Chapter 16
economic evaluation

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A growing environmental awareness and the development of environmental and ecological economics over the last three decades have led to an increasing understanding that the economic values of environmental attributes are considerably wider than just the dollar values they generate.

The studies in this report examine in detail different aspects of Kosciuszko National Park. Theis economic study in this chapter attempts to combine the financial, social and environmental values to give a broad perspective of how the park contributes to the state and to the nation. Such an attempt at valuation is not easy, and its comprehensiveness has been limited by the available time and resources. By no means have all the economic values of the park been valued here, although we do detail how such values may be estimated.

Valuation methodology

Economic values associated with environmental attributes can be described in many ways, and have been categorised by various authors (eg Young, R 1991; Pearce and Turner 1990). While there are similarities in the general concepts, there are differences in the details and underlying assumptions of the various approaches. Although environmental valuation methodology has wide acceptance, there are still some economists and environmentalists who question its relevance and use (eg Tietenberg 1992).

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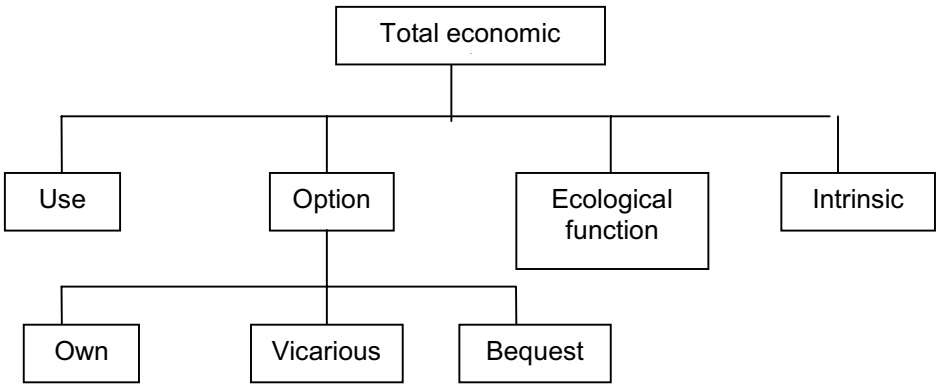
Nevertheless, the use of environmental valuation is increasing (eg Queensland Environmental Protection Agency 2002). Figure 16.1 shows the approach reported here, which is adapted from MD Young (1992).[1]

Figure 16.1 Model for environmental valuation



'Use values' are values that people gain from using the environmental attribute. This category includes a diverse range of values such as the value of water provided, power generated and crops produced, as well as the value of recreation experiences and the enjoyment that people gain from viewing environmental attributes in photographs or television documentaries.

'Option values' are values held by people who want the resource to be there in the future for their own personal use or the personal use of others. Following Pearce and Turner (1990), both 'bequest values' and 'vicarious values' fall into this category.[2]

'Ecological function' values are benefits that humans derive directly or indirectly from the habitat, biological or system properties or processes of ecosystems. It includes such functions as flood control, regulation of the atmosphere's gases and the waste assimilation capacities of river systems. This type of value has received widespread interest since 1997, when Costanza and others published a paper in *Nature* (Costanza et al 1997). While research in this area is progressing, there are currently insufficient relevant data to assign monetary estimates to these types of values for the Kosciuszko National Park.[3] A project to quantify ecosystem values in the park could be undertaken. Significantly, a number of these values are likely to take the form of services, like water supply, delivered to other parts of New South Wales (NSW), Victoria, the Australian Capital Territory (ACT) and South Australia.

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[1] One common community view is that environmental attributes have value in their own right (that is, in the absence of humans they would still have value). The approach taken in this report is that environmental attributes have value because they are important to people. In many cases these values can be related to aspects of irreversibility, uncertainty and uniqueness.

[2] 'Bequest values' are concerned with the value that people place on preserving the environment for future generations. 'Vicarious values' refers to the pleasure that people obtain from observing others derive use values.

'Intrinsic values' are values that people attribute to the knowledge that the environmental attributes exist. According to Pearce and Turner (1990), they reflect people's preferences and include concern for, sympathy with and respect for the rights or welfare of other organisms, not related to their use by humans. For example, people gain value just from knowing that the Corroboree Frog exists.

Use and non-use values are strongly related to cultural values. Many cultural values (such as aesthetic, historic, scientific and social values) are part of use and non-use values. These are examined in depth elsewhere in this report (eg Chapters 13 and 14). However, one source of difficulty is the significant difference between what Adamowicz et al (1998) call 'held values' and 'assigned values'. Held values are the ethical beliefs that individuals or groups share concerning how one should live one's life. They involve concepts that go well beyond the standard economic concept of a good that can be exchanged or traded. Assigned values are defined by the relative worth of things. Held values tend to be relatively stable over time but assigned values reflect adaptations to changing conditions (CSIRO 2000).

When objects, practices or places are considered sacred, revered or taboo, conventional decision-support techniques have little application. Typically, held values are sacrosanct and non-negotiable. They are not considered tradeable. No monetary amount or preference ranking can be assigned (CSIRO 2000). Hence, these values can be above and beyond any values described in this chapter.

In economics, the estimation of total economic values in itself is not as important as assessing the change in economic values that may result from a change in policy or direction. However, the brief for this paper was to determine the economic values associated with Kosciuszko National Park, not the change in value from a change in management.

Values attached to Kosciuszko National Park

Examples of the types of values associated with the Kosciuszko National Park are presented in Table 16.1. These types of values were largely derived from the literature provided to the members of the Independent Scientific Committee (ISC) and they fit most neatly into use and ecological function values. However, there are also significant option and intrinsic values. The table shows that there is considerable overlap among different types of benefits; they are not additive.

[3] Costanza et al (1997) provided broad estimates for a range of values derived from the literature available at the time. For example, the waste treatment functions of rivers and lakes were valued at $695 per hectare per year when expressed in 1994 US dollars. Further examples of the values derived by Costanza et al are presented later in this report.

Table 16.1 Examples of values associated with Kosciuszko National Park

Use values	Ecological function values
Irrigation	Atmospheric gas regulation
Urban water use	Flood mitigation
Power generation	Genetic resources
Recreation (including bushwalking, sightseeing and skiing)	Pollination
Photography	Waste assimilation
Education	Nutrient cycling
Health	Pharmaceuticals and other products
Research	Water supply

Generally, it is much easier to gain data for values related to the direct use of an environmental attribute, such as value of water supplied to irrigators.

Without conducting specific studies, it is difficult to gain estimates for many other values of Kosciuszko National Park. For example, robust estimates of the values of specific ecological functions or intrinsic values would need further study. Although it is usually possible to quantify environmental benefits in physical terms, it is much harder to place monetary values on environmental benefits without substantial effort. Briefly, there are three main ways to estimate the value of environmental benefits:

- 'Environmental valuation' estimates the specific benefit and costs for a given project through various environmental economic approaches (such as contingent valuation, choice modelling, hedonic pricing or travel cost method).
- 'Benefits transfer' involves transferral of values obtained from other economic environmental valuations if they meet some prior criteria.
- The 'threshold approach' provides a figure for what the minimum value of environmental benefits has to be in order to justify the existence of a project.

Much of the new work on the value of ecosystem services seeks to identify opportunity cost. Environmental valuation is generally expensive and resource intense. Although many projects may have several unpriced benefits and costs associated with them, a choice needs to be made on when and how values are attributed to the environment. Such unpriced benefits or costs are referred to as 'externalities'. A first best policy is always to try and accurately estimate the value of all externalities, but in reality this is rarely possible. This is why many economic analyses will employ the method of benefits transfer. In some cases, it is possible to provide a broad order-of-magnitude estimate by reference to the values derived in other studies. For such a transfer of values to be valid, the following criteria need to be met:

- the primary study cannot be fundamentally flawed;
- the study site and the policy site need to be similar;
- the environmental change at the policy site needs to be similar to the environmental change at the study site; and
- the socioeconomic characteristics of the populations affected by the environmental changes at the two sites need to be similar.

These criteria are very restrictive and consequently are rarely met. New developments in environmental valuation have increased the probability of benefits transfer.

Recently, another technique for valuing changes to environmental attributes has been developed and trialled. This approach is termed 'choice modelling'. Respondents evaluate a number of different options or scenarios that have varying levels of attributes, taken from a common set, and express their preference by making a choice between options. Given the wide-ranging design of choice modelling, early indications are that it has the potential to satisfy benefit-transfer rules; therefore, some carefully planned choice-modelling studies could be used to transfer benefits from one study to another. If the review of the management plan for the Kosciuszko National Park indicates major changes to costs of managing the park, then it would be desirable to use a choice-modelling approach to gain an understanding of the values that people place upon changes to various attributes of the park. Not all values will be covered by this technique. In fact, there is no known simple technique that is capable of estimating all values. Normally, a suite of techniques needs to be used with careful design to avoid double counting and the summing of inconsistent numbers.

If conditions for benefits transfer are not satisfied, then the threshold approach could be used. This approach provides a figure for what the minimum willingness to pay for the environmental benefits would need to be, to warrant the change in expenditure. This figure is then presented to the community and to government and they are asked whether this figure seems reasonable given the presence of environmental improvements and costs.

The following section describes the values associated with Kosciuszko National Park that it has been possible to quantify. Tourism economic values are part of use values but are not elaborated here as they are detailed in Chapter 17.

Use values

Irrigated agriculture

The annual value of irrigated products from the Murray-Darling Basin is approximately $3.5 billion. Under the Snowy Water Licence, Snowy Hydro Limited is required to provide minimum annual releases of 2088 GL to the Murray and Murrumbidgee rivers — ie 1062 and 1026 GL respectively (Carol Bruce, Snowy Hydro Limited, pers comms, 14 August 2002). Scoccimarro et al (1997) report that these releases represent long-term average contributions of approximately 5% to the Murray system and 14% to the Murrumbidgee system. They further report that in years when downstream water supplies are reduced by low rainfall, the relative importance of the contributions from the Snowy Mountains Hydro Electric Scheme increases significantly.[4] Adopting a conservative approach and using the long-term average contributions presented in Scoccimarro et al, the Snowy contributes at least 7% ($245 million)[5] to the annual value of irrigated production in the Murray-Darling Basin. Based on an estimated, indicative value-added multiplier of 0.6 the annual value-added contribution to the regional economies associated with this level of irrigated production could be in the order of $150 million. In traditional terms this is often described as the economic impact of the water provided for irrigation to regional economies.
Of course, there are significant extra contributions to the regional economies from the further processing of these agricultural products.

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[4] This point is supported by Carol Bruce (Snowy Hydro Limited), who reported that flows from the scheme into the Murray River range from 5% of average annual flows in wet times to 33% in dry times and that for the Murrumbidgee the contributions of the flows range from 25% in wet times to 60% in dry times.

[5] Note that these values will be influenced by a range of factors, including, but not restricted to, seasonal conditions and world commodity prices. They are provided only to give an indicative estimate of the size of the possible values.

According to Snowy Hydro Limited, water from this storage is also used to increase flows in the Murray and Murrumbidgee rivers during drought.[6]

Significance

As described above, the contribution of the waters from the Snowy River to the value of irrigated agriculture in the Murray-Darling Basin is significant. The Murray-Darling Basin comprises about 70% of the nation's irrigated land and the value of production from the basin represents approximately 40% of the national total. The contribution of the region's water to the national value of agricultural production is thus very important, though overall it represents only about 3% of the national total. The contribution to both the basin and the nation varies considerably, depending on seasonal conditions and world prices, but from a world perspective it could not be considered significant.

Trend in condition

As discussed above, the annual value of irrigated agricultural production varies with seasonal conditions and world prices. Despite these variations, it could be expected that, in real terms, the value of production over the last few decades has probably increased due to improvements in production efficiency. For example, total factor productivity in the dairy industry increased by 1.6% per year for the 22 years to 1998–99 (Martin et al 2000).

Pressures

Significant pressures on the region's contribution to the value of irrigated agricultural production within the basin are likely to come both from diversions of extra water away from the Murray and Murrumbidgee systems as a result of the Snowy River Inquiry, and also from moves to increase the quantity of water retained within the River Murray to improve environmental flows within that system.

Domestic, industrial, stock and town water use

In addition to its use by irrigators, water from the Snowy system is an important source of water for residential and industrial use in several major urban centres throughout the basin. For example, as cited above, long-term average water contributions from the Snowy River contribute approximately 5% to the Murray system and 14% to the Murrumbidgee system.

Table 16.2 illustrates that on average, between 1988 and 1993, 208 GL of water was used largely for urban and industrial purposes. Applying the above percentages results in an average contribution of the Snowy River to urban and industrial uses of about 13 GL.

Volumetric charges paid by residential users of this water vary between 28 cents per kilolitre (Lower Murray Water) and 97 cents per kilolitre (SA Water).[7] On these figures, the relevant water authorities would gain about $7 million each year for the provision of this water.

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[6] Sourced from <www.snowyhydro.com.au>.

[7] Source: < www.sawater.com.au>

Table 16.2 Average domestic, industrial stock and town water use, 1988–93

River system and state	Water for domestic, industrial, stock and town use (GL)
New South Wales	
Murray	19
Murrumbidgee	29
Victoria[a]	
Murray	56
South Australia	
Murray	104

Source: <www.mdbc.gov.au>
a Includes Ovens and Kiewa river system

Power generation

The Snowy Mountains scheme has a generation capacity of 3756 MW and can provide up to 11% of the total power requirements of the mainland of eastern Australia at any one time. Over a 12-month period, the scheme produces approximately 3% of the total energy in the National Electricity Market. The difference between capacity and production is due to limits on the amount of water that is collected, stored and released each year .[8] As electricity prices are now determined on the spot market, prices are calculated at half-hour intervals and reflect rapidly changing market conditions. Consequently, it is difficult to assign a value to the current level of power produced. Nevertheless, a potential indicative value can be estimated from data provided in Scoccimarro et al (1997), where the annual value of electricity produced from the Snowy scheme is estimated at about $180 million. This estimate represents the value of the revenue derived from generation of electricity, but does not consider the costs of generating that electricity. Snowy Hydro Limited is one of the largest employers in the region, with approximately 400 full-time employees (Carol Bruce, Snowy Hydro Limited, personal communication, 14 August 2002).

In the absence of the Snowy Mountains scheme, extra power would need to be generated from thermal plants. Snowy Hydro Limited estimates that it directly displaces 4.5 million tonnes of carbon dioxide emissions each year. If these emissions were valued at $10 per tonne,[9] then the annual value of reduced emissions would be approximately $45 million.

Significance

Whilst the actual contribution of Snowy Hydro Limited to the National Electricity Market in the eastern states is not very significant, there is potential for this contribution to increase. In any case Snowy Hydro Limited is considered to be an important peak load and emergency supplier because of the speed with which it can respond to sudden demands for power.

From an international perspective the contribution to power generation could not be considered significant.

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[8] Source: <www.snowyhydro.com.au>

[9] The Australian Greenhouse Office (AGO 2001) cites recent predictions of permit prices in Australia ranging between $10 and $50 per tonne.

Trend in condition

As discussed above, Snowy Hydro Limited now operates in the National Electricity Market in the eastern states of Australia. A key feature of this market is the variability of electricity spot prices, which are based on half-hour intervals and respond to rapidly changing market conditions. It is thus difficult to determine future trends in Snowy Hydro Limited's income from power generation.

Pressures

The results of the Snowy River Inquiry are expected to have a significant impact on the value of power generated by Snowy Hydro Limited. However, increasing concerns over the level of greenhouse gases produced by thermal generating plants have the potential to increase the contribution that Snowy Hydro Limited makes to the National Electricity Market in the eastern states. For example, Dickson et al (2002) stated that in 1998–99 the contribution of renewables to total energy consumption was approximately 6%. However, they noted that concerns surrounding the environmental consequences of the consumption of coal fuels mean that the contribution of renewables is expected to increase in the future. In particular, they cited the *Renewable Energy (Electricity) Act 2000*, which requires the generation of 9500 gigawatt hours (GWh) of extra renewable electricity per year by 2010. Dickson et al reported that the quantity of electricity generated from hydro sources is expected to grow from 16, 300 GWh in 1998–99 to 19, 100 GWh in 2019–20. Therefore, taking into account the policy initiative described above, the reduction of water passing down the Snowy River and the extra generating capacity of Snowy Hydro Limited, there is potential for Snowy Hydro Limited to increase its contribution to the National Electricity Market in the eastern states.

Recreation

Estimating the recreational use value of the Kosciuszko National Park is difficult because the values that people gain are not usually exchanged through normal market processes. Therefore, alternative techniques are needed to gain an estimate of these values. One of the most common techniques for estimating the value of the recreation experience provided by national parks is the 'travel cost' method. In this method the costs of travelling to and from the recreation site as well as the value of the opportunity cost of the time spent travelling are used to estimate recreation use value. A draft travel cost study of the recreation use values of the Australian Alps has recently been completed (Mules et al 2002). The study was based on the following recreational activities (in order of activities undertaken most by visitors to the New South Wales Alps): bushwalking/hiking; car touring/sightseeing; nature appreciation; downhill skiing; camping; fishing; four- wheel driving; snowboarding; mountain bike riding; horseriding/trailriding; cross-country skiing; canoeing; kayaking; white water rafting; orienteering; rock climbing/abseiling; and trail bike riding.

The study estimated the value of recreation in the New South Wales part of the Australian Alps at about $300 million per annum.[10]

Significance

From a regional perspective, the recreation use values presented in this report are significant. It is harder to classify the values from a national perspective, because there is little information on recreational value for Australia. From an international perspective, the values cannot be considered significant.

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[10] This uses a discount rate of 6% and a 1000-year time period to calculate annual values.

Trend in condition

In the absence of other similar studies of the region it is difficult to determine a trend in the condition. It is, however, possible to identify pressures.

Pressures

The value that individuals gain from a recreation experience is influenced by various factors and varies from person to person, so the pressures on recreation use values have different sources.

For some people, the value of the recreation experience is increased by a sense of isolation. Increased numbers of tourists and increased interactions with other people would decrease the value of the experience for these people. For others, the experience is dependent on social interactions with others. Below a certain threshold of congestion, the value of the recreation experience would in general be increased by more tourists. Beyond this threshold congestion level, the values that these people gained from their recreation experience would in general decrease. Yet another group of people will derive enjoyment from the state of the biological and geological attributes of the park. The recreation use value for these people would be diminished by deterioration of these attributes.

Recreational and commercial fishing

Many of the values associated with recreational fishing in Kosciuszko National Park are captured in the estimate of the value of recreation above. However, Dominion Consulting Pty Ltd (2001) recently confirmed some of the recreational values cited above. It is important to note that the presence of some recreational fish (eg trout) can have a negative influence on native fish (See Chapter 8 for more detail).

The economic study of the Snowy Mountains trout fishery had three core elements: face to face fishing interviews in the Snowy Mountains region, the use of freshwater recreational fishing license records and the economic survey of businesses.

Results from the state-wide analysis of the recreational fishing licence records showed the popularity of inland native fish and trout fishing. The results suggest that $46.5–70 million is spent annually on trout fishing in the Snowy Mountains region (Dominion Consulting Pty Ltd 2001).

Amenity migration

There has been substantial migration to certain towns in the Snowy River Shire area because it is an amenity rich region; for example, the Snowy River Shire has had an average population growth of 1.6% over the last five years (Department of Local Government 2002).

Indeed, the Snowy River Shire spends a significantly higher amount per person on recreation and leisure services than the average in New South Wales (around 16% higher, Department of Local Government 2002).

Amenity migration has its own benefits and costs to individual council (and state) areas. If migration to a scenic rural area exceeds a certain threshold level, the social, economic and ecological resources of the area in question may be compromised through, among other things, congestion.

Although increased amenity migration may result in additional economic activity within the Snowy River Shire, this may result in a reduction in economic activity in another part of the state or nation. This could represent a redistribution of economic activity within the state or nation. However, if a considerable number of the immigrants have come from other countries, there would generally be a net economic development benefit to both New South Wales and Australia.

On the other hand, net welfare of the country is increased because of the increase in consumer surplus that arises from individuals choosing to move into amenity-rich areas. The enjoyment and pleasure that people receive from such a move increases society's overall consumer surplus.

Unfortunately, it has not been possible to quantify the benefits (or costs) associated with amenity migration to the Snowy River Shire within this report.

Intrinsic values

As with the estimation of recreation use values, specific techniques are required to obtain estimates of the intrinsic values associated with specific environmental attributes such as national parks.[11] One of the most commonly used techniques has been the 'contingent valuation' technique. With this technique a sample of people are generally asked how much money they would be prepared to pay to achieve a specified change in a particular environmental attribute. For example, they could be asked to state how much they would be prepared to pay to increase the area of remnant native vegetation in a particular area.

The expense of these studies has been one of the key factors in limiting their wider use in decisions about the management of natural resources. Instead there has been a tendency to try to transfer the derived values from one study to another. As discussed above, there are criteria that need to be satisfied for such a transfer to be valid, and these criteria are rarely satisfied.

A review of the literature indicates that no specific contingent valuation studies have been completed for the Kosciuszko National Park. Lockwood et al (1993) used the contingent valuation technique to estimate the willingness to pay of Victorian households to reserve unprotected East Gippsland national estate forests in national parks. Lockwood et al (1993) estimated that the aggregate annual non-market value to Victorians was $41 million when expressed in 1999 dollars. However, for the reasons given above, it is impossible to extrapolate this value to the Kosciuszko National Park case.

National Land and Water Resources Audit (2002) presented the results of another stated preference technique that appears to hold greater promise for the transfer of benefits from one study to another. As part of the National Land and Water Resources Audit, the choice modelling technique was used to estimate how non-market environmental and social values could be affected by land and water degradation. In these studies, households in various parts of Australia were asked how much they would be prepared to pay for changes in the following four attributes: species protection, landscape aesthetics, waterway health and social impact. The reports also recommended an approach for transferring these results to other situations. Therefore, if the review of the management of Kosciuszko National Park led to specific changes to the way in which Kosciuszko National Park was to be managed and, further, if it was possible to quantitatively specify how those changes would affect the number of species to be protected, the hectares of bush to be protected, the kilometres of waterways to be restored for fishing or swimming, and the number of people leaving country areas each year, it would be possible to estimate the non-market values associated with those management changes.

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[11] This is not to suggest that such non-market valuation techniques provide only estimates of intrinsic values. They can also provide estimates of the bundle of non-market values, including option values. Some of the more recent research also captures aspects of direct use values.

Ecological function

There are many ways in which environmental attributes create values for society. For example, Kosciuszko National Park can increase the quality of water caught in catchments (and hence reduce water treatment bills) by providing filtering services. It also provides a wide diversity and stock of plants and other produce. As well as having current uses, plants provide future option values through new pharmaceuticals and other products.

Placing a value on such ecological functions is not easy. Each value needs a highly specialised study, and is above and beyond the requirements of the current report.

Table 18.3 presents the values developed by Costanza et al (1997) for various ecosystem services that would be provided by biomes present in the Kosciuszko National Park. Again, for the reasons given above about benefits transfer, it would be inappropriate to expect that the values quoted would be relevant to the Kosciuszko National Park. Therefore no attempt has been made to multiply the unit values by the relevant areas of the Kosciuszko National Park. They are presented only to illustrate the types of values that the Costanza et al study derived for these types of ecosystem functions. In all cases the unit values have been converted to the value of the Australian currency in 1999.

Table 16.3 Summary of annual ecosystem function values ($/ha), 1999

	Biome			
Ecological function	**Forest**	**Grass/rangeland**	**Wetland**	**Lake/river**
Gas regulation		10	191	
Climate regulation	202			
Disturbance regulation	3		6506	
Water regulation	3	4	21	7804
Water supply	4		5447	3034
Erosion control	138	42		
Soil formation	14	1		
Nutrient cycling	517			
Waste treatment	125	125	5987	953
Pollination		36		
Biological control	3	33		
Habitat/refugia			436	
Food production	62	96	367	59
Raw materials	198		152	
Genetic resources	23			
Recreation	95	3	823	330
Cultural	3		1263	
Total value	**1389**	**333**	**21,191**	**12,180**

Source: Costanza et al (1997)

There has been a recent update of the above work by Balmford et al (2002), who elaborate on the economic reasons for conserving wild nature.

Conclusion

This study has identified that there are considerable economic values (environmental, social and financial) attached to Kosciuszko National Park. Some of the values that have been able to be identified include irrigated agriculture, urban and domestic water use, power generation, recreation, and commercial and recreational fishing. In addition, there are large economic values attached to amenity migration, ecological functions and cultural values, but it has not been possible to quantify these.

References

Adamowicz WL, Beckley T, Hatton MacDonald D, Just L, Luckert M, Murray E and Phillips W (1998). In search of forest values of aboriginal peoples: the applicability of non-market valuation techniques. *Society and Natural Resources* 11:51–66.

AGO (Australian Greenhouse Office) (2001). *Growing Trees as Greenhouse Sinks: An Overview for Local Government*. AGO, Canberra.

Balmford A, Bruner A, Cooper P, Costanza R, Farber S, Green R, Jenkins M, Jefferiss P, Jessamy V, Madden J, Munro K, Myers N, Naeem S, Paavola J, Rayment M, Rosendo S, Roughgarden J, Trumper K and Turner RK (2002). Economic reasons for conserving wild nature. *Science* 297, 9 August.

Costanza R, d'Arge R, de Groot R, Farber S, Grasso M, Hannon B, Limburg K, Naeem S, O'Neill R, Paruelo J, Raskin R, Sutton P and van den Belt M (1997). The value of the world's ecosystem services and natural capital. *Nature* 387(15):253–260.

CSIRO (Commonwealth Scientific and Industrial Research Organisation) (2000). *Supporting Decisions: Understanding Natural Resource Management Techniques*. A report prepared for the Land and Water Resources Research and Development Corporation, June 2000.

Department of Local Government (2002). *Comparative Information on NSW Local Government Councils, 2000–01*.

Dickson A, Short C, Donaldson K and Roberts A (2002). Australian energy: key issues and outlook to 2019–20. *Australian Commodities* 9(1):198–208.

Dominion Consulting Pty Ltd (2001). *An Economic Survey of the Snowy Mountains Recreational Trout Fishery*. Report prepared for New South Wales Fisheries.

Lockwood M, Loomis J and DeLacy Y (1993). A contingent valuation survey and benefit–cost analysis of forest reservation in East Gippsland, Australia. *Journal of Environmental Management* 24:45–55.

Martin P, Riley D, Lubulwa M, Knopke P and Gleeson T (2000). *Australian Dairy Industry 2000: A Report of the Australian Dairy Industry Survey*. Research report 2000.10, Australian Bureau of Agricultural and Resource Economics, Canberra.

National Land and Water Resources Audit (2002). *Australians and natural resource management 2002*. Commonwealth of Australia, Canberra.

Pearce DW and Turner RK (1990). *Economics of Natural Resources and the Environment*. Harvester Wheatsheaf, London.

Queensland Environmental Protection Agency (2002). *Total Economic Values: The Great Barrier Reef Marine Park and Other Marine Protected Areas*. Queensland Environmental Protection Agency, May.

Scoccimarro M, Beare S and Brennan D (1997). The Snowy River: opportunity costs of introducing environmental flows. *Australian Commodities* 4(1):67–78.

Tietenberg T (1992). *Environmental and Natural Resource Economics*. Harper Collins Publishers, New York.

Young MD (1992). *Sustainable investment and resource use: equity, environmental integrity and economic efficiency*. Man and the Biosphere Series 9, Parthenon, Carnforth.

Young R (1991). The economic significance of environmental resources: a review of the evidence. *Review of Marketing and Agricultural Economics* 59(3):229–254.