



**VALUING
NATURE
PROGRAMME**

VNPO4



Demystifying Economic Valuation:

Valuing Nature Paper | June 2016

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² The Valuing Nature Programme is a 5 year £6.5M research programme which aims to improve understanding of the value of nature both in economic and non-economic terms, and improve the use of these valuations in decision making. It funds interdisciplinary research and builds links between researchers and people who make decisions that affect nature in business, policy-making and in practice. See www.valuing-nature.net. Like the VNP, this paper focuses mostly on the UK applications/examples, though concepts are universal.

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³ Here we use 'natural environment' to mean all living and non-living things that make up the environment, above and below ground, and in water and air. Other terms are sometimes used interchangeably like 'environmental resources', 'natural resources', 'natural capital' and 'ecosystem services'. There will be another Valuing Nature Programme paper to clarify these terms.

Why economic valuation?

We live in a world in which resources are limited and choices are inevitable. So it helps to understand the relative pros and cons of the different choices.

Our existence, health and happiness depend on the natural environment. But when we make choices about how we use it, often we do not consider all its dimensions and their varied values. Instead, we tend to focus on the financial gains in the relatively short term.

Economic valuation is one way to, at least partially, redress this imbalance. Economic analysis is not a replacement for social or political debate. The best practice should be to use all sorts of high quality evidence to support better decisions — including different interpretations of 'value' of resources and our choices. 'Value' has different meanings in different contexts as defined by different disciplines. This paper is about the economic interpretation of value.

Economics contributes to our understanding of how we make choices and how the choices we make affect our health, happiness, wealth and prosperity – different terms such as 'wellbeing', 'welfare' and 'utility' are used, but mean broadly the same thing. Our tendency to take for granted the contribution of the environment³ to our health and happiness has been a subject for discussion in economics for centuries: Petty, Malthus, JS Mill and Marx, to name a few, wrote about the value of nature, as early as the 17th and 19th centuries.

⁴ The natural environment is also valuable beyond our individual relationship with it: 'intrinsic value', for example, is the value of things in and of themselves, not their value as held by humans and hence not included in economic value.

The benefits we receive from the environment come in many forms. Some environmental goods are traded in the market economy. For example, we pay for the food we eat and the materials that give us shelter. But these traded goods exist because of other ecosystem services, for example pollination by insects, and nutrient cycling by soil organisms. There is also the clean air we breathe, clean water in the rivers, lakes and oceans and the beauty that makes us happy, fills us with wonder, inspires art, and supports the bonds that keep us together as societies. We do not buy or sell these goods and services, at least not directly, but they are just as important as, in some cases more so than, those we do and we value them for a variety of reasons.⁴

What is economic valuation?

Economic valuation is a way to understand how much something is worth to particular people or to society as a whole.

Total Economic Value is a framework developed to characterise why and how individuals value the benefits received from the environment. The most obvious reason is that we personally benefit from the many uses of the natural environment, directly (e.g. by eating food grown in our fields) and indirectly (e.g. through the processes that cycle nutrients in the soil and make them available to crops), now and in the future. This is **use value**. We also benefit from knowing that environmental resources we currently don't use will still be there if we do in fact need them in future, a bit like an insurance policy. This is **option value**. And we may also value the environment for unselfish reasons: wanting it to be there for the benefit of other people during our lives (**altruistic value**), for future generations (**bequest value**), and for the sake of nature itself independent of our use of it (**existence value**). The last three 'components' are collectively referred to as **non-use values**. The word 'total' refers to the sum of use, option and non-use values. Total value changes in response to changes in the environment, which can be positive or negative.

We express some of these values through our behaviour as consumers when we purchase environmental goods and services. But the price of something is not the same thing as the value we place on it. The price is determined by demand and supply and reflects the cost of production – which often does not include the cost of environmental damage (such as pollution) resulting from production unless there is a policy requirement (e.g. pollution tax). Moreover, many consumers will derive a benefit greater than the price they are charged (known as 'consumer surplus').

There are no markets to buy and sell most environmental goods and services. In economic terms, the benefits of these non-traded (non-market) goods and services are not included in the prices and are termed **‘positive externalities’** (like a beautiful view provided for free). The costs of (declining) quality and quantity of these goods and services are termed **‘negative externalities’** (like air pollution). They are ‘external’ in that they do not directly affect the profits or welfare of those involved in the market transactions, but they do affect other people. The result? We make choices we would not have made had we taken the total economic value of the environment and externalities into account. We produce and consume more (or in different ways) as a consequence, leaving the natural environment in a degraded state.

One contribution to solving this problem involves measuring the externalities, and implementing policies which take account of them. Many such policies already exist and we have done much to reduce environmental damage. There is still a long way to go, however, and measuring externalities and understanding economic values is vital to achieving sustainable economies.

How do we estimate economic value?

This paper is about how we estimate economic value in monetary terms. In principle other units can also be used for economic valuation. But money is preferred because it is a familiar, comparable and continuous unit of measurement. Financial gain is also measured in monetary terms. Thus using money allows comparison of: financial, environmental and social costs and benefits.

There are different ways to estimate the economic value depending on which benefit we want to estimate.⁵

The economic value of a positive change in the natural environment is measured by what individuals are willing to pay to secure this benefit, or what they are willing to accept as compensation to forgo it. The economic value of a negative change, on the other hand, is measured by what individuals are willing to pay to avoid such a cost, or what they are willing to accept as compensation to tolerate it.

⁵ Estimates of different benefits can, by definition, be added together, but different estimates of the same benefit should not be added together, as that would be double counting.

The two measures are known as Willingness to Pay (WTP) and Willingness to Accept (WTA).

The change valued could be in the quality and/or quantity of the environment or the individuals' access to it. What's important is that the change is measurably linked to the benefit received by individuals (e.g. improved health linked to reduced air pollution) or directly discernible by the individual (e.g. change in the landscape). **This is why economic valuation is, in fact, a three step process.** First, the way a decision will influence the environment needs to be understood (qualitative assessment). Second, the change in the environment and the related benefits need to be measured (quantitative assessment). Only then can the third step of valuation in monetary terms take place.

Three types of data are used for the third step of the process, the monetary valuation: market prices, observed consumer behaviour and individuals' statements of value. Methods developed to analyse such data are summarised below, but let's illustrate the thinking with a familiar example.

Imagine you regularly go for a walk in your local park to keep mentally and physically healthy.

The entrance to the park is free, you don't spend any money to make the trip and you don't make any purchases while out for a walk. So if we look at market (expenditure) data, it looks like the park has no economic value. In fact, local authority accounts tend to show the value of the parks (as assets) at their nominal value of £1 for this reason. In the same accounts, actual spending is shown for the cost of upkeep. In reality, the value of the park is, of course, much greater than £1 because many people derive great benefit from using or viewing the park.

For example, without the opportunity to exercise in the park, you could become more prone to getting ill, maybe being off work, reducing your economic output. You may have to get medical treatment which would cost you or society.

Besides, maybe you just enjoy walking in the park, seeing the seasons change and watching geese come and go. Economic value includes this enjoyment too.

The properties near the park may fetch just that little bit more in the housing market when compared to the same properties a few hundred yards away. This price premium reflects some of the value individuals place on the enjoyment of the park, the views, the recreational opportunities and so on.

If we had sufficient data on increased productivity, reduced costs to the health service and the avoided costs of illness to individuals, we could estimate the impact of the park in terms of health benefits from exercise. Alternatively, we could ask you and other visitors how much you would be willing to pay to maintain the park.

In the example of the park overleaf, qualitative assessment would involve identifying the benefits the park provides, who the beneficiaries are and how these would change if the use of the park changed (e.g. development making park use impossible). Quantitative assessment would involve measuring the number of users, number of visits, types of activities, improvement in health, number of properties in the vicinity of the park etc. Monetary assessment would involve looking at the (avoided) medical costs, property price premium and WTP to avoid development.

Using market prices: *estimates use values alone*

For example, we can look at how much food, water, timber, fuel, minerals and so on people buy (and at what price) either for direct consumption or to use as an input to production. We could, then, observe how this purchase changes in response to changes in the quality and quantity of the goods and services.

Economic value is not the same as price as mentioned above. When there are no markets, the price is zero when the value is not. Even with markets, the price does not reflect all components of value (or externalities). However, it is still useful to use market data as an approximation of value.

Revealed preferences: *estimate use values alone*

For example, we can observe how much people spend on travelling (in terms of fuel, accommodation, food, entry fees, time and so on) to a beautiful landscape for recreation. What they pay to travel is at least how much they value the recreational benefit, otherwise they would not make the trip. Data collected on the number of visits and travel costs can be analysed to estimate the demand for the recreational benefits of a site. **This method is known as the travel cost method.**

The property market is another example. We can look at how property prices vary with environmental and other factors. If we have data on a sufficiently large number of transactions for properties with a wide range of characteristics, we can calculate the price premium buyers are willing to pay for living in a cleaner area, near a park, with good views, or with a garden, just as we can calculate the premium for an additional bedroom or period features. It can also be used to estimate how much homebuyers need to be compensated (through lower prices) for a disamenity such as airport noise. **This method is known as hedonic property pricing.**

We can also observe what people purchase and how much they spend when they feel the need to compensate for declining benefits from the natural environment. For example, if people buy filters and bottled water. Purchases may be made for multiple reasons: some people simply prefer the taste of filtered/bottled water while others believe the tap water is not clean enough. Such different reasons need to be taken into account, but ultimately, what people spend on such market products is an indication of how much they value the natural benefit they no longer have. **This method is known as averting expenditure or averting behaviour method.**

Such compensatory behaviour can be seen at organisational scales: for example a local authority may need to build a flood wall because the coastal marshes have been degraded and can no longer protect the town from coastal flooding. The cost of the wall is a minimum expression of the value of protection service provided by the coastal marshes. **This method is known as replacement cost.** It is only useful if there is widespread agreement that replacement is worthwhile.

Finally this type of data can be used to estimate how much a given environmental good or service contributes to the delivery of market goods or services. For example, the value of pollination services can be estimated in terms of their contribution to the crop yield and valued at the market price of the crop. **This method is known as production function.** It can potentially value all goods and services used as an input to production.

Stated preferences: *estimate use and non-use values*

Through carefully designed questionnaire we can present choices to people directly. Questionnaires explain the choice options, their environmental and other impacts, who is responsible for their implementation and how the flow of money offered, or requested, would be organised. The surveys also remind respondents that their budgets are limited and that there are many other things that require their attention and money. A sufficiently large and varied group of people is sampled and the data are analysed to estimate the economic value, and to explain how it changes. **These methods are known as stated preference surveys.**

They can be designed as 'contingent valuation', which asks direct (WTP/WTB) questions, or 'choice modelling', which presents respondents with choices that involve different costs and asks them to choose their favourite. Some surveys include both designs. They can be used for all environmental goods and services and are the only economic valuation method that can estimate non-use values.

⁶ Practical guidelines and examples for using value transfer, Defra official guidance prepared by eftec (2009)

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182376/vt-guidelines.pdf

Benefiting from previous research:

Undertaking original economic valuation research is not always possible, neither is it necessary. Looking at the existing evidence can often be practical and sufficient. The process of finding the appropriate evidence and adjusting it to the consideration in hand is called **value (or benefit) transfer** ⁶.

All evidence for policy is subject to uncertainty. In economic valuation there is uncertainty in each of the three steps: understanding the environmental change, measuring it, and estimating the economic value in monetary terms. This is inevitable. Good practice is to identify the sources of uncertainty and how they affect the results, and present these in a transparent way.

Whose values count?

Everyone whose welfare is (expected to be) affected by the change considered should count. This is regardless of whether they are *currently* benefitting from the environmental good or service in question.

In most public sector work, at the national scale, it's the entire population whose values should count. It also includes both those who gain from the change and those who lose. At the local scale, going back to the example above, it's the people who use the local park (and those who may use it in future, or those who simply would like to protect the heritage), and those who would contribute to its upkeep through their council tax.

How do we use economic values in decision making?

Economic value evidence can be used to compare financial costs (benefits) against environmental costs (benefits) so that it can contribute to investment, policy and budget allocation decisions.

⁷ For example:

Natural Capital Protocol from:
www.naturalcapitalcoalition.org
Corporate Natural Capital
Accounting by Eftec, RSPB
and PwC (2015) for the
Natural Capital Committee
Available from:
www.eftec.co.uk

⁸ UK National Ecosystem Assessment
(2011), and Follow On Phase (2014):
<http://uknea.unep-wcmc.org>

⁹ The Economics of Ecosystems
and Biodiversity:
www.teebweb.org

¹⁰ Impacts to the market economy
such as jobs and expenditure are also
considered but are a different type
of analysis than the welfare (utility)
based Total Economic Value.

As with any other type of evidence, better information about economic values does not necessarily result in better decisions.

And economic value evidence is only one input to decision making. All other scientific, social, moral, ethical and legal factors (not in any particular order) must also be considered.

Economic value evidence can be used to improve our **understanding of how the natural environment benefits us**, for example: to help set policy, management and investment priorities. Better understanding of the economic value of the natural environment can also highlight sustainable opportunities for business. This is particularly relevant for natural capital accounting⁷ and large scale exercises like the UK NEA⁸ and TEEB⁹ initiatives.

Economic value evidence can be used for **economic appraisal** to estimate both costs and benefits. The value evidence can also be used to make a business case for investments that will generate economic value, but not necessarily financial return.¹⁰

Economic value evidence can be used for **capturing some of the value currently ignored by the markets**. For example: the economic cost of environmental pollution can be used to set the level of pollution taxes.

But economic values vary! And so they should!

The prices of manufactured goods and services, labour or commercial land vary and so do the values of environmental goods and services. In fact, *how* economic values vary is just as informative for decision making as the values themselves as they help us understand which factors are important in maintaining or increasing this value.

Economic values vary with the following interrelated reasons (not an exhaustive list):

- **The condition and location.** Different resources are expected to have different values. But what applies in all cases is that a resource is valued less when it is in a poor condition – because it cannot provide all the services it is capable of providing. Location is particularly important for use values. Easy access may mean higher values for some resources (like an inner city park) but this does not necessarily mean that inaccessible resources are less valuable – it depends on the resource, its uses and types of value.

- **Scarcity and substitutability.** Resources have different values depending on whether there are any available substitutes: the more scarce a resource (less substitutes) the higher its value.
- **The direction, scale and timing.** Individuals tend to value negative changes more highly than the equivalent amount of positive changes. This is observed in many other fields, and is explained by psychology as ‘loss aversion’. In terms of scale: the greater the change, the greater its value. In terms of time, changes today are valued more highly than changes next year and so on.
- **Individuals.** People have different values for the same thing – just as they react differently to prices. Because they have different rights, responsibilities, needs, wants, cultural and individual tastes and habits, knowledge and experiences that influence their relationship with the natural environment. They also have different incomes that influence their willingness to pay more than their willingness to accept compensation. This is a fact of observing consumer behaviour and expressing value in monetary units. It need not reinforce unjust distribution of access to the environment. Results can be presented separately for different income groups to make comparisons easier; and weighted to account for income differences.

How to communicate economic value evidence

1. **Be clear about what’s included in the economic value estimate and what’s not.** Reporting the following, as a minimum, will help convey this and explain the variation between different estimates: goods, services, benefits, and changes valued; location; the definition and characteristics of the affected population; and valuation method used. It is also important to acknowledge which components of the total economic value are articulated in an estimate. It is not necessary to be able to disaggregate the monetary estimate amongst the components but listing them is useful. Finally, it is important to use other (non-monetary) data to describe/measure what’s not included in the monetary estimate so as not to bias the decisions in favour of what’s possible to express in monetary terms.

2. **Engage with decision makers and stakeholders.** Presenting economic value evidence to decision makers and their stakeholders is not about simplifying the complexities. It's about making the evidence relevant to the choices and constraints they are facing. Economic valuation work is not only about the monetary results. Going through the three steps of the qualitative – quantitative – monetary assessment process with the stakeholders has proven to be useful even on its own in moving decisions forward.
3. **Be specific about what types of decisions economic value evidence can be used for.** The context in which valuation took place and the context of the decision need to match. Context is determined by the factors listed in (1) above. Provide information about each of these. But equally too much information confuses: proportionality and relevance to the evidence and audience is key.
4. **Use language everyone can understand.** Jargon does not add credibility. It often alienates. Short cuts can be problematic: for example use 'economic value' when you mean total economic value, don't revert to 'financial value' or 'pricing the environment'.
5. **Do not aim for a single number that claims to answer all questions.** Be open about uncertainties and assumptions. Use sensitivity analysis to show how sensitive the results are to key factors and assumptions. If there are no quantitative data or methods available, describe impacts qualitatively rather than leaving them out of the analysis.
6. **Choose the appropriate economic valuation method.** There are practical factors here like availability and ease of getting the relevant data, budget and timing. In terms of the purpose of valuation, the following considerations may help:
 - If you are only interested in use values for a resource that's traded in markets, use the market price. Beware that market prices are distorted by subsidies and taxes which can be adjusted for.
 - If you are only interested in use values for a resource that's not traded in markets but likely to influence one that is, use revealed preference methods (travel cost, hedonic pricing and averting behaviour). This is true when the environmental change (or one like it) you are valuing has already happened.
 - If you are interested in all components of total economic value and/or measuring the economic value of a change that has not happened before, or goes beyond current experience (so no opportunity to observe consumer behaviour), use stated preference methods.

¹¹ Integrated Valuation of Ecosystem Services and Tradeoffs
www.naturalcapitalproject.org/invest

¹² TIM (The Integrated Model) is a location specific economic valuation model developed through the UKNEA: Bateman, I.J., Day, B.H., Agarwala, M., Bacon, P., Ba'ura, T., Binner, A., De-Gol, A.J., Ditchburn, B., Dugdale, S., Emmett, B., Ferrini, S., Fezzi, C., Harwood, A., Hillier, J., Hiscock, K., Hulme, M., Jackson, B., Lovett, A., Mackie, E., Matthews, R., Sen, A., Siriwardena, G., Smith, P., Snowden, P., Sünnerberg, G., Vetter, S. and Vinjili, S. (2014) *Economic value of ecosystem services*, Final Report to the UK National Ecosystem Assessment – Follow-On programme, Defra, London (available at <http://randd.defra.gov.uk>) and UNEP-WCMC (<http://uknea.unep-wcmc.org>).

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7. Agree the appropriate level of effort. The cost of economic valuation should be proportional to the magnitude of the environmental change. For decisions that will lead to large changes, that will have long term effects, that differ across constituencies, higher certainty is likely to be needed, and hence undertake original research. Otherwise, order of magnitudes may be sufficient and you can select and adapt estimates from the literature, so use value transfer.

Increasing experience with undertaking valuation exercises and using technology (e.g. online surveys instead of in-person surveys, GIS for local data, valuation tools like InVEST¹¹ and TIM¹²) make data collection and analysis easier and cheaper, approaches to valuation once deemed too expensive may no longer be so.

8. Present economic value evidence as part of the three-stage process, together with qualitative and quantitative assessments of change. Also remember economic value evidence is only one of many inputs to the decision about which option might be the best.

Further reading or sources

HM Treasury Green Book – for the economic appraisal principles (and using economic value evidence within this context) officially adopted in the UK (2013).

<https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

Green Infrastructure – Valuation Tools Assessment (2013) by eftec for Natural England – <http://publications.naturalengland.org.uk/publication/6264318517575680>

Environmental Valuation Reference Inventory www.evri.ca

Hanley N and Barbier E. (2009) *Pricing Nature: Cost-Benefit Analysis and Environmental Policy*. Cheltenham: Edward Elgar.

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