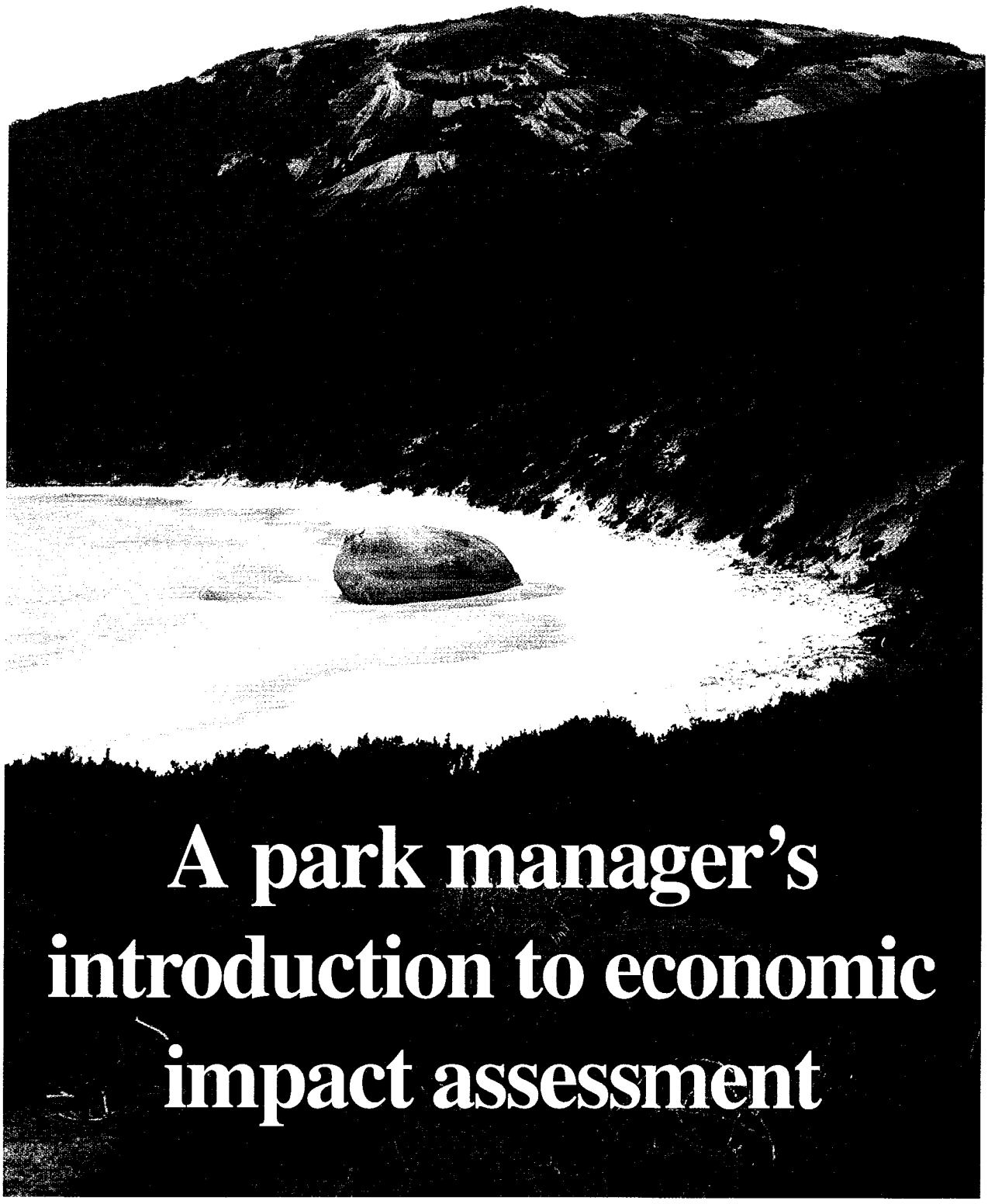

A park manager's introduction to economic impact assessment

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Executive Summary

The protected areas of the world contain some of its most beautiful scenery and outstanding natural landscapes. These feature wildernesses, mountains and volcanoes, rain forests, untouched crystal-clear marine waters, white sandy beaches and unique cultural sites – to mention but a few of their attributes.

The natural features of protected areas offer attractions which in many countries have become the cornerstone of tourism. Promoting tourism for the economy is not, of course, the primary role of protected areas. Protected areas have the prime purpose of conserving species biodiversity, as well as providing a rich resource which permits scientists, educators, the community at large etc. to meet their various needs. Free markets are unable to provide these non-financial benefits at the optimal level required by society – and hence society must provide substantial levels of environmental protection in the same manner that they provide defence and legal systems. Failure to provide these public services will impoverish the quality of life. But as this report makes it clear the inadequate provision or loss of protected areas also has the potential to cause financial impoverishment for entire nations.

The debate about environmental protection is usually couched in terms of trying to achieve a balance between leaving areas in their natural state, and developing and exploiting them. This balance generally tends to be fraught with tension – an example of this being the continuing dispute over whether to leave forested areas uncleared, or to log them and convert the land to agricultural purposes. The draining of natural wetlands and the clearing of mangroves for the development of sites is another well-known example.

This report begins the process of moving beyond this constrictive and misleading paradigm. The evaluation framework will identify those sites where protecting the environment has also made a significant contribution to the economy – increasing national wealth, national incomes and levels of national economic output.

Public policy has a broad focus on the welfare of the community and much work has been done by economists systematising the evaluation of welfare benefits from protected areas. The political process largely focuses, however, on the economy. It is considered that the framework developed in this report can thrust environmental protection issues into the centre of the economic policy argument.

This is achieved by utilising a 'niche growth' paradigm rather than a 'balance' paradigm. 'Niche growth' suggests that within some industry/environmental categories, there are solutions where the environment and the economy can win simultaneously.

Books by Dixon et al (1990a, 1990b, 1994); Pearce and Moran (1994) and McNeely (1988), McNeely and Munasinghe (1994) reveal that protected areas are often significant revenue-earning entities and can make an important contribution to local economies. For instance, Canada is expected to create $6.5 billion dollars in annual Gross Domestic Product from the expenditure of participants in wildlife-related

activities. This sustains 159 000 jobs and creates $2.5 billion in tax revenue each year. Australia receives over $2 billion in expenditure from eight national parks – at a cost to Governments of $A60 m. In Costa Rica, it can be seen that from some $12 million per annum spent to maintain national parks, income of more than $330 million in foreign exchange was generated in 1991 with 500 000 visitors arriving, representing the second largest industry in the country.

Numerous other examples abound:

- In Tanzania, the poaching and uncontrolled hunting of elephants to the south-east of Tangire National Park led to an increase in woody plants growth in the park, which in turn caused an increase in tsetse flies and led to livestock reduction in the area. Conservation of elephants would have enhanced the productivity of the livestock industry.
- McNeely notes that Zaire receives 75 percent of animal protein from wild sources. Some 40 percent of the diet in Botswana is received from animal protein produced by wild sources.
- Firewood and dung provide 90 percent of the energy needs in Tanzania, Nepal and Malawi and exceed 80 percent in other countries.
- In Australia, it was determined that water production in the Upper Thompson dam in Victoria was more valuable than the timber production from the same land.
- Hodgson and Dixon concluded that tourism and fishing were more economically valuable than logging in the Phillipines.
- Lal found that Fijian mangroves were more valuable for firewood collection, fishing and sewage disposal than when cleared as agricultural land.
- The US National Marine and Fisheries Service estimated that the destruction of US coastal estuaries between 1954 and 1978 cost the US economy $200 million in fish production on an annual basis.

In each of these cases, the economy is demonstrably receiving a boost from the existence of protected areas and indigenous natural landscapes.

There is a clear message from the above that investment in protected areas can provide a significant benefit to national and local economies. Far from being locked up and lost to local users, these areas represent an opportunity for sustainable industries and for the generation of financial returns. With proper management, the 'product' on offer can be sold over and over again without diminishing its value. Unlike extractive industries, the string of returns can be maintained over a long period for the benefit of a wide range of users and stakeholders.

This report identifies ten types of activity which can cause impacts on the economy. These include tourism, natural services, water production, mitigation of natural disasters, breeding habitat, subsistence living and commercial activities. Of these, tourism is the largest and fastest-growing industry in the world, accounting for 12 percent of global gross national product. Tourism, globally, was worth $US388 billion per year in 1988, and heading for a 50 percent increase in arrivals by the end of the nineties (600 million arrivals). The tourism industry provides a significant proportion of benefits, although there is evidence that many impacts are overlooked, even when a valuation exercise is conducted. This leads to reduced levels of conservation as well as reduced wealth, incomes and jobs. It is clear that policy mistakes which undersupply conservation are likely to be very costly and may condemn many economies to perpetual poverty.

Case studies reviewed in this report show that the different approaches to valuation can lead to inconsistent reporting of outcomes. The report recommends a standardised valuation methodology be adopted and this is described fully in the text. The methodology provides sound guidance for those unfamiliar with measuring costs and benefits. For those who are familiar, the standardised approach will reduce the incidence of impacts remaining unvalued and unappreciated, in a format suitable for future studies. Above all, measuring the benefits of protected areas in a standard global format enables comparisons and aggregations to be made of studies in different parts of the world.)

Section 1: Set the context

Section 1. Summary Points

- Assess the economic benefits of protected areas.
- Define the economic benefits as the impact on the creation of wealth, incomes, jobs and tax revenue.
- Assessing the economic benefits of protected area's leads to a re-integration of the economy and the environment.
- Natural areas, of themselves, can make an economic contribution.

The economic significance of ecology

Protected areas represent an effort to conserve natural areas from the process of 'development'. As humans, we have evolved from the natural systems of this planet and have built our own system in parallel with the natural system. For centuries, the human economy lived as an integrated component of the natural system. This integration was often successful in providing for thriving communities that lived in an apparently sustainable manner. For other humans, the experiment proved disastrous, as natural systems became over-exploited, resulting in collapse of societies.

The evolution of the human race has always been intimately linked to the state of the natural system. However, the advent of the Industrial Revolution during the nineteenth century was a major historical turning-point that encouraged people to believe that they could live outside nature. In order to advance economically, natural systems needed to be utilised, often unsustainably. (McDonald notes the ironic corollary that certain key parts of the natural system therefore needed to be conserved as reminders of the past.) This perception – that the environment needed to be sacrificed in order to advance the economy – is still strongly held by developing and developed countries, conservationists and industrialists alike.

Calculating the economic benefits of protected areas is a small step towards reversing a centuries-old trend of pitting humanity against nature. The hunter-gatherer in the past lived in an economy that was highly visible. Today's 'hunter-gatherer' working in a money-market broking firm fifty floors above street level only sees the economy in terms of numbers. Few living in today's knowledge-based industrial economy can perceive the economy as a whole. As a result, the linkage between economic productivity and ecological productivity has become less visible, and seemingly, less plausible.

The traditional hunter-gatherer villages have given way to the global economy, which in turn requires a biosphere civilisation to understand the global ecological context in which the global economy operates. The global economy needs to assess and understand the economic input from the smallest local ecosystem all the way up to, and including, global systems such as the 'climate sink' function of the atmosphere.

'If it isn't measured, then it doesn't exist' is a familiar cry throughout modern economic activity. Put another way, the human tendency to myopia is being borne out through our failure to measure and understand all inputs into wealth creation. This by definition includes the natural environment, which we so easily take for granted.

How dependent is the modern economy on the natural environment?

This is one of the least-asked questions in an age of technological confidence – but perhaps one of the most important. Examination of this relationship will often lead to the pleasing discovery that the dependence is greater than may otherwise have been believed.

The reason for this question is that the state of the economy and its ability to provide incomes and jobs is the central plank of virtually all political decision making. The studies advocated in this report are designed to acknowledge the economic benefits of protected areas and to influence the arbiters of political power, in their own economic

language.

Which economic benefits are being discussed?

The guidelines presented introduce park managers to the concept of assessing the economic benefits of protected areas in monetary terms. The full explanation of this process is included in the economic assessment guidelines *Assessing the Economic Benefits of Protected Areas.*

In economic language, there are subtle distinctions between assessing the economic welfare produced by a protected area, assessing the financial value of an area and assessing the impact on the economy caused by the protected area.

Economic benefits can be broad-ranging in that they include all values generated by a protected area. These might be the scientific, aesthetic, cultural and other values of a site alongside the financial values.

- A study which examines the full suite of values derived by society is called an economic welfare analysis. This type of analysis seeks to examine the contribution to the welfare (ie 'happiness' or 'psychic well-being') of society caused by a particular policy, or other object such as a protected area.
- A second type of analysis seeks to measure the financial values generated by protected areas. This type of study can be performed as a subset to the economic welfare analysis, or it can be studied in its own right. The financial values generated by a protected area can include the capital value of a location as well as the flows of financial benefits such as payments by tourists. Such an analysis can be called a **financial analysis**.
- A third type of analysis, **economic impact analysis** looks at the impact on the economy, caused by some particular project, policy or activity. Broadly defined, the economy consists of the series of flows of financial value which are generated when people exchange goods and services, or engage in production of goods and services. Bartering and home production can generate financial flows as do those using money as a means ofmeasurement. All of these types of transactions have validity as being parts of the economy.

All three types of analysis are known as 'economic' studies. The meaning of the word 'economic' is altered by the context in which it is used. Here focus is made on assessing the **economic impact analysis** (the change in the economy) generated by the existence of protected areas. In order to avoid confusion, the word 'economic' should be interpreted here to mean economic impact assessment of change in the economy – unless specified differently.

Seeking means of measurement

The methods advocated by this paper calculate the economic contribution made by protected areas. They accordingly examine how natural areas add value to an economy (creating wealth, jobs and tax flows) by virtue of merely existing. They also challenge the concept that natural areas are necessarily economically valueless. By establishing that natural areas contribute to the economy (defined as the process of creating wealth, jobs and taxes), the task of conserving protected areas will become easier, and the mantle of conservation will spread further than protected areas to include natural areas not presently subject to protection.

This guide for park managers and conservationists is intended to be a 'political weapon' which has significant impact on the political process. Money and wealth issues normally engage the national political psyche with ease. It is anticipated that reports about the wealth and job benefits of protected areas will do the same.

Section 2: Identifying the types of physical/economic activities created by protected areas

Section 2. Summary Points

- Protected areas interact with the economy via physical 'impacts'.
- Physical impacts are defined as human activity, which makes use of some aspects of the protected area for the purposes of making money.
- Park managers will need to systematically identify these human activities for the protected area under analysis
- Physical impacts can be quite subtle, and probably require both extensive knowledge of the economy and the protected area.

How do protected areas cause economic impacts?

Protected areas can be the venue for activities – or by their mere existence, they can influence activities elsewhere, which will in turn affect the economy. Activities on the site of a protected area may include, for example, tourism whereby people travel to a protected area and spend their money in order to partake of the area's natural beauties. Alternatively, the protected area might contain a wetland which mitigates the impact of heavy rain, preventing a flood downstream which would in turn damage crops and possibly even cities. Thus the presence of the protected area influences flood activity elsewhere, providing a benefit to the economy through lower costs in flood mitigation work/damage.

Obviously, some links between a protected area and the economy will be quite subtle, and in many cases, the link may well be.a unique reflection of the region's ecology and its economy. What provides a positive economic benefit in one area may well provide a negative economic benefit in another. Sometimes the links will be generated by a long causal chain of circumstances, such as an open ocean fishery which may depend upon a coastal mangrove swamp for fish breeding, which in turn depends on fresh water from a nearby stream. The stream is in turn generated by forests in a distant protected area.

Not all sites, however, generate wealth for the economy. Some protected areas are valued for scientific reasons, in that they contain rare species. Such a site, while a valuable component of a park system, may not attract visitors nor contribute in any other way to the economy. The area will contribute to man's knowledge of nature's functions, but does not of itself create wealth. At some future point, the park may contribute a new substance or compound with profound economic implications. Once this occurs, the impact on the real economy can be measured.

These benefits to the economy are not measured in advance. For instance, the mining industry does not include sites as assets which are not being mined, though they do include the money spent on prospecting. Alternatively, the wetland that reduces the risk of flooding, has a direct impact on the cost of flood mitigation works in a neighbouring area. The existence of the wetland contributes to the lower cost of flood prevention , and hence saves the economy a considerable amount of money. This results in expanded economic output for the regional economy.

Thus a crucial test is whether or not the physical impacts can be translated into impacts which alter economic output.

Systematically Review all protected area impacts on the Economy

In reviewing a number of studies for this report, it has become quite clear that protected areas provide a range of economic impacts, which need systematic analysis and quantification. In some studies, there was a heavy focus on one economic impact alone (such as tourism), while other economic benefits were either ignored or barely mentioned.

One of the most obvious of these benefits is the contribution of protected areas to improved water production in their region. Overlooking such benefits has the effect of devaluing the activity and hence the natural area by

definition, as well as adjacent unprotected areas. One consequence of this effect is clear in the realm of fishery economics, where a considerable focus is placed upon catching fish, and little effort is expended in evaluating fish breeding in sea grass beds and mangroves. As a result, contradictory policies arise, whereby enormous effort is expended into protecting fisheries, while developers are destroying seagrass beds to foster new resorts.

To avoid this, these studies emphasise the need to value all economic impacts.

Subtle economic impacts require a multi-disciplinary approach

Conducting such studies requires that different disciplines work together. It is insufficient for an economist to examine an area and determine the likely impacts, when there's a likelihood that he/she may well not understand the full range of physical processes taking place in a protected area. Accordingly, activities may be overlooked and not valued.

While a scientist may grasp all the processes, the economic impacts of those processes will not be as apparent. Economists may dwell on the numbers of fish being caught, while their fellow scientists examine wetlands and seagrass bed destruction. The subtlety of links between natural processes and the economy also extends to examples such as sedimentation. The sediment which runs off a dirt track in a protected area, and ends up in the river, ultimately contributes to tourist decline in the town, because of the problems with local water.

The example points to one very obvious conclusion: that the various disciplines need to work more closely together, and to acknowledge the value of each other's field of specialisation.

Section 3. Valuing the benefits

Section 3. Summary Points

- Decide on your objective.
- Identify your target audience and their information requirements.
- Locate the people required to put the study together.
- Decide on the scope of the study
- Bear in mind that the economic assessment will need to be repeated.
- List the identified physical impacts and their economic consequences.

What should the study outcomes look like?

The purpose of carrying out a study is to assess the impact on 'economic output' caused by the protected area. 'Economic output' can be defined in many ways. Commonly national gross domestic product is used as a measure of the total production of the economy. In pure economic terms, what matters are changes in income per head of population. It will be necessary to decide in which terms the output of the study will be described. If, for example, the study represents part of a nationwide integrated approach to assessing the economic impact of protected areas, then clearly it is likely that the result will need to be described in the same terms used to describe the national economy (GDP, etc).

These issues will need to be settled in discussions between the economic analysts and the park management.

Speak in the language of economics

Studies should be deliberately designed to influence policy-makers, politicians, the electronic media, industry, unions and other key players in national economic debate. It will be necessary to have a clear understanding of the information needs and political and economic interests of one's target audience. It is then important to shape one's analysis into a form that is recognisable by this audience and which addresses their interests.

At times, it may well be that a study will conflict with the issues usually discussed by

park authorities. There is often a deep philosophical chasm between park managers and the economic community over the key issues in public policy. In this instance, the aim is not to seek to convert the economists to the park managers' way of thinking. Rather, it is to seek to address the economic community, by means of economic language, within the framework of its own philosophical approach.

Anything that does not use the economic language is likely to be counter-productive because to the economic policy maker, protected areas represent only one small subset

Questions that should be answered by an Economic Impact Assessment

Superficially an economic impact analysis seeks to answer the question 'what impacts does this protected area have on the economy?' In reality, in order to answer this question, a economic impact analysis must answer an entire series of questions. Some of these questions are listed below, to provide a feel for the sorts of issues that an economic analysis must come to terms with.

- Do we want income data or sales data etc?
- Do we want to identify impacts on the economy only?
- Describe how the study results will be integrated with measures of economic performance relevant to the economy, such as national accounts data.
- Define the economy against which the PA's economic benefits will be compared.
- What type of economic analysis is being adopted?
- What other objectives apart from economic objectives are being considered?
- Which objectives are important to the national policy-makers?
- What type of protected area status is being implemented?
- What were previous land use patterns prior to PA status?
- What is the relationship between the PA and adjacent land?
- Identify and calculate direct, indirect and induced financial costs and benefits thorough use of various techniques such as multipliers and input and output analysis.
- Decide on the appropriate level of interest rates, and foregone expenditure and income for each impact.
- Analyse the opportunity costs of the economic benefits associated with the PA.
- Are there any 'distortions' of market behaviour which result in perverse or inaccurate results?
- Are there any key externalities?
- Calculate the net economic benefits to the economy.
- How are the income gains due to the PA distributed throughout the community?
- What are the key uncertainties and risks in this analysis?
- Is government expenditure seen as an economic benefit in the study?
- Are any investment funds/grants from international organisations, or other organisations used in the PA?
- Are there any institutional factors that influence the creation of economic benefits from the PA?
- Qualitatively describe the economic linkages from the PA to the broader macroeconomy.
- Are there other social costs and benefits due to economic impacts of the PA?

of economic issues. Failing to use economic policy language implies that park managers have nothing to say to economic policy makers because, by implication protected areas, do not make an economic contribution. Secondly, the economic policy maker is not generally looking for an economic contribution from protected areas and therefore will not take the time to learn the language of park managers because there is no perceived benefit for doing so.

Bluntly speaking, the economic mountain will not come to the park manager's village - therefore, the village will need to go to the economic mountain! This is another reason why it is important that economists and park managers work together on these studies – to ensure an efficient interchange of understanding.

Seek sympathetic economists

Locating the team capable of putting together a study is an important part of determining the success of such an exercise. Not all economists will be acceptable for this exercise, since they are likely to lack the experience to comprehend the physical-economic links that underlie such analysis. Your protected area may well have a particular interaction with the economy that has not been identified in other studies. The economic analysts will need to be able to 'capture' all the data relevant to these interactions, and to work out how to evaluate the economic impact from first principles.

Many studies have not examined the complete offering of interactions and this is resulting in a underestimation of the significance of protected area Conversely, environmental specialists often have a misleading view of what is economically valuable, which may require some adjusting in robust conversations (ie arguments!). The team will need to be able to cope with the mutual incomprehension that accompanies multi-disciplinary analysis. Prior experience in such assessment is useful - though institutions such as ministries of finance should not be overlooked, because engaging them in the process may result in greater level of understanding by such central bodies, about the role of protected area in the economy.

Define the scope of the study – identify the economic breadth

The scope of the study refers to two key components. The first component is the economic breadth of the analysis. The economy, for example, can be thought of in 'levels'. That is, the economic impact assessment can take place at the local level, regional level, national level and the international level. For the purposes of these guidelines, focus is directed to the local level and the national level. Regional economic impacts can be analysed in the same manner as either a local or a national economy.

The scope of the study, the analytical team and the objectives will all be influenced by the size of available resources. *In this regard, the study should always be seen as a continuing process.* The economic benefits from protected areas, like other aspects of the economic process, will require constant monitoring over the years. This will assist in ensuring that the details of such analysis become acceptable and well-known to policy-makers. Thus what is not achieved the first time may be achievable in subsequent assessments.

List economic/physical interactions

Each of the different economic/physical activities described for the protected area or national park should be listed and the relationship between the physical activity and the economic activity needs to be discussed and explained. Where necessary, supporting evidence may be required.

For example, the impact of vegetation on water production seems to be accepted intuitively by people with environmental experience on one hand, but regarded as unexpected by economists and others. The evidence to support the existence of this relationship may need to be provided as part of the study. The relationship between the physical activity and the economic activity, and the nature of the physical impact and the economic impact are all subject to uncertainty. The nature of this uncertainty, and the risks associated with it also need to be explained. Where the uncertainty and risk are significant, the effect on the study should be detailed.

Section 4: Calculating the economic impact

Section 4: Summary points

- Calculating the economic value is relatively straightforward with good preparation.
- The guidelines provide a series of steps for calculating the economic value.
- The guidelines provide a list of likely sources of economic value.
- For each likely valuation source the guidelines provide a module for calculating the economic value.
- The guidelines provide assistance on aggregating the economic impact of several valuation sources.

Scarcity of data is a common obstacle

Understanding the calculation of economic values for each physical impact is relatively simple. The more difficult part is in carrying out practical estimations. The scarcity of data is likely to imply the need for making compromises in the calculus. These compromises will qualify the quality of the output data, and can lead to errors creeping into the analysis. It is in this area that judgement needs to be exercised to distinguish between acceptable and unacceptable compromises. This is where good preparation helps. *By reading other studies, and networking with other practitioners, the different compromises can be assessed against other experience.* Good preparation at the survey stage or during data gathering may allow the collection of useable information, which enables compromises to be avoided or mitigated.

The main guidelines list the following physical/economic impacts as the major economic effects from protected areas. There may be others which will be unique to particular protected areas, and should be included if data can be produced. The categorisation of financial values in the valuation modules, derived from protected areas, varies from the list of economic values derived from protected areas. The economic values derived from the protected area cover the entire range of financial and non-financial services (aesthetic values etc). The values that comprise the valuation modules have been aggregated on the basis of the style of arithmetic calculation required to provide an assessment of the economic impact. The non-financial services The next section lists the different types of physical/economic interaction that have been identified so far.

Physical/economic interactions in protected areas

1. Tourism/recreation – see Ch 3. Valuation module 1

This category consists of a range of components. Its core is the visitor-day, which is a key unit of output by the tourism industry. Another key measure is the expenditure rate per visitor day by tourists. The multiplication of visitor days by expenditure per day gives a measure of the volume of production attributable to a protected area. The tourism industry services the ability of tourists to experience a visitor-day at various locations. Any form of visitation counts in this category, though different types of visitors will have different expenditure patterns.

The American Money Generation Model was used on the Gateway National Recreation Area within New York City. It has six million visitors a year, who may only spend a small amount of money to get the park, compared with others who travel to the isolation of the Death Valley National Park. It is reasonable to speculate that the Death Valley tourists will spend large amounts at distant locations while the large numbers of Gateway visitors will spend small per capita amounts in areas immediately adjacent to the park. This expenditure profile is important to obtain and effects the economic impact the park will have.

Canada is expected to create $6.5 billion dollars in annual Gross Domestic Product from the expenditure of participants in wildlife-related activities. This sustains 159 000 jobs and creates $2.5 billion in tax revenue each year. Australia receives over $2 billion in expenditure from eight national parks – at a cost to governments of $A60 million.

2. Natural services – see Ch 3. Valuation module 2

Protected areas can provide a range of services to adjacent industries caused by the natural biological processes that they protect. An example is pollination services, where the existence of the protected area contributes to a greater population of birds and insects that provide this service. This improves the return on the crops in the local area. McNeely noted:

The existence of a protected area may help maintain a more natural balance of the ecosystem over a much wider area. Protected areas afford sanctuary to breeding populations of birds which control insect and mammal pests in agricultural areas. Bats, birds and bees which nest, roost and breed in reserves may range far outside their boundaries and pollinate fruit trees in the surrounding areas. Ledec and Goodland (1986) have shown how the production of Brazil nuts depends on a variety of poorly-known forest plants and animals. Male euglossine bees which pollinate the flowers of the Brazil nut tree gather certain organic compounds from epiphytic orchids to attract females for mating. The hard shell covering the nut is opened naturally only by the forest-dwelling agouti (a large rodent), thereby enabling the tree to disperse. Thus, maintaining Brazil nut production appears to require conserving enough natural forest to protect bee nesting habitat, other bee food plants, certain orchids and the trees upon which they grow, insects or hummingbirds that pollinate the orchids (and all their necessities in turn), and agoutis. Another good example comes from Tanzania, where the poaching and uncontrolled hunting of elephants to the south-east of Tangire National Park led to bush encroachment which caused an increase in the tsete flies which in turn led to a livestock reduction in the area; conservation of elephants would have enhanced the productivity of the livestock industry.

Other but less obvious services are the buffers provided by the protected area which reduces wind speed at ground level and promotes greater crop growth.

3. Water Production – see Ch 3. Valuation module 3

Some protected areas provide natural 'filters' and 'sponges' that absorb and clean water which is then made available downstream to villages, towns, cities and industry. In the absence of these runoff aids, the water catchment would have to be managed in some manner, in order to meet the demands of the communities. This was demonstrated in Melbourne, Australia where a heavily forested water catchment was assessed for its water production. It was found that the area's water production capacity was more valuable than the logged timber.

The Canadians provided the following insight:

An example, with economic consequences, is that of watersheds protected within parks and ecological reserves, which benefit downstream communities. Protected watersheds offer communities and business stable, high quality water sources, which can alleviate the need for costly water treatment costs. Watershed protection also has economic

value in the sense that biologically active watersheds help to moderate flash flooding in river basins, and help to control channel siltation. A watershed with a thick covering of vegetation acts as both a sponge and filter, controlling speed of run-off from heavy rain. Not only does water enter a drainage system at a slower rate, it is also cleaner and therefore less expensive to process, with less need for dredging or cleaning of water intake pipes.

Similarly to Coopers and Lybrand, McNeely cited the same expereince for tropical forests. In particular drawing attention to the significance of deep tree roots (ie older forests) and the role of forest in managing microclimates (ie maintaining rainfall and temperature control). McNeely continued:

Replacing the efficiency lost to dams by erosion can be assigned a value, to the extent that the siltation of reservoirs feeding hydropower facilities involves a loss of some 148 000 gigawatt hours which, at US$15 per barrel, would cost some $4 billion per annum to replace using thermal generation.

He concludes:

Venezuela's Canaima National Park safeguards a catchment feeding hydroelectric developments which are so important that the government recently tripled the size of the park to three million ha to enhance its utility for watershed protection.

4. Mitigation of Natural Disasters – see Ch 3. Valuation module 4

Some protected areas such as coastal wetlands, swamps and other features of the natural environment act as a means for mitigating natural disasters like ocean storms and land-based floods. These services resemble insurance policies and can be invaluable. They may reduce the cost of providing engineering works, for example, to reduce flood damage.

In one study, Fijian mangroves were identified as an economical sewage treatment system. This system was cheaper than provision of tertiary treatment plants. McNeely cites the US Army Corps of Engineers which claimed that 'retaining a wetlands complex outside of Boston, Massachusetts realised an annual cost savings of $17 million in flood protection alone'.

5. Fish Spawning and Breeding – see Ch 3. Valuation module 5

Some marine areas provide a means for fish to breed and re-populate adjacent areas, which have been subject to overfishing. This useful facility provides services similar to those provided by a hatchery. Its absence would cause a loss of output in the dependent fishing industry.

The Fijian mangroves provided a fish breeding facility. Similarly the Hol Chan marine reserve also provides a facility for breeding fish that are caught in adjacent waters. McNeely cites 'US National Marine Fisheries Service estimates that the destruction of US coastal estuaries between 1954 and 1978 cost the nation over $200 million annually in revenues lost from commercial and sport fisheries'.

6. Food and Fibre hunting and gathering – see Ch 3. Valuation module 6

Some protected areas have food and fibre gathering as activities within their boundaries. These do provide economic output which may be counted as part of the contribution made by protected areas. The task is to conduct a 'with and without' analysis of the activity. In the absence of protection, how would the activity have fared? If protection facilitated the activity's continuation, then 'protection' can be credited with its economic output. If 'protection' reduced the output which would otherwise have been sustainable, then the reduction in output must be set as an economic loss resulting from protection. If the output was unsustainable, then 'protection' must be seen in a similar light to that of fisheries management policy. In other words, it's a worthy public good or public policy – a bit like transport infrastructure or the legal profession. It has made a valuable contribution to the economy that is measured by the amount of avoided losses.

There are a range of examples of the productivity of indigenous ecosystems. In economies which are highly dependent upon primary production, the contribution from natural areas to economic output can be the difference between economic decline and economic survival. McNeely notes that: *75 percent of animal protein consumed in Zaire is from wild sources. Some 40 percent of the diet in Botswana comes from wild animals. Firewood and dung provide 90 percent of the total primary energy needs in Malawi, Nepal and Tanzania.*

7. Other changes to the protected area not itemised– see Ch 3. Valuation module 7

Some protected areas support a range of commercial activities. For instance, certain Australian protected areas allow commercial fishing. This economic activity is derived from the protected area, and should be valued for its economic contribution alongside other

activities. Other protected areas sell surplus animals, have guesthouses physically located within the area, or have tourists within the protected area. These commercial activities may all be valued for their economic contribution. The valuation adopted will depend on the style of economic analysis. The approach could either be a straight accounting for the financial/economic output (national accounts style), or it could consider the 'with and without' (opportunity cost style) approach. In the latter case, which is the more accurate economic analysis, it is a question of determining what change would occur to economic output if the protected area status was to be removed. This provides a measure of the value of protected area status.

How to value the physical/economic impacts

The guidelines provide advice on calculating the economic value of the above impacts. It is likely that each type of economic impact will need to be calculated in a different manner. For each value, a module is provided (see Chapter 4) that takes the practitioner through the valuation process. As other economic impacts are discovered, new valuation modules can be added. Each valuation module follows the steps outlined below:

8. Financial costs of protected area administration – see Ch 3. Valuation module 8

This counts as a positive if the money raised for these costs comes from outside the economic boundaries of the study area. In Belize, for example, some outside money is donated for management of protected area's. Thus if it is a local study, and the administration costs are paid for nationally, the money may be seen as a free gift to the local area, and hence adds to economic activity.

The financial costs of protected area administration in a national study are a negative impact of protected areas – but only under certain circumstances. If the protected area is regarded as an essential part of public policy which would exist in the absence of economic benefits from protected areas, then it is not strictly necessary to count financial administration costs as a negative against the benefits of protected areas. This is another demonstration of the use of a 'with or without' framework. If protected areas produced no economic output benefits, but it was still considered necessary to have protected areas, as any sensible public policy in the late twentieth century would conclude, then the negative costs of protected areas do not need to be counted against the benefits. These issues need careful examination, and further discussion is available in the main report.

9. Natural phenomena causing damage – see Chapter 3. Valuation module 9

One study reviewed in this analysis reported claims of animals roving outside park boundaries causing damage to crops. The analysts investigated the claim but found that it was not supported by the evidence. This instance, though, does highlight a potential negative impact from a protected area. Other such impacts should also be counted. In some cases, the presence of the protected area may exacerbate certain phenomena that have negative impacts such as harbouring feral animals or native animals that are 'pests' – these need to be counted in the negative category.

10. Displaced economic activity – see Ch 3. Valuation module 10

The creation of the protected area may result in the displacement of other economic activity. The displaced economic activity, as for any other project, must count against the economic benefits, unless the people were induced to leave voluntarily – subject to compensation. In this case, the compensation costs should count against the economic benefits. The only circumstance where this is not the case is if, in the absence of economic benefits, and on the grounds of public policy, the protected area would have gone ahead anyway. Under this circumstance, the cost of the action is a cost of public policy, and it needs to be justified by reference to that public policy.

Valuation Step 1.

Identify the physical, financial and other research data required to evaluate the economic impact of the physical phenomena under consideration.

Valuation Step 2.

Explain the process by which the above data is manipulated to calculate a measure of the financial/economic benefit of the identified physical impact.

Valuation Step 3.

Check to see if any modifications are required to adjust the calculated value.

Valuation Step 4.

Calculate the indirect and induced effects that flow as a result of the identified direct effect.

Valuation Step 5.

Calculate the impact on other economic and social objectives.

The results of each valuation module, however, will provide measures of economic impact that are likely to be denominated in different measurement units. For instance, flood mitigation could cause a lowering in production costs, while tourism causes an increase in sales revenue. Each of these effects needs to be translated into a unit of economic impact such as the change in GDP. The last section of Chapter 4 provides a discussion of the process of aggregating the different economic impacts from each valuation module.

Section 5. A Worked Example

The main report provides two imaginary worked examples of economic impact assessment. One example is a local area study and the second example is a national analysis built up from several local analyses. The examples have been kept simple to illustrate the key points and a shortened version of the first example is offered here.

Local Area Study: Environia Protected Area' National Park No 1

The imaginary Protected Area National Park No 1 provides the following physical activities which translate into valuable financial transactions for the local and national economy of a country called Environia. Protected Area National Park No 1 provides:

- 2000 visitor-days of tourism;
- clean water to a nearby city called Downtown;
- subsistence production to local people; and
- wetland provides flood mitigation features for Downtown.

The calculations are as follows:

Tourism calculations

The visitors are surveyed. It is discovered that 900 comprise overseas tourists, 50 are from other regions of the country called Environia and 50 are from the local area. They are asked to provide details of their total trip length in days; the number of days spent at each site in their trip; and how much time was spent in transit, between each site. The total expenditure on the trip was also elicited, as were the expenditure categories. In addition, tourists were asked where they would have gone if they had not visited the Protected Area National Park No 1. This enabled more data on the expenditure benefits of the park to be elicited.

PA sites	No of visitor-days Overseas/ Regional/ Local	No of visitor-days in transit for each PA**	Expenditure rate* of overseas tourists	Expenditure rate* of non-local, non-overseas tourists	Expenditure rate* of local tourists
PA national park No 1	1800/ 150/ 50	200	$100	$50	$20

* The expenditure rate per visitor day. **The expenditure per transit day is $20.

The Environia Economic Impact Assessment study team used the transport expenditure data, and the map of tourist destinations, to estimate the amount of transport expenses for visitors travelling to the PA National Park No 1. Transport expenses were included that fall within the boundaries of the region that contains PA National Park No 1. The data is gathered by a survey. The study team, however, makes use of other sources as they are identified. The study team have already decided that they are estimating the economic impact of the tourism within the region that contains the PA No 1 National Park and Downtown city. For our purposes, this region serves as a 'local' area. The per day expenditure rate does not include transport expenses since these are incurred, in this example, outside the local area, and hence do not appear in a local study.

The aim of the PA study is to produce an analysis that can be integrated with analyses done at other parks within Environia to produce an overall national picture. The task then is to ensure that transport expenditure is allocated correctly between regions. Hotel and food expenditure is spent within the region and does not suffer the same ambiguity. Using the table below, which aggregates data from the PA National Park No 1 with the data from other national parks within Environia, the study team is able to correctly allocate the transport expenditure between each national park. This avoids doublecounting of expenditure.

Each site visited by the tourists was listed in the following table

PA sites	**No of visitor-days.Overseas/ Regional/ Local**	**No of visitor-days in transit for each PA****	**Expenditure rate* of overseas tourists****	**Expenditure rate* of non-local, non-overseas tourists****	**Expenditure rate* of local tourists****
PA national park No 1	1800/ 150/ 50	200	$100	$50	$20
No 2 national park	1800/ 150/ 50	200	$100	$50	$20
No 3 national park	1800/ 150/ 50	200	$100	$50	$20
No 4 national park	1800/ 150/ 50	200	$100	$50	$20
No 5 national park	800/ 150/ 50	200	$100	$50	$20

* The expenditure rate per visitor day. **The expenditure per transit day is $20.

** In real life the expenditure is likely to vary from site to site.

The above diagram makes the point clearly that we are looking for economic impacts inside the region. The study team estimates that 200 days were spent in transit, by tourists in the region surrounding the PA National Park No 1. These transit days were worth $20 per day to the transport sector in gross revenue from sales.

The following table adds up gross visitor expenditure in the region surrounding the PA National Park No 1.

Total Tourism expenditure in the PA National Park No 1

	No of visitor-days	Expenditure rate per day	Total expenditure per visitor day	No of transit days	Expenditure rate per transit day	Total expenditure per transit day	Total expenditure including transport
Overseas tourists	1800	$100	$180000	150	$20	$3000	$183000
Non-local, non-overseas tourists	150	$50	$7500	30	$20	$600	$8100
Local tourists	50	$20	$1000	20	$20	$400	$1400
Total	2000	———	$188500	200	———	$4000	$192500

Water production calculations

The city receives water from the river that flows from the PA National Park No 1. In the absence of protection, the park would be cleared for grazing. The shallow root mass of grasses, the clearance and grazing of stream side vegetation, and the disappearance of forests would lead to a rapid increase in sediment load, turbidity and bacterial presence in the waters of the river serving the city of Downtown. Furthermore, in the absence of protection, the lower quality river water would require the authorities to provide a water treatment plant for $8 000 000 dollars. Presently such a plant is not required. Estimates indicate that the city is avoiding expenditure of $536 000 per year as a result of not having a treatment plant.

Calculation of the economic benefit of subsistence production

The administration of the PA National Park No 1 is conducted jointly with local people who have retained their right to harvest food products from the area in accordance with long-standing tradition. The harvest is examined and found to be equivalent to 50 percent of the daily required food intake by the average person. This is estimated to replace the purchasing of products worth $500 per head, per year from the local supermarket. The community consists of 100 people. The estimated production value is 100 people time $500 per head. Thus the gross value of the production is estimated to be $50 000.

Calculating the costs/benefits of wetland flood mitigation features of the PA National Park No 1

The PA National Park No 1 has considerable areas of wetland. The land, in the absence of protection, would be cleared and drained for grazing. The area is subject to frequent flooding from the catchments beyond the PA National Park No 1. The wetland area acts a barrier to flood events. It slows down and spreads out the surge of flood water, reducing the speed and volume. This reduces the downstream impact of flood events. It is estimated that in the absence of the wetland the average flood event would cause Downtown an estimated $500 000 in damage or the equivalent in on-going flood control works. Average flood events would happen once every five years. Due to the wetland, average flood events occur only once every ten years with an estimated damage cost of $50 000.

The cost of a flood with the wetland in place is $5 000 per year. The cost of flood events without the wetland is $250 000 per year. The cost of not having the wetland is thus the

difference which is $245 000 per year. The benefit received for the presence of the wetland is $245 000 per year. That is, the residents of Downtown are better off by $245 000 per year due to the presence of the wetland. If they understood this benefit, the residents of Downtown may be willing to pay the protected area for the protective service it provides. They may be willing to pay a value up to $245 000 per year.

Damage caused by animals from the protected area

Finally, it is estimated that wandering animals from the protected area cause damage in local crops worth $10 000 per year. This is a reduction in gross output equivalent to $10 000. This was counted as a cost of the protected area.

Aggregating the results

The results of this study are required in terms of per capita income gains for the population of the study area. Since the money spent passes through many hands, these subsequent impacts can be measured by multipliers. Multipliers can be estimated as simple numbers, as tables or in a complex economic model. Each study will decide how to measure the multiplier impacts. See Appendix B for further information on multipliers.

The results for the PA National Park No 1 were converted by the use of estimates of the multiplier. The study results are converted, where necessary, to data which represents the income gain, as a result of the activity.

The per capita gain in income for the region is $1060, after taking into account multipliers.

Table showing the aggregated results of financial benefits bestowed by the PA National Park #Population is 1000

	Study result	Conversion factor	Gross change in regional income	Per capita income gain#
Tourist revenue	$192 500 increase in gross sales revenue	Use a income multiplier = 1.2	$231 000	$231
Water production	$536 000 gain income	No income multiplier required	$536 000	$536
Subsistence food production	$50 000 gain in gross regional product	Apply income multiplier of 1.2	$60 000	$60
Wetlands mitigation	$245 000 gain in gross revenue	No income multiplier required	$245 000	$245
Crop damage	$-10 000 loss in gross revenue	Negative income multiplier of 1.2	Taking account of negative income multiplier leads to losses of $-12 000	$-12
Total	_____	_____	$1 060 000	$1060

Section 6. How to Sell the Report

The Guidelines conclude by offering some assistance on using the economic impact assessment. The US National Parks and Wildlife Service use the Money Generation Model, and have completed some 300 studies since 1990. Arnberger from a Texas based national park offered some advice on using the MGM model, which applies equally well to using the guidelines for economic impact assessment.

1. Conduct the MGM annually.
2. Design and conduct a visitor use survey to acquire the most accurate economic expenditure information to be used in conjunction with the MGM.
3. Publish/announce results of the MGM in press releases, newspaper feature articles, park newspaper, television news story, radio interview, etc.
4. Produce slide presentation suitable for delivery at community service organisations and public meetings.
5. Compile executive summary etc, booklet on MGM for distribution at public meetings, public speaking appearances, etc.
6. Produce a list of local service organisations to contact through speaking engagement highlighting the result of MGM.
7. Conduct speaking engagement slide show tour explaining the results of MGM.
8. Establish collateral duty for staff member to carry out objectives related to the MGM.
9. Provide assistance to chambers of commerce in local area in developing-tourism-related literature.
10. Establish and maintain contact with political delegation regarding MGM, park economics, external threats, etc.

While the specific purposes of each study will vary, it is clear that the key message will be the scale of economic benefits caused by the existence of the protected area. This will have its pitfalls, as discussed in previous sections, but given the strong focus by government on economic performance, it is also likely to draw a lot of policy attention.

Section 7. Conclusion

The impact of protected areas on the economy is not being measured - and in terms of public policy, this means it does not exist. This guidebook is intended to show the relative simplicity of such work and encourage park managers to consider systematic analyses of their own. While some of the concepts may be unfamiliar, they are not difficult to master with some practise and the assistance of sympathetic economists. Both economists and park managers have a lot to learn from each other!

It is recommended that other studies be examined as part of the process of preparing for this type of analysis. The reading of such reports will make the task seem more manageable. Finally, there are many other park managers who completed economic impact assessments in the past, and some liaison may assist in any future studies.

It is also recommended that park managers see the evaluation efforts as part of a process rather than as a single project. With time, statistics on the economic contribution of protected area's will become standard material in the public policy debate.

Appendix A. Calculating the cost of a water treatment plant

The cost of such a plant is estimated by calculating the discounted net present value of the of the operating costs of the plant over a 30-year period. Similarly the foregone interest on the $8 000 000 is estimated by use of a discounted net present value calculation. The two sums are added together with the $8 000 000 to provide an estimate of the total life cycle cost of the treatment plant. The total life cycle cost is then divided by the life of the plant (30 years) to provide a annual cost of plant operation.

The total operating cost and forgone interest cost of the waste water treatment plant is estimated to be $500,000 per year. The discounted net present value of $500,000 per year over thirty years, at 5% interest, is just over $8,000,000. The total capital cost is $8,000,000 as well, giving a total life cycle cost of $16,000,000. $16,000,000 over thirty years is annual expenditure of roughly $536,000 per year. That is, a water treatment plant in total costs the community $536,000 per year to build and operate. The community is avoiding expenditure of $536,000 per year as a result of the protection afforded by the PA national park. The community would be willing to pay up to $536,000 per year to maintain the PA national park were they aware of the benefit provided. The Downtown city communityÕs income is $536,000 higher than it would have been - had there been no PA National Park No 1. This is, therefore, part of the value of the national park to the people of Downtown.

The annual cost for plant operation provides a measure of the increased cost of water treatment that would occur if the plant was required. Conversely, it represents the income gained by the residents of Downtown through the presence of the PA National Park No 1 as a de facto water treatment facility. In theory, the residents of Downtown would be willing to pay for the maintenance of water quality and hence the maintenance of PA National Park No 1. The fee would be no more than the level of the avoided cost of water treatment.

Appendix B A further word on multipliers

The income multiplier is used to estimate the change in regional income as a result of the transaction. When a transaction takes place, the money earned is respent. Thus the initial transaction is the direct expenditure. Subsequently, some of the money earned will be used to pay suppliers. This is the indirect expenditure. Finally, the remainder of the money will be used to pay the wages for employees who worked for the company which got the direct benefit, and also for the suppliers. These are known as 'induced effects'. The expenditure can go round and round an economy, passing through many hands, facilitating a range of transactions. What prevents the money going around forever is that it 'leaks' out of the region and is used to buy imports. Thus eventually, all the money leaks away, bringing the multiplier process to an end. These leakages occur across the regional boundary into other regions. A multiplier analysis estimates the value of the direct expenditure plus the indirect expenditure plus the induced expenditure – caused by one initial transaction. A single transaction can have a large multiplier effect, expanding considerably, and thus providing a larger economic clout.

The difficult task is to get an accurate estimate of the size of the multiplier. The estimates of multipliers should be used with extreme caution. They are often formulated by survey techniques which estimate the amount of local expenditure which is spent on imports. Alternatively, input-output tables can be made up which provide a more transparent estimation of the multipliers. Finally, very complex economic models can be developed. It is recommended that input-output tables be used in these studies where sufficient data is available (see Chapter 4.).