APPENDIX 1. MEASURES OF ECONOMIC AND FINANCIAL VALUE

A1.1 Types of value[22]

To most people, economic values mean dollar values. The discipline of economics, however, is concerned with considering how resources (labour, capital and natural resources) can be used to contribute most to the welfare of society. In considering how social welfare can be maximised, it is obvious that many of the things we value are not usually measured in dollar terms; the amenity derived from the existence of natural environments and cultural heritage features are important examples. It is also the case that many of the things we do to generate goods and services traded for dollars often have unpriced detrimental or beneficial side-effects (termed *externalities*). So, consideration of obvious dollar values alone does not tell the full story of the effects on the welfare of society of our actions.

Economists therefore use the term *financial values* for flows of dollar values and reserve the term *economic values* for measures of values in terms of their contributions to social welfare. Economic values include the net benefits of commercial activities plus any unpriced values, including environmental amenity. It is usually the aim of economists to measure as many of these values as possible in dollars in order to add, subtract and compare them on a common basis. Both financial and economic values are important in what they tell us, so they are discussed further below. A more detailed explanation of the basis of deriving financial and economic values is included in section A1.2 in this appendix.

Financial values

Financial values are the measurable flows of dollars generated by human use of the resources. In the case of protected areas, examples include commercial tours such as camping trips and boat tours, where there are financial flows from tourists who purchase tickets to the businesses operating the tours, and subsequently to wages, other costs of running the tours and profits to the operators. *Gross financial values* include the money spent on the *costs of production* of a service such as a commercial tour, plus the *profit* earned. These gross values are measured either by calculating the *total expenditure* by people buying a good or service (for example, tourists purchasing tours) or the *total revenue* received by people selling a good or service (for example, sales of fish from commercial fishing vessels).

The importance of financial values is that these illustrate the magnitude of economic activity. At a national level, financial values are the basis of calculations of *Gross Domestic Product (GDP)*. Financial values of industries may be compared to determine their relative importance in terms of contribution to GDP. Financial values are also used in calculating *multiplier effects* on the wider economy of any particular industry sector (see below).

Financial values are measured by adding together the values of all relevant transactions, for example all spending by tourists or all costs of production for tour operators. Comprehensive financial information is not collected regularly for any of the protected areas studied. There have been one-off studies conducted in a number of the protected areas and these have provided good quality data, although some of it is old. Information on tourism is collected regularly at a regional level but it is not possible to disaggregate data for the protected areas in question. For this reason, it has been possible to report gross financial values for only some of the commercial activities in the eight protected areas included in this report. In some cases, estimates have been made in this study based on what data was available.

[22] Terms used in this section indicated in italics are briefly defined in the Glossary at Appendix 1.3.

Multiplier effects

Multiplier effects are a particular type of financial value. They are gross measures of the impact flowing on to the rest of the economy from a particular activity. All activities produce multiplier effects, but their magnitudes can differ. It is usual to calculate three different multipliers, output, income and employment. There are also different types of multipliers expressed as ratios of the total impact to the initial impact of some economic activity, or as the ratio of the flow-on impact to the initial impact. Multiplier effects have been calculated for only some of the activities in some of the protected areas studied.

A multi sectoral general equilibrium model of the Australian economy named ORANI has been built to explain the impacts of increases or decreases in economic activity in an industry in terms of effects on economic indicators including Gross Product, disposable income and the Consumer Price Index. This model is based on the input output analysis approach but has more sophisticated feedbacks to better simulate how the economy works. Tourism in Kakadu National Park has been modelled using ORANI (see section 4.2)

Economic values

What economics attempts to do is apply a common measuring rod to value all manner of things from which humans gain satisfaction. Some of these are goods and services that are traded in markets using dollars as the currency for exchange. Trade is possible where a person can gain exclusive ownership of a good, for example a fish, or exclusive rights to a service, for example a seat on a tour bus, in exchange for money. This type of good (and service) is called a *private good.* The dollar values people place on private goods are able to be observed from the functioning of competitive markets. These are termed *market values.*

Many attributes of natural environments are not regularly traded in markets. One reason for this may be historical. Protected natural environment areas are public lands and it has not been usual to charge for the services they provide. Another reason is that many of the services of natural environments have the characteristic of *public goods* and it is not possible to divide them up for exclusive sale, so it is not feasible to trade them in conventional markets. Clean air, biodiversity and functioning ecosystems, for example, have public good characteristics. The values of natural environments that are not able to be observed in markets are given the term *non-market values* by economists.

The total economic values of the protected areas covered in this study include both market values and non-market values. Non-market values are of two types; direct and indirect use values. *Direct use values* include the benefits accruing to people who visit, or live in, an area and enjoy its attributes. This obviously includes people who visit for tourism and recreation. *Indirect use values* accrue to people who may never visit an area but who nevertheless value the fact that it exists in its natural state.

It is widely acknowledged that natural environments produce a range of values to society associated with their roles as havens for conservation of biodiversity, contribution to global life support systems, and amenity arising from knowledge that wild and natural areas exist. *Existence*, *bequest*, *option* and *quasi-option values* have been identified as legitimate indirect use values arising from natural environments.

Existence value is the value people place on ensuring an area remains as a natural environment; bequest value is the value they place on ensuring it is available to future generations; option value is the value they place on ensuring that it remains as a natural environment so that they may visit in the future; and quasi-option value is the value people place on conserving a natural environment for the new information which may emerge in the future.

Together, market and non-market values cover all the benefits to humans flowing from the resource whether or not these are normally measured in dollar terms. Economic values are necessarily anthropocentric and do not recognise any value of nature conservation to the non-human elements of nature involved.

The economic values of most interest in describing an activity are its *net economic benefits,* that is *total economic benefits* minus *total economic costs.* In identifying total economic costs, a firm's financial costs of production may need to be adjusted. Adjustments are required when the markets fail to take account of positive or negative externalities (or markets fail for other reasons not further discussed here). Negative externalities such as damage to the environment require the costs to be increased while positive externalities require the opposite.

The basis of measuring total economic benefits is the total *willingness of consumers to pay* for goods and services. For most goods and services that are purchased in competitive markets, the purchase (market) price can be taken to represent willingness to pay. This readily observed measure of value is not available if the good or service is not sold. This is clearly the case with regard to indirect uses of protected areas.

It is important to point out that monetary transactions observed from markets that are not working in a competitive mode will not reflect total economic benefits. This is generally the case for tourism and recreation in the protected areas studied. Park management agencies do not charge access (entry) fees for private recreation or commercial tours to cover the full costs of providing the services of the natural environment, in the way a private supplier operating in a competitive market would. It follows that entry fees and prices of commercial tours are below what they would be in a competitive market and do not reflect the full willingness to pay by visitors.

In order to measure total economic benefits of indirect uses and those direct uses where competitive markets do not exist, economists attempt to measure willingness to pay using a variety of valuation techniques. These include *related market methods* and the *Contingent Valuation Method (CVM).* In the former method, markets for related goods are examined to provide information on how the market for the good in question might function. The most relevant example for protected areas is the *travel cost method* where expenditure on travel to the areas is used to estimate how much visitors would be willing to pay for entry, if entry fees were charged at market rates.

The CVM involves asking people what they would be willing to pay contingent upon a proposed change in the state of things, for example to provide more nature conservation reserves or to avoid damage to existing reserves. The contingent valuation approach can in theory be used to address public good issues and to cover the full range of direct and indirect non-market values that people perceive to flow from protected areas. Considerable debate is occurring about philosophical and technical aspects of this approach (Wilks 1990). It would be fair to say that CVM is not totally accepted inside and outside the economics profession, yet no satisfactory alternative to actually asking people what they would be willing to pay for non-market values has been developed.

These valuation techniques are used on the assumption that it is conceptually possible and ethical to place dollar values on everything. Many people would disagree with this, in which case it is necessary to at least describe these values in other ways. Ignoring them altogether means that they are given zero value in economic analysis.

Economic analysis

Economic analysis may be employed to help answer resource use questions such as: Will a particular natural environment area bring greater net benefits as a protected area or if it was converted to another form of land use?; or, What combination of allowed uses within a protected area brings greatest net benefits? To examine the first question, the net benefits of the protected area may be compared with the net benefits of alternative land uses. This form of analysis is termed *Benefit Cost Analysis.* The approach taken is that the net benefits from the alternative land uses are the *opportunity costs* of the protected area option[23]. It is obvious that for this type of analysis, it is important to try to take account of the net benefits

[23] Implicit but worth emphasising is that the decisions by governments to confer protected area status incorporate judgements that the total economic value of the protected area is likely to be greater than the opportunity costs (benefits of alternative land use pattens) over the long term.

Demand and supply for commercial tours to a National Park

Fig. A1.1

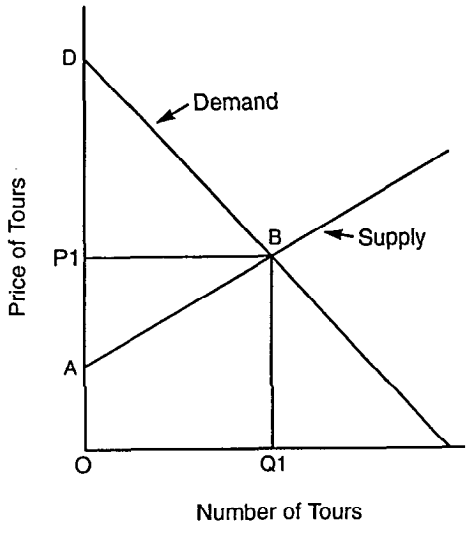
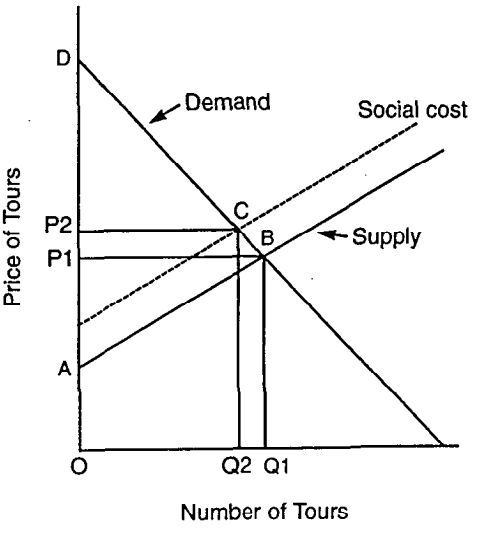


Fig. A1.2



Demand and supply for private visits to a National Park

Fig. A1.3

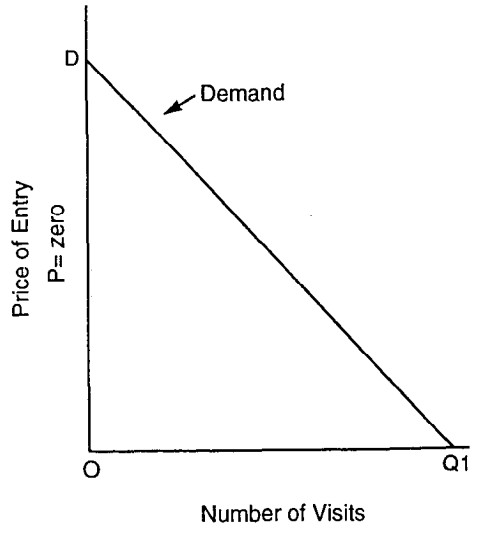
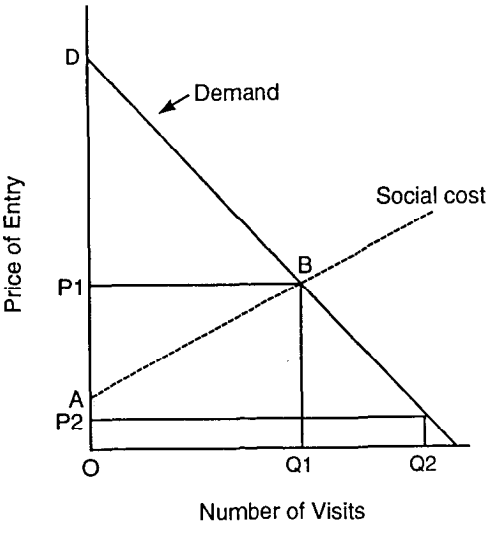


Fig. A1.4



Gross Domestic Product (GDP)
A measure of the total flow of goods and services produced by the economy over a specified time, normally a year or a quarter. It is obtained by valuing outputs of goods and services at market prices and then aggregating them.
gross financial value
The total dollar value of output at market prices, measured as total expenditure or total revenue, without deductions for cost of production or environmental costs.
indirect (output) effects
The dollar values of the economic activity generated within a defined regional or national economy due to the direct output effects of production of goods and services.
indirect use value
The values accruing to people who do not visit protected areas but place a value on knowing it is being conserved. It includes bequest, existence, option and quasi-option values.
Input Output Analysis
A technique for modelling flows of production and consumption in a defined regional or national economy. The flow-on, indirect or multiplier effects throughout the economy of output or employment produced in any one sector may be examined with the model.
market values
Market values or market prices are those realised through sales of goods and services using money as a currency in a conventional market.
multiplier effect
The flow on of increased activity in an economy due to increases in one sector, measured for output income and employment.
multipliers
Indices used to convert direct effects to direct plus indirect effects.
net economic benefits
Total economic benefits obtainable from a project minus total economic costs.
Net Present Value (NPV)
The discounted value of a stream of values arising in the future.
non-market values
Values of goods and services which are not usually traded in conventional markets but which accrue to people, and for which people are willing to pay.
option value
Option value is the value people place on ensuring natural environments and cultural heritage remains as they are so that they may visit in the future.
opportunity cost
The benefits of using the resources in question in their next best alternative use.
primary uses
A term used for this report - it refers to the uses of nature conservation and conservation of cultural heritage (and for some areas, the continuation of contemporary Aboriginal use) which are the main reasons the protected areas have been conferred special status.
private goods
Private goods are able to be traded with exclusive use rights attached.
producer's surplus
The excess of the revenue received by a supplier of goods or services over the minimum they would be willing to accept to maintain the same level of supply.
profit
The residual financial return to suppliers of goods or services over costs of production.
public goods
Public goods have the characteristics of being *non-rival* in consumption (consumption by one person does not reduce the amount available for others) and *non-excludable* (it is impossible, or at least not efficient, to exclude any person from consuming the good or service). Many features of natural environments have public good properties and are not efficiently delivered through private markets.
quasi-option value
Quasi-option value is the value people place on conserving a natural environment for the new information which may emerge in the future.
related market methods
Techniques for estimating dollar values for goods and services that are currently not traded in the market, which look at markets for similar or related goods. Hedonic pricing is a

related market method where property values are used to estimate the value of environmental factors such as noise or views which affect these property values. Another related market method is Travel Cost Analysis, see below.

total economic benefits

All financial benefits plus positive externalities.

total economic costs

All financial costs of production plus costs of negative externalities.

total economic value

All direct use plus indirect use, market plus non-market values arising from a resource. In the case of natural environments total economic value includes all values to all people regardless of whether or not these are usually traded for dollars in a market.

total expenditure

Dollar values of payments for goods and services, for example, tourists purchasing tourism services.

total revenue

Dollar values of payments accruing to people selling a product, for example, sales of fish from commercial fishing vessels.

Travel Cost Analysis

A technique to estimate the dollar value of benefits of recreation, in the absence of a market for access for recreation. In travel cost analysis, the costs of travel to protected areas are modelled to derive a demand curve for visits which is then used to estimate benefits of recreation.

willingness to accept compensation (WTA)

The willingness of people who currently have rights to use a resource to accept compensation for a reduction in the quality or quantity of the resource or their rights to use it.

willingness to pay (WTP)

The willingness of people to pay for a good or service, regardless of what they currently have to pay to acquire the good or service or whether the good or service is currently available free of charge.

APPENDIX 2. APPROACHES TO VALUING USES

As explained in the Introduction, the uses identified for the protected areas studied include both the conservation of natural and cultural features and direct uses. Approaches to valuing these are described below.

Conservation

The non-market indirect use (primary use) values of protected areas are the most difficult to value in dollar terms yet they are the main reason for the special protection given to these areas. Considerable research is underway on means of valuing environmental services such as biodiversity, and valuing the risks of losses and potential discoveries. The main approach currently used to value such attributes as existence, bequest and option values is the Contingent Valuation Method (CVM). This method has been applied to the Great Barrier Reef WHA and Kakadu National Park. While the results of these studies may be open to interpretation, there is no question that primary uses of protected areas do have considerable value, and they have been judged to override the dollar values of alternative development uses of these areas.

It should be pointed out that (consistent with present economics practice) the values derived in the CVM studies of the Great Barrier Reef WHA and Kakadu National Park represent values held by the Australian population only. As both the sites are World Heritage listed, using the Australian population as the reference point is likely to prove an underestimate of the population to whom the value of these areas is relevant. There is no information available to indicate what value the rest of the world places on Australian World Heritage Areas or other protected areas. Consider however the following scenario. The population of North America and Europe is around 600 million people. If these people had existence, bequest and option values of $1 per annum for Australian World Heritage Areas, this would give the considerable value of $600 million per annum. This possible scenario has been presented to illustrate that these non-market values may be very significant in comparison to some direct use values. It also highlights that significant values can exist, even if they are not captured in markets or if the research has not been done to measure them.

Commercial and recreation uses

Activities which are dependant upon the resources of the protected areas analysed in this study include tourism and recreation, commercial fishing, harvesting of plants and animals, beekeeping and mining.

The approach to measuring financial values of tourism and recreation is to identify expenditure by visitors. (This is generally more efficient than identifying the diverse producers of goods and services that cater for tourists and adding up all sales to 'tourists'). Measuring values of tourism and recreation is discussed in more detail below.

The gross financial values of activities such as commercial fishing, mining, beekeeping, and extraction of other saleable products, is the value of sales by the producers.

Transport and communication

A number of the protected areas considered in this study are traversed by such transportation and communication links (depending on the nature of the area) as roads, railways, shipping routes, power lines, or aqueducts and have telecommunications or navigation facilities located within. These transport and communication facilities were usually present before declaration of protected area status and have been allowed to continue to exist, though expansion may be limited. These facilities generate financial value on the same principle that any transport and communications facility adds value to goods or services carried.

While these values are generated *in* the protected areas, it can not be considered that value is generated *due* to the protected areas, with the exception of facilities developed to allow visits