PART II

This part of the Guidelines for protected area managers provides 16 examples or case studies of the process of valuation to help clarify the steps involved and highlight the ideas presented in Part I. Since each protected area is unique, stakeholders are interested in a different array of values. Each valuation exercise is itself therefore likely to be unique. Nonetheless, learning from practical experiences is probably the most useful way to understand in full how valuation can be used for a protected area and what a valuation study may entail in terms of resources, data and time.

1. Valuation study examples

The case studies cited here show that a valuation study is much more than attaching numbers to a stream of benefits flowing from a protected area. The valuation process can provide the protected area manager with an array of funding options, help to identify potential threats to the protected area, and lead to a justification for additional funding from existing sources.

Identifying alternative funding sources is an increasingly important topic in these times of fiscal austerity. The study of Borivli National Park (2.6) reveals that local businessmen in Bombay may be one approachable group for the protected area manager, as they attach unexpectedly high values to the protected area. Of course, actually capturing the values that are identified in the study is also important. The Pilanesberg study (2.8) is particularly interesting in that it results in a transfer of money from local resorts to the protected area to cover costs for introducing lion. Identifying and capturing alternative sources of funding can serve to secure the long-term existence of the protected area and its biodiversity, as a broad funding base is likely to be more stable than a narrow one.

A protected area may have been established without consultation of local groups or stakeholders, who may stand to lose their land or livelihood. The valuation process can help managers identify the groups which suffer as a result of the presence of the protected area and, perhaps, identify ways of altering management practices to ensure that the groups derive some benefits. The establishment of Mantadia National Park in Madagascar (2.3) is an example of local people bearing significant costs because of a protected area, and therefore being a potential threat to it. Though the authors of this study recommend that local people become involved in the planning of the protected area, they do not exploit the valuation tool by identifying possible benefits that local people could derive. Lucy Emerton's study (2.2), on the other hand, gives a detailed account of many of the benefits that local people in Kenya can derive from a protected area and offers an innovative method of measuring the value of those benefits.

Perhaps the most common reason for embarking on a valuation study is that the results can be used to justify additional funding for the protected area. Howard's study of the Ugandan protected areas system (2.1) stands out in this category because of its detailed analysis of the flow of funding and benefits. His conclusion that Uganda is actually subsidising carbon sequestration for the international community is persuasive and could provide a platform for Uganda to approach international donor agencies for more money. Also, Howard's study should be commended for its exploration of the various means of capturing this international funding.

Valuation is a developing tool and, as is evident from the studies in Part II, there are many ways to approach a valuation study. The reason for conducting the study, the audience which the study addresses, the nature of the protected area, the time limits of

the study, and the methods used for collecting the data will all be specific to the study. Table 1 below outlines how each of the studies here measure up to these tasks.

Table 1. Summary of the case studies

	1	2	3	4	5	6	7	8	9
Audience definition	x	x		xx	x	x	x	xx	xx
End use definition	x	x	x	x		x	x	x	x
Scope	x	x	xx	x		x	xx	x	x
Limits	x		xx						
Techniques									
• contingent valuation						x			
• hedonic pricing									
• travel cost method									
• change in productivity				x					
• loss of earnings			x	x					
• cost benefit analysis								x	x
• opportunity cost	x			x			x		
• other tools		x	x				x	x	
Policy outcome	x	x		x	x	x	x	x	xx
Means of capturing values	x							xx	

Key

1 Opportunity costs of protected areas in Uganda
2 Contingent valuation and costless choice methods in Kenya
3 Loss of productivity and contingent valuation in Madagascar
4 Stakeholder identification for Indonesian coral reefs
5 The value of forest reconstruction to the Croatian tourism industry
6 Willingness to pay for a protected area in India
7 Opportunity costs of alternative forestry practices in Nepal
8 Using a valuation study to capture revenues in South Africa
9 Benefit cost analysis in South Africa

x – Issue addressed
xx – Issue addressed very well

Table 1. Summary of the case studies (cont d.)

	10	11	12	13	14	15	16
Audience definition	x	x		xx	x	xx	
End use definition	x	x		x			
Scope			x		x		xx
Limits			x				
Techniques							
• contingent valuation							
• hedonic pricing							
• travel cost method				x	x		
• change in productivity							
• loss of earnings							x
• cost benefit analysis	x	x		x			x
• opportunity cost		xx					
• other tools		x	x	x	x	x	xx
Policy outcome	xx	x		x		x	
Means of capturing values						x	

Key

10 The economic contribution of key conservation areas in South Africa

11 Total economic value in Kenya

12 Financial benefits to a local economy in Australia

13 Financial benefits to a regional economy in Australia

14 The effect of environmental quality on consumer demand in Honduras

15 Local and national financial benefits from protected areas in Belize

16 The opportunity cost of a Fijian mangrove

x – Issue addressed

xx – Issue addressed very well

It is our hope that as people use this guide and as more economic valuation studies are conducted, these case summaries will be updated and amended to reflect this experience. The developing nature of the valuation tool requires a dynamic and ever evolving document. Further to this end, IUCN will house the background materials for these case studies and others which are collected over time on the Internet site, <http://economic.iucn.org>, email <economics@indaba.iucn.org>. This electronic filing system will provide a growing source of information on economic valuation for protected area managers and practising economists alike.

2. Case studies

This section contains case studies demonstrating a number of approaches to the economic valuation of protected areas.

2.1 Opportunity costs of protected areas in Uganda

Peter Howard (1995) assesses the overall benefits and costs associated with Uganda's protected area system so as to determine the net benefit to society of maintaining them. The study identifies a host of values attributable to protected areas and the array of measures which can be used in valuation. It also measures the benefits derived from direct use of marketed and non-marketed products, indirect uses and non-use values, and compares these to the costs of management and opportunity costs. A benefit-cost framework is used to compare the financial net benefit to the economic net benefit, reflected in social benefits and social costs.

Howard's study looks at the costs and benefits for three categories of protected areas: National Parks, Game Reserves and Forest Reserves. He selects three survey areas representing different forest ecosystem types, including tropical forest, savannah woodland and natural high forest mixed with grasslands.

Calculating the benefits derived from direct use of marketed products, Howard uses data on revenues from concessions, protected area and gate receipts, permits and licences, zoo entrance fees, softwood plantations, and other revenues from forest department licences for goods, such as timber, charcoal and building poles. The income from these sources is $1 million for 1993–94 (reflecting a financial year in Uganda).

To estimate the benefits derived from the direct use of non-marketed products, Howard surveys six local villages near a representative sample of the protected areas in Uganda. In the study, 84 household heads are interviewed about their resource use and data are collected about the quantities taken, the values of each product, time involved and the local market values. From this, the mean quantities and values of firewood, poles, timber, charcoal, thatch, hunting, granary materials, food and water are calculated. The values which households attribute to the protected areas depended on their distance from the protected area. The mean annual value for protected area products for households living within 1.5km of the boundary is determined to be $82 per year. For households living 1.6–2.5km away, the value is only $36 per year. As an alternative means of calculating this local use value, estimates are derived from the local market prices of these resources (with the exception of charcoal and timber), which range from $30 to $136 per household per year. On the basis of these field estimates, Howard arrives at a national figure of $33 million annually. While there are significant benefits to households living adjacent to protected areas, there are also large

costs suffered due to crop and livestock losses. The study determines that the annual household cost associated with these losses amounts to $135 per year.

The indirect uses considered in Howard's study include watershed protection, carbon sequestration and potential influence on the local climate. Howard derives an estimate for the value of watershed protection benefits as a portion of the value of fish catch and arrives at a figure of $13.8 million annually. He estimates carbon sequestration values in two ways. Based on figures of the damage that would be done if the land were converted and carbon released in the atmosphere, the value of Uganda's protected areas as a carbon sink is estimated at $245 million, which amounts to a $17.4 million annual cash flow if discounted at 5% over 25 years. Based on the estimated cost of replacing Uganda's carbon sink functions through an afforestation scheme, the value of the protected areas is estimated at $20.3 million annually.

Biodiversity values are the only option and existence values measured in the study. Based on a value of $0.4 per hectare per annum for the pharmaceutical value of rainforest land, and a $0.2 option value per hectare per annum figure for savannah and wetland systems, Uganda's annual option value for the pharmaceutical industry is calculated as $788,000. Additionally, the option value of Uganda's wild coffee genetic material is estimated to be worth an annual $1.5 million.

On the cost side of the equation, management costs include capital development and recurrent expenditures (such as salaries) estimated at $14.6 million. Howard breaks these costs down and identifies the funding sources. Of particular importance is the $6.2 million coming from international donors for site-specific protected area management and $4.5 million from donors for institutional support.

The opportunity costs measured in this study include benefits foregone due to the exclusion of human settlement, cultivation and pastoralism. These are measured in terms of expected net returns from conversion to land-use patterns similar to those in nearby areas. This part of the analysis uses the following steps:

1. assessment of the land area under cultivation in each district;
2. assessment of the land area under protection in each district;
3. assessment of the land area available for livestock in each district;
4. estimation of land values under cultivation;
5. estimation of land values under livestock; and
6. calculation of the potential value of protected area land under agro-pastoral development.

This results in an estimated opportunity cost from land that could have potentially been under cultivation or available for livestock production amounting to $110 million per year.

Howard then combines these values to arrive at the total economic value of Uganda's protected areas. The net financial benefit to Uganda of the protected areas combines (in millions) total revenues ($1) and donor contributions ($10.7) and subtracts from these

the government capital development expenditures ($1.1), the government recurrent expenditures ($1.2), and the national protected area revenues reinvested ($0.9) to arrive at a net financial benefit to Uganda of $8.5 million which represents a net present value of $120.6 million or $37.20 per ha per annum (using a 5% discount rate over 25 years).

The calculation of the value of Uganda's protected areas from an economic point of view, which takes into account non-marketed benefits and non-marketed costs, results in a very different sum. In this case, the non-marketed benefits include (in millions) timber values ($40), tourism revenues ($16.3), potential game utilisation ($0.7), community use ($33), watershed benefits ($13.8), carbon sequestration ($17.4), and biodiversity option value ($2.3). These total $123.5 million. The non-marketed costs include financial costs to Uganda, which are identical to the financial costs listed under the financial net benefit case above ($3.1), donor contributions ($10.7), crop and stock losses ($75.5), and opportunity costs ($110.6) totalling to $199.9 million. Thus, the economic perspective of the protected areas of Uganda indicate a net loss of $76.4 million annually – representing a net present value of $–1,077.60 million per year, or $–332.4 per ha per year (at a 5% discount rate over 25 years).

From this analysis, Howard then suggests that Ugandan protected area managers should find ways of increasing the direct revenues and social benefits from the protected area network, while seeking to reduce the management costs incurred. The national government should look at ways of increasing investment in its protected areas and reducing the demands on protected areas that are resulting from population growth.

Comparing the carbon sequestration benefits attributable to Uganda's protected areas and the current level of donor contributions to protected areas, Howard determines that Uganda is effectively subsidising the clean-up of atmospheric pollution from industrialised nations. Therefore he recommends that donors increase their level of support for protected area management and additional funding made available through mechanisms such as the GEF.

This example highlights the difference between financial and economic assessment in benefit-cost analysis. The net values for national considerations are strictly financial and the result differs substantially from the economic values, calculated at the international level. This is because the economic values reflect social benefits and costs. Many of these costs are not reflected in the financial analysis, such as the substantial estimate of opportunity costs, and some of the benefits in the financial analysis are actually interpreted as costs under the economic calculation.

Equally important is the array of policy suggestions that come out of such a study. The values have highlighted several management and financing measures which can be taken at many levels – from protected area managers to international donors – to improve the situation of Uganda's protected areas.

2.2 Contingent valuation and costless choice methods in Kenya

This study, conducted by Lucy Emerton of the African Wildlife Foundation (1996), provides a closer look at the process of eliciting people's non-market values for protected areas. The study was conducted to identify how and why local people use forests around the Aberdares in Kenya, so as to guide protected area managers towards a management system which integrates meeting local people's needs with conservation efforts.

The group conducting the study has to overcome a general unwillingness to reveal values of forest products, because many of the villagers' uses are considered illegal under the current management regime. By showing pictures of different types of forest use, the survey team provides a feasible alternative to direct questioning, which proves capable of eliciting values – though occasionally there is a problem of misinterpretation of the pictures. The forest uses measured include fuelwood, grazing, charcoal, building materials, honey, medicines, wild foods, hunting, and timber.

The group finds that cash measures have little relevance in the region. It is therefore necessary to find an item which has local value and can be translated into a monetary amount – such as a radio, a bicycle, or a milk cow. Cards represent the various forest uses and villagers are asked to allocate counters (seeds or stones) to each use in order to rank the value of each activity and the monetary item. For instance, if five counters are allocated to a radio (worth, say, $20), ten counters allocated to fuelwood, and 13 counters to grazing, then the value of fuelwood is two radios ($40) and the value of grazing 2.6 radios ($52). From this the number of counters allocated to each card is translated into a wealth item equivalent, then to a cash amount, which is discounted to arrive at an annual forest use value. The average annual forest value comes to 18,408 KSH in 1996 (or $306) per household.

The valuations arrived at through this study reveal the costs imposed on local communities by cutting off legal access to forest products in the protected areas. Additionally, these values indicate the high value of use for local livelihoods, which in turn can lead to ways of incorporating the community in management practices. Such a study can provide a useful means of turning threats to a protected area into assets – by partnering with villagers interested in the sustainable use of forest resources.

2.3 Loss of productivity and contingent valuation in Madagascar

Priya Shyamsundar and Randall Kramer's study of households in the vicinity of Mantadia National Park in Madagascar (Shyamsundar and Kramer, 1997) reveals some of the motives behind local resistance towards conservation efforts. The study uses cash flow and risk analysis to determine the magnitude of costs borne by local residents, due to lost access to land with the establishment of the protected area.

Cash flow analysis is an accounting tool which evaluates the monetary value of a flow of resources to a group of people. This study estimates the net present value of costs impacting three groups neighbouring the protected area. These costs are based on benefits foregone from agriculture and forest products, which are adjusted for labour

and capital costs. Risk analysis looks at a range of outcomes, such as low or high deforestation rates or low or high commodity prices, and predicts the likelihood of each outcome. Introducing risk allows for a consideration of the possible variation in factors which affect the net present value estimate. It is used to find mean net present values (NPV) of the costs.

Welfare implications are measured in terms of estimating the amount of land lost to households, reflected in reduced household production, which affects household income and consumption. A household survey is conducted to obtain information on land-use patterns, agricultural yields, forest outputs, forest product processing, and labour use. Interviews reveal market and price information related to the local subsistence economy.

The study finds that households bear an average cost of $49 annually, which is approximately 18% of total gross household income in 1991. While the average NPV cost (calculated on a 20 year basis) is $419, NPV costs vary from $240 (group 1) and $427 (group 2) to $564 (group 3), indicating that cost estimates for villages to the south-west of the protected area are much higher than those estimated for other villages.

Shyamsundar and Kramer do not provide a full accounting of the benefits and costs of conservation, since amenity, non-use and environmental values associated with forested protected area land are not measured. The authors conclude that such an exercise is valuable for its insight into relative differences of use by local residents and the different welfare impacts upon protected area-adjacent communities. They argue that the relative magnitude of the costs may be more important for policy decisions than the absolute value of the costs. The aggregate NPV of costs for a total population of 3,403 came to $305,590. This figure represents the value of benefits foregone to villagers due to the presence of the protected area.

This study can help managers understand and manage for local needs. Clearly, local residents stand to lose economically from the establishment of a protected area in their neighbourhood. Hence villagers need to be actively involved in the planning of protected areas if conservation efforts are to succeed.

2.4 Stakeholder identification for Indonesian coral reefs

Though not a valuation study of a protected area, but rather of a threatened ecosystem, this study of the values and forces behind the destruction of Indonesian coral reefs was conducted to recommend management responses. It reveals the importance of discovering not only what values exist but also who holds those values. In this study, Herman Cesar *et al*. (1997) attribute the deterioration of Indonesia's coral reefs to five causes: poison fishing, blast fishing, coral mining, sedimentation and pollution, and overfishing.

The study looks at the forces driving each of these destructive activities, the costs involved, and the distribution of the benefits and costs. It relies on observable data such as the value of the declining fish catch or hotel expenditures on reversing the process of

beach erosion. On the basis of these data, the study estimates the losses attributable to each threat in terms of fisheries, coastal protection, tourism and other losses, such as food security and biodiversity values. The estimated total net loss to society from poison fishing ranges from $43,000 to $476,000; from blast fishing, $98,000–$761,000; from coral mining, $176,000–$903,000; from logging sediment, $273,000; and from overfishing, $109,000. This compares to net benefits for individuals/stakeholders derived from poison fishing of $33,000; from blast fishing, $15,000; from coral mining, $121,000; from logging sediment, $98,000; and from overfishing, $39,000.

It is evident that the non-marketed costs of these activities greatly outweigh the benefits, so why do the threats exist in the first place? The authors answer this question by looking at the size of the stake per person and at the location of the individual causing the threat. They find that for poison fishing and logging, the private benefits per stakeholder are significant – ranging from $2 million per logging company to $0.4 million per fishing boat. They also find that large scale poison fishing operations are conducted by captains and crews from outside the local area, as is frequently the case with logging-induced sedimentation. Overfishing, though, may arise from local or distant sources.

The location of beneficiaries and size of their economic stake are important factors in determining appropriate management alternatives to the *status quo*. For instance, small threats from insider or outsider groups may be dealt with through community-based management techniques. In the case of overfishing, alternative income generation activities, regulations and the establishment of co-operatives may sufficiently address the threat. The authors suggest that when large threats derive from outside – such as poison fishing – these are best addressed through national action as it may require the involvement of the navy or police in large operations. Integrated coastal zone management is recommended as a tool for dealing with large internal threats as it is capable of dealing with multiple threats in an integrated manner. New legislation to transfer user rights to reef resources to local communities, or to sanction a return to the system of traditional rights (e.g. the 'sasi' system), would also offer solutions to current destructive behaviour.

The authors suggest that current implementation efforts of marine protected areas have so far been ineffective, due to poor management capacity. They assert that outside technical support or private sector interest, teamed with a stakeholder approach, may improve these results. They emphasise the importance of capturing revenues to compensate the destructive users for benefits foregone.

2.5 The value of forest reconstruction to the Croatian tourism industry

An economic analysis of a proposed Coastal Forest Reconstruction and Protection Project in the Republic of Croatia, Stefano Pagiola's (1996) study reveals the significance of environmental amenities – such as forests – to the tourism industry. Though not a study of a specific protected area, it is relevant to this guide because its lessons can be readily applied to protected areas.

The study is focused on the war-torn coastal zone forests of Croatia, which are particularly important for the tourism industry. The primary benefit of the forests is considered to be their contribution to the landscape. Additional values included in the study are benefits from wood production, hunting, and – where appropriate – watershed functions.

14 sites have been proposed for a reforestation project, so the economic assessment is conducted for these sites. Estimates for the landscape value of reforestation are based on the tourists' willingness to pay for the forested landscape (derived from previous contingent valuation studies) estimated to be $1.50 per tourist per day. Benefits from each site are then determined from the number of hotel beds which would benefit from the reforestation (based on the area visible from each site). The results are adjusted for site-specific factors – such as whether they will provide benefits to tourists driving through the region, but not occupying hotel beds, or sites which suffer from negative features (such as a mine) and would therefore be less likely to obtain the average willingness to pay for a forested landscape.

Hunting values are measured in terms of additional permits sold to foreign hunters. Wood production is based on harvest rates for pulpwood or saw-logs, and assumed stumpage fees of $10/m3 and $30/m3 respectively. Where watershed values are relevant, benefits are calculated on the basis of cost per hectare to avoid the damage caused by deforestation.

The costs of the project at each site are measured in both financial and economic terms. These are based on discussions with those implementing the project. The major difference in the financial and economic valuations results from the difference in labour costs. The financial measurement uses a labour cost of $36/day where the economic analysis uses a cost of $23/day – which adjusts for taxes and other transfers.

Based on these figures, Pagiola determines that the landscape considerations are paramount and by themselves justify restoration at all of the sites where restoration has a positive rate of return. (At these same sites, the total of the other three benefits would not be enough to justify reforestation). Relaxing the assumptions (about willingness to pay and the recovery of tourism) does not change the results.

Though 11 of the sites in this study are judged on a benefit-cost basis, the author argues that three of them should be judged on a cost-effectiveness basis because they are inside a national park. Cost-effectiveness criteria are more relaxed than benefit-cost criteria, thereby enabling the decision-maker to account for the fact that the primary function of forests within the park is their contribution to the park's ecosystem rather than to the tourism industry.

This study demonstrates how valuation can be used as a tool for aiding decisions at a project level. Economic benefits of environmental amenities such as forests can and should be included in the benefit-cost analysis of projects. At times these values may prove to be the deciding factor in the analysis – such is the case with the landscape values of forests in the coastal zones of Croatia.

2.6 Willingness to pay for a protected area in India

Though largely an academic exercise in contingent valuation, Hadker's study (1997) provides some interesting insights into the practice of contingent valuation in a developing country. The focus of the study is Bombay (now Mumbai) residents' willingness to pay for maintenance of Borivli National Park, which is located within the city limits of Bombay. The study interviews nearly 500 residents from around the city and from a variety of socio-economic backgrounds.

Interview material includes a brochure which informed the respondent about the protected area, including a description of the valuable flora and fauna and the management problems that the protected area currently faces. Respondents are assured confidentiality and are given the prospect of making monthly payments over the next five years. The first section of the interview is dedicated to obtaining information about the respondent's social, economic and demographic characteristics: their age, gender, occupation, education level, residential area, family size and income level.

The second section of the interview tries to categorise the respondent as pro-conservation, pro-development or in the middle. The third section involves the presentation of the brochures and information about the protected area. Respondents are then presented with two scenarios – one where present detrimental trends continue, and another where a management plan is put in place to halt these trends. In the fourth section respondents are given an 'opening bid', representing their contribution for the implementation of such a management plan.

After explaining that acceptance of the bid would mean they would be likely to forego alternate investments – in other environmental causes or goods or services – respondents are asked to accept the bid, reject the bid, or offer no response. Respondents accepting the bid are then asked the maximum they would pay. Additionally, respondents are asked if they would like to volunteer in the protected area. This question is intended to discover the willingness to pay of people who could not afford a monetary bid. The study finds that time constraints limit respondent's ability to volunteer.

In designing the survey, the team attempts to:

1. make the objectives of the interview clear;
2. enable interviewers to record as many of the preferences respondents were expressing as possible;
3. account for, and manage, the numerous biases relating to a contingent valuation study; and
4. define the scenario as realistically as possible.

The study finds that income, visitation rate to the site, membership in an environmental organisation and preferences for environment-related activities are significant in identifying those respondents with higher values for the protected area. This last factor – the "green" factor – is explained by economists by embedding, where a person's response to a valuation is affected by their underlying value system.

Interestingly, businessmen are willing to pay significantly more than other professionals. The study suggests that this has important policy implications as this group may be able to finance environmental improvements. Indeed, it would seem logical for the protected area manager reviewing this study to pursue this avenue of funding.

Additionally, the study arrives at a willingness to pay of 7.5 Rupees (equal to $0.23 in 1995) per month per household. This amounts to a total present value of 1033 million Rupees (or $31.6 million). The authors suggest that this number could be used to influence policy decisions as the protected area currently runs on a budget of 17 million Rupees (or $520,200).

This study is also interesting for its treatment of a number of biases which it accepts may introduce an element of uncertainty into the valuation study. When an adjustment is made for this uncertainty, the estimated mean value for willingness to pay drops from 27.75 Rupees ($0.85) per month to 7.5 Rupees ($0.23) per month. Willingness to pay is also broken down into groups of people who are defined as pragmatic (12.81 Rupees or $0.39), green (with a very high level of 40.85 Rupees or $1.25) and development-oriented (10 Rupees or $0.31).

Though the study is largely dedicated to the development of contingent valuation methodology for the case of developing countries, it arrives at some interesting insights for policy and management avenues, such as the idea of approaching businessmen for funding. Some aspects of the study, such as the idea of volunteering in lieu of a monetary payment, provide possible alternatives to problems which are more likely to occur in developing countries.

2.7 Opportunity costs of alternative forestry practices in Nepal

Though this too is not strictly a protected area case study, Katherine Houghton and Robert Mendelsohn's economic analysis of multiple-use forestry in Nepal (1997) demonstrates how valuation information can feed into decisions about alternative management practices. This study compares the contribution to net income of five different forest types to non-irrigated agriculture.

Forested land in Nepal has been the issue of some intense property rights conflicts between the Nepalese Government and villagers. The government has traditionally used forested land for timber or conversion to farmland. Villagers rely on forests for fuelwood and fodder. In 1957, the government nationalised all forests and banned villagers from them. However, in 1978 national legislation on community forestry was passed that allowed for the handing over of forest management rights for a large portion of the forests in the Middle Hills. Thus, once a management plan is agreed between local communities and a forest officer, forest use by villagers is no longer considered illegal. Yet, even after the handover of community forests, the government has not fully acknowledged the value of non-timber forest products and thus has, in the view of the authors, underestimated the importance of multiple-use forestry.

The authors measure the value of three products – timber, fuelwood and fodder – over the life of five types of stands (chir-pine, old-growth sal, seedling sal, oak and chir-pine mix, and rianj oak). The quantity of a particular product varies over the course of the life of a tree. For example, fodder in the form of grass is available from the first year of a plantation, while fodder in the form of leaves is available from the fifth year on. Fuelwood from branches is available from the seventh year on and from the bole (tree trunk) from the 15th year on. Timber is available from the 15th year on.

Firewood and fodder prices and harvesting costs (measured in time spent collecting) are obtained through interviews. Timber prices are fixed by the government and therefore do not necessarily reflect the true market price. Instead the authors use fuelwood prices as a minimum measure of timber products – as timber producers would sell their boles for fuelwood, if fuelwood prices were higher than timber prices.

Combining the quantity, price and collection cost data, the study concludes that the net value of branches is low – largely because of the time involved in collecting them. The high price of grass makes grass production one of the most important sources of revenue. Fodder production in general accounts for 40–55% of the net value of broadleaf forests but only 22% of the net value of evergreen forests. Bole provides between 42–54% of the net value for broadleaf forests and 71% of the value for evergreen forests. Overall, broadleaf forests are found to have higher net present values – ranging from $2,732 to $3,616 per ha – than the evergreen forests – valued at $2,167 per ha.

The authors conclude that landowners can best use their forests by taking advantage of fodder, fuelwood and timber products. Comparing the forest values to agricultural values, the authors further determine that forests generate more than 10% higher values per ha than agriculture (or a net present value for non-irrigated agriculture of $3,140, which includes maize, millet, wheat, crop residue and terrace grass). Thus, multiple-use forestry management practices provide the most efficient use of forests in Nepal.

2.8 Using a valuation study to capture revenues in South Africa

The importance of identifying the groups of people who obtain the benefits as well as those who pay the costs associated with those benefits is brought out in an economic study by Deborah Vorhies and Frank Vorhies (1993). The study was commissioned by a protected area and wildlife management board to inform a management decision to introduce lion into Pilanesberg Protected area in South Africa. By tracing both the benefits and costs of introducing lion, the authors identify the potential ecological, social, economic and political impacts related to lion introduction.

On the benefit side of the equation, the authors determine that the primary benefit from the introduction of lion would come from increased tourism expenditures in the protected area and in the neighbouring resorts. The study measures these benefits through increases in gate revenues, camp revenues, photo safaris, hunting safaris and resort revenues.

The authors divide the costs of introducing lion into capital and operational costs. Capital costs include the purchase of the lions, sterilisation, boma facilities (confined areas for the lions when they are first moved to the protected area), monitoring equipment, fencing and so on. Operating costs include salary for a monitoring officer, monitoring costs, maintenance, insurance, food for the lions and so forth. Worst, likely and best scenarios for each of the benefits and costs are given to account for various projected changes.

Based on these benefits and costs, the authors conclude that the protected area itself would lose between $63,000 and $670,000 with the introduction of lion. On the other hand, the region would earn between $5,300,000 and $12,000,000. This second set of 'regional' numbers reflects the significant benefits to the tourism industry from the introduction of lion into the protected area. Based on this study neighbouring tourist resorts agreed to cover the costs to the protected area of the lion introduction programme.

2.9 Benefit cost analysis in South Africa

In his study of Kruger National Park in South Africa, administered by the South African National Parks Board, Mike 't Sas-Rolfes (1997) examines the flow of costs and benefits, identifies the groups who attain the benefits and bear the costs, determines the threat that arises out of this allocation of costs and benefits, and recommends alternative policies and management practices and policy roads.

The study determines that protected area staff, visitors, scientists and poachers receive benefits under the current management style in the form of employment, below market visitation fees, access to an 'outdoor laboratory' and income from harvesting resources. Additionally the protected area provides values in the form of education, environmental services, and option and existence values.

Costs are accrued by South African taxpayers, local people, the South African public and consumers of natural products. The taxpayer contributes to the park's operations. Local people are subjected to raids by wild animals such as elephants, lions and hyenas. The local public therefore bears the costs from owning an asset which they do not benefit from. Consumers of natural products bear a cost because they are denied access to them despite their willingness to pay market values. Additionally, the local public may hold a negative existence value for the protected area because they view other uses of the land as more beneficial.

The distribution of these benefits and costs demonstrates the inequitable nature of current protected area management practices. Additionally, the study shows that Kruger National Park's performance is inefficient because many of the opportunity costs exposed in the 'costs' section could be eliminated or converted to benefits without seriously compromising the existing benefits. In other words, it is possible to make some people better off without making anyone else worse off.

The study concludes with a series of recommendations for the South African National Parks Board, including a suggestion that the Board:

1. diversify Kruger National Park operations – increasing the range of revenue producing activities;

2. democratise the park's management operations through a devolution of property rights to local people or through the development of more participatory systems of democracy; and
3. commercialise the management of the park.

This last concept, commercialising the management of the protected area, is particularly interesting for the purposes of this guide. Commercialisation, as 't Sas-Rolfes refers to it, includes any changes to the management regime that lead to greater use of business principles. 't Sas-Rolfes argues that commercialisation will lead to greater efficiency in the running of the protected area which will in turn result in improved benefits to taxpayers since they get better value for their money. This occurs because state subsidies are cut and the financial viability of the protected areas system is strengthened. As a result, funds are released for non-commercial conservation activities. Together these developments help to secure the long term financial viability of the Kruger National Park's management.

't Sas-Rolfes recommends that the National Parks Board establish strong property rights, market pricing and a competitive environment in order to institute a more commercially viable operation. These steps will provide managers and other stakeholders with incentives to improve their performance and that of the National Park as a whole.

2.10 The economic contribution of key conservation areas in South Africa

Geert Creemers, Louis Liebenberg and Peter Massyn (1995) examine the economic contribution of key conservation areas such as St. Lucia in South Africa. The values measured in this study are based on the financial benefits the protected areas bring to the South African economy.

The study argues that certain protected areas in South Africa – such as Kruger National Park, the Cape Peninsula, and possibly St. Lucia – are instrumental in attracting tourists to South Africa. Therefore, the authors believe, the value of the tourists' financial contribution to the South African economy should be based on the total value spent in the country by tourists who have chosen South Africa because of the particular protected area(s) which have attracted them.

The authors argue that St. Lucia's high biodiversity, its status as a Wetland of International Importance under the Ramsar Convention, its application for status as a World Heritage Site, and the fact that it is home to the 'big five' game species ranks it among the key protected areas for tourism.

The study was produced to refute an estimate completed by an Environmental Impact Assessment (EIA) team for a proposed mining project in St. Lucia. The EIA places a value of foregone tourism benefits (due to mining) at between R30 and 70 million. The authors argue that this value, which assumes that visitors will select alternate destinations in South Africa, understates the potential impact of the mining

operations. Working from an alternate set of assumptions (that the presence of the mine could preclude overseas marketing of the park), the authors conclude that foregone revenue to national tourism would be R300 million per annum. This figure, when projected over 28 years (un-discounted) amounts to a loss of R8000 million, which rivals the expected revenue for mining.

Based on these results, the authors argue that the mining proposal should be rejected as it jeopardises the site's application for World Heritage status, and is not in keeping with South Africa's obligations under the Ramsar Convention and the CBD.

The study was presented at a national workshop attended by the Ministers of Economic Affairs of the province and subsequently had a major impact on the mining development plans. The mining application was rejected on the basis that conservation could bring economic benefits while being environmentally sustainable. Incidentally, the mining project's EIA was the largest ever undertaken in Africa, costing about R10 million. This economic valuation study was done without a budget and took 10 days to complete. This emphasises how tailoring the study to the needs of the audience can minimise the costs and maximise the effectiveness of the study.

2.11 Total economic value in Kenya

M. Norton Griffiths (1994) uses a total economic value framework to determine what costs and benefits are associated with Kenyan protected areas and where those costs and benefits accrue – nationally or globally. The study arrives at some interesting conclusions in that Griffiths determines that the Kenyan government is subsidising global use and non-use values for the protected areas.

By measuring the tourism, forestry, watershed, biodiversity and carbon sequestration benefits and the opportunity costs of Kenyan protected areas, Griffiths determines that Kenya bears an annual net cost of US$2.8 billion. This is largely because of the significant opportunity costs as measured in terms of the value of protected area land if it were converted to agricultural or other uses. On the other hand, the global benefits of Kenya maintaining the protected areas amount to a significant $11 billion. Thus, it is in the global interest for Kenya to maintain its protected areas.

The obvious policy implication is for the global community to compensate Kenya for maintaining their protected areas and foregoing the development benefits. The GEF is one possible mechanism for making such a payment. The GEF pays the incremental costs for projects undertaken by a nation to preserve biodiversity. The incremental costs are those additional costs that the nation would accrue by altering a project in such a way that it serves the global environment.

But, as Griffiths rightly points out, Kenya's situation was not considered when the rules to the GEF were drawn up. There is no single 'project' in Kenya for the GEF to fund, nor are there incremental costs.

Griffiths suggests that Kenya could propose a project to develop a portion of their conservation estate. The global community should then be willing to pay Kenya not to

pursue the project. He terms this 'environmental blackmail' and suggests that any country pursuing such a strategy for acquiring global funding for its protected areas would 'come under intense pressure'. An alternative could be to establish a trust fund which would provide Kenya with annual derivatives for maintaining their protected areas.

2.12 Financial benefits to a local economy in Australia

As part of a larger book on the Economic Evaluation of National Protected Areas, the Warrumbungles study (Ulph and Reynolds, 1981) measures the value of Warrumbungles National Park to the local economy. The Warrumbungles National Park is located in New South Wales, Australia.

This study surveys regional tourist expenditures; collates expenditure data on protected area operations; surveys regional employment and recreation-related industries resulting from the protected area; and traces the effect of this employment as it filters through the regional economy. The study then applies employment and income multipliers and finds that the protected area brings $8.5 million annually into the local economy. Protected area costs are determined to be in the order of $3.95 to $5.44 per visitor-day. Thus the study concludes that the Warrumbungles National Park contributed $500,000 and 39 jobs to the economy of the local area in 1978.

The Warrumbungles study focuses on the financial value contributed by the tourism and recreation sectors, and the government expenditure paid into the region. The report then checks to ensure that the costs of protected area operations were less than the revenue generated by the protected area.

The strongest merit of the Warrumbungles study is the elegant means by which it explains the key features of an economic assessment. Though the book was written in 1984, it provides the reader with a useful introduction to economic valuation issues. It also provides an explanation of welfare analysis. The study's results, methodology and practice examples are easy to follow.

2.13 Financial benefits to a regional economy in Australia

The Grampians National Park study (Read-Sturgess, 1994) was completed in 1994 on behalf of the State Government of Victoria, Australia. The study assesses the contribution of the Grampians National Park to the regional economy and calculated consumer surplus benefits from the area.

The study identifies tourism/recreation, honey production and water production as economic and financial values derived from the Grampians region. Mining and forestry occurred in the past but are no longer practised. The site, and hence the Grampians region, is the beneficiary of expenditure by the State government. Apart from mention of the previous activities, no opportunity costs are given. It is assumed that the opportunity cost of establishing the Grampians National Park area is zero.

In completing the study, the authors first identify the relevant region around Grampians National Park which is defined by direct expenditures of visitors to the protected area, and the associated level of employment. From these expenditures and the related jobs, the study estimates the multiplier effect of direct expenditure in the Grampians region on the economy of Victoria as a whole.

Travel cost methods are used to estimate tourist expenditure (calculated by using total trip costs) and on-site costs (estimated using a weighted average of three visitor classes). The authors note that the expenditures incurred by the protected area authority and other agencies within the region would otherwise have been avoided if the Grampians National Park had not been established.

The Grampians National Park has 68 sites for bee hives. These produce honey that raises about A$156,000 (US$120,000) per year in revenue. Other benefits include building up hive strength and bee numbers, but these benefits are not quantified.

A visitor survey forms the basis for the calculation of tourist expenditure. The survey looks at accommodation, mode of travel and length of stay. The study then estimates likely expenditure on car or bus travel costs, accommodation, food and other expenses on the basis of these survey data. A major concern in this study is the allocation of transport costs, and distinguishing between different types of visitors. Visitors are classified by their point of origin, distance travelled, length of stay, mode of transport and estimated costs for different components of the visit.

Water data estimates correspond to likely water prices inferred from known water prices. However, this calculation was taken no further.

Indirect and induced financial benefits are calculated by applying a multiplier to direct expenditure in the region in order to obtain an overall assessment of the economic impact on the region. Similarly, the State multiplier is applied to the direct expenditure in the region so as to obtain a measure of the overall economic impact through indirect and induced effects.

The Grampians National Park study demonstrates the possibilities for assessment when using limited data. The absence of cost data necessitated the estimation of costs, which were then manipulated by estimated multipliers. The study also clearly outlines problems surrounding allocation of expenses for travel purposes.

2.14 The effect of environmental quality on consumer demand in Honduras

This study was conducted by Linwood Pendleton (1993), based at the Yale School of Forestry and Environmental Studies in the United States. His work examines the role of environmental quality in determining the frequency of diver visitations in Roatan, Honduras.

This study uses multiple regression analysis to test the hypothesis that environmental quality affects the demand for dive sites. Put simply, it sought to test whether

environmental, topographical and time parameters determine the number of visits at dive sites.

The study recorded data from one resort that was thought to have 90% of the dive visitors for the area studied. The data recorded included:

- the number of divers;
- dive boat destination for all day dives;
- the number of divers per dive site per boat trip;
- number of visits to a dive site by dive boats; and
- time each dive occurred (morning or afternoon).

Each dive site was measured using four environmental parameters, which were indicators of reef health:

- percent of live coral cover;
- percent of algal cover;
- parrot fish abundance; and
- sturgeon fish abundance.

The presence of topographically interesting attributes such as caves and tunnels were evaluated, using 'dummy' variables for each category. At the suggestion of the dive masters, the number of houses within view of the dive site was also included.

Intuitively, it would seem reasonable to postulate that, to some degree, the environmental quality of the reef would positively correlate with the number of tourist visits. If the relationship is positive and strengthening, the implication is that one way of increasing economic benefits is to improve environmental quality.

The study concludes that the travel time to the dive site and percent of live coral cover were significant variables in the divers' choice of sites. Also significant was the presence of interesting topographical features. Aside from the percent of live coral, other indicators of coral health were not significant variables, nor was the number of houses visible at the dive site.

2.15 Local and national financial benefits from protected areas in Belize

Kreg Lindberg and Jeremy Enriquez (1994) conducted a study commissioned by the World Wildlife Fund in conjunction with the Belize Ministry of Tourism and Environment to examine the contribution of ecotourism to environment and development in Belize. The aim of the study is to provide information to assist planning and development efforts in Belize.

The study focuses on benefits of tourism to protected areas, local economies and the national economy. At the protected area level, the primary focus is on financial impacts. At the local level, employment and income impacts are the primary focus.

At the protected area level, the authors judge tourism on two sets of criteria: 1) does tourism pay for itself? and 2) does it generate revenue above the level necessary to cover costs incurred to proved ecotourism opportunities? They determine that the protected area funders (government and international donors) are subsidising tourism – thus not even the first set of criteria are met.

The authors suggest that the government set out general objectives for tourism (such as whether tourism should be subsidised, just pay for itself, or support protected areas). The government should then allow individual protected areas to develop site-specific policies for meeting these objectives. Additionally, revenues earned by protected areas should be returned to protected areas and the government should establish an endowment fund which enables 'popular' protected areas to cross-subsidise unpopular, but environmentally important, protected areas.

At the national and local economy level, the authors conclude that the Belizeans have not taken full advantage of tourists' values for protected areas. Their recommendations to the Ministry of Tourism and the Environment and other governmental and quasi-governmental agencies include:

1. increase training and capital availability to help Belizeans own and manage tourism businesses;
2. improve tourism promotions;
3. link tourism to other sectors in the economy;
4. improve tourism infrastructure including facilities and services; and
5. expand tourist attractions.

2.16 The opportunity cost of a Fijian mangrove

Padma Lal (1990) completed this study as a PhD thesis. It was subsequently published by the United Nations Development Programme (UNDP) and UNESCO. This study examines mangrove conservation and use in Fiji and analyses ecological and economic dimensions of mangrove management actions. Specifically, the study analyses the decision to carry out rice farming and sugarcane farming schemes from an economic and financial standpoint. The analysis is useful for: (a) its comparison of financial and economic costs and benefits; (b) its integration of subsistence use benefits into a benefit-cost framework; and (c) its application of incomes approach, alternative costs, and non-market transactions of use rights to measure economic costs and benefits. Additionally, the study shows how ecosystems can be used to delineate the boundary of a valuation study.

The dual analysis of financial and economic costs and benefits reveals how the scope of a valuation study can affect the results. For instance, Lal finds that the financial costs

of farming one hectare of recovered land range from $528 to $617 but the economic costs of farming that same land (accounting for subsidies and family labour) range from $592 to $761.

The economic analysis becomes particularly relevant when Lal examines the subsistence use of mangroves. The net benefits of subsistence uses of fisheries products nearly equals the net benefits of commercial uses. For forestry products, the subsistence uses exceed the commercial uses. Clearly a straight financial analysis would miss a large portion of the picture.

Lal uses a number of techniques to measure the non-commercial benefits and costs. The incomes approach values the marginal change in fishery output as the mangrove swamp is reclaimed. Where such information is not available, a sensitivity analysis is applied using factors derived from the literature. The alternative cost method derives the waste recycling value of wetlands based on the cost of the next possible solution – a tertiary sewage treatment plant. The non-market transaction of use rights reveals an estimate of ecosystem values based on the practice of trading use rights.

The case of the non-market transactions of use rights is particularly interesting. Indigenous peoples in Fiji hold the right to use the mangroves as "traditional fishing right owners" (TRFO). In the 1960s a non-market institutional mechanism was established to provide a formal process of compensating TFROs for losses incurred from the conversion of mangroves as a result of development. The amount of compensation is determined by an independent arbitrator, though, which leads to wide variations in amounts given for compensation. Lal observes that these variations are rarely related to the ecosystem of economic parameters but rather to the political activity of the TFROs (those who are more politically active receiving more compensation).

Finally, Lal demonstrates how ecosystems can be used to define parameters of a valuation study. Mangrove ecosystems are linked terrestrial-aquatic systems which are affected by upstream land-use decisions and are at the same time important to the aquatic part of their life zone. This interrelated nature of the ecosystem highlights potential secondary impacts of developments.

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