Charging users of the Great Barrier Reef Marine Park

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*A report to the Great Barrier Reef Marine Park Authority*



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*The views expressed in this paper are not necessarily those of the Great Barrier Reef Marine Park Authority*

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# Foreword

The Great Barrier Reef and its surrounds are managed by the Commonwealth government as a marine park with the aim of conserving the living marine resources while allowing a range of 'reasonable' commercial and recreational uses. A system of use and preservation zoning has been developed, together with a permit system for some activities in some zones, as the primary means of achieving this end.

Over the past decade, the use of the marine park has increased substantially, particularly as a result of the development of large scale 'intensive' tourism operations. Private recreational use has also increased markedly over the same period.

The prospect of overuse of the reef and the increased conflict between users have forced the introduction of increasingly complex management arrangements by the Great Barrier Reef Marine Authority, the Commonwealth agency charged with the management of the marine park. This is despite the Authority having an explicit aim 'to minimise regulation of, and interference in, human activities consistent with meeting the goal and other aims of the Authority'.

Increased management activities and expenditures will probably be necessary to keep pace with the expected growth in the amount of use of the marine park in the 1990s. The purpose in this study is to explore the possibility of charging users of the marine park to supplement funds provided by the Commonwealth and Queensland governments for marine park management.

The study is wide ranging, including a review of the purpose and nature of management of the marine park. Such scope is necessary to establish the link between the management services provided by the Great Barrier Reef Marine Park Authority and the benefits derived by the users of the marine park, a prerequisite to the introduction of a charging system. Two distinct types of potential user charges are examined; one based on the recovery of management costs, and the other on the scarcity, or resource rent, value of the reef sites being used.

The emphasis in the study is on identifying a charging system which, while raising sufficient revenue to fund the future increases in management of the

marine park, would also strengthen the incentive for individuals to use the resources of the marine park in an ecologically sustainable and efficient way.

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# Contents

# Summary and recommendations

Since 1975 the resources of the Great Barrier Reef and its surrounds have been managed by the Great Barrier Reef Marine Park Authority. The primary aim of the Authority has been to conserve these resources while allowing a range of 'reasonable' commercial and private uses.

Recreation is the predominant use of the marine park. Recreational activities can be split into those that are extractive and those that are not. Commercial tourism is based mainly on the latter. In contrast, private recreation is firmly based on fishing. Over the past decade both tourism and private recreational use of the marine park have increased substantially. Although the private and commercial uses can be quite different the same reef sites are often preferred by both user groups. As a result, the potential for overuse of reef sites and for user conflict is growing.

The management system used by the Authority is based on defining a range of use and preservation zones according to the ecological and use characteristics of different areas of the marine park. Different activities are allowed in different zones. For example, in general use zones both extractive and non-extractive commercial and private activities are allowed, whereas 'marine national park B' zones prohibit extractive uses.

The increasing use of the marine park has led the Authority to introduce ever more detailed zoning arrangements in an attempt to reduce user conflicts and prevent unacceptable damage to the resources of the marine park. The increased use of the marine park and the more detailed management system implemented to cope with it have led to increased management expenditures by the Authority. Further increases in funding are likely to be necessary to enable the Authority to keep pace with the growth in the use of the marine park.

The Great Barrier Reef Ministerial Council, which oversees the operation and funding of the Authority, at its 13th meeting in April 1988 responded to these financial pressures by asking the Authority to investigate the feasibility of introducing charges on commercial users of the marine park. At the 17th meeting of the Ministerial Council held in February 1991, the ministers indicated that general taxpayers should not be the only ones contributing to the

costs of park management. They agreed that charges on users of the marine park should supplement government appropriations.

Accordingly, this study examines the scope for charging users of the marine park. Two types of charges have been assessed, one based on the recovery of management cost and the other on the recovery of the scarcity value, or resource rent, associated with particular reef sites in the marine park.

Irrespective of the type of charge used, a prerequisite to its introduction is the assignment to marine park users of more clearly defined private rights to use the resources of the marine park. The ownership of the resource would, however, remain vested in the government on behalf of society as a whole. Clearly defined private use rights specify the rights and freedoms of individuals, as well as the conditions imposed by governments, on their use of a resource.

The assignment of improved private use rights would strengthen the link between the management services supplied by the Authority and the benefits derived from use of the park by tourism and mariculture operators and private users. The provision of more clearly defined use rights may also provide stronger incentive for individuals to conserve the resources of the marine park and to use them efficiently within the environmental guidelines set by the Authority. This may be particularly applicable to non-extractive users such as tourism operators whose livelihoods are likely to be closely linked with the quality of the reef sites on which their enterprises are based. If rights are transferable between different types of commercial operators, the industry can adjust to the most efficient size and structure to profitably match the demands of consumers. At the moment, the private use rights of commercial operators are very loosely defined while those of private recreational users are virtually non-existent.

Tourism use rights to a certain reef site are generally non-exclusive, ostensibly non-transferable and of only three years duration. In practice, the Authority has renewed permits provided the operator has not breached permit conditions and has agreed to transfers of permits between similar tourism enterprises.

Defining clearer use rights for tourism operators could, to a large extent, simply amount to clarifying and formalising the 'de facto' characteristics of the rights currently held. The duration of the use rights will depend on the desired frequency of rezoning the marine park. At the moment rezoning is carried out



on a five year cycle. The strengthening of incentives for individuals, through the assignment of improved use rights, to conserve the resources of the marine park and to adapt to changing patterns of consumer demand for reef experiences may lessen the need for such frequent rezoning.

The development and enforcement by the Authority of quantitative limits on the amount of use of individual reefs, based on the estimated limits of acceptable change to the resources of the reefs, may also reduce the need for rezoning. The limits of acceptable change for particular sites may be adjusted over time by the Authority if, for example, improvements in knowledge of the ecology of the reefs indicates that they are being overused. This could be done without going through the rezoning process.

**Recommendation 1**

*That the rights for tourism and mariculture operators to use particular reef sites, and the conditions of use, be clearly defined, particularly in terms of the exclusivity, transferability and duration of the rights. If quantitative limits on the use of reef sites by visitors can be defined and implemented as conditions of tourism use rights, the Authority should review the need for frequent rezoning of the marine park.*

The cost to the Authority of managing private recreational use of the marine park is probably already substantial and, with increased private use, is likely to increase still further. There would appear to be grounds for the Authority to recover these management costs from private users.

Private recreational users currently enjoy virtually unlimited access to the marine park. Restricting commercial users alone will be unlikely to conserve its resources, particularly if the growth of private recreational use of already highly used inshore reefs is not controlled. If the concept of the limits of acceptable change to reef sites is used to set quantitative limits on the maximum allowable number of visitors per day, a mechanism must be developed to limit the private recreational use of such sites. This might, for example, involve the permanent or seasonal siting of enforcement officers at some high demand sites, such as islands and cays, to ensure that the visitor limits are not exceeded. The costs of doing so would be borne by the private users wishing to use these high demand sites, who could be required to buy short term passes to the sites, possibly from regional offices of the Queensland National Parks and Wildlife

Service. The higher charges associated with the use of these sites would be likely to have a rationing effect on their use.

For lower demand areas of the marine park, use rights could be assigned to local private boat owners on a reef by reef or area basis as an added part of the existing annual boat registration process administered by the Queensland Department of Transport. Interregional boat owners could also be required to purchase a pass to have access to the marine park, again perhaps from regional offices of the Queensland National Parks and Wildlife Service.

**Recommendation 2**

*That private boat owners be required to purchase use rights to designated areas of the marine park to contribute to the costs of managing the park. The use rights could be assigned annually on a site or area basis except for high demand sites, access to which would be gained by purchasing short term passes. The cost of use rights for high and low demand sites should reflect the different costs to the Authority of monitoring their use.*

Commercial fishermen and collectors should also be assigned improved use rights but probably by the Queensland Department of Primary Industries as this agency already has prime responsibility for the management of these users.

Once clearly defined use rights are assigned to marine park users, many of the services supplied by the Authority can be viewed as either defining or enforcing these individual rights. Zoning and many of the day to day management activities, particularly surveillance and monitoring, fall into this category. The costs of these services should then be recoverable from tourism, mariculture and private users.

The levy on tourism operators and private boat owners should reflect their use of management services. It is likely that the maximum passenger capacity of tourism operations and the maximum likely use of private boat owners, both expressed in terms of the annual number of visitor days spent in the marine park, would be an appropriate levy base. This is because the amount of visitor days is likely to be closely related to the extent of management activities aimed at preventing crowding and user conflicts and unacceptable levels of damage to the resources of the marine park. The suggested levy on tourism operators is in



addition to charges that may be imposed to recover the costs of providing specialised services to individual operators, such as permit assessment and any subsequent site monitoring.

**Recommendation 3**

*That tourism operators and private boat owners be subject to a common levy base for the purpose of management cost recovery — that is, the maximum likely number of visitor days per year spent in the marine park.*

Mariculture operators would have to be subject to a different levy base. This could be related to the area of the mariculture site relative to the total reef area in a particular section of the marine park. A share of the total zoning and enforcement costs could be apportioned on this basis.

As the majority of the expenditures of the Authority are related to the development and surveillance of use and preservation zones it is possible that a cost recovery strategy along the lines outlined above could recover a sizable proportion of these expenditures. However, the costs associated with managing the preservation and scientific research zones should be borne by the Commonwealth on behalf of society as a whole.

The accounting systems of the Authority would have to be upgraded to allow expenditures to be more readily identified, by activity and reef site where applicable. Data collections relating to the intensities and patterns of use of the marine park by tourism operators and private recreational users would also have to be initiated to support a cost recovery program. A mandatory log book system to record the number of visitors per day at various sites could be introduced for tourism operators, and comparable information on private recreational use could be obtained from periodic user surveys.

**Recommendation 4**

*That improved data collection systems be developed to monitor the commercial and private recreational use of the marine park. The accounting system of the Authority must also be upgraded to allow expenditures to be more readily assigned by management activity and reef site.*

An important feature of a cost recovery program would be the incentive it provides for marine park users to scrutinise the expenditures of the Authority. Representatives of the various user groups should be consulted on the amount, type and cost effectiveness of management services supplied by the Authority. Provided that the use rights of various users are well defined their incentives to conserve and efficiently use the reef may not be dissimilar to those of society as a whole. This is particularly likely to be the case for tourism operators whose livelihood may depend on maintaining the relative quality of the reef sites on which their enterprises are based. Accordingly, their willingness to pay for management services may provide a rough guide to the appropriate level of supply of the services from a public perspective.

**Recommendation 5**

*That user group representatives be consulted on Authority expenditures on management services.*

The possible introduction of resource rent charges rests both on equity and efficiency arguments. On equity grounds, it could be argued that Australian society as a whole, being the owner of the resources of the marine park, is owed a return to its ownership in the form of resource rent.

Gains in the efficiency of use of the resources of the marine park would be achieved through the assignment of more clearly defined use rights to commercial and private users. However, these gains may be eroded if the method used to assign the rights encourages individuals to engage in costly and wasteful activities such as lobbying aimed at improving their initial assignment. The use of market based methods of assignment, and hence the payment of a charge for the use of a site, will reduce the incentive for prospective rights holders to behave in this way.

Competitive bidding is the assignment method most likely to reduce such inefficient behaviour and may also prove a cost effective method of assigning use rights in some circumstances. Bids could take the form of a single 'upfront' payment for the use of the site, annual payments possibly based on a share of the operator's gross revenue, or a combination of both sorts of payment. A bidding system which includes the option of annual charges may attract some bidders who, unable to raise sufficient capital for an upfront lump sum payment, would otherwise be excluded from bidding.



An alternative market based approach of government valuation and sale of use rights for commercial operators to reef sites is fraught with difficulties and should be avoided.

**Recommendation 6**

*That if resource rents are to be appropriated from tourism operators this be achieved by using a system of competitive bidding for clearly defined rights to use individual reef sites.*

The question of whether a government instrumentality such as the Authority should be allowed to directly appropriate and spend resource rent returns has both equity and efficiency dimensions. From an equity viewpoint the rent may be argued to represent a return on ownership of the resources of the marine park which should be provided to society as a whole, as the owner of the resource, via Commonwealth consolidated revenue.

As there is likely to be no relation between the amount of resource rent collected and the necessary cost of management of the marine park, the amount of funds expended by the Authority, if it were able to directly appropriate the rent, may not be optimal from a public perspective. It could also be argued that the likely payoff to society as a whole from investment of the rent returns may be greater if it has a larger range of investments from throughout the economy to choose from.

There may also be equity considerations among users relating to the possible introduction of a resource rent charge for using highly demanded sites. If a resource rent charge were to be introduced on commercial operators, it may be inequitable to levy established operators with site specific permits if the permits had been purchased from previous operators at the site. The price paid to the departing operators is likely to have included a part of the resource rent which the new operator could otherwise have expected to earn over the course of his or her use of the site. This being the case, the introduction of a resource rent charge on these users, in the short term at least, could amount to penal taxation. In the longer term, the use of such sites could be subject to a rent charge provided that the likely introduction of the charge is made known well in advance so that operators could take this into account in relation to the trading price of use rights in the intervening period.

**Recommendation 7**

*Current high demand reef sites should only be offered for tender in the longer term, and only if current operators are told well in advance of the Authority's intention to do so. Any resource rent returns from the use of the resources of the marine park should be appropriated by Commonwealth consolidated revenue for allocation between competing investments throughout the economy.*



# 1. Introduction

The Great Barrier Reef is an extensive and complex system of coral reefs stretching 2500 km along the north-eastern coast of Queensland. It is ecologically diverse, supporting an abundance of corals, fish, shellfish, marine mammals and seabirds. There is a range of physical environments within the barrier reef system, such as coral cays, individual and fringing reefs and continental islands. The natural and physical resources of the reef have attracted a large number of recreational and commercial users.

As with many other renewable marine resources, users of the Great Barrier Reef have, until fairly recently, been allowed virtually unlimited access. The depletion or degradation of such 'common property' resources, both terrestrial and marine, has been well documented. However, the Great Barrier Reef does not have the long history of intensive use usually associated with common property resources. The formation in 1975 of the Great Barrier Reef Marine Park Authority to regulate the use of the reef preceded any large scale development of industries or recreation based on the use of the reef and has, as a result, managed to conserve most of the reef's resources. While there are exceptions, such as some favoured fish species, the populations of which have been significantly reduced in some areas, the overall condition of the reef and its populations of plant and animal inhabitants is unmatched by coral reefs elsewhere in the world.

Over the past decade the use of the reef and its resources has expanded substantially. The development in the mid-1980s of intensive tourism operations using high speed vessels with large passenger capacities greatly increased the demand for access and the potential for physical damage to certain reef sites. Although only a relatively small proportion of the reef as a whole is within easy reach of coastal towns and thus accessible by the intensive tourism industry, these same reefs are also popular with private recreational users.

Although essentially non-extractive in nature, tourism has placed the resources under increased pressure through, for example, trampling, and the need to site infrastructure facilities such as pontoons, jetties or walkways on the reef. Private recreational use of the reef has been growing rapidly in concert with the tourism industry. However, unlike tourism, private recreation has been firmly rooted in extractive activities, primarily fishing. In fact, some 70 per cent of the

total reef fish caught around the Barrier Reef are estimated to be taken by recreational fishers (Craik 1989).

There is also a large commercial fishing fleet active in the waters of the marine park. The majority of the fleet are prawn trawlers operating mainly in the areas between the reef and the shore, with a smaller number of boats engaged in droplining for reef fish species. Commercial collecting of aquarium fish, coral, trochus shell and beche-de-mer is also carried out and there is a growing demand for sites adjacent to reefs for various mariculture activities.

Although the types of use of the reef are diverse, as are the reef environments, many of the user groups have similar preferences in relation to reef characteristics. The characteristics which are highly favoured include ease of access, availability of sheltered anchoring sites and high diversity and abundance of corals and fish. The potential for conflict both between and within user groups for access to favoured reef sites is large and growing.

The Great Barrier Reef Marine Park Authority was established to manage the use of the reef and its surrounds. The stated objective of the Authority is to 'provide for the protection, wise use, understanding and enjoyment of the marine park'. The major focus of the Authority is to conserve the natural qualities of the reef while allowing as much human activity as is consistent with its conservation motive. The Great Barrier Reef Marine Park stretches from north of Bundaberg to the tip of Cape York and encompasses waters stretching from the low water mark on the Queensland coast and around islands managed by the Queensland government to the edge of the continental shelf seaward of the reef. The littoral areas between the high and low water marks on the coast and islands are also marine parks managed under complementary legislation by the Queensland National Parks and Wildlife Service which also carries out much of the day to day management of the Great Barrier Reef Marine Park on behalf of the Authority.

The management system employed by the Authority is based on zoning the marine park according to its ecological and use characteristics. The zones specify allowable types of use ranging from preservation with only research allowed, to general use 'A' zones which provide for both extractive and non-extractive commercial and recreational use. In between these extremes are four other types of zones which allow varying mixes of recreational and commercial use. Zoning enables a broad separation of potentially conflicting uses of the reef.



Another important feature of the marine park management system is the issue of permits for tourism operations and for the commercial collection of corals, shellfish and aquarium fish. Commercial fishing operations in the waters of the marine park are licenced separately under an agreement between the Authority and the Queensland Department of Primary Industries. The main purpose of the permit system has been to ensure that tourist operations do not impose unacceptable levels of environmental damage on the reef. Environmental impact assessments of proposed operations and site monitoring of certain types of permitted projects are carried out as part of the permit system.

The growth of tourist demand over recent years has led to increased numbers of applications for permits for structures on or near reefs. Also, the proposed structures have often become larger and more elaborate, such as in the case of floating hotels, demanding more detailed examination of their potential environmental impact and consequently more of the resources of the Authority. The rapid rate of growth of reef use in general, estimated at around 10 per cent a year over the past few years, has also led to a greater need for other Authority services such as monitoring and surveillance. Use of the marine park is expected to continue to increase.

It is likely that significant increases in funding will be required for the Authority to keep pace with this expected growth in marine park use. Funding is currently derived from Commonwealth and Queensland government appropriations and has been supplemented since 1990 by charges collected from users of permit assessment and site monitoring services. The Great Barrier Reef Ministerial Council, which oversees the operation and funding of the Authority, at its 13th meeting in April 1988, responded to the financial pressures resulting from increased use of the marine park by requesting the Authority to investigate the feasibility of introducing charges on commercial users of the marine park. At the 17th meeting of the Ministerial Council, held in February 1991, the ministers indicated that the general taxpayers should not be the only ones contributing to the costs of park management. They agreed that charges on users of the marine park should supplement government appropriations.

While the need to raise sufficient revenues to meet the growing demand for management of the park is the driving force behind the suggestions of the Great Barrier Reef Ministerial Council to examine the scope for broadening user charging, future growth in park use is also likely to result in the need to devise means of rationing the use of the park's resources. This is emerging as an

important issue, and one which is clearly linked with the development of charging policies.

The main purpose of this study is therefore to develop charging policies which, while satisfying the budgetary requirements of the Authority, will also enhance the conservation and efficiency of use of the resources of the marine park. The study examines the scope for charging both commercial and private users of the marine park. To do this a broad review of the purpose and nature of management of the marine park is necessary.

Two types of charges are assessed, one based on the recovery of management cost and the other on the recovery of the scarcity value, or resource rent, associated with particular reef sites in the marine park. Analysis of the management cost recovery option involves identifying a clear link between the management services supplied by the Authority and the benefits derived by individuals from their use of the marine park. If such a link exists, or can be established, the services which are supplied primarily for the purpose of yielding benefits to particular user groups are potential targets for cost recovery from their beneficiaries. Once the management activities, and hence costs, attributable to particular user groups are established, a levy base must be formulated to spread the cost burden across individual users.

The possible introduction of fees based on the benefits flowing from the use of the resources of the marine park is distinct from cost recovery and requires an appreciation of the ways in which different user groups make use of the resources of the park and how these user groups may interact. For commercial operators such fees would attempt to capture part or all of the 'above normal' profit, or resource rent, gained from using the resource. Before resource rent can be recovered the ownership or use rights to the resources to be allocated must be clearly defined in terms of the tenure, transferability, divisibility, exclusivity and quality of title which they offer. The potential impacts of the introduction of more clearly defined use rights and resource rent charges on the efficiency of resource use are examined.



# 2. Resources of the marine park and their uses

The Great Barrier Reef is the largest collection of coral reefs and islands in the world. The marine park encompassing much of it was inscribed on the World Heritage List in 1983.

## 2.1 Natural resources of the marine park

The Great Barrier Reef consists of a chain of reefs starting just north of Bundaberg and extending to the Gulf of Papua. The Great Barrier Reef marine park stretches some 2500 km along the north-east coast of Queensland from just north of Bundaberg to the tip of Cape York. The marine park covers an area of around 350 000 $km^2$ seaward of the low water mark on the Queensland coast and surrounding a number of continental islands, many of which are under Queensland jurisdiction (table 1).

The Great Barrier Reef has developed over the past 8000 years on a limestone foundation. The reef in its present form is largely a result of limestone accretion of minute skeletons of single celled animals called polyps and a cementation process associated with coralline algae. There are about 2900 individual reefs in the marine park as well as many small bare sand cays, vegetated cays and

Table 1: **Main physical and biological characteristics of the Great Barrier Reef Marine Park**

| Characteristic | Number or size |
|---|---|
| Area of the marine park | 348 700 $km^2$ |
| Length of coastline | 2 500 km |
| Number of reefs | 2 900 |
| – fringing reefs | 760 |
| – continental reefs | 618 |
| Number of reef islands | 318 |
| Number of cays and wooded systems | 300 |
| Number of fish species | 1 500 |
| Number of hard and soft coral species | 400 |
| Number of molluscs | 4 000 |
| Number of bird species | 240 |
| Number of turtle species | 6 |

continental islands. There are also 300 reef islands including 213 unvegetated cays and 83 permanently vegetated sand cays (table 1).

The reef and the surrounding waters support a rich diversity of plants and animals. The myriad of interdependent plants and animals is specially adapted to its complex physical environment. The species composition varies across the reef shelf because of microclimates created by the interaction of siltation, availability of nutrients, light intensity, ocean currents, and many other factors (Gilmore 1988). Living on the limestone foundations are 400 species of hard and soft coral as well as numerous other animals, including sponges, sea urchins, fish, birds and turtles. Whales are also frequent visitors to the marine park.

## 2.2 Users of the marine park

The Great Barrier Reef is a source of many highly valued goods and amenity services. The reef environment supports many organisms exploited by humans. Commercial and recreational fishers harvest a range of fish and shellfish. However, the most highly valued uses of the reef are likely to be non-extractive. The aesthetic appeal of the reef and its diverse and abundant animal species and corals attract many tourists. Popular recreational activities include diving, snorkelling and viewing the corals from glass bottomed or semisubmersible vessels.

The marine park is used by a wide variety of people. User groups include recreationists aboard their own vessels and those who gain access to the reefs using various commercial tourism operations. Access for recreational fishing and diving from both private and charter boats is also in high demand. In addition, there are mariculture operations that require exclusive use of parts of the reef for the purpose of culturing molluscs and fish. A summary of the different uses of the marine park is given in table 2.

Shipping also makes use of the waters of the marine park. The gaps within the Barrier Reef serve as important routes for international and local vessels travelling to and from east coast ports.

### Tourism

Tourism is the dominant commercial activity in the region. There are around 14 different types of tourism operations. Since the early 1980s, the growth in



tourist demand has resulted in an almost sixfold growth in the number of tourism operators (Scrivens 1989). Consequently, there has been a large increase in the number of visitors to the marine park. Up to 8500 tourists a day are now able to visit the reefs aboard the 300 vessels operating from the mainland or reef island resorts. A large share of the increase in the number of visitors to the reef has been in response to the introduction of comfortable, large, high speed catamarans. The range of day trip tourism was greatly extended by

Table 2: **Summary of user groups operating within the Great Barrier Reef Marine Park**

| Activity | Number |
|---|---|
| **Tourist operations** | |
| Intensive tourism; general and extended charter; gamefishing; bare boats; cruise liners; day trips; overnight trips; beach hire; diving; interpretive services; service and scenic flights; and underwater observatories | 300 **a** |
| **Recreation** | |
| Tourists | |
| – international | 182 700 **b** |
| – local | 486 200 **b** |
| Private pleasure craft | |
| – local fishing | 24 300 **c** |
| – other local boats | 11 700 **c** |
| – interstate boats | 6 000 **d** |
| – international craft | 2 000 **d** |
| **Commercial fisheries** | |
| Otter trawling (prawn and scallops); other (line, net and crabbing) | 1 075 **e** |
| **Collecting fisheries** | |
| Collection of coral; aquarium fish; beche-de-mer; trochus; pearl harvesting; oyster harvesting; and others (shell, sea snake) | 350 **f** |
| **Mariculture** | |
| Ventures specialising in pearls, clam or fish (barramundi) | 20 **g** |
| **Traditional users** | 6 communities |

*Sources:* **a** Great Barrier Reef Marine Park Authority. **b** Hundloe (1990); estimates for 1986 and 1985 respectively. **c** Blamey and Hundloe (1991); estimates of boats specifically fishing in the Great Barrier Reef Marine Park. **d** Great Barrier Reef Marine Park Authority; indicative estimates only. **e** Hundloe (1985). **f** Estimated by the Great Barrier Reef Marine Park Authority (1990b) from their own and Queensland National Parks and Wildlife Service sources. **g** Great Barrier Reef Marine Park Authority permits database (1990).

their introduction. More distant, offshore reefs became accessible within the two hour cruising time generally considered the acceptable limit of most passengers. In 1987, approximately 450 000 passengers visited the Great Barrier Reef aboard these catamarans alone (Kenchington 1991).

Many other tourists opt for overnight visits or extended stays on island resorts in the marine park. There are a total of 26 resorts on 16 islands and 3 coral cays. Island resorts were estimated to have a capacity of at least 2 million visitor nights in 1989 (Scrivens 1989). Many of the resorts emphasise reef activities and offer reef walking, fishing, snorkelling and scuba diving.

Alternative, more specialised reef related activities are offered by general and extended charter boat operations which are provided by about 115 operators. Many of these vessels offer a combination of activities, including line and troll fishing and diving and snorkeling. Specialised gamefishing is offered by about 10 per cent of these operators (Driml 1987). Such operations tend to rove between reefs unlike many of their intensive tourism counterparts whose operations are usually 'site dedicated'. The total number of visitor days spent on the reef in 1987 has been estimated at around 2.2 million by Driml (1987).

Tourism may adversely affect the resources of the reefs in two main ways. There are impacts from the activities of the tourists themselves and those from the construction and placement of tourism facilities. Fishing and coral collecting are examples of tourist activities that have direct imports on the ecology of the reef. Unintentional damage to the coral occurs, for example, through anchor damage and trampling.

Tourism may affect the reef environment indirectly through the construction or installation of tourism support facilities such as jetties, moorings, marinas and resorts. The major impact of such structures on the marine environment is often during the construction stage. However, there may be longer term effects arising, for example, from the disposal of sewage. Some of the more important negative impacts of tourism and other activities on the reef are given in table 3.

**Private recreation**

Private boats provide an important means of access to the amenities of the marine park. There are about 36 000 private boats registered in coastal towns and cities from Bundaberg to Cooktown (Blamey and Hundloe 1991). It has been estimated that at least 690 000 visitor days are spent aboard private boats



Table 3: **Activities that damage the ecology of the reef environment**

| Ecological effects | Source activity |
|---|---|
| Direct physical changes | Trampling by visitors; anchor damage to corals by private recreational and tourism vessels |
| Changes in composition and size of fauna and flora populations | Commercial and recreational fishing; collection of aquarium organisms |
| Physical destruction of habitats | Construction of jetties and mooring structures; construction of marinas for residential and tourist developments |
| Cumulative changes to reef ecology | Effects of nutrient buildup in the waters of the reef environment (nutrients are of terrestrial origin and from sewage discharge from tourist resorts and vessels) |

in the marine park each year (Scrivens 1989). For private boaters recreational fishing is the single most important purpose in visiting the reef, with 68 per cent of boats being used for regular fishing trips (Blamey and Hundloe 1991). Other purposes include visiting island national parks, swimming, snorkelling and diving.

In 1990, recreational fishers were estimated to have made between 210 000 to 270 000 fishing trips to the Great Barrier Reef, catching around 12 000 tonnes of fish (Blamey and Hundloe 1991). As noted previously, about 70 per cent of the total reef fish catch is thought to be taken by recreational fishers. The key species targeted by the recreational fishers are mackeral, coral trout and red emperors — the same species targeted by commercial line fishermen.

The abundance of coral trout on inshore reefs and the average size of the fish are believed to have declined markedly (Craik 1989). At the same time recreational fishing effort on these reefs is estimated to be increasing at a rate of around 8 per cent a year (Gwynne 1990).

**Commercial fisheries**

The marine park supports a large proportion of Queensland's commercial fisheries. Commercial activities range from trawl fisheries for prawns and

scallops to set net and line fisheries. The otter trawl fleet alone comprises about 485 vessels which operate in waters between the shore and the reef and in the sandy channels between reefs. A large proportion of the 7000 tonnes or so of prawns caught each year from the waters off eastern Queensland is taken in the marine park. The fishery is managed under a system of limited licensing by the Queensland Department of Primary Industries under the Offshore Constitutional Settlement agreed by the Commonwealth and state governments.

The commercial reef line fishery is also carried out predominantly within the waters of the marine park. In 1989, total production from the commercial reef line fishery was estimated at around 4000 tonnes (Gwynne 1990). This fishery is also managed by the Queensland Department of Primary Industries via a system of limited licensing. Currently there are 1963 commercial fishing vessels licensed to operate in the fishery. These 'primary' vessels are also licensed to be used in concert with a number of dinghies or dories as part of their fishing operations. A total of 2027 'secondary' boats are also licensed for use in the fishery (Gwynne 1990).

In 1990, some 67 per cent of the total commercial catch was taken by only 5 per cent of the licensed primary vessels. There is considerable potential for increases in fishing effort by the other 95 per cent of the fleet (Gwynne 1990).

### Collecting fisheries

The collection of aquarium fish and other organisms is a growth industry in the region. Since 1986, the number of aquarium fish collectors has increased about fivefold. In 1989, 140 collectors obtained permits to operate in particular areas of the marine park and spent more than 4000 person days collecting over 138 000 specimens of different types of organisms. These included fish, crustaceans and sea anemones. The gross returns from this activity was estimated at around $3.5 million in 1989 (Queensland Department of Primary Industries 1991). Most collecting activity occurs on reefs close to Cairns. Besides collection of live organisms for aquariums some mollusc and fish species are collected for use as broodstock in mariculture enterprises.

### Mariculture

The marine park contains many sites suitable for maricultural use. In 1990, over 20 mariculture operations culturing pearl, clam and barramundi were permitted in the marine park. Pearl and clam farms make use of the shallow waters of the reefs for 'grow out' of the organisms to marketable size. Barramundi farming



is based on cage culture in deeper, sheltered waters adjacent to reefs or islands. Mariculture, by its nature, requires exclusive use of sites. These sites may also be demanded for recreational and tourism purposes.

## 2.3 Conflicting user demands

Many of the activities described above require similar physical and locational features — reefs easily accessible from the mainland with one or more safe anchorages and a productive reef system harbouring a colourful, abundant and diverse range of organisms. Thus, there is bound to be competition among the user groups for access to the limited number of reef sites with these desirable specifications.

With increasing numbers of uses and users, the potential for habitat destruction and congestion at particular sites has increased. So have the conflicts among users. These conflicts develop because of the incompatible and competitive nature of some activities. For example, there may be rivalry between high capacity tour operators and private vessel owners who demand a 'wilderness' type of reef experience. The presence of a large vessel and many tourists at a

Table 4: **User conflicts in the Great Barrier Reef Marine Park**

| Nature of conflict | Examples of competing activities |
|---|---|
| Crowding | |
| – visual/aesthetic | The presence of large numbers of tourists at a site may deter private recreational users seeking 'wilderness experiences' |
| – physical | Tourists and private recreational users may prefer the same reef sites — physical crowding may result |
| Resource depletion | Commercial and recreational fishers targeting the same fish species — fishing and collecting activities, by reducing the diversity of species or concentration of organisms, may reduce the aesthetic quality important to other tourist uses of the reef |
| Physical interference with permanent facilities | Pontoon facilities of intensive tourism operators being damaged (or dirtied) by overnight use by commercial fishermen |

reef may constitute crowding from a private recreationist's viewpoint. However, such crowding may be visual or aesthetic rather than physical.

Recreational and commercial fishers often compete for the same fish resources. By depleting local fish populations, recreational or commercial fishing may adversely affect tourism operations which depend on the visual abundance of fish and other marine animals close to reef anchorages. There are also conflicts within user groups. For example, at some highly preferred, but relatively small, reef sites the presence of several tourism vessels may result in physical crowding of the site and the loss of amenity value among tourists. Competition for access to such sites may be intense. In table 4 some examples are given of the main types of conflict in the marine park.

## 2.4 Summary

The Great Barrier Reef Marine Park comprises a large range of reef environments supporting a vast diversity of plants and animals. The goods and amenity services available in the marine park have attracted a variety of extractive and non-extractive uses.

In the 1980s, use of the marine park by tourists grew rapidly. Although tourism is essentially non-extractive in nature it still results in significant damage to the reef's resources through trampling and indirectly through the placement on the reef of tourism infrastructure facilities such as pontoons and jetties.

Private recreational use of the marine park has also been increasing steadily over the last decade. Fishing is the main activity of private users who take a large proportion of the total annual catch of reef fish. Commercial fishermen compete with amateurs for the same highly valued fish species. Collecting of marine organisms and mariculture are also significant activities in the marine park.

Many of these activities compete for either reef sites or for the resources of the reefs. Future growth in the use of the marine park, particularly tourism and private recreational use, is likely to lead to increased damage to the reef's resources and increased congestion at preferred sites. Increased conflict between users is likely to result.



# 3. Management of the Great Barrier Reef Marine Park

In common with marine fisheries and other aquatic resources, the Great Barrier Reef and its plant and animal inhabitants have, until fairly recently, been regarded as 'common property'. The incentives provided for individuals to overexploit such resources are well known. The underlying problem is one of a lack of private property rights to the resources. Without the ability to exclude others from using the resource, individuals have a reduced incentive to conserve as much of the benefit of so doing will be lost to other users. Only if resource users bear the full consequences, both positive and negative, of their individual actions will they have the incentive to make those choices which will be of maximum benefit to the community as a whole (see, for example, Rose and Cox 1991).

Where it is feasible, the most efficient way of managing conservation and the use of natural resources is through the assignment of well-defined property rights and the consequent development of markets. Assignment of rights to natural resources is not always feasible. In some cases this is because of the existence of natural impediments to the development and operation of markets. In other cases it reflects cultural resistance to private ownership of some assets. If assignment of full rights of resource ownership is not possible, some of the advantages of market systems may be realised by assigning quota rights to resource access or to particular activities involving use of the resource and the consequent development of a parallel market in quota rights. Individual catch quotas for fish are an example. Finally, command and control regulation of resource users' activities may be used as the management device. To date, the Commonwealth government, through the Great Barrier Reef Marine Park Authority, has adopted a purely regulatory approach to managing the Great Barrier Reef and its surrounds. Ideally, the choice between the degree of reliance on markets, relative to a reliance on direction of resource use, should be based on a comparison of the likely full costs and benefits of the alternatives.

The main regulatory activities of the Authority are centred on using a system of zoning to 'provide for a range of reasonable uses which do not threaten the essential ecological characteristics and processes of the marine park' (Great Barrier Reef Marine Park Authority 1991a). By prohibiting certain activities in

specific areas, zoning achieves a broad allocation of the rights to use the reef's resources between various user groups, or combinations of user groups. Allocation of use rights at the individual level for commercial operations (and scientific research) is effected through the issue of permits. This management system is evolving in response to changing patterns and increasing intensities of reef use. Increasing congestion and physical damage to the resources at some reef sites has led to the development of increasingly detailed zoning and management arrangements to prevent the overuse of the resources and conflicts between users.

## 3.1 Large scale zoning of the marine park

The marine park has grown substantially in size since the early 1980s. This growth has involved the sequential declaration of four areas or 'sections'. Each section has a separate zoning plan. Initial zoning of the marine park was completed in 1988 and each section is subject to rezoning on a five year cycle. This is to allow the management of the park to adapt to changes in use patterns and to increased knowledge of the ecology of the resources of the park. The chronology of the expansion and zoning of the marine park is provided in table 5.

Within each section there are up to six different types of use zones. An important aim of the zoning process is to separate potentially conflicting uses of the marine park. The main strategies used to manage each type of zone are given

Table 5: **Sections of the Great Barrier Reef Marine Park**

| Section | Area | Year declared | Zoning | |
|---|---|---|---|---|
| | '000 km | | | |
| Cairns and Cormorant Pass | 35 | 1981 | initial<br>rezoned | 1983<br>1991 a |
| Far Northern | 83 | 1983 | initial | 1986 |
| Central | 77 | 1984 | initial | 1987 |
| Mackay/Capricorn | 149 | 1987 | initial | 1988 |

**a** The rezoning process started in 1988.



Table 6: **Zonal management strategies**

| Zone type | Management strategy |
|---|---|
| General use 'A' | Reasonable general use consistent with conservation of park resources |
| General use 'B' | Reasonable general use in areas that are free from trawling and generally free from shipping |
| Marine national park 'A' | Protection of the resources of the park while allowing recreational activities and approved research |
| Marine national park 'B' | Protection of the resources of the park while allowing their appreciation and enjoyment but not removal — that is, a 'look but don't take zone' |
| Scientific research | Protection of the resources of the park while allowing certain research to be carried out free from other human disturbance |
| Preservation | Reserve areas of the park in their natural state, undisturbed by human activity |

in table 6. The activities consistent with these strategies and which, therefore, are allowed to take place are detailed in table 7.

While this level of zoning is effective in separating obviously conflicting uses such as trawling and preservation it still allows a wide range of potential local conflicts within zones. For example, increased tourist use of a particular site may adversely affect private recreational amenity. A survey of visitors to the Great Barrier Reef found that the large majority of people interviewed were opposed to more commercial development on the reef (Vanclay 1988). The survey was interpreted by the Authority as revealing disquiet about future levels of crowding and placement of tourist facility hardware on the reefs (Kelleher and Driml 1988).

To help maintain recreational amenity values in the face of increasing commercial and recreational demand for reef access the Authority introduced a 'no structures subzone'. This additional level of control allows the Authority to identify reefs, or parts of reefs, on which structures such as pontoons, walkways or jetties, may not be erected. Other 'areas of additional control' which can be declared by the Authority are fisheries experimental areas, seasonal closure areas, special management areas, shipping areas and defence areas. Figure A

Figure A: **Schematic representation of the relationships between various zoning measures**

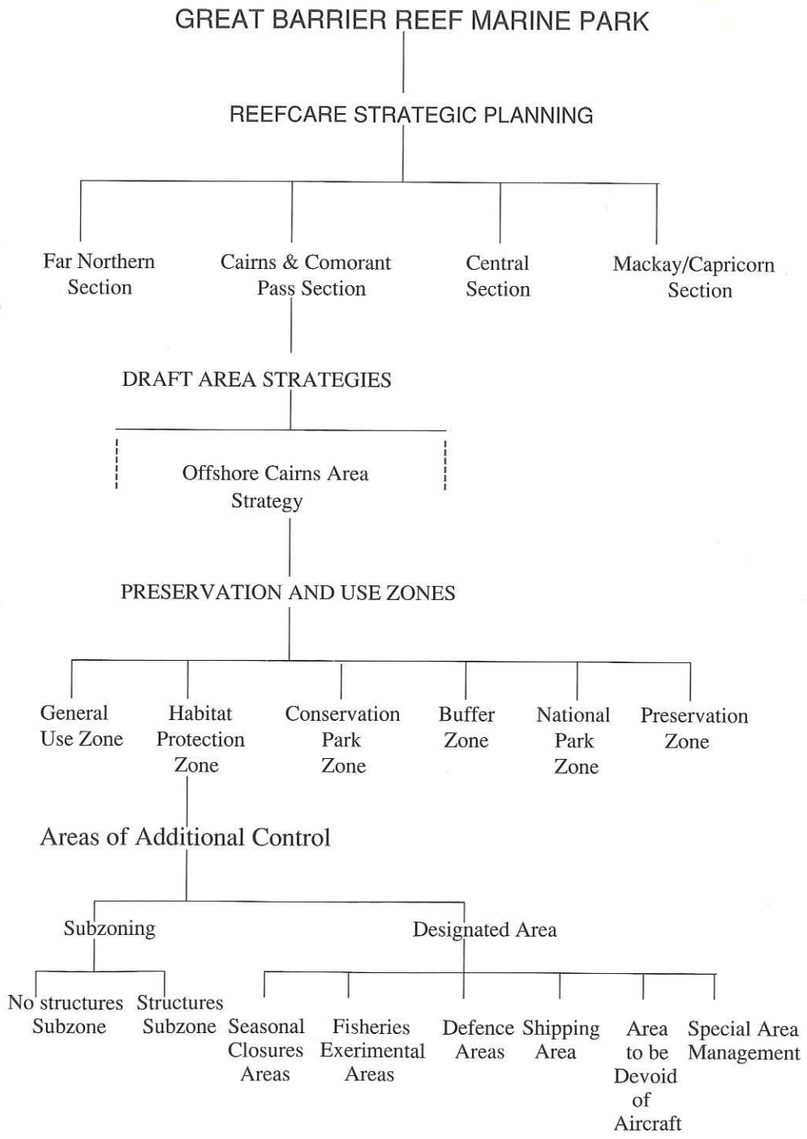





Table 7: **Activities allowed in each type of zone**

| | Type of zone [a] | | | | | |
|---|---|---|---|---|---|---|
| **Activity** | **General use 'A'** | **General use 'B'** | **Marine National Park 'A'** | **Marine National Park 'B'** | **Scientific research** | **Preser-vation** |
| Bait netting and gathering | yes | yes | yes | no | no | no |
| Camping | permit | permit | permit | permit | no | no |
| Collecting – recreational | limited | limited | no | no | no | no |
| Collecting – commercial | permit | permit | no | no | no | no |
| Commercial netting | yes | yes | no | no | no | no |
| Crabbing and oyster gathering | yes | yes | limited | no | no | no |
| Diving, boating, photography | yes | yes | yes | yes | no | no |
| Line fishing | yes | yes | limited | no | no | no |
| Research (non-manipulative) | yes | yes | permit | permit | permit | permit |
| Research (manipulative) | permit | permit | permit | permit | permit | permit |
| Spear fishing | yes | yes | no | no | no | no |
| Tourist and education facilities | permit | permit | permit | permit | no | no |
| Traditional hunting, fishing, gathering | permit | permit | permit | no | no | no |
| Trawling | yes | no | no | no | no | no |

**a** The recent rezoning of the Cairns section led to the renaming of the types of zones. The equivalent zones to those specified above are (from left to right); general use, general use (no trawling), marine park recreation, marine national park and preservation which combines the former scientific research and preservation zones.

provides a schematic representation of the relationships between the various zoning measures.

While the introduction of no structures subzones may have alleviated some conflicts between user groups, many others remain. Even in the subzones there is ample scope for conflict between tourism (without the use of structures) and private recreation. Growth in both activities will further increase congestion and the likelihood of physical damage to the reef environment, with consequent reductions in amenity values and increases in conflicts. The rapid development of the Cairns section of the reef as a tourist destination brought the potential for increased conflict and ecological damage into sharp focus. The need for further separation of conflicting uses and to place limits on the use of the reefs resulted in the recent development by the Authority of individual reef management plans and area strategies.

## 3.2 Area strategies and reef management plans

The purpose of area strategies is to provide a coordinated regional basis for the development of reef by reef management plans. The area strategy indicates a desirable balance (as judged by the Authority in consultation with users) between commercial, recreational and conservation uses of the area as a whole. Management plans for individual reefs are developed in this light, taking into account the opportunities available for the competing activities on other reefs in the area.

Area strategies thus provide for a more detailed level of zoning and hence a more specific allocation of the use of the resources of the region. Draft area strategies have so far been developed for the 'offshore Cairns' region and the Whitsunday Islands. Both areas have been subject to a rapid expansion in tourism over the past five years. Each area strategy comprises a package of management plans for the individual reefs falling within the designated high pressure area. The offshore Cairns area is delineated with regard to the most distant reefs visited by tourism operators offering day trips from Cairns.

Reef management plans specify which activities are allowed to take place on the reef. In deciding which uses will be allowed the amenity values for a range of uses of each reef are qualitatively assessed. Seven amenity classes have been formulated by the Authority (table 8). The amenity classes prescribe the 'desirable recreational setting' for a reef and the types of activities which are



Table 8: **Characteristics of amenity classes**

**Class One: Commercial and mariculture**
- mariculture allowed with little disturbance from tourism and recreational users
- sites should fulfil necessary requirements for mariculture operations and there must not be existing high levels of tourism or recreational use

**Class Two: Intensive tourism with structures**
- areas where there are permanent tourist facilities with minimum alteration to natural setting
- generally involve site specific and dedicated tourist operations
- may preclude use for some recreational and commercial users

**Class Three: Intensive tourism with limited removable structures**
- permanently moored facilities, such as pontoons and floating hotels allowed
- may involve site specific and dedicated tourist operators
- tourist program use would be such that recreational and other commercial users will encounter many tourists

**Class Four: Recreational and intensive tourism without structures**
- intensive levels of tourism without structures moored or permanently located
- site dedicated to daily and regular tourist operations using large to moderate size tourist vessels, with facilities such as glass bottom boats, semisubmersibles and dive tenders
- at local site levels allocation of areas for recreational users may be planned

**Class Five: Recreation and moderate tourism without structures**
- intensive levels of tourism without structures moored or permanently located
- regular tourist and roving operations using small tourist vessels such that recreational and commercial users do not encounter tourist activities that substantially reduce their access and use; tourist operations with large vessels not appropriate

**Class Six: Recreation with limited tourism**
- predominantly for use of recreational users
- tourist operations permitted for those activities where group sizes are similar to those of recreational users and carried out using small tourist vessels similar to those used by recreational users

**Class Seven: Recreation in a natural setting without tourism**
- only for private recreational users, will typically provide for recreational activities such as wilderness activities which are likely to be displaced by intensive tourism

**Class Eight: Preservation**
- no tourism or recreational users permitted; typically areas in this class are zoned as 'preservation zones' by the zoning plan, although areas of buffer zone may be included

*Source*: Great Barrier Reef Marine Park Authority (1991a).

suitable in order to maintain that setting (Great Barrier Reef Marine Park Authority 1991). An implicit goal of the Authority has been to encourage a wide range of commercial activities with the purpose of providing a broad choice of recreational activities for visitors.

The decision of which amenity class to attach to a reef is basically a judgment on the uses for which the reef is most suitable. The assessment is mainly based on the current uses of the site and its physical and ecological characteristics. The designation of an amenity class to a reef is effectively a further level of zoning. Some commercial uses which would otherwise be acceptable under the broader zoning plan for the area are prohibited by the management plan. For instance, one of the amenity classes virtually dedicates a reef for private recreational use, excluding tourism.

Emerging as an important aspect of the development of management plans for reefs is the estimation of their maximum desirable level of use. The estimate is based on the concept of the 'limits of acceptable change' (Watson 1989). This embraces the issues of user congestion and the impact of use on the sustainability of the resources. Both congestion and physical damage to the resources impose 'external costs' on users. That is, the actions of each user imposes costs on other users, reducing the overall level of amenity from the resource. Beyond a certain level of use the total benefits which can be gained from the resource fall. Limits on the use of recreational resources, if correctly set, can therefore reduce the incidence of external costs and increase the efficiency of resource use and the amount of benefits from its use (Fisher and Krutilla 1972).

The determination of the maximum desirable level of use of a reef, measured in terms of the maximum number of visitors allowed daily access, and its amenity class are important steps in the current process of defining rights to use the marine park. The allocation of rights to use the reef involves the issue of permits to commercial users.

## 3.3 The issue of permits

Permits are required for all tourism operations as well as for the collection of aquarium fish, shellfish and corals. As mentioned previously, commercial fishermen are licensed separately by the Queensland Department of Primary Industries, while recreational boat owners must register their boats with the Queensland Department of Transport.



The stated purpose of the permit system is to 'provide for assessment and management of environmental impacts to facilitate the development and care of the marine park' (Great Barrier Reef Marine Park Authority 1990a). While the focus of the permit system is on environmental impact, it is nevertheless the means by which use rights are allocated to individuals. The rights are to use certain reefs or areas of a reef for tourism operations. By allowing access to a site the rights implicitly allow the use of all the resources, such as coral and fish, found there. Such uses may be extractive or non-extractive depending on the type of zone in which the site is located. Permits are either site specific or 'roving'. Roving operators are allowed to visit, as frequently as they wish, any reef in the section unless otherwise specified on the permit.

Each permit application is assessed according to its likely impact on the environment, existing users and the amenity value of the site in question. Until recently, there were no defined limits to the number of tourist operations permissible on particular reef sites.

However, the physical characteristics of reefs sometimes constrain the amount of certain types of use, particularly use by tourism operators. Specifically, the number and quality of anchorages adjacent to a reef and sheltered from the prevailing winds restricts the number of tourist vessels which can simultaneously use the reef. For some reefs there may be only one such suitable anchorage. The first operator to apply for a permit to place a permanent private mooring or structure on the anchorage, and who satisfied the environmental impact objective, was thus effectively granted exclusive tourism use rights to the reef. For some sites many more permits have been issued than could be used simultaneously owing to the constraining physical characteristics of the site. Access to such sites is competitive on a first-come, first-served basis for the limited anchorages.

As a result of increasing use and the associated development of area strategies and site management plans the number of site-dedicated permits on some highly used reefs has been restricted and restrictions are proposed for some others. The number of times a week that roving operators are allowed to visit some highly used sites is already limited, although the total number of roving permitees allowed access is not.

Under the few existing site management plans for heavily used reefs, the number of site dedicated operators is limited. To date, this limit has been set to

correspond to the number of existing commercial operators. As mentioned earlier, the concept of the limit of acceptable change to the resource has been suggested by the Authority as an appropriate guide to the total number of visitors that should be allowed to visit a particular reef each day. This implies the need to also limit the number of private recreational users. At the moment, there is no means of doing so. However, both private and commercial uses should be accounted for within the total visitor quota. The likely growth in the number of private recreational users will force this issue to be addressed if the visitor quota is not to be exceeded. How the quota will eventually be allocated between these uses is not clear.

When the commercial share of the visitor quota is decided, permits could be issued until the passenger capacity of the tourism vessels corresponds to the commercial visitor quota. But this is not straightforward because of the mix of site-dedicated and roving operations already holding permits to particular reefs. Although a reasonable estimate could be made of the number of tourists likely to visit a reef on a particular day aboard site-dedicated vessels, the number aboard the boats of roving operators would be highly uncertain. These operators may be restricted to a maximum number of visits a week to a given reef but the days which they are allowed to visit are not specified. Consequently, under the current system some or all of the roving operators could turn up on the same day and the visitor quota could be exceeded. This problem may be resolved by simply specifying which days a permittee is allowed access to a reef. Management issues relating to the definition of both site-dedicated and roving use rights are discussed in more detail in chapter 5.

At the moment, tourism permits have a three year duration and are ostensibly non-transferable, both between different types of users (such as dive charter and tourism day trip operators) and between similar users (for example, dive charter operators). In practice, the Authority has always renewed expired permits provided that permit conditions have not been breached. Also, permits have been reallocated if the permitted operation was sold and the new owner intended to carry on a similar operation to that for which the permit was originally issued. Otherwise, a new and costly environmental impact assessment would have to be carried out. As transfers of permits between different types of commercial operators is prohibited, the pattern of commercial use of a reef is more or less fixed for the five to eight year duration of the zoning plan. The grant of a permit has not in itself conferred any exclusive rights to use the resource although, as



noted previously, the physical characteristics of a reef may, in some cases, serve to limit the competition from other operators.

Clearly, the implementation of management plans for individual reefs is giving the permit assessment process a more explicit resource allocation role. When the assessment process is applied to reefs which are underused, and for which additional permits may be allocated, the Authority may be forced to choose between a number of permit applicants who cannot be separated in terms of their likely impact on the reef's resources. The current first-come, first-served allocation system is not usually well suited to this sort of high demand situation. Charging for access is seen as one possible alternative means of efficiently allocating the resource between competing commercial users (Great Barrier Reef Marine Park Authority 1991b). Charging for access also provides one possible way of stemming the growth of private recreational use of the marine park.

## 3.4 Summary

The initial zoning and subsequent rezoning of sections of the marine park has, to a large extent, preserved the status quo for tourism and private recreational users. Prawn trawling was the only activity to be significantly restricted, being excluded from some previously fished areas. The development of areas of additional control, area strategies and reef management plans reflect the Authority's desire to prevent overexploitation of resources in the face of rapidly increasing use. Again, these additional measures have not generally resulted in significant changes to existing use patterns. Private recreational users are virtually unrestricted in their use of the vast majority of the marine park.

For highly used reefs, the Authority recognises a need to limit the number of visitors allowed access each day if both the resource and its amenity values are to be maintained. The resulting daily visitor quota will somehow have to be allocated between tourism and private recreational users. The current permit process allows the Authority a measure of control over the number of visitors to a reef on commercial boats. However, no mechanism exists to limit the numbers of private recreational users. Without such a mechanism some of the resources of the marine park are likely to become overused. The introduction of charges on users will, to some extent, ration the use of the marine park, as well as raise revenue.

# 4. Charging for environmental goods and services

Charging a price for the use of goods and services has two main functions. The first is to cover the cost of their production and provide the producer with signals on whether more or less should be supplied. The second is to ration their use. Markets carry out these functions for most of the goods and services produced in the economy and are generally regarded as the most cost effective means of ensuring their provision. However, markets only work well to allocate resources to their highest valued end uses if private property rights to the resources are well defined and transferable.

In the case of many environmental resources, such as the Great Barrier Reef, rights of private ownership have not developed. This may be because of the nature of the resource or the ethical or cultural factors relating to its use.

The inability of a would-be owner of a resource to exclude others from its use (or from the use of goods and services derived from it) is a natural impediment to the development of private property rights. This lack of excludability is often a feature of goods or amenity services derived from environmental resources. 'Non-excludability' usually results in the undersupply of goods, services or amenities, overexploitation of the resource and underinvestment in the management, conservation and productive capacity of the resource (Randall 1987).

Another feature of some environmental goods and services, often associated with non-excludability, is 'non-rivalry in consumption'. A good is said to be non-rival if one person's consumption of the good has no impact on anybody else's enjoyment of the same unit of the good. Many of the amenity services of the marine park, such as the satisfaction which people gain from the knowledge that the reef's resources are being conserved, are non-rival. These can be contrasted with rival goods such as a seat on a tourist boat which, if occupied by one person cannot be used by anyone else. 'Public goods' are non-excludable or non-rival or both.

Examples of goods and amenity services of the marine park which are non-excludable or non-rival are given in table 9, as are some of the likely features of the existing and potential rights to use them.



Ethical and cultural values of a society may also prevent the formation of private property rights over some environmental resources. Randall (1987) notes that 'all societies have chosen, for their own unfathomable reasons, to classify some things as simply inappropriate to exclusive ownership and unrestricted trade'. Some environmental amenities fall into this category.

A cautious approach to the development of private property or use rights and markets for such amenities is thus warranted because, as pointed out by Rose and Cox (1991), a high degree of community respect for those rights is essential if markets are to work. Clearly, new rights need to be defined in such a way that bringing them, and the markets which develop the handle them, into existence does not create undesirable third party effects.

The lack of private property rights over the use of the Great Barrier Reef, and the consequent reduction of incentives for conservation, led to the establishment

Table 9: **Characteristics of marine park resources**

| Examples of goods and services of the marine park | Characteristics of the good or service produced | Features of possible use rights |
|---|---|---|
| Fish when caught | Rival, excludable | Exclusivity, divisibility; can be easily transacted through market transactions — private property rights exist |
| Fish before capture | Rival, non-excludable | Individual shares of a total allowable catch may be issued; shares could be divisible, exclusive, transferable |
| Viewing the reef | Non-rival, excludable | Exclusive use rights possible for reef sites |
| Existence value of the environment | Non-rival, non-excludable | Virtually impossible to define private use rights |
| Islands, cays, reefs | Congestible | Non-rival at low intensities but rivalrous at higher intensities; exclusive, functional, spatial or temporal use rights possible |

by the Commonwealth government of the Great Barrier Reef Marine Park Authority. The Authority has sought to conserve and manage the resources of the marine park by introducing regulations to control the patterns and intensities of resource use. The continued growth in the use of the marine park does, however, raise doubts about the ability of such regulatory measures alone to conserve the resources while fostering their efficient use. Although some use rights have been conferred on commercial operators in the regulatory process, these rights are poorly defined and probably of little use in promoting the efficient use of the marine park or the conservation of the resources within it. Use rights differ from resource ownership rights in this case because the ownership of the resource remains vested in the government on behalf of society as a whole.

The primary motive of the Authority for examining the possible introduction of a charging system in the marine park is to increase its revenue base. This reflects a perceived need for additional management services in order to maintain the quality of the resource in the face of increasing use. The proposed introduction of increasingly restrictive zoning regulations emphasises the need to further ration the use of the resource. The likely growth in use will reinforce this need.

As recently pointed out by the Commonwealth working group on the ecologically sustainable development of tourism (Commonwealth of Australia 1991), an alternative to a strict regulatory approach would be to provide individual users with the incentive to use the natural resources more efficiently and conservatively by giving them more clearly defined private use rights. An example of the assignment of clearly defined use rights having these effects is provided by the experience of paua (abalone) divers in the Chatham Islands in New Zealand following the introduction of a system of individual transferable catch quotas.

Prior to the introduction of the individual transferable quota system in 1987, the paua fishery had been subject to a plethora of management regulations aimed at conserving the resource by controlling fishing effort. As pointed out by Ackroyd and Hide (1991), 'the regulations restricted the taking of paua but in so doing they restricted the potential of the fishery. Licence requirements locked out new entrants, gear restrictions kept the cost of taking paua high and export quotas discouraged product development and price competition. The regulations were themselves a cause of considerable waste. What is more, the regulations never got to the heart of the problem. The fishermen were left



fishing a common stock and the total catch was never directly constrained'. Ackroyd and Hide concluded that the regulations did not provide the necessary incentives to divers to ensure sound resource management.

These regulations were replaced by an individual transferable quota system which gives divers an exclusive long term right to harvest a share of the annual paua crop. Divers recognised that it was in their interest to maintain or enhance paua stocks to maintain or improve their income stream and the value of their paua quotas (Ackroyd and Hide 1991). In an attempt to do this the divers have contracted the New Zealand Ministry of Agriculture and Fisheries to carry out a trial paua reseeding program on the reefs surrounding the Chatham Islands. Ackroyd and Hide suggest that providing divers with better defined use rights to the paua resource encouraged them to become custodians rather than plunderers of the resource.

This is not to imply that the assignment of such use rights is all that is needed to ensure conservation of the resources in question. The size of the paua harvest in the above example is determined by the New Zealand government, which also maintains controls on the minimum size of paua that can be harvested. These controls are needed as the use rights provided to divers are not perfectly defined. There are still spillover effects from one diver to another which could result in overuse of the resource. It is possible that the development of private use rights may even unexpectedly result in other spillover effects.

If more clearly defined rights to use the marine park are specified by the Authority, these rights should have strict environmental conditions attached to their use. The Authority should retain the power to adjust the conditions of use to ensure the conservation of the resources of the marine park in the event of ecological or technological changes.

## 4.1 Improving the quality of resource use rights

Clearly defined private use rights specify the rights and freedoms of individuals, as well as the limits which are imposed, on their use of a resource. Use rights can be defined in terms of their combinations of five key characteristics: exclusivity, divisibility, duration, transferability and quality of title. The following discussion will focus on the desirable attributes of tourism and private recreational use rights. Commercial fishing and collecting use rights are

not included as it appears likely that these activities will be managed, and possibly levied, separately by the Queensland government.

**Exclusivity**

Exclusivity refers to the ability of an owner of a use right to a resource to exclude other potential users. The desirable degree of exclusivity depends on the nature of the resource and the uses to which it is put. Some activities may not be competitive with the operation of the owner of the use right so there may be no need for their exclusion. If a tourism use right was to a certain reef site and allowed the operator to provide facilities for snorkelling, scuba diving and coral viewing from glass bottomed boats, some private recreational activities at the site may be non-competitive — for example, private, non-extractive, recreational use of a commercial reef site at times when the commercial operator is not there. A low level of recreational activity during the times when the commercial operator is at the site may still be acceptable. Exclusion of private recreationalists may, however, be important if their use increases to the level where the site becomes congested and the amenity values of the tourists on the commercial vessel are reduced.

It is important for the owner of the use right to a reef site, and the resources found at the site, to exclude other competing commercial operators. If they could not be excluded, the use right would be of little value. As noted earlier, the use rights currently granted to tourism operators are non-exclusive in that they do not prohibit other similar operators from using the resource. However, the physical characteristics of the reefs, the Authority's stringent environmental requirements for the placement of moorings and the apparent respect for each others moorings among tourism operators may confer varying degrees of commercial exclusivity.

Exclusive, non-extractive use rights are most readily defined for identifiable structures such as reefs, cays or islands, or fabricated facilities such as pontoons, piers or moorings. Such rights could be for using the whole or part of a reef or cay and its associated resources such as corals and fish. Because fish are mobile, the right to use a certain reef site will not confer exclusive use of the fish resources found there. If fishermen catch these fish when they swim to adjacent reefs the fishermen may impose external costs on the tourism operator because of the decrease in the amenity value of the tourism dedicated site. However, given the large number of fish species typically found at any given reef and the mobility of many species between reefs, the task of designing,



allocating and enforcing exclusive use rights would probably be extremely difficult and prohibitively expensive. Zoning might, however, be used to limit such problems by restricting the areas in which extractive activities such as fishing are allowed to take place. Individual catch limits might also be set for both recreational and commercial fishermen.

It is likely that tourism use rights will continue to be based on the use of particular sites, rather than individual resources. If the maximum number of visitors per day at a reef is specified under a site management plan, a tourism use right must also specify the maximum number of tourists the operator is allowed to bring to the reef a day. The Authority may want to adjust the size of the quota over time, possibly before the end of a given planning period, due, for example, to changes in the biological state of the resources.

**Divisibility**

If the rights to use a reef site can be divided over space or time, the efficiency of use may be significantly improved. Reefs could be geographically divided into a number of distinct sites. If an operator wanted to use his or her site only one day a week the site on other days could be sublet for the use of other operators, provided that the limits of use defined in the right were not exceeded. For example, if the owner of the use right to the site ran an operation based on allowing tourists to snorkel or view the coral from glass bottom boats, he or she may wish to sublet the site to other tourism operators wishing to conduct compatible activities, such as scuba diving perhaps. To some extent this is happening under the existing permit system as some site dedicated intensive tourism operators have leased space on their vessels to businesses offering scuba diving activities.

Subleasing of the reef site would allow the initial right owner to adjust his or her use to the amount at which profits were highest, thus improving efficiency and possibly allowing a wider use of the reef.

**Duration**

The duration of use rights has an important influence on the investments made by commercial operators. Investments can be made in human capital through training, in physical capital, such as boats, and even in the resource itself if it is renewable. The investments being made by New Zealand paua divers in reseeding the reefs is an example of the latter type of investment. The duration of use rights will affect the type, scale and pattern of investment in each of these

various capital assets. Basically, the longer the duration of the right the more efficient and profitable the investments will be.

The owner of a use right is more likely to conserve a resource if he or she has been granted a long term right to its use than if the right is of only limited tenure. Simmons (1991) suggests that the problem of soil degradation could be ameliorated by giving farmers longer term leases or freehold over their land. Quiggin (1987) discussing the same issue, cites the case of tenant farmers in 19th century Ireland who, holding only nine year leases to their land, spent the first three years repairing the damage done by the previous tenant, the next three in farming efficiently and the last three in running the land down as fast as possible.

Without sufficient tenure individuals using the marine park may be reluctant to invest in the resource, training or the most efficient boats or other physical capital, even if these investments would be likely to generate higher profits in the longer term. Some banks and lending institutions surveyed by Coopers and Lybrand (1990) in relation to their lending policies to commercial operators in the marine park indicated that loans may only be given if the duration of the use right is at least twice the loan period. This extended tenure is sought so that in the case of default the loan can be refinanced within the unexpired tenure of the use right. This suggests that if a use right is of ten years duration the banks may grant loans with a maximum term of only five years. Clearly, a short duration of use rights would be likely to discourage the purchase of expensive, but possibly efficient, capital items. Investment in the conservation of the reef would be similarly discouraged.

The use rights conferred to tourism operators in the marine park are currently of only three years duration. Prior to 1990, they were of one year's duration. Coopers and Lybrand (1990) does, however, point out that banks were actually giving loans to marine park operators under these conditions. This probably reflects the fact that the Authority never failed to renew permits if the commercial operator had stayed within the permit conditions. Commercial operators and banks may, therefore, have viewed the permits as actually conferring long term or even permanent rights.

The current system of rezoning on a five year cycle may prevent the Authority from specifying use rights of longer duration. If a reef was rezoned from, say, marine national park B in which non-extractive uses are allowed to a scientific research zone in which they are not, then existing tourism use rights would be



annulled. The uncertainties associated with possible rezoning may severely hamper the efficient use of the resources of the marine park. Such losses, added to the administrative costs of rezoning, must be measured against the possible gains from better conserving the resource as a result of more frequent reassessment.

The impact of rezoning on investment behaviour will also be influenced by operator expectations of the likelihood of significant changes to zones. The rezoning of the Cairns section for example, resulted in only minor changes to the status quo for existing operators. If the use rights for commercial operators were more clearly defined in general, and of longer duration in particular, there may not be a need for such frequent rezoning. In this event, commercial operators would have a greater incentive to husband the resources found at the sites for which they hold use rights.

If the Authority were to introduce daily limits on the number of people allowed to visit particular sites, the limits could be implemented as conditions attached to tourism use rights. The Authority is likely to want to adjust the visitor quotas at a site over time. Adjustments may be necessary because of changes in the ecosystem resulting, for example, from infestation by crown of thorns starfish, or in response to the receipt of better information on the ecology of the reef and the effects of human use. Such adjustments could be carried out without having to go through the process of rezoning.

The owners of use rights to sites would bear the risk of the Authority adjusting visitor quotas, but may be able to insure against this risk. The provision by the Authority to tourism operators of the best available ecological advice on resource management may partly alleviate the uncertainty caused by the prospect of quota adjustments.

The Working Group on Ecologically Sustainable Development of Tourism noted that while the assignment of more clearly defined use rights would be unlikely to result in a 'hands off' approach by the regulatory agency, it may reduce the amount of public resources required to manage the resource (Commonwealth of Australia 1991).

**Transferability**

Transferability of rights is essential to ensure that most of the potential gains, referred to above, from better defined use rights are realised. Market transactions

allow the more efficient and profitable operators to purchase rights from the less efficient operators who value the resource less highly. The use rights would thus gravitate to their highest valued commercial uses.

The degree of freedom attached to transferability of rights would also influence the competitiveness of the market, which in turn largely determines the efficiency with which the resource is allocated. If transfers can be carried out fairly easily and use rights are divisible, individual operators can readily adjust the size and structure of their businesses to improve their profitability.

Tourism use rights in the marine park, although legally non-transferable, are in fact transferred fairly readily with the approval of the Authority — that is, provided that the planned operation of the purchaser is of the same type and inflicts no more environmental damage than that of the seller. Given the need to enforce the conservation of the marine park it is unlikely, at least in the short term, that the Authority would confer significantly greater freedoms of transfer. The right of transfer could, however, be made explicit as well as the conditions attaching to the approval of transfers.

The implication of allowing use rights to be transferred more freely between different types of commercial users (for example, dive charter and intensive tourism operators) is that the Authority would lose control of the exact nature of the tourism experiences being offered. Limits on the maximum environmental impact of each project and on the associated total number of visitors to a reef site would, however, maintain the Authority's control over impacts on the reef environment and on site congestion.

With transferability of use rights, the demands of tourists, expressed in the market, would largely dictate the types of tourism enterprises operating in the marine park. This would allow the tourism industry to rapidly and flexibly adjust to changes in the market for reef experiences, in contrast to the current regulated pattern of commercial use which is more or less fixed for at least the duration of a zoning plan.

**Quality of title**

Quality of title is related to the enforcability of use rights. If use rights cannot be effectively enforced an efficient market for rights will fail to develop. Why purchase a use right when you can simply use the resource without paying? Enforcement of rights is thus crucial to prevent overuse of the resource. The



design of use rights will be influenced by the difficulties and costs of enforcement. Totally exclusive rights to a reef which bar all other commercial operators and private recreationalists may be extremely costly to enforce. A less complete use right which allows the owner to only exclude other commercial activities may, in this circumstance, be a more cost effective and efficient alternative, as long as commercial and private uses are quite distinct and the latter are not large scale.

Another factor influencing the quality of title of a use right is the likelihood of the government agency which issued the right unexpectedly changing any of the conditions attached to the right. For example, if the freedom of transfer is annulled. This 'sovereign risk' may distort investment decisions and use patterns in favour of short term alternatives, the longer run holding too much uncertainty. Commercial operators' perceptions of the stability of their use rights are likely to have a significant influence on the efficiency with which they are used.

On the basis of the above discussion, the definition of the rights provided to tourism operators could be substantially improved with a view to increasing the incentive for individuals to conserve the resources of the reef and use them efficiently. A more clearly defined use right would provide a tourism operator with the exclusive commercial use of a reef site and the natural resources such as corals and fish found there. The extractive use of such resources may or may not be allowed, depending on the zone in which the site is located. The use right would be denominated in terms of the maximum number of tourists permitted to be carried to the site each day set with reference to the estimated limit of acceptable change to the reef. This daily tourist quota would, however, be subject to change over time if ecological or technological changes indicate the need for the Authority to adjust use levels to conserve the resources of the site. Provision, by the Authority, to operators of the best available information on the ecology and management of the resources of the reef site would reduce the uncertainty of prospective changes to their conditions of use.

The right would be of long duration, possibly permanent, and transferable to both similar and dissimilar commercial operators, provided they could satisfy conditions relating to the maximum acceptable level of damage to the reef environment. Finally, the desirable use right would be divisible over time and space, and once assigned, changes to the use right by the Authority would be

minimised. Ownership of the resources of the reefs would be retained by society as a whole.

**Private recreational use rights**

The use rights of private recreationalists are currently poorly defined. Recreationalists are allowed unlimited access to all parts of the marine park except for the few areas zoned for preservation and scientific research. Further, there are no limits on the amount of fish, coral or other organisms which they can remove from general use zones.

Preserving the status quo of unrestricted access for recreational users invites overuse of the resources, particularly of the already heavily used inshore reefs adjacent to ports and coastal resorts. As mentioned in chapter 3, the use of the concept of 'limits of acceptable change' which defines the permissible number of visitors at a site each day implies the need to somehow divide this 'quota' between tourism and recreational use. While the commercial visitor quota could be enforced fairly easily by controls on the passenger capacity of tourism vessels, a means to limit the number of private recreational visitors must also be developed. It may, for example, be possible to seasonally or permanently locate enforcement officers at the highest demand sites, usually islands and cays, to ensure that visitor limits are not exceeded. The costs of doing so would be borne by the private users wishing to use these high demand sites, who could be required to buy daily access permits to the sites, possibly from regional offices of the Queensland National Parks and Wildlife Service. The higher charges associated with the use of these sites would be likely to have a rationing effect on their use and to provide an incentive for boat owners to use less heavily exploited reefs.

For lower demand areas of the marine park, use rights could be assigned to local private boat owners on a reef by reef or area basis as an added part of the existing annual boat registration process administered by the Queensland Department of Transport. The reefs which a boat is allowed to visit could be specified on its registration document. More specific rights to numbers of visits to relatively low demand sites or areas might be prohibitively expensive to enforce given the large number of recreational boats and the size of the marine park.

As there are likely to be a considerable number of private recreational boats originating from ports distant from the marine park and small boats brought interstate by trailer, the owners of these boats should bear their share of the



management cost provided that the cost of levying them does not exceed the benefits. These boat owners may also be required to buy a permit to enter the marine park, the cost of which would depend on whether they want access to high or low demand sites. Regional offices of the Queensland National Parks and Wildlife Service could also be given the responsibility for issuing these permits to interregional boat owners.

Overall, the often multilocational and multipurpose nature of recreational use of the marine park is such that it is likely to be prohibitively costly to enforce well-defined use rights for recreational users. Nevertheless, consideration may need to be given to constraining the growth in recreational use if the resources of the marine park are to be conserved and their amenity values protected.

## 4.2 Assignment of use rights

The actual assignment of use rights is often the stumbling block to the replacement of current resource management practices by those that are potentially more effective. In relation to the prospective introduction of individual fishing rights in the form of catch quotas, Scott (1988) notes that commercial fishermen's experience of official makeshift arrangements does not encourage them to accept their initial assignments passively. Further, their protests about the proposed starting assignments and procedures may be even sufficient to prevent it from coming into effect.

The attitudes of the prospective rights holders to proposed changes in the way that the resource is managed may well depend on the way that rights are allocated. Fortunately, most of the resources of the marine park do not appear to be overexploited (except perhaps for some reef fish species) so there may be little need to reduce the use of the resources below the current level. In contrast, marine fisheries are usually depleted before resource managers start investigating the difficult task of introducing catch quotas which are less than the historic levels of catch of the individual fishermen.

From an economic perspective the main consideration in assigning use rights is that the transaction costs are kept to a minimum. These are the costs associated with negotiating assignment procedures with the various interest groups and subsequently settling any disputed assignments. Provided that the rights are transferable the market will ensure that they end up in the hands of the most efficient operators. The government agency's perceptions of equity

are usually the driving force behind the development of assignment procedures. This is because the initial assignment of rights will largely determine the distribution of wealth from the use of the resource. Even if the individuals initially allocated rights subsequently decide to leave the industry, the price which they receive on selling their use right may represent a large share of the expected future profits from its use.

There are a number of possible market and non-market means by which use rights could be assigned. Different mechanisms have different distributional implications and imply potentially different levels of transaction costs. The market based means of assignment are discussed in chapter 6 on 'resource rent'.

Non-market assignment of use rights involves the development of criteria against which the claims of existing or prospective resource users are measured. The regulatory agency maintains a large degree of control over the distribution of use rights, and hence the benefits of resource use, by using non-market assignment mechanisms.

Non-market mechanisms include 'grandfathering in' those individuals who already use the resource, using a 'first-come, first-served' approach, allocating by lottery and by bureaucratic discretion.

**Grandfathering**

Grandfathering involves allocating use rights to those individuals who can demonstrate historical use of the resource. The size of individual commercial investments in the physical assets needed to use the resource has also sometimes influenced the amount of use rights granted (see, for example, Geen and Nayar 1989, on allocating individual catch quotas in the southern bluefin tuna fishery).

Grandfathering is often the preferred approach by administrators to the assignment of use rights to resources which have a history of established use. It is administratively simple and is likely to cause the least aggravation to those with the greatest apparent stake in the resource. It is, therefore, unlikely to cause many problems politically, provided the amount of allowable use is not reduced below historical levels.

**'First-come, first-served'**

The 'first-come, first-served' approach is a commonly used assignment mechanism in circumstances of relatively low demand for a resource. Its merits



are that it is easily understood by prospective right holders and it is simple to administer. It is often used in the preliminary stages of the development of a resource prior to its gaining a substantial value.

When the potential value of the resource is recognised the 'first-come, first served' approach may encourage speculation if there is little cost involved in obtaining the rights. When a resource has been developed and is being used by established commercial and recreational interests it would clearly be inequitable to reallocate rights on this basis.

**Lottery**

Lotteries are sometimes used to assign rights when there are a large number of potential users and only a very few rights to be assigned. Because allocation occurs by chance, lotteries are impartial, and can thus be argued to be equitable. They do, however, require more administrative effort than do some other allocation devices and this greatly reduces their practicality for general use (Cullen 1985).

**Administrative discretion**

Discretionary assignment of rights gives administrators the greatest possible control over the use of the resource and hence the distribution of wealth from its exploitation. It allows a lot of flexibility in relation to the tradeoffs which may have to be made between possibly conflicting management objectives. For example, the aim of improving the efficiency of resource use is likely to conflict with the Authority's apparent desire to concurrently maintain a wide range of uses at given sites, and hence opportunities for varied recreational experiences. If use rights were to become more clearly defined and transferable the Authority would be less able to control which activities (consistent with the zone plan) would take place at particular sites. Nevertheless, being able to periodically determine who gets what rights at each site would enable the Authority to give different weights to its objectives and to vary them over time.

However, discretionary allocation, even by honest well-intentioned administrators, may greatly reduce the potential benefits from the use of the resource. This is because it invites individuals or firms to try to increase their chances of gaining use rights by engaging in activities such as lobbying. Such activities are costly and wasteful from a public perspective as they are designed to merely redistribute wealth between individuals rather than create additional benefits.

Administrative discretion is also manifest in the process of work program bidding which is the primary method used to assign rights for mineral exploration in Australia. This process may encourage firms to carry out excessive and inappropriately timed exploration and development work in the hope of gaining rights to exploit profitable deposits (Rose and Cox 1991).

Because of the overriding need to conserve the resources of the marine park, and the differing impacts of various commercial operations on the resources, there may appear to be incentive for the Authority to adopt a discretionary approach to the assignment of use rights. However, a similar conservation outcome should be achievable, at a much lower efficiency cost, by setting firm conditions on the use of the resource and firm rules on its assignment. The amount of discretion in the allocation process should be minimised.

As mentioned earlier in this chapter, there are also market based approaches to the assignment of use rights. These are discussed in chapter 6 on 'resource rent'.

## 4.3 Summary

The ownership of well-defined private rights to the use of a resource provides strong incentive for individuals to both conserve the resource and use it as efficiently as possible. If rights are transferable between different types of commercial operators, the industry can adjust to an efficient size and structure to profitably match the demands of consumers. At the moment, the private use rights of commercial operators are very loosely defined while those of private recreational users are virtually non-existent.

This lack of private use rights is partly reflected in the development by the Authority of increasingly detailed management arrangements to cope with the increasing use being made of inshore reefs. However, it is unlikely that additional regulations alone will be able to achieve the Authority's conservation and efficiency goals in the face of increasing use. Improving the quality of private use rights would complement the existing management system. The more clearly defined the rights, the greater the prospect that individuals will husband the resources of the reef and operate in an efficient manner.

At a more pragmatic level, the specification and assignment of more complete private use rights is likely to greatly enhance the chance of successfully introducing a charging system. This is because the use rights of individuals



form the link between the services of the Authority and benefits which the individuals derive from them. The existing resource management system and the physical characteristics of the resource already combine to provide commercial operators with use rights. What is being suggested is that these 'de facto' use rights are simply strengthened and formalised.

From an economic perspective, the method chosen to assign rights is generally less important than is the clear definition of those rights. Provided that the rights are transferable, an efficient distribution is likely to be achieved, with the rights being purchased by those operators who can use them most profitably. However, an important proviso about assignment procedures is that bureaucratic discretion may give rise to costly and inefficient activities such as lobbying for rule changes. For this reason discretion in the allocation process should be minimised.

# 5. Recovery of management costs

The price charged to users of the marine park could be based on the Authority's costs of supplying services to maintain the resource. Such services may include the preparation and enforcement of zoning and site plans. Alternatively, a sometimes higher price could be charged reflecting the scarcity value of the resource. Clearly, the latter would be most effective in rationing its use but need bear little or no relation to the necessary costs of management.

## 5.1 A 'user pays' levy

Application of the 'user pays' principle has been a central tenet of recent government policy on the provision of services to individuals across a wide range of industries and recreations. The user pays concept as defined by the Commonwealth and states is that users should pay for government services in proportion to the benefits that they receive. For example, commercial fishermen in Commonwealth managed fisheries have, since the mid-1980s, had to pay a proportion of the direct costs of fisheries management. This proportion currently stands at 90 per cent based on research that suggests that commercial fishermen generally retain at least 90 per cent of the market benefits of management (Department of Primary Industries and Energy 1991).

A criticism of the 'user pays' concept as defined by the Commonwealth government is that it may go beyond cost recovery from the perspective of some of the individuals being levied. For certain individuals the levy may be more akin to a resource rent charge if the amount they pay depends on how much they benefit as a result of the service rather than on the cost of providing the service to them. There is no economic reason why management services should not be treated and paid for like any other input to a commercial or recreational business activity — that is, individuals paying for what they use rather than according to the benefits they derive from their use (ABARE 1991).

If all the beneficiaries of the marine park and their demands for government services were readily identifiable and could be cost effectively levied the process of cost recovery would be straightforward and should generate sufficient revenue to meet the management needs of the Authority. But this is not the case. Only the commercial operators can be easily identified through the permit and licensing procedures of the Authority and the Queensland government.



Identifying the many private recreational users is more difficult. Many gain access to the marine park aboard privately owned boats without the need for any form of permit. Some beneficiaries may seldom, or never, visit the park. Their enjoyment of the knowledge that the resources of the marine park are being conserved is nevertheless an important benefit which stems from the activities of the Authority. Clearly, it would be virtually impossible to identify and directly charge the latter group of individuals for such conservation services. The costs of these services are borne by taxpayers.

Some conservation or preservation services have the properties of pure 'public goods'. Once the services are supplied for one person it costs no more to supply them to everyone else, and one person's consumption of the services has no effect on anyone else's enjoyment of the same services. As noted earlier in this chapter, such services are likely to be undersupplied as it is usually difficult to get private individuals to pay for them. Rose and Cox (1991) do, however, point out that organisations such as charities and private conservation agencies are sometimes prepared to voluntarily contribute to the costs of supplying non-excludable environmental goods and services. At the moment, government appropriations are largely funding the conservation of the marine park.

## 5.2 Cost recovery: efficiency considerations

There are three main considerations from an efficiency viewpoint in deciding who and how much to charge. These relate to the level of service to be supplied, the extent to which use of the resource should be rationed and whether it is cost effective to collect any charges.

At the moment the Authority decides on the type, amount and thus cost of services which it provides. Although reef users are consulted extensively on some aspects of management their input is primarily for refinement of proposed management plans. For example, rezoning involves much community consultation on the likely impacts of the proposed new arrangements on use patterns and amenity values. However, users are not interested in the cost of the rezoning process as they don't pay for it directly. Incentive therefore exists for user groups to lobby hard for all their concerns to be met through complex zoning procedures. At the same time there may be a tendency for the Authority to engage in some activities which are technically desirable from its point of view but which may not be justified economically — for example, levels of data collection or research which are greater than necessary (Haynes and Brown

1985). Such activities, whether by private individuals or government agencies, are wasteful from a national perspective.

If users are charged for the services provided to them they will quickly develop a close interest in the amount of money spent by the Authority, and hence on the amount and cost of services supplied. Users will demand value for money. This is likely to lead to services being supplied more cost effectively provided that users can gain the necessary information on, or impute, a competitive cost for the services. And importantly, the demands for management services from the user groups will be at least partly revealed through their willingness to pay for the services. This will provide a rough guide to the efficient level of supply of management services — that is, provided that the use rights to the resource have been fairly well defined. In this circumstance, the attitude of users of the marine park toward conservation of the marine environment may not differ markedly from that of society as a whole. This is particularly likely to be the case for tourism operators whose livelihood may depend on the conservation of the resources of the marine park. Representatives of all of the groups benefiting from the management of the marine park should be consulted by the Authority on expenditure issues.

Charging users of the marine park may have a rationing effect on its use. Clearly, the higher the charge the larger will be the number of existing and would be users who will be deterred from using the marine park. Rationing of use is necessary as some reefs may already be overused. As explained in chapter 3, reducing the amount of use of these reefs could raise their total amenity value by reducing the external costs of congestion and physical damage to the environment. The external costs imposed by users on each other would thus be reduced. By degrading the environment, current users also impose external costs on those individuals who value, but who may never use, the marine park. It has been suggested that it is appropriate for user charges to reflect the cost that use pressures impose on such 'off-site' beneficiaries (Rose and Cox 1991).

Although there may be worthwhile reasons for wishing to introduce user charges, the administration and collection procedures must be cost effective. The benefits from the charge must outweigh the costs of collection and make a contribution toward the cost of resource management. As mentioned earlier, a major factor affecting the cost of administration and collection is the ease with which users can be identified and levied. The difficulties of accurately identifying private recreational users are considerable as there are no records of private use



of the marine park. However, private users normally gain access to the reef by boat. Private boat registrations, and thus registered boat owners, in the areas adjacent to the marine park might therefore be used as a rough proxy for private recreational users (Great Barrier Reef Marine Park Authority 1991b).

The cost of administering and enforcing the collection of charges is likely to be influenced substantially by the attitudes of the individuals being levied. Obviously, if people consider the charge an unacceptable impost from which they receive no benefit, enforcement costs will be high. Involvement in the process of deciding how the money is to be spent and how much is to be spent may improve the overall acceptability of the charge and thus lower the enforcement costs. The establishment of an effective framework for consultation and negotiation on user charges between the Authority and user representatives is thus likely to significantly influence the success or otherwise of a cost recovery system.

## 5.3 Which services are cost recoverable, and from whom?

Defining the link between the provision of services by the Authority and the benefits derived by users is an essential step in the cost recovery process. Clearly, not all of the management activities of the Authority are beneficial to each user or user group.

The more direct the link between a particular management service and the demands and benefits of a particular user the more acceptable a cost recovery levy is likely to be. At one end of the spectrum are the environmental impact assessments carried out by the Authority on proposals for commercial use of the marine park. The proponents are already charged for a proportion of the cost of these assessments. The full costs of any necessary scientific monitoring of the site is also borne by the project proponent. This appears uncontroversial despite some of the benefits of the assessment being derived by other users of the site. Around 7 per cent of the Authority's total expenditure is recovered in this way (table 10).

At the other end of the spectrum of activities sponsored by the Authority is basic biological research aimed at improving society's store of knowledge of the ecology of the reef system. Such research is not necessarily oriented toward resource management issues and may not provide any tangible benefits to users of the marine park. Users are unlikely to willingly shoulder the cost of this

research. Even for strategic research, directed more toward management issues the possible benefits may still be diffuse or realised only by future generations. Government funding of basic and strategic scientific research is usually appropriate.

In between these extremes is a range of services which are, to a greater or lesser degree, directed at satisfying the demands of various on-site users. The most important and costly resource management activities are those related to zoning and the surveillance and monitoring of the use of the zones. An approximate breakup of the costs of the Authority are given in table 11. As described in chapter 3, zoning encompasses many activities, ranging from the initial declaration of use and preservation zones to the development of detailed site management plans. The various levels of zoning are depicted in figure B.

The zoning system specifies which parts of the marine park can be used by which types of users. The issue of permits to commercial tourism operators places further limits on what can be done and where. By defining what is not permissible, both systems currently, by default, imply what is permissible and thus what use rights operators hold to the resource. Clearly, the benefits an individual gets from use of the resource are dependent on the form of use right he or she holds. The desirable characteristics of use rights to encourage conservation and efficient use of the park's resources were outlined in the previous chapter.

Table 10: **Sources of revenue for the Great Barrier Reef Marine Park Authority, 1989-90**

| Source | Revenue | Share of revenue |
|---|---|---|
| | $m | % |
| Commonwealth government appropriation | 9.3 | 75.6 |
| Queensland government contribution | 2.2 | 17.9 |
| Receipts from services provided: permit assessment, monitoring studies, educational training and sale of educational materials | 0.8 | 6.5 |
| Total **a** | 12.3 | 100.0 |

**a** Excluding aquarium revenues



Any management activities which define or protect individual use rights, and which therefore provide benefits to users, are good candidates for cost recovery by the Authority. The administration of zoning and many of the day to day enforcement and monitoring activities would fall into this category, particularly if private use rights were to be more clearly defined so that the individual benefits of these activities become more discernible. Activities such as public liaison are also cost recoverable insofar as the purpose of the activities is to improve the understanding and respect of the general public for the individual use rights which have been assigned.

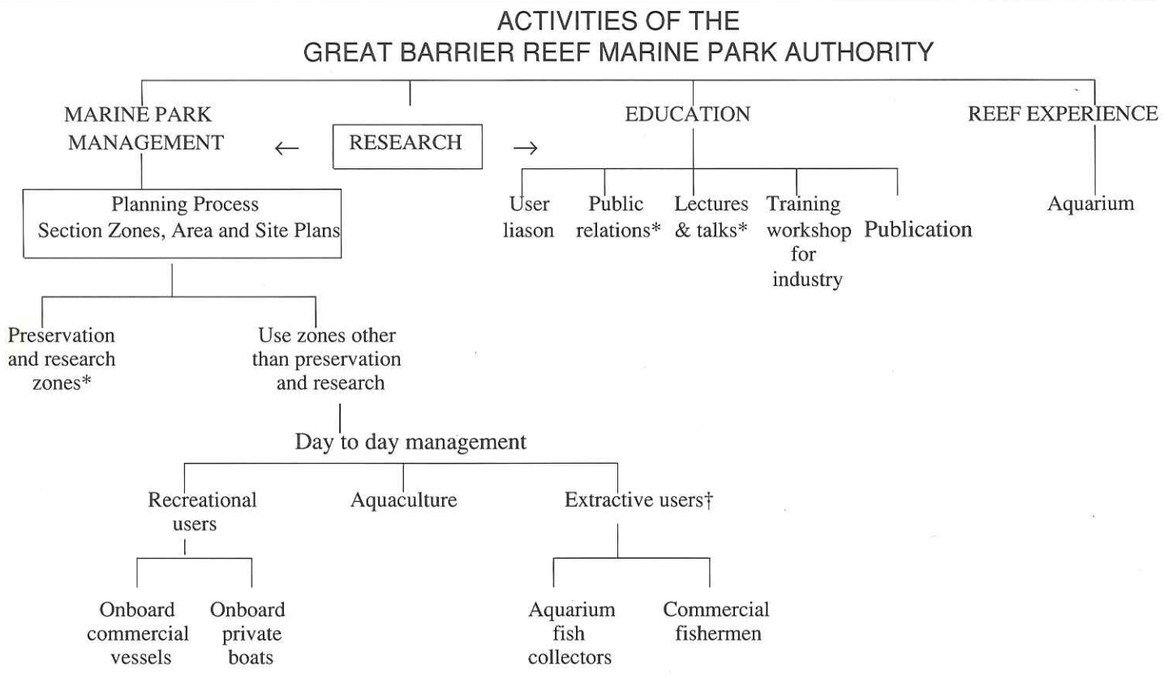
However, not all aspects of zoning are beneficial to on-site users. The declaration of preservation zones is likely to be of primary benefit to off-site users (and possibly future generations) who value the knowledge that the resource is virtually undisturbed by human activities. The costs associated with zoning for preservation should be borne by society as a whole rather than on-site users. The costs of zoning for commercial and recreational use are primarily attributable to, and thus recoverable from, on-site users (figure B).

Table 11: **A breakup of Authority expenditure, by activity**

| Activity | Estimated cost | Share of total cost |
|---|---|---|
| | $m | % |
| Corporate planning **a** | 0.90 | 7.7 |
| Planning and management in the development of zoning, area strategies and site management plans | 1.50 | 12.8 |
| Day to day management (provisional) **b** | 4.80 | 40.9 |
| Environmental impact management | 1.60 | 13.6 |
| Research (excluding site monitoring) **a** | 1.60 | 13.6 |
| Education and information **c** | 1.30 | 11.1 |
| Library **a** | 0.04 | 0.3 |
| Total expenditure | 11.74 | 100.0 |

**a** Cost which are probably not attributable to marine park users. **b** A proportion of this is attributable to commercial fishermen who should be levied separately by the Queensland Department of Primary Industry. **c** Only a small percentage of this is probably recoverable from park users.
*Source*: Great Barrier Reef Marine Park Authority (1990b).

Figure B: **Schematic diagram of the Authority's services, costs of which can be recovered from the users**




* Paid for through government appropriations. † Likely to be managed, and thus charged separately by the Queensland Department of Primary Industries.

However, different users make differing demands on the services of the Authority. All should not be expected to pay equally. Commercial fishermen, for example, may gain little from the activities of the Authority. Commercial fishing operations, while carried out in waters under the jurisdiction of the Authority, are managed by the Queensland government. The rights which prawn fishermen have to operate in the waters of the marine park are conferred as a limited entry licence granted by the Queensland government. Management of the commercial reef line fishery is likely to be conducted in a similar fashion. Surveillance of these users is largely carried out by an arm of the state government, the Fisheries and Boating Patrol. The Queensland National Parks and Wildlife Service and the Authority, particularly through its expenditure on 'coastwatch' services, also carry out some surveillance of commercial fishing activities in the marine park.

As the rights of commercial fishermen and collectors of marine organisms are, for the most part, defined and enforced by agencies of the Queensland government it would probably be more efficient if it also had full responsibility for any levies on them. Part of the levy receipts may, though, have to be passed on to the Authority as reimbursement for its surveillance services. Prawn fishermen already pay a proportion of the cost of fishery management to the Queensland government.

The remaining users of the marine park who may therefore be levied by the Authority are tourism operators, private recreationalists and mariculture operators.

## 5.4 A levy base

The levy base should be as closely related as possible to the characteristics of individual use which have the greatest bearing on the cost of supplying management services. There may be a need for different levy bases for recreational and other user groups.

**Tourism operators**

For tourism operators the amount of management services required hinges on the size of their operations. The permit assessment charges currently levied on such operators are based on the size of their operations measured by the passenger capacity of their vessels.

The adoption by the Authority of the concept of the limits of acceptable change to provide a guide to the appropriate level of use is also relevant to the decision on an appropriate levy base. This concept is being used to express the maximum acceptable impact on the resource and on the amenity values of users in terms of the maximum number of visitors per day allowed to visit a particular site. As management is focused on resource conservation and the maintenance of amenity values it is likely that the amount of services supplied is also closely related to the number of visitors to the marine park. This being the case, the number of tourists potentially visiting the marine park aboard commercial vessels could be an appropriate levy base for tourism operators. This would be calculated as the product of passenger capacity of the boat and the expected number of trips to the reef.

There may, however, be other variables which influence management expenditure. For example, surveillance costs may be related to the number of tourism and private boats in an area as well as to the potential number of passengers aboard the boats. Without detailed knowledge of the nature of surveillance activities the simple assumption that they are entirely dependent on potential visitor numbers at a site is retained. Using potential, rather than actual, visitor numbers to the marine park will have the desirable effect of discouraging speculation by commercial operators in tourism capacity.

The number of visitors to island resorts should also be included in the levy base if these visitors use the reefs and, as a result, the services of the Authority. However, the fact that most resorts are on islands under Queensland government jurisdiction results in certain legal impediments to the introduction by a Commonwealth agency of a charge on resort operators. For the purpose of this study it is assumed that the visitors to island resorts will not form a part of the tourism levy base.

A distinction may also have to be drawn between the costs of administering and enforcing use rights for 'high demand' reefs, usually subject to area strategies or special management arrangements, compared with those which are not. Because area strategies have been developed only in areas subject to intense use, it is likely that these areas also receive a disproportionate amount of management attention. Management costs are, therefore, likely to be higher for these high pressure areas than for elsewhere. If a tourism operator uses, at different times, various areas of the marine park, some of which are within an



area strategy and others which are not, the number of tourists carried in each area must be assessed and levies charged accordingly.

Another issue is how to divide the burden of cost recovery between commercial and private recreational users. For much the same reasons as given for commercial operators, it would be appropriate for private recreational users to share the management costs with tourism operators in proportion to their use of the marine park. That is, based on an estimate of the relative numbers of potential private recreational users and tourists.

**Private recreational users**

The charge for private recreational users can be calculated in much the same way as for tourism operators. As noted previously, a charge could be levied on private boat owners for the use of high demand sites through the issue of daily 'permits'. Interregional boat owners may also be required to purchase short term permits. For low demand sites or areas the charge could be levied as part of the annual boat registration process. A separate charge could be set for each group of private boat owners reflecting the estimated average number of visitor days spent by individual boat owners in each group in the marine park. The total cost recoverable from each group of boat owners may also be divided according to the size of the boat and its associated passenger capacity.

Based on the above ideas, some formulas are suggested in the appendix which could serve to apportion management costs between the various users of the marine park.

## 5.5 Information required to support a cost recovery program

The existing information collections will need to be significantly upgraded and some new collections initiated to underpin the suggested cost recovery program. In general, more detailed information is needed on the amount of use of the marine park by tourism and private recreational users and on the attribution of Authority expenditures. This same information is necessary to facilitate the efficient management of both the resources of the marine park and of the Authority itself.

**Information on use of the marine park**

At the moment only rudimentary statistics are available on the commercial use of the marine park. There is no record of the number of tourists gaining access

to the marine park aboard commercial vessels, nor of which reef sites they have visited. The only proxy for this information is the maximum passenger capacity of the 'site dedicated' commercial vessels and the sites which they are allowed to visit as recorded on their permits. For operators holding 'roving permits' even less information is available, as the permits only specify which reefs they are not allowed to visit (or the maximum allowable number of visits per week to certain sites). The introduction of a mandatory log book program for all tourism operators in which the number of tourists per trip, the sites in the marine park visited and the activities offered by the operators would be recorded could largely resolve this problem. The cost of administering and enforcing the log book system should be borne by the tourism operators. Similar log book programs should also be introduced by the Queensland Department of Primary Industries in relation to the commercial fishing and collecting activities conducted in the marine park.

Gaining detailed information on private recreational use of the marine park is likely to be more difficult. If the cost recovery system recommended above is implemented, additional data on recreational use will become available to the Authority. These data will be on the number of local private boat owners who, through the boat registration process administered by the Queensland Department of Transport, have purchased annual access rights to various parts of the marine park. Similar information would be forthcoming from the regional offices of the Queensland National Parks and Wildlife Service on the number of interregional boat owners using various parts of the marine park. Occasional surveys of a sample of private boat owners might also be carried out to elicit more detailed information on their use rates and use patterns of the marine park.

**Authority expenditures**

Currently, Authority expenditures are recorded against broad program areas such as day to day management which encompass a range of different activities, only some of which may be attributable to tourism and private users of the marine park. The activities and associated expenditures of the Authority need to be identified in more detail.

Where possible expenditures should be recorded against particular sites or areas in the marine park. For example, day to day management might be broken up into category expenditures of aerial surveillance, marine surveillance, public liaison, administration, legal proceedings and maintenance of capital items. Expenditures on each of these categories could be further divided if they



Table 12: **Data requirements of the Authority for cost recovery purposes**

| Data required | Data source |
|---|---|
| **Use of the marine park** | |
| Number of tourists | Tourism log books, permits |
| Sites visited | Tourism log books, permits |
| Number of permitted local private boats, by area of the marine park | Queensland Department of Transport |
| Number of permitted interregional private boats by area of the marine park | Regional offices of the Queensland National Parks and Wildlife Service |
| Intensities of private use and use patterns | Occasional surveys of private recreational users |
| **Authority expenditures** | |
| On preservation zones<br>– mariculture operations<br>– commercial fishing and collecting activities<br>– recreational user groups<br>– individual users<br>– subprogram areas, by site if applicable | Records of the Authority and its agents (eg Queensland National Parks and Wildlife Service) |

are site specific. For example, the proportion of the time spent by marine patrols in high and low demand areas of the marine park could be recorded.

A record of Authority expenditures on services to individual users, such as permit assessment or the conduct of training courses for commercial operators, should also be kept, as these costs should be recovered directly from the users in question. The costs attributable to mariculture activities and to the definition and enforcement of preservation zones should also be recorded.

The main data necessary to underpin a cost recovery program, and their possible sources, are given in table 12.

## 5.6 Summary

Before introducing a cost recovery system, the link between the services supplied by the Authority and the benefits of the services to individual users of

the marine park must be made clearer. This linkage could be strengthened by the assignment to individuals of more complete rights to use the marine park and its resources.

An important result of the subsequent introduction of a cost recovery system would be that the users of the marine park would have the incentive to advise the Authority on the appropriate levels of service which should be supplied. The interests of all the beneficiaries of the marine park should be represented in consultations with the Authority on desirable management expenditures. The advent of such consultations is also likely to promote improvements in the cost effectiveness of the supply of the services.

The recoverable costs of the Authority are essentially of two types: those which are highly specific to individual users, such as permit assessment costs, and those which serve to define or enforce the use rights to the reef of individual users. The latter include the costs of Authority activities associated with zoning and day to day management, such as monitoring and surveillance.

Not all users of the marine park should be subject to charges by the Authority. Commercial fishermen and collectors are in this category. This is because the management of their activities and the definition of their use rights is already, in the case of prawn trawler operators, or likely to be, in the case of reef line fishermen, in the hands of the Queensland government rather than the Authority. If a levy is to be charged to commercial fishermen it should be administered by the Queensland government under its current institutional arrangements for fisheries management.

The levy for tourism operators could be based on the numbers of visitors carried to the reef, this being closely associated with the extent of congestion at reef sites and physical damage to the reef environment, and hence with management activities and expenditures. Private recreational users could be levied on the same basis. Locally based private boat owners could pay a charge as part of the annual boat registration process required by the Queensland Department of Transport, while interregional boat owners could be required to buy a marine park access permit, possibly from a regional office of the Queensland National Parks and Wildlife Service. Both agencies may be contracted as agents of the Authority to do so.



Individual charges to private boat owners may vary according to the size of their boat, this being a proxy for the number of visitors likely to be carried on board. The allocation of total attributable management costs between tourism and private users could be based on an estimate of their relative amounts of use of the marine park. Mariculture operators could be charged a proportion of the Authority's management costs based on the proportion of the total reef area taken up by their allotted mariculture sites.

Such charges would not recover all Authority expenditures, nor should they. Some of the services supplied by the Authority are more appropriately funded by the Commonwealth on behalf of society as a whole. Preservation services, strategic planning and basic and strategic research fall into this category. The information base of the Authority relating to the nature of their expenditures, as well as on the commercial and private use of the marine park, needs to be substantially upgraded to underpin the suggested cost recovery program.

As a large proportion of the zoning and day to day management cost of the Authority could potentially be recovered under the system outlined above, the sum of Commonwealth appropriations and user charges might well exceed necessary management expenditures. In this event, only a percentage of the total cost attributable to users need initially be recovered. The percentage recovered could be increased over several years in line with the demand for increased Authority expenditures, unless of course Commonwealth appropriations were reduced.

# 6. Resource rent charges

Resource rent is the long run excess of revenue gained from the use of a natural resource over the necessary long run costs of using that resource. Long run costs include a 'normal return' to the capital employed (excluding the capital cost of purchasing the right to use the resource). That is, the minimum rate of return required to attract and maintain capital in the activity. The availability of resource rent reflects the scarcity of the resource. Private recreational users can also gain significant benefits in excess of the cost incurred in using the resource, analogous to the resource rent described above. These gains are non-monetary and are known as consumer surplus. The true willingness of a private user to pay for access to the resource is a measure of his or her consumer surplus.

The realisation of resource rent is closely linked to the possession of well-defined private use rights to the resource. If use rights are not assigned, the possibility of earning above normal profits will attract new resource users. Unless the physical nature of the resource prevents the entry of more users, much or all of the resource rent will be dissipated through the growth in the total costs of using the resource, including the costs associated with possible resource degradation. Clearly, this is wasteful from a public perspective. As discussed in chapter 4, assigning and enforcing clearly defined use rights is probably the best way of remedying such inefficiency and fostering the conservation of resources.

The introduction of charges to recover part or all of the resource rent has been suggested by the Authority as a way of improving the efficiency of resource use in the marine park (Great Barrier Reef Marine Park Authority 1991b). However, most of the efficiency gains alluded to would result from the assignment of more complete use rights associated with the proposed ownership of site concessions and not from the introduction of a resource rent charge.

The primary motive of the Authority of wanting to introduce a resource rent charge is, as suggested earlier, to increase the revenue base to allow more management services to be supplied. The merits or otherwise of this idea are discussed in section 6.2.



## 6.1 An economic role for resource rent charges?

If fairly well-defined use rights to the marine park were to be assigned to commercial operators for high demand reef sites, allowing efficiency gains to be realised, the main economic role of a resource rent charge would be to reduce the incentive for individuals to indulge in wasteful activities, such as lobbying, designed to improve their chances of gaining use rights to presently unused reefs. Another possible role could be to ration the access of private recreational users.

If resource rent is to be appropriated from tourism operators a choice must be made between different charging mechanisms. There are two distinct approaches which could be used. One is based on assigning the necessary use rights to a reef site by competitive bidding and the other on valuing the resource and charging users for some or all of its estimated value.

**Competitive bidding**

Competitive bidding can be a useful way of allocating use rights to a resource in a cost effective and equitable manner. Theoretically, competitive bidding should result in the rights being sold to the most profitable and efficient operators who value the rights most highly. However, it is important to note that whatever method is used to assign use rights they are likely to end up in the same hands if they are transferable.

Although competitive bidding may appear to be an attractive option for the assignment of use rights there are some important issues which, if not addressed in the design of the bidding system, may result in bidding being both inefficient and inequitable. The primary issue relates to whether there are established operators at the site to be assigned.

As the use rights granted through the permit process are already transferable to a degree, and apparently believed by operators to confer long term rights, it is not surprising that these rights have gained a market value. The price paid by some existing operators to departing operators for use rights to a reef site is likely to represent some part of the expected rent from using the site. The share of the potential resource rent appropriated by the seller of the right is likely to be influenced by the relative negotiating strength of the parties and the information available to each, among other things.

Nevertheless, it is likely that some part of the expected resource rent from using the sites has been captured by departing operators. This being the case, it may be inequitable to introduce a rent charge on operators who had already paid at least a share of the rent to the seller of the use right and who themselves may have no expectation of obtaining substantial rent (as opposed to normal returns) from their operations (Campbell and Haynes 1990). This implies that on equity grounds resource rent charges should not be introduced, at least in the short term, for sites for which permits have already been granted.

This problem does not arise for presently unused or lightly used reef sites. A competitive bidding system could be used for assigning use rights to such sites if they were to become highly demanded because of a change in tourism use patterns. The system would, however, have to be designed carefully to prevent the exclusion of some potential bidders, a circumstance which could have adverse efficiency and equity effects. If a use right is of long duration, a single 'once and for all' upfront payment for it may imply, for some preferred sites, a very high price beyond the means of small operators lacking access to sufficient capital (Campbell and Haynes 1990). If small operators are effectively excluded this may lower the competition between bidders and possibly increase the chance of collusion.

This problem may be alleviated by using a bidding system which allows for annual charges rather than a single upfront payment. For example, operators could bid a share of their annual gross revenue over the life of the use right. Alternatively, a system could be formulated which combines annual charges with a lower upfront payment. The latter has been suggested by Hinchy, Fisher and Wallace (1989) as being likely to result in an efficient distribution of risk between operators and government in relation to bidding for rights to exploit mineral resources.

If a system of competitive bidding is introduced to assign use rights to commercial operators the use rights should be assigned to the operator who bids highest, provided that he or she is likely to be able to meet the environmental conditions attached to the use of the site. In practice, this may involve initial screening of the proposed operations of all potential bidders to assess whether they are likely to be within specified limits of environmental damage. The operators whose activities satisfy these conditions should then be able to bid, with the highest bid winning the use right. There should be no need for



administrative discretion in the assignment process beyond the initial (environmental) screening of applicants.

**Valuation and sale of rights**

An alternative system of assigning use rights and appropriating resource rent is by somehow valuing the site for commercial use. The rights are then assigned to commercial operators at a fixed price. Clearly, if there is more than one operator willing to pay the asking price then some form of non-market approach would have to be used for the assignment of the use right.

Valuing the use right for a site is difficult. The site will be worth different amounts to different users. The maximum resource rent value of the site could be estimated by collecting financial costs and returns for a sample of tourist enterprises and modelling the likely operation of the most efficient of these at the site in question. A lot of judgments would have to be made to reach such an estimate so its accuracy would be highly questionable. It would also be expensive to carry out.

An alternative approach would be to base a price on the market values of use rights at other similar sites, if these values can be obtained. The difficulties of judging how the value of one site compares with another are, however, obvious. Such an approach may also lead to strategic behaviour by operators in the market for use rights in order to mislead the Authority about the true value of reef sites.

Valuation of reef sites by the Authority may be costly and is likely to involve considerable administrative discretion in the actual assignment of the use rights, which in itself is likely to impose costs on both successful and unsuccessful applicants for the rights. The overall efficiency cost of this approach is likely to be high and this charging option should be rejected.

## 6.2 Who gets the rent?

If the Authority introduces some form of resource rent charge the rent will clearly be appropriated by government. The question is whether the Authority or the Commonwealth government as a whole should be the recipient of the funds. There are two main considerations in this respect.

The first is that Australian society as a whole, as mentioned earlier, is the owner of the resources of the marine park. It could be argued that as owner of the resource society as a whole, through consolidated revenue, should receive the returns to ownership. While this is primarily an equity issue it also has an efficiency dimension. This relates to the incentive for individuals to engage in wasteful lobbying activities to try to secure for themselves a more favourable assignment of use rights than they might otherwise receive. Assigning rights by market mechanisms will reduce the scope for such inefficient behaviour.

From an economic viewpoint there is another important consideration. This relates to the efficiency with which the funds would be used if the Authority were to receive them.

Earlier in the paper it was noted that the amount of resource rent recovered from commercial operators or private recreational users need bear no relation to the necessary cost of management of the marine park. This being the case, if the Authority were to receive the rent, its expenditures on management and research may increase beyond the levels which are economically justifiable. Thus, by routing the rent return to the Authority rather than Commonwealth consolidated revenue, investment projects with a higher potential payoff to society as a whole may be forgone, imposing efficiency costs on the economy.

Unlike charges for cost recovery, the details of rent charges would probably be non-negotiable with industry, particularly if competitive bidding were to be used as the means of appropriating rent. The amount collected would therefore depend solely on the value of the sites to commercial operators, or if the valuation approach is used, also on the proportion of the rent which the Authority wishes to appropriate. Once the resource rent is paid, operators would have little incentive to scrutinise the cost effectiveness with which it is spent. Rather, the incentive would be to try to win some benefits from the use of the funds by lobbying the Authority to carry out particular research or management activities.

From an economic perspective, if resource rent is appropriated it should be consigned to Commonwealth consolidated revenue from where it can be allocated to the projects with the highest expected payoffs in the economy as a whole. If the Authority requires additional funds from the Commonwealth it should compete for them on the basis of the expected payoffs to society from its projects relative to alternative government investments.



## 6.3 Summary

Resource rent is the net value that individuals, in a competitive market, would be willing to pay for clearly defined rights to use a resource. That is, the value of the revenues or non-market benefits over and above the necessary cost incurred in using the resource. The rent is attributable to the scarcity of the resource.

Both equity and efficiency issues are relevant to the decision of whether to appropriate resource rent from tourism operators and private recreational users. Equity may be served by the owner of the resources of the marine park — society as a whole — getting a return on its ownership in the form of resource rent. From an economic viewpoint, the main role of a resource rent charge is to reduce the scope for individuals to indulge in inefficient activities designed to improve their initial assignment of use rights.

If a resource rent charge were to be introduced on tourism operators, it may be inequitable to impose a levy, at least in the short run, on established operators with site specific permits if the permits had been purchased from other previous operators at the site. The price paid to the departing operators would probably have included a component of the expected resource rent which the new operator would otherwise earn over the course of his or her use of the site. In the longer term, the use of such sites could be subject to a rent charge provided the likely introduction of the charge is made known well in advance so that operators could take this into account in relation to the trading price of use rights in the intervening period.

If a change in tourism use patterns were to result in reefs which are currently lightly used becoming popular commercial sites, introducing a system of competitive bidding may prove a useful way of assigning use rights. Initial screening of the proposed operation of each potential bidder could be carried out by the Authority to ensure that the operations were not likely to impose unacceptable damage to the environment. The rights should then be awarded to the highest bidder. A bidding system which combines an upfront payment with annual charges may be more efficient and equitable than one based on a single large upfront payment.

An alternative charging approach is based on valuation and sale of use rights. Unless there are few potential bidders for a site and a strong chance of their

collusion, the process of valuation and sale is unlikely to be as cost effective or efficient as competitive bidding.

The efficiency with which resource rent is likely to be spent is also an important consideration in relation to which government agency should receive the rent returns. As the amount of rent appropriated need bear no relation to the necessary cost of management incurred by the Authority, there is little reason to believe that appropriation of rent by the Authority would lead to the optimal level of management expenditure. Appropriation and allocation of the rent by the Commonwealth Treasury would be likely to result in a higher return to society from the use of the funds.



# 7. Concluding comments

Future growth in the use of the marine park is likely to result in greater demands for the management services of the Authority. Prospective increases in Authority management expenditures are unlikely to be met by increased appropriations from the Commonwealth or Queensland government. Introducing charges on users of the marine park has been suggested by the Authority as a means of increasing its revenue base.

Such charges could be based on the recovery of the costs of management of the marine park. Additional charges could be levied on the resource rent, or scarcity, value of the resources of the marine park. If a resource rent charge is introduced the revenue which is raised should be returned to Commonwealth consolidated revenue as a return to society as a whole on its ownership of the resources of the marine park, rather than being retained by the Authority. The likely payoffs to society are greater if the funds are invested by the Commonwealth Treasury which can choose from a range of investment projects from throughout the economy.

An important step concomitant with the introduction of either form of charge involves the specification by the Authority of more clearly defined private rights for both tourism operators and private boat owners to use the resources of the marine park. The specification and assignment of such use rights would bridge the gap between the resource management expenditures of the Authority and the benefits derived from use of the park by individuals. The use rights would provide much stronger incentive for individuals to conserve the resources of the marine park and use them more efficiently.

The management services supplied by the Authority which either define or enforce individual use rights are likely to be cost recoverable from the holders of the use rights. The main management services in these categories are zoning and day to day management. Environmental impact assessment and monitoring is also closely related to individual use rights and the cost of these activities is already partially recovered. The potentially recoverable component of current Authority expenditures probably approaches two-thirds of its total budget.

A levy could be charged to tourism operators and recreational boat owners on a common basis of the number of visitors that they bring to the marine park. This

is an appropriate base as it is likely to reflect both the damage caused to the resources of the marine park and the loss of amenity values due to site crowding — factors which are related to the amount of management services supplied. Mariculture operators could be levied according to the size of their mariculture site as a proportion of the total reef area in the section. The Authority's day to day management costs associated with commercial fishermen and collectors should be estimated and charged to individual operators by the Queensland Department of Primary Industries, on the Authority's behalf, which is the agency with prime responsibility for managing these activities.

Resource rent charges, as well as raising revenue for the Commonwealth, may also be useful for dampening demand for the use of reef sites in the marine park. While the assignment of clearly defined private use rights, by any means, would serve to improve the efficiency of use of the resources of the marine park, an associated rent charge would be likely to reduce the demand for use rights, particularly for speculative purposes. If resource rent is to be recovered from users, competitive bidding is likely to be the most cost effective way of doing so. The bids may be in the form of single upfront payments or annual payments based or a combination of both. A bidding system incorporating annual payments is likely to attract a larger field of bidders, some of whom may not be able to raise sufficient capital for a single upfront bid.

As some of the current permitted operators may have purchased their use rights from previous operators, and probably paid part of their expected rent in the sale price, it may be inequitable to impose a rent charge on these operators, at least in the short term.



## Appendix

# Formulas for deriving management cost recovery levies

The formulas suggested below are designed to provide a rough guide to the Authority for estimating and apportioning management costs between user groups in the marine park. Two main categories of recoverable management costs can be identified, those associated with zoning and those with day to day management. These are in addition to the costs of permit assessment and monitoring of tourism activities, parts of which are already recovered. There are bound to be other types of management related costs which do not fall neatly into these categories but which may, nevertheless, be attributable to users of the marine park. The cost of a log book program for tourism operators is probably one such example. No attempt has been made to be exhaustive in specifying which services, or what share of the cost of some services, should be attributable to user groups of the marine park.

The purpose in this appendix is to illustrate how a 'per visitor day' charge for zoning and day to day management services might be estimated, which can then be combined and applied to tourism enterprises and private boat owners according to their maximum number of annual visitor days in the marine park. As management services are not spread evenly across a section it is probably desirable to identify areas of high and low user demand and estimate a separate user charge for each to reflect the differing management inputs.

The per visitor day charge for high, $UC_h$, and low, $UC_l$, demand areas respectively can be expressed as follows:

$$UC_h = LZ + LS_h + LM_h$$

$$UC_l = LZ + LS_l + LM_l$$

where $LZ$ is the per user day cost for section zoning; $LS_h$, $LS_l$ are the per user day costs of preparing site management plans for high and low demand areas, respectively; and $LM_h$, $LM_l$ are the per user day costs of day to day management of high and low demand areas, respectively. Each of these per user day charge

is calculated by taking the activity cost and dividing it by the maximum potential number of visitor days in the respective area.

**Estimating the per user day zoning charges**

The total zoning cost attributable to tourism and private recreational users as a combined group could be calculated by deducting the zoning cost attributable to preservation and scientific research zones and (to be paid for by society as a whole) and those attributable to mariculture operators and commercial collectors. Commercial fishermen are unlikely to use the services of zoning, so should not be levied for this activity. The proportion of total zoning cost attributable to preservation zoning and to mariculture operators may be calculated on the basis of the proportions of total reef area in the section under preservation and mariculture. The zoning cost attributable to collectors is probably negligible.

The cost of zoning can be divided into two main categories based on the development of section zones and site management plans.

**Section zoning**

For each section, the per user cost of a section zoning plan is the total cost divided by the potential number of visitor days (maximum likely number of private boat owners and the maximum passenger capacity of tour operations times their respective visitation rate) in the section.

User day levy for section zoning

$$LZ = \frac{CZ}{(DP + DT)}$$

where $DP$ is the number of private recreational visitor days:

$$DP = \sum_{i=1}^{r} (B_p N_p)$$

that is, the sum of the number of visitor days on board all, $r$, of the private vessels, each being the product of (the likely maximum number of persons per boat, $B_p$, and the likely number of trips per boat a year, $N_p$); and $DT$ is the



potential maximum number of visitor days on board commercial tourism operations:

$$DT = \sum_{i=1}^{k} (B_t N_t)$$

that is, the sum of the number of visitor days on board all, $k$, of the tour boats, each being the number of visitor days equal to the product of (daily passenger capacity, $B_t$, and the maximum number of trips a year, $N_t$ ).

**Preparation of site management plans**

The per user cost of preparing site management plans can be estimated according to whether the site is subject to low or high demand and the maximum number of user days spent at each site.

**Low demand site**

$$LS_l = \frac{CS}{(DP_l + DT_l)}$$

**High demand site**

$$LS_h = \frac{CS}{(DP_h + DT_h)}$$

where $CS_h$, $CS_h$ are the average costs of preparing site management plans for high and low demand areas respectively; and $(DP_h + DT_h)$, $(DP_l + DT_l)$ are the potential maximum number of visitor days a year in high and low demand areas respectively.

**Estimating daily user charges for day to day management**

As for zoning, the cost of day to day management associated with commercial fishermen, collectors, mariculture operators and with the enforcement of preservation zones have to be subtracted to estimate the total day to day management expenditures attributable to tourism operators and private users. Again, a distinction between the day to day management cost for the high and low demand sites is warranted.

The daily user charges for day to day management in low and high demand areas respectively, can be estimated as follows.

**Low demand area**

$$LM_l = \frac{CM_l}{DP_l + DT_l}$$

**High demand area**

$$LM_h = \frac{CM_h}{DP_h + DT_h}$$

where $LM_h$, $LM_l$ are the average day to day management costs attributable to high and low demand sites respectively.

As recreational users may use both high and low demand areas of the marine park, the charges indicated above, and summarised in the table 13, for the different types of management activity and area have to be combined to produce a daily user charge which is weighted by their use of particular areas.

Table 13: **A summary of the suggested formulas for estimating 'user day' charges for high and low demand area zoning and day to day management services**

| **Authority's service** | **Formula for estimating per visitor day charge — high demand site** | **Formula for estimating per visitor day charge — low demand site** |
|---|---|---|
| Zoning | | |
| – preparing section plan | $LZ = \frac{CZ}{(DP + DT)}$ | $LZ = \frac{CZ}{(DP + DT)}$ |
| – preparing site management plan | $LS_h = \frac{CS}{(DP_h + DT_h)}$ | $LS_l = \frac{CS}{(DP_l + DT_l)}$ |
| Day to day management | $LM_h = \frac{CM_h}{DP_h + DT_h}$ | $LM_l = \frac{CM_l}{DP_l + DT_l}$ |
| User charge, UC | $UC_h = LZ + LS_h + LM_h$ | $UC_l = LZ + LS_l + LM_l$ |



**A tourism operator levy**

The levy on a tour boat operation that uses only a single site, say a high demand area, can be as follows:

Single site operator = $UC_h$ (annual number of person day visits to the site)

= $UC_h$ (passenger capacity x annual number of visits by the tour vessel)

On the other hand, a levy on the tour boat operator that uses more than one site, say two — a high and a low demand site — can be estimated on the basis of the proportion of visits to each of the sites. That is:

Dual site operators levy = levy for high demand site + a levy for low demand site

Levy for the high demand site = $UC_h$ (proportion of the total number of person day visits to the high demand site)

Levy for the low demand site = $UC_l$ (proportion of the total number of person day visits to the low demand site)

**A private boat owners levy**

Similarly, the levy on a private boat owner that uses only high demand sites, can be estimated as follows:

Single site operator = $UC_h$ (likely number of person day visits to the site)

= $UC_h$ (maximum number of passengers carried x annual number of visits by the private vessel)

On the other hand, a levy on the private vessel owner that uses more than one site, say two — a high and a low demand site — can be estimated on the basis of the proportion of visits to each of the sites. That is:

Dual site user levy = levy for high demand site + a levy for low demand site

Levy for the high demand site = $UC_h$ (proportion of the total number of person day visits to the high demand site)

Levy for the low demand site = $UC_l$ (proportion of the total number of person day visits to the low demand site)

The above formulas are suggested for an average user using an average high or low demand site. However, in some cases additional services, such as greater enforcement of a particularly high demand site used largely by private recreational users, may be necessary. The extra cost of providing such additional services would thus need to be recovered from those recreational users directly benefiting from them.



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