawkins and Roberts (1992, 1993) had also studied carrying capacities in coral reef areas in Egyptian waters, concluding that 30,000 to 50,000 dives per site per year, as forecast for certain areas was "approaching" the carrying capacity of those areas. However, following further consideration, including a review of Dixon *et al.*'s work, Hawkins and Roberts (1996, p. 4) concluded: "In the absence of site-specific data, our findings suggest that a good rule of thumb is to maintain use levels [for diving at coral reef sites] at levels below 5,000 to 6,000 dives per site per year. This is, therefore, a precautionary approach, taken on the basis of limited biological information.

VI. SUMMARY AND CONCLUSIONS

Marine tourism is a rapidly growing phenomenon world-wide. Concerns arise that important marine resources, such as coral reefs, are used sustainably for recreation and other pursuits. A number of possible management strategies exist that might contribute to such a result. Many of these have been touched on in this paper and are summarised below.

Property rights – the open access and public good nature of most marine recreation resources means they are subject to potential over-use and degradation. There are potential advantages in commercial users of such resources being able to obtain, through purchase, greater property rights in those resources. Those rights would, desirably be transferable by sale between commercial operators (perhaps with some controls on monopoly holdings, etc.). Operators with a financial stake in an appreciating capital asset are more likely to take care of that asset.

The public good nature of the resources means that, ultimately, they belong to the wider community who should, therefore, appropriate some of the benefits from their use (perhaps by redistribution of the money paid to purchase property rights).

User-Pays – there is a strong argument that the consumers (divers, day-trippers, etc.) in marine tourism should pay to access and use the nation's environmental assets. It is desirable that the use of any fees or levies collected is transparently obvious to those who are paying (similar to the whale shark case) and that those fees are returned to management and research in the area in which they were collected.

Regulation – by it self, regulation has generally failed to deliver desired management outcomes because it is too inflexible. It is normally also expensive to implement. Some regulation will, how-

ever, be needed, but such regulation is best applied in combination with other management strategies such as user-pays, consumer education and codes of conduct.

Education and codes of Conduct – these have a significant contribution to make to sustainable use of marine tourism resources. They will be best developed in conjunction with tourism industry "players" who, in general, will be convinced that it is in their best long-term interest to conserve the resources upon which they depend.

Permanent Moorings – it is well accepted that anchor damage is a major cause for concern in coral reef areas. Consequently, permanent moorings for dive boats and other vessels should be given a very high priority. Furthermore, it is important to seek ways for the users of such facilities to pay for their installation and management.

Socio-Economic Research – short term socio-economic research will provide information that can be used by management agencies to develop management strategies for user groups such as recreational scuba divers, day trippers and so on. Information on perceptions of crowding, reduced amenity values, and the economic value of popular sites (reflecting the willingness to pay to protect and use those sites) can be gathered both quickly and relatively cheaply. Such information will be of substantial benefit to the managers of marine recreation areas. Conversely, while biological information is critically important, evidence of ecological impacts will take longer to collect, is affected by natural perturbations and is, therefore, of a more long term nature. In heavily used locations managers might not have the luxury of being able to wait until the required scientific information is available before taking needed action on user levels and activities. Socio-economic research might also be supported by international aid agencies.

In conclusion, it is clear that no one management strategy will ensure that Indonesia's significant coral reef and other marine areas are conserved and used in a sustainable fashion. Rather, a judicious blend of the use of economic instruments and concepts, regulation, education, and "site-hardening" (e.g. by use of moorings) is required to ensure that marine tourism is sustainable.

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