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NON-MARKET VALUATION DATABASES: HOW USEFUL ARE THEY?

*Mark Morrison
School of Marketing and Management
Charles Sturt University
Panorama Avenue
Bathurst NSW 2795*

The use of benefit transfer has in the past been restricted by a shortage of original non-market valuation estimates. However, in recent years several non-market valuation databases have been developed to facilitate the use of benefit transfer. This paper describes three of these databases. The question is raised regarding what would be the ideal characteristics of a non-market valuation database. Eight characteristics are suggested, and are used to evaluate the three databases. It is concluded that the greatest strength of the databases is in alerting analysts to the existence of studies that are potentially suitable for use in benefit transfer. However, the databases are limited in several respects. Because of under-reporting of specific information, analysts will need to obtain copies of original studies to perform rigorous benefit transfer.

1. INTRODUCTION

Estimates of non-market values, such as values of improved environment quality, are increasingly finding their way into economic analyses. This has been influenced by legislative and policy requirements of Commonwealth and State government agencies that non-market values be explicitly considered in economic analyses (NSW EPA 1995). It is also reflected in the numerous "How to" guides that have been developed to facilitate the use of non-market valuation techniques by economic analysts (e.g. DEST et al. 1995).

While non-market valuation estimates are often needed, it is often not practicable to generate new estimates for every analysis that is conducted. The studies that generate these estimates can be both costly and time consuming, and finding practitioners that have the necessary skills to generate robust estimates can be difficult. For these reasons, analysts are frequently required to extrapolate from existing data that were collected for a different purpose. This process is known in the resource economics literature as 'benefit transfer'. As stated by Boyle and Bergstrom (1992, p. 657):

Benefit transfer is defined as the transfer of existing estimates of nonmarket values to a new study which is different from the study for which the values

were originally estimated. In essence, this is simply the application of secondary data to a new policy issue.

The use of existing data is not something new to economics, or indeed many other disciplines. However, 'benefit transfer' was not that widely used for many years because it was considered that the existing estimates were already subject to various biases and transferring them would create unacceptable levels of error. Use of benefit transfer was also restricted because of a dearth of original estimates (Loomis 1992).

A watershed in the development of benefit transfer was a special issue of the journal *Water Resources Research* in March 1992. This issue generated a number of important outcomes for the use and further development of benefit transfer. One of its recommendations was the development of a library of non-market valuation studies to facilitate the use of benefit transfer (Boyle and Bergstrom 1992). Since that time, three non-market valuation databases have been developed. These include the ENVALUE database developed by the New South Wales Environment Protection Authority, the EVRI database developed by the Canadian Department of Environment in conjunction with the US Environmental Protection Agency, and the New Zealand Non-Market Valuation Database.

The purpose of this paper is to acquaint the reader with the existence and features of these databases and to evaluate their usefulness. Section 2 discusses desirable features of such databases. Each of the databases is described (Sections 3 to 5), and they are evaluated in Section 6. Section 7 presents some conclusions about these databases, and recommendations for their future development.

2. WHAT USERS WOULD LIKE TO SEE IN A NON-MARKET VALUATION DATABASE?

Considerable information is needed about an original study to use benefit transfer accurately. Detailed information is needed about the study site, the previous environmental change valued, the population and the study methodology. Armed with this information, an analyst would be well placed to conduct benefit transfer. Hence before attempting to evaluate each of the three databases, desirable characteristics of a non-market valuation database will be outlined.

2.1 Broad selection of value estimates

Non-market valuation databases must have an extensive collection of studies that cover a broad number of areas to be useful for a wide audience. Many types of value estimates are needed, including both use and non-use values. There are numerous different natural resources where analysts seek to use benefit transfer, e.g. beaches, rivers, wetlands, national parks, forests, remnant vegetation, biodiversity, air quality, water quality, land quality, and noise levels. These are environmental goods, but there are other types of non-market goods where people may seek to use benefit transfer. For instance, health economists are increasingly making use of non-market valuation techniques. And while it is a sensitive topic, there is also interest in values that people place on risk reduction, morbidity and mortality.

It is apparent that analysts seek to use benefit transfer for a broad range of issues, and particularly for those areas that are most often utilized, it would be desirable to include a selection of studies. Hence, inclusion of value estimates of water quality improvements in urban rivers in addition to rural rivers would be useful. Similarly, estimates of the value of recreation in national parks that are close to and distant from urban centres would be useful. As will be discussed, the context for benefit transfer can vary greatly; hence analysts need to be able to choose studies that are relevant for their context.

The selection of studies could also be enhanced by including studies that have been deliberately tailored so that they are suitable for benefit transfer. Some studies are more suited for use in benefit transfer because they allow for differences in site characteristics. These include meta-analyses¹, random utility travel cost models, generalized (i.e. hedonic) travel cost models, hedonic price models and stated preference conjoint studies.

2.2 Commodity description

When comparing changes in the environmental quality of policy and study sites, there are three factors that can vary. First, there are the characteristics of the natural resources. For example, an inland ephemeral wetland is different from a coastal mangrove wetland, even though they share the same name. A coastal beach in Sydney differs from a beach along an inland river. The second difference is in the base level of environmental quality. Natural resources can be in relatively pristine condition, partly degraded or severely degraded. For example, the Narran Lakes are considered to be relatively healthy, whereas the Gwydir Wetlands are regarded as heavily degraded. Thirdly, the changes in environmental quality considered may vary in their extent: for some sites only a marginal change in quality is planned, while for others major works may be planned to improve environmental quality.

Empirical evidence indicates that the values people have for a change in environmental quality depend on all of these factors: the characteristics of the site, the base level of environmental quality and the changes being contemplated (e.g. Smith and Huang 1995; Brouwer et al. 1997). Thus it is desirable that information about each of these factors be reported in any non-market valuation database.

2.3 Population details

The values that people have for a given change in environmental quality are likely to depend primarily on their preferences and socio-demographic characteristics. Preferences indicate people's priorities for changes in environmental quality, while socio-demographics determine people's ability to pay for changes in environmental quality. These are not the only factors that will affect a respondent's willingness to

¹ A meta-analysis is a systematic review of a set of previous studies. It typically involves regression analysis. The value estimate is the dependent variable, and the independent variables include context relevant variables (e.g. site characteristics, whether there are non-use values in addition to use values involved) and methodological variables.

pay for a change in the quality of a natural resource (see Blamey 1998), but arguably are the main factors. Thus, when using benefit transfer it is prudent to check whether populations are indeed similar in terms of preferences and socio-demographics. The latter are easier to check, e.g. in terms of whether average income, education and age of the two populations are similar. The former are more difficult to compare. An example is the comparison of preferences between rural or urban populations². Therefore it would be useful for a non-market valuation database to provide information not only about socio-demographic characteristics, but also about the type of population that was sampled.

2.4 Extent of the market

When undertaking benefit transfer, it is necessary to make a decision about the number of people to include within the population. Suppose that there is interest in estimating the value of improving water quality in the Georges River in Sydney, and an analyst has found a suitable estimate of the willingness to pay of households for improved water quality. Which households should be included when calculating aggregate willingness to pay? Just those within the Georges River Catchment, those households within five kilometres of the river, or households throughout Sydney?

This decision can have a substantial effect on value estimates, yet it is one that according to Smith (1992, p. 687) is "not as easily reconciled with the current focus on benefit measurement". Empirical evidence indicates that for some goods, particularly where use values are involved, willingness to pay declines with distance from the site. Thus in some instances the geographical extent of the market can be estimated mathematically. However, in other contexts the relationship between distance and willingness to pay is less certain (Pate and Loomis 1997). In these cases it is less easy to identify all of the people who would benefit or lose from a change in environmental quality.

It would be desirable for non-market valuation databases to report information about distance decay functions, i.e. how willingness to pay changes with distance from a site. If this information were not available, a detailed explanation of the population that was surveyed and their distance from the site would be useful. With this information, the analyst can make the assumption that it is reasonable to extrapolate values for that proportion of the population that is a similar distance from the policy site.

2.5 Detailed reporting of results

Benefit transfer can differ greatly in its level of sophistication. The simplest forms of benefit transfer involve the transfer of aggregate or mean values (e.g. per household). However, where a regression equation has been estimated so that value estimates are a function of socio-demographic or site characteristics, it is possible

² In some cases, more detailed information about people's preferences may be available from other sources of secondary data. In Australia one could obtain data from the Australian Bureau of Statistics environmental attitudes survey, and compare results from different areas.

to derive more refined estimates by transferring the benefit generation functions (Desvousges et al. 1992; Loomis 1992). Value estimates for benefit transfer can be calculated by entering the population and site variables of the policy site in the regression equation. The capacity to undertake this latter type of benefit transfer is dependent on the reporting of regression equations and appropriate evaluative statistics (e.g. t statistics, adjusted R^2 , F value). Hence reporting of this type of information is desirable.

2.6 Validity of the value estimates

"Validity" implies an estimate is free from bias and is reproducible. Any assessment of validity must involve an assessment of the methodology of the study. To do this, information would be needed about the sampling procedure and response rate, the key features of the survey instrument (if applicable), and the modeling procedure used. Table 1 provides examples of the types of questions that might be asked.

The results of a study can also provide evidence of validity and should be assessed. For instance, where there are *a priori* expectations the existence of correctly signed and significant variables provides evidence of theoretical validity. This typically involves examination of socio-economic variables such as income, education, age, number of children, and membership of environmental groups or environmental orientation and attitudes towards big business (Arrow et al. 1993). For stated preference studies, it can also include examining the significance of scope variables (Bennett et al. 1998). This is sometimes described as testing theoretical or construct validity. There are several other methods for testing validity that are used in survey research that have found their way into the non-market valuation literature. These include tests of content validity, convergent validity and predictive validity³. Testing of this type provides further support for the validity of non-market valuation estimates, and thus should be reported.

2.7 Precision of the value estimate

Validity also requires that the results of a study are reproducible or reliable. Formally, reliability can be determined by using what are known as test-retests. That is, a study is repeated some time later to determine if the results have changed. However, repeating a study is costly. An alternative is to examine the precision of the results. Is there strong central tendency, or are the data widely distributed? If the results are narrowly distributed, it is more likely that a similar mean estimate would be produced if the study were to be repeated.

³ Content validity occurs when there is validation either by experts or respondents that a Rerword to "These relate respectively to: validation by experts or respondents that a construct is measuring what it seeks to measure; convergence of the results from two different approaches that seeks to measure the same construct; results predicted by a survey actually occurring.

TABLE 1
POSSIBLE METHODOLOGICAL ERRORS IN NON-MARKET VALUATION STUDIES

Type of error	Questions to ask
<i>Sampling errors</i>	<ul style="list-style-type: none"> • Was the method of sampling appropriate for the study? • Was the non-response rate unacceptably high? • What assumptions were made about the preferences of non respondents? Are they justified? • Was the sample representative of the population? If not, were appropriate adjustments made to the value estimates?
<i>Questionnaire design errors for stated preference studies</i>	<ul style="list-style-type: none"> • Was the payment vehicle clearly specified? • Was the year that payment would start specified? • Was a rationale for payment provided? • Was the good described in detail and clearly? • Is there evidence of the accuracy of the description provided in the questionnaire (e.g. external assessments)? • Was the change in the environmental good clearly described? • Was the timing of the environmental improvements specified? • Was any uncertainty about outcomes acknowledged? • Were questions included to check on respondents' understanding and acceptance of the hypothetical scenario? • Was a reminder about budget constraints provided? • Was a "not sure" option included in the elicitation question? • How were the attributes and their levels selected for a conjoint analysis?
<i>Measurement errors in travel cost studies</i>	<ul style="list-style-type: none"> • Was the number of user days measured accurately? • Did respondents give accurate estimates of times and distance? • Was there congestion at the recreation site? • Was the value of time estimated and included appropriately? • Were groups that share travel costs (e.g. buses) treated appropriately? • Was the recreational trip split into components where several sites were visited?
<i>Modelling errors</i>	<ul style="list-style-type: none"> • Was the modeling technique used appropriate for the data? • Was there evidence of model mis-specification (e.g. multicollinearity, heteroscedasticity, autocorrelation, IIA violations, etc)? • Were alternative functional forms tested? • Did the model have reasonable explanatory power? • Were the assumptions made about error terms appropriate?
<i>Value estimation errors</i>	<ul style="list-style-type: none"> • What method was used to generate value estimates and is this method currently recommended? • What assumptions were made about non-respondents when calculating value estimates?

2.8 Conservatism of the estimate

Once a source study has been identified that is sufficiently similar in context to the target study, assessment of the appropriateness of using benefit transfer usually focuses on questions of validity. While it is proper to assess validity, it is also prudent to question how the judgement of the researcher may have affected the value estimate (McConnell 1992). There are various ways of designing a non-market valuation study to derive conservative value estimates. The recommendation of the stated preference literature is to derive conservative estimates where possible (Arrow et al. 1993). Nonetheless, with virtually all non-market valuation techniques there are ways of increasing or decreasing value estimates.

For example, in stated preference studies a choice has to be made about whether payment should be one-off or annual. It is well known that annual payments result in much larger value estimates because of the high discount rates that respondents use (e.g. see Holcomb and Nelson 1992). Similarly, particular contingent valuation elicitation formats produce more conservative estimates. For example, open-ended questions and the dissonance-minimising format generally produce more conservative estimates than the dichotomous choice format. Other recognized methods of producing more conservative estimates in contingent valuation studies are to include a reminder statement about budget constraints, include protest bids, choose a payment vehicle that is likely to be less acceptable to respondents and include a "not sure" option in the elicitation question (Morrison et al. 2000).

For conjoint analysis studies there are also choices that can affect value estimates. For example, limiting the attribute space is known to inappropriately reduce value estimates (Meyer and Eagle 1982), while excluding the alternative specific constant can either increase or decrease compensating surplus, depending on the sign of the constant.

Estimates derived using revealed preference methods can also be affected by the judgement of the researcher. For example, value estimates derived using the travel cost method can be made more conservative by excluding a value for travel time, or only including a percentage of the average wage rate. The treatment of substitute sites, alternative travel destinations and the assignment of travel costs can also affect value estimates. Moreover, empirical evidence indicates that the type of travel cost model used can substantially affect value estimates, with single-site travel cost models producing smaller value estimates than multiple site models (Smith et al. 1986; Carson et al. 1996)⁴. Hedonic price studies are not immune from these problems either. Value estimates can be affected by the attributes selected, the accuracy of measurement of the pollutants involved and the functional form used (Graves et al. 1988).

⁴ Carson et al. (1996) provide three reasons for this: (1) many single site models exclude travel time, (2) multiple site models tend to be more elaborate with visitors coming from long distances to one or more sites, and (3) multiple site models often use functional forms which tend to produce large estimates.

TABLE 2
RESULTS FROM META-ANALYSES SHOWING HOW STUDY METHODOLOGY
AFFECTS VALUE ESTIMATES

Study	Significant coefficients	Non-significant coefficients
Smith and Kaoru (1990)*	<ul style="list-style-type: none"> • Substitute price term included in travel cost equation (-) • Fraction of wage used to estimate the cost of travel time (+) • Linear model specification • Log-linear model specification (semi-log in logs of independent variable omitted for each) (+) • Semi-log (dependent variable) specification (+) • ML-TRUNC estimator (simultaneous equation estimators omitted for each) (-) 	<ul style="list-style-type: none"> • Average wage rate used to measure the cost of travel time • OLS estimator • GLS estimator
Walsh et al. (1992)*#	<ul style="list-style-type: none"> • Survey was conducted on site (-) • Open-ended question used (base iterative bidding) (-) • Contingent valuation rather than travel cost (-) • Inclusion of a substitute price variable in the travel cost equation (-) • Travel cost observations at an individual level (+) 	<ul style="list-style-type: none"> • Administered by the Forest Service • Dichotomous choice question asked (base iterative bidding)
Boyle et al. (1994)#	<ul style="list-style-type: none"> • Use of the dichotomous choice format rather than open-ended or iterative bidding (-) • Estimation of use values only (-) • Response rates (-) 	
Smith and Huang (1993)~	<ul style="list-style-type: none"> • Number of neighbourhood characteristics in hedonic price model (+) • Number of air pollution variables in hedonic price estimation (-) • Use of actual prices (+) • Linear model (+) • Semi-log model (+) • Log-linear model (+) • Unpublished study (+) 	

TABLE 2 (contd.)
RESULTS FROM META-ANALYSES SHOWING HOW STUDY METHODOLOGY
AFFECTS VALUE ESTIMATES

Sturtevant et al. (1995)*#	<ul style="list-style-type: none"> • Price of substitutes included in model (-) • Fraction of wage rate included as a travel cost (+) • Semi-log functional form used (+) • Double-log functional form used (+) • Maximum likelihood estimation (-) 	<ul style="list-style-type: none"> • Consumer surplus a per trip value instead of a per-day value
Smith and Osborne (1996)#	<ul style="list-style-type: none"> • Use of open-ended format (-) • On-site interviews (-) 	<ul style="list-style-type: none"> • Use of the iterative bidding format (+) • Inclusion of residents only in the state where the park was located (+)
Brouwer et al. (1997)#	<ul style="list-style-type: none"> • Income tax payment vehicle (+) • Use of open-ended format rather than dichotomous choice (-) • Response rates (-) • North America rather than Europe (+) 	

* Meta-analysis of travel cost studies

Meta-analyses of contingent valuation studies

~ Meta-analyses of hedonic pricing studies

Detailed empirical information about the effect of the study methodology on value estimates is summarised in an increasing number of meta-analyses of non-market valuation studies. These studies show the types of factors that affect value estimates, and the signs and magnitudes of the effects. Table 2 summarises results from these studies.

It is evident from this discussion that non-market valuation studies can be designed to produce conservative estimates. This is not surprising, being done in many other areas of economics as well as other sciences. However, if an estimate is to be transferred it is vital that the analyst conducting the transfer knows whether the estimate is likely to be conservative.

To summarise the discussion, it would be desirable to see the following features in a non-market value database:

- 1) Broad selection of value estimates
- 2) Details about the change that is being valued, including the characteristics of the natural resource, the base level of environmental quality and the change that was valued
- 3) Information about the socio-demographics of the population at the site, and any other pertinent information that could be useful in assessing the preferences of the population
- 4) Details about the extent of the market: how far away from the site were respondents identified who still valued the natural resource?
- 5) Detailed reporting of the study results
- 6) A thorough assessment of the validity of the study, including discussion of any important methodological issues and reporting of results of validity tests
- 7) Details about the precision of value estimates so that reliability can be assessed
- 8) Information about the study that can be used to ascertain whether a conservative value estimate has been produced.

3. ENVALUE: NSW EPA ENVIRONMENTAL VALUATION DATABASE

The ENVALUE database was released by the New South Wales Environment Protection Authority in 1995. The initial version was in the form of a handbook with an accompanying floppy disk database⁵. An updated and web-based version of the database was released in 1998. The database is free to access and is found at the NSW EPA's website (www.epa.nsw.gov.au/envalue). ENVALUE predominantly contains reviews of non-market valuation studies, but also a selection of conceptual papers. Help screens are provided to support analysts in conducting benefit transfer.

The database contains reviews of about 350 studies (one-third conducted in Australia) as well as summaries of about 30 conceptual papers relating to non-

⁵ The author of this article was the principal author of the first version of this database.

market valuation. The studies in the database have been peer reviewed by a panel of non-market valuation practitioners and government economists.

3.1 How does the ENVALUE database work?

ENVALUE has relatively simple-to-use search mechanisms. Searching is by four main fields: type of study, medium (i.e. environmental asset), country and author. For the first two of these fields additional sub-fields can be selected to refine searching. Figure 1 provides an example of the results from a search by the "medium" field. In the left hand side of the screen one double clicks on the medium of interest (e.g. air quality), and the available studies appear in the right hand side of the screen. One can then refine the search by clicking on a sub-field (e.g. health impacts) or choose to view any relevant studies.

When a study is selected, more detailed information is provided, including a summary of the results with value estimates translated into 1997 Australian dollars; an "annotated bibliography" that contains the reference, a short description of the study site and population, a short commentary on the study; and an evaluation of the study using a set of "evaluation criteria". Examples from the "Annotated Bibliography" and "Evaluation Criteria" fields are provided in Figures 2 and 3.

**FIGURE 1
EXAMPLE SELECTION FROM THE ENVALUE DATABASE**

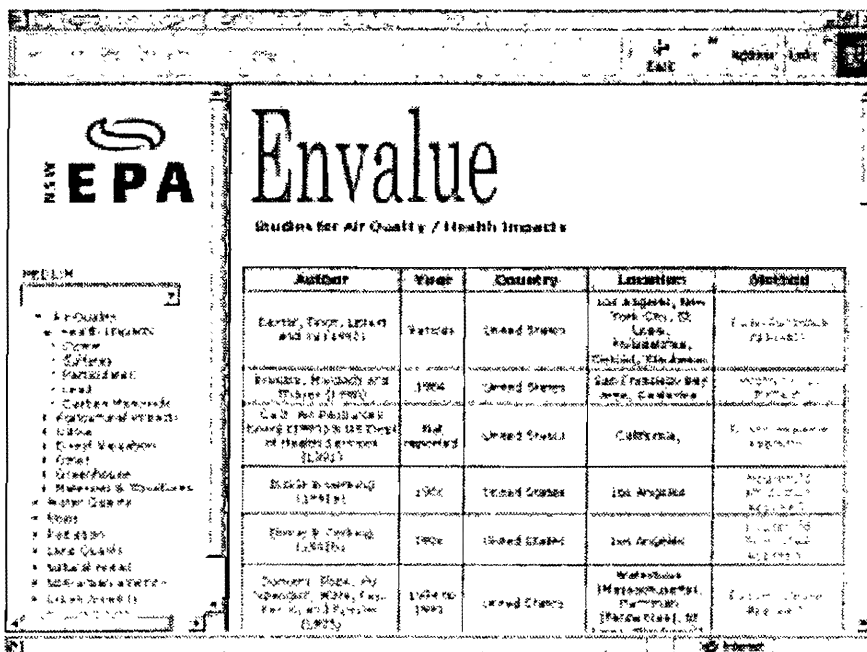
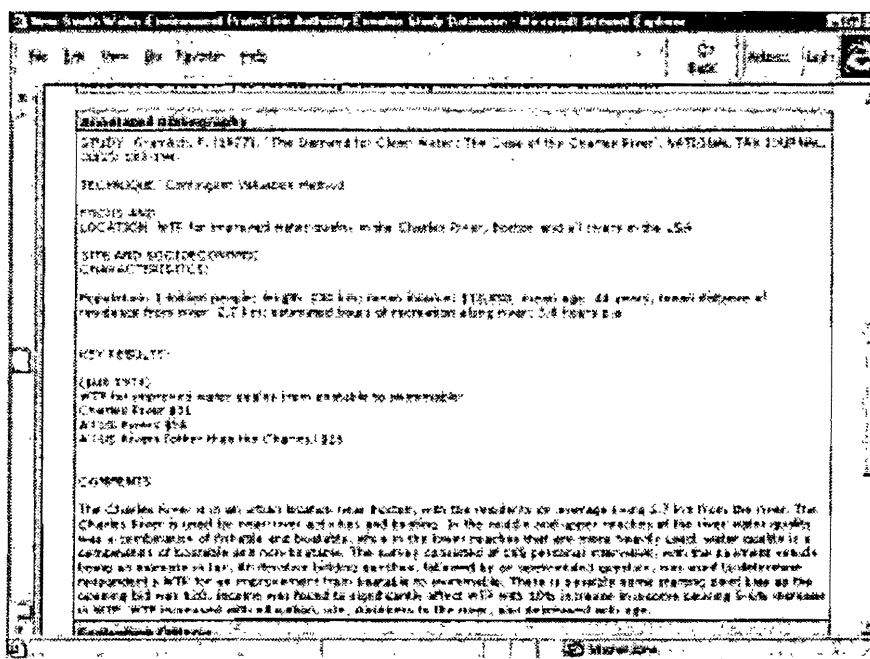


FIGURE 2
THE "ANNOTATED BIBLIOGRAPHY" FIELD IN THE
ENVALUE DATABASE



4. EVRI - ENVIRONMENTAL VALUATION RESOURCE INVENTORY

The Environmental Valuation Resource Inventory was developed by Environment Canada in association with the US Environmental Protection Agency. Other collaborators included the World Bank, European Union, Government of Quebec, and Economy and Environment Program for South-East Asia. The structure of the database was developed with the assistance of a panel of international experts in non-market valuation⁶. The content of the database has similarly been reviewed. The database is available at the web address (<http://www.evri.ec.gc.ca/evri/>) in three languages, namely English, French and Spanish. The database is currently only available via subscription, but may soon become available free of charge. It currently contains summaries of over 900 non-market valuation studies, 590 from North America, 85 from Europe, 53 from Asia, 18 from Africa and 8 from South America.

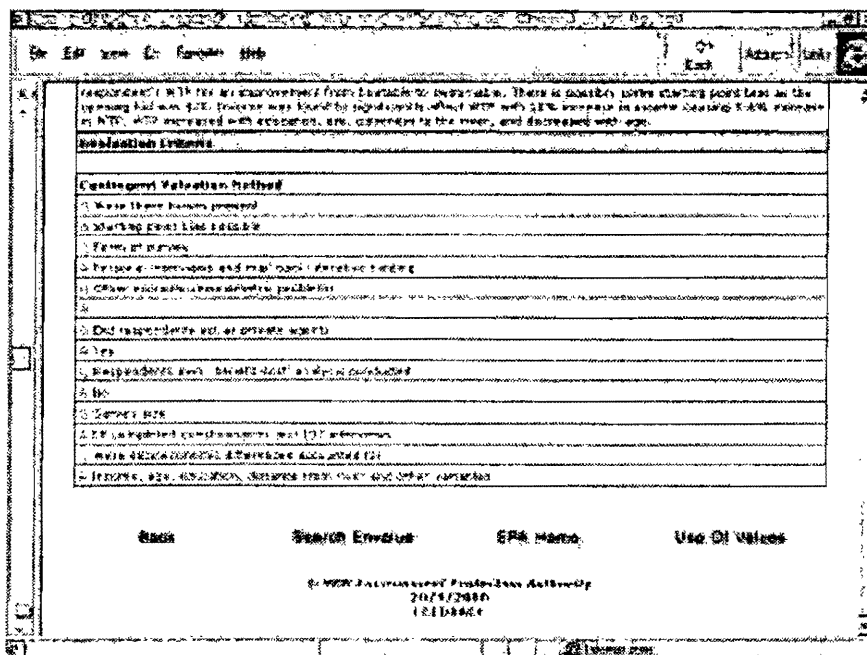
⁶ Victor Adamowicz, Richard Carson, William Desvousges, John Loomis, Robert Rowe, Michael Welsh, Rick Freeman, Alan Krupnick and Jason Shogren.

4.1 How does the EVRI database work?

The EVRI database has somewhat different searching functions to ENVALUE, and it is more complicated to use, although there is a useful tutor in EVRI. It is possible to conduct a simple keyword search, or to use a searching protocol. The protocol involves first searching for potential studies using a "Searching Module", and then viewing the selection in a "Screening Module". Within the "Searching Module" one can define five categories of desired information: similarity of environmental issues; geographic characteristics; specific environmental assets or goods and services; specific geographic characteristics; and economic measure and market characteristics.

An example of one of these categories is provided in Figure 4. The searching module is quite detailed and gives the researcher various options for refining searches. Once the search has been defined, a message is displayed informing the user how many studies in the database satisfy the criteria nominated. If there are too many studies, the search may be further limited. Eventually access is made to the "Screening Module" where the relevant studies can be viewed. The information categories within the Screening Module are virtually identical to those provided in

**FIGURE 3
THE "EVALUATION CRITERIA" FIELD IN THE
ENVALUE DATABASE**



the "Annotated Bibliography" in ENVALUE. That is, the following six categories of information are provided:

1. Study Reference
2. Study Area and Population Characteristics, i.e. information about the location of the study along with population and site data
3. Environmental Focus of the Study, i.e. a description of the environmental asset being valued, stressors on the environment, and the specific purpose of the study
4. Study Methods, i.e. technical information on the actual study, along with the specific techniques that were used to arrive at the results
5. Estimated Values
6. Results Summary

An example of the information provided within this module is provided in Figure 5. Note that no systematic criteria for evaluating records within the EVRI database are displayed.

FIGURE 4
EXAMPLE OF A CATEGORY IN THE SEARCHING
MODULE OF EVRI

The screenshot shows a web-based interface for the EVRI Searching Module. The main content area is titled "Searching Module" and "Environmental Value Assessment & Inventory". It features a sidebar on the left with navigation options: "Searching Module", "Screening Status", "EVI: Issues", and "Feedback". The main content area is organized into several sections, each with a list of items and checkboxes:

- General Type of Environmental Goods and Services Valued:**
 - Public recreation
 - Wildlife/birds/nature
 - Scenic view
- Environmental Stressor:**
 - Industrial/urban
 - Transportation/traffic
 - Recreation/visitation
- General Environment Asset:**
 - Air Quality:**
 - PM10
 - PM2.5
 - Ozone
 - Land Quality:**
 - Open space
 - Number of structures/land use
 - Water Quality:**
 - Stream/river
 - Groundwater
 - Other Characteristics:**
 - Soil type
 - Historical monuments
 - Other characteristics

5. THE NEW ZEALAND NON-MARKET VALUATION DATABASE

The New Zealand Non-Market Valuation Database was developed by Geoff Kerr from Lincoln University. Released in 2000, the database is confined to summaries of 85 non-market valuation studies that have been conducted in New Zealand, some unpublished, and information about non-market valuation practitioners in New Zealand. It can be accessed at <http://learn.lincoln.ac.nz/markval/>.

This database has a simple structure, and is therefore straightforward to use. There are two main search screens: "Search the Studies" and "Search for Studies by Author". Under the first of these screens, there are three fields that can be used for selecting studies, namely date of study; type of study (e.g. travel cost method, conjoint analysis), and object of study (e.g. recreation, pollution, transport). These fields are illustrated in Figure 6.

The information for each study reported by a search is relatively succinct, and includes the study reference, a one line description of what was valued, the value estimate and references to any reviews of the study (see Figure 7).

FIGURE 5
EXAMPLE FROM THE SCREENING MODULE IN EVRI

The screenshot shows a web browser window titled "EVRI - Screening Module (Screened) Internet Explorer". The address bar shows "http://www.evri.org.nz/". The page content includes a logo for EVRI and a navigation menu with options: Home, Search, About, Contact, and Help. The main content area displays the following information:

- Category:** EPA's Docket (EPA) - Kestel's (EPA)
- Population:** Docket (EPA) - Kestel's (EPA)
- Language:** English
- Country:** United States
- Keywords:** EPA's Docket (EPA) - Kestel's (EPA)
- Abstract:** The study data indicates how various data can be used to develop an estimate of the total environmental value of improvements in water quality. The information in the CVI study are a random subset of a telephone survey of the Estuaries-Washington Statistical Metropolitan Sampling Area (EMSA). The total cost estimate was based on a survey of 450 people in 11 public beaches on the western coast of Maryland in January, 1994. They are random samples of beaches and days. The design was a 2-stage stratified random sample in which the probability sample of beaches and days was selected, and then a random sample of people was interviewed at each beach site. The beaching analysis is based on a 1993 survey of beaches by request for the Department of Marine & Fishery Resources and the Maryland Coastal Zone Management Program. The most survey covered 2,519 boat owners in Maryland. The 1990 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (NHWS) data is the major basis for the study. The survey portion of Maryland marine fishing is random was used. 254 respondents to the National Survey listed on average four Maryland fishing trips per year (page 377) for the Chesapeake Watershed Model.

FIGURE 6
SEARCHING FOR STUDIES IN THE NZ NON-MARKET
VALUATION DATABASE

New Zealand Non-Market Valuation Database

Search For Studies

Date of Study

- Any Date
- Prior to 1985
- 1985 to 1995
- 1991 to 2005
- 1996 to 2000
- 2001 to 2005

Type of Study

- Any Method
- Travel Cost Method
- Contingent Valuation Method
- Hedonic Price Method
- Benefit Transfer
- Other Methods

Object of Study

- Any Object
- Recreation
- Pollution
- Aesthetics
- Noise
- Community Services
- Transport
- Environmental Problems
- Other

Search

6. EVALUATING THE DATABASES

Each of the three databases are now examined, in terms of the eight characteristics noted as being desirable for any non-market valuation database, and thus how useful they are likely to be for analysts contemplating the use of benefit transfer.

6.1 Characteristic 1: Broad selection of value estimates

As can be seen in Table 3, the ENVALUE database has reasonably broad coverage, including a wide selection of Australian studies. However, there are no studies on the value of morbidity or mortality, or pesticide risk, and there is limited reporting of the results from meta-analyses and other studies particularly suited to benefit transfer.

TABLE 3
SELECTION OF STUDIES WITHIN ENVALUE

Medium	Number of studies
Air	80
Water	68
Noise	34
Radiation	5
Land quality	43
Natural areas	102
Non-urban amenity	4
Urban amenity	16
Risk of fatality	1

The EVRI database has a much larger number of studies than ENVALUE (about 940 compared to about 350). However, as noted in the introduction to EVRI,

FIGURE 7
INFORMATION REPORTED IN THE NZ NON-MARKET VALUATION DATABASE

The screenshot shows a search results interface with the following content:

Search for Studies - Response
 Type of Study = Any Type, Object of Study = Any Object, Issue of Study = Any Issue
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Date Year	Object of Study	Type of Study
1997-2004	Radiation	Contingent Valuation Method
Issues Valued	Radiation Dose Fatality	
Issues Valued	Radiation Dose Fatality	
Authors:	Richard Cook	
References:	There are no references listed for this record	
References:	Waters, R. J. (1994) An economic evaluation of the health impact of a nuclear power station. Working Paper, Department of Commerce, Lower Hutt.	
Date Year	Object of Study	Type of Study
Not Reported	Recreation	Travel Cost Method
Issues Valued	Medical Air Quality	
Issues Valued	Medical Air Quality	
Authors:	Alan Woodhouse Don Cooper	
References:	There are no references listed for this record	
References:	Woodhouse, A. and Cooper, D. (1995) The Value of Medical Air Quality. Working Paper, Department of Commerce, Lower Hutt.	

there is currently a bias towards water and animals (Table 4)⁷. There are also few studies from Asia. Thus, while EVRI is likely to be particularly useful for North American analysts, it is likely to have less relevance for researchers in Australia.

TABLE 4
EVRI STUDIES ACCORDING TO ENVIRONMENTAL
ASSET CATEGORY

Environmental Asset Category	Number of Studies
Water	382
Plants	62
Micro	3
Man	54
Land	193
Human	115
Animals	305
Air	49

The majority of the small collection of studies in the New Zealand database involves the valuation of recreational activities; few deal with the impacts of pollution (see Table 5). Due to the local nature of the studies, the database is likely to be of greatest relevance to New Zealand analysts.

TABLE 5
STUDIES BY CATEGORY IN THE NZ NON-MARKET
VALUATION DATABASE

Category	Number of studies
Recreation	34
Pollution	1
Aesthetics	5
Risk	5
Community Services	4
Transport	11
Environmental Preservation	5
Other	9

⁷ A somewhat different categorisation is used in the ENVALUE and EVRI databases. In the ENVALUE database there is a category "natural areas" that contains such things as "rivers", "wetlands" and "national parks". Within the EVRI database these categories are all subsumed under land or water.

6.2 Characteristic 2: Commodity description

The databases vary in level of detail about the characteristics of the natural resource, the base level of environmental quality and the change that was valued. This is a strong point for both ENVALUE and EVRI, as emphasis is placed in the "annotated bibliographies" and "Screening Module" on explaining exactly what was valued. Analysts should find this feature useful in selecting studies that are relevant to their policy site.

6.3 Characteristic 3: Information about socio-demographics

Within the "annotated bibliographies" in the ENVALUE database and the "Screening Module" of the EVRI database are detailed descriptions of socio-demographic characteristics such as income, age and education. However, less information is consistently reported that could be used to determine whether people's preferences are likely to be similar, such as whether sampling was conducted in rural or urban areas. While this type of information may be obvious to people within the country where the study was conducted, for analysts in other countries it may be less clear. The New Zealand Non-Market Valuation Database provides no information about socio-demographic characteristics.

6.4 Characteristic 4: The extent of the market

Since willingness to pay appears to be a function of distance, it is important to know what proportion of the population should be included when transferring value estimates. However, this tends to be an issue that is overlooked in the benefit transfer literature. Details about sampling areas are generally only reported incidentally within ENVALUE. Typically, mention is only made of the location of the study. More detail is provided in EVRI within the section "Study/Survey Information" in the "Screening Module". For example, in reviews of stated preference studies information is reported about the location of the people who were surveyed.

6.5 Characteristic 5: Detailed reporting of the study results

Ideally, non-market valuation databases should report not just mean or aggregate estimates, but regression equations and other relevant statistics. Despite the importance placed on this type of benefit transfer in the benefit transfer literature, few regression equations are reported in any of the databases, limiting use of the results reported in the databases to relatively simple forms of benefit transfer. In the introduction to the EVRI database, analysts are encouraged to obtain original articles prior to undertaking benefit transfer. It is apparent that this is necessary if more sophisticated methods of benefit transfer are to be used.

6.6 Characteristic 6: Thorough assessment of validity

Attempts have been made to assess the validity of many of the studies included in ENVALUE, and some studies of inferior quality were excluded when compiling the database. A short discussion of the results of each of the studies is included in

the "Annotated Bibliographies" field. In this discussion the methodology of the study is often critiqued. The validity checking has also been expedited by use of systematic criteria for assessing validity. However, many of these assessments are relatively rudimentary, and no assessment of validity has been conducted for about 60 of the studies which are reported from secondary references. Moreover, only a few of the issues that are pertinent for assessing validity (see Table 1) have been considered. There is a tendency in the reviews to record only problems or biases that have been noted by the authors.

In EVRI, a basic review of each study is provided within the "Screening Module". The reviews are generally more thorough than those in ENVALUE, with more information provided about how the study was conducted. For example, information is provided about how the questionnaire was developed, the method of sampling, and the modelling process, including the type of equation that was estimated. However, it is apparent that the objective of EVRI is to summarise study results rather than explicitly assess validity, and unlike ENVALUE's "Evaluation Criteria" there is no systematic attempt to assess validity.

The New Zealand Non-Market Valuation Database only reports study results briefly, with no assessment of the validity of the results.

Thus in all three databases there is only a rudimentary assessment of validity, if it occurs at all. A more thorough assessment of validity would require analysts to obtain copies of the original articles and make their own assessment.

6.7 Characteristic 7: Details about the precision of value estimates

Generally, little information is provided in any of the databases about precision. No confidence intervals or standard errors have been reported for the majority of studies. Thus the task of checking reliability as well as validity primarily remains with the analyst conducting benefit transfer. Reporting of this information is arguably one way that non-market valuation databases could be readily improved. It is not difficult to report confidence intervals or standard errors (if they are available in the source studies), and such information is useful for screening studies.

6.8 Characteristic 8: How conservative is the estimate?

Within the ENVALUE database, some information is reported in the "Evaluation Criteria" and "Annotated Bibliographies" fields that could be used to assess whether a conservative value estimate has been produced. For example, information about the treatment of travel time and substitute sites is recorded for travel cost estimates, and response rates and elicitation methods are generally reported for stated preference studies. In EVRI, information is reported in the "Screening Module" that could be used to assess how conservative an estimate is, such as type of elicitation technique in contingent valuation studies, independent variables included in regression equations and functional form. However, more information of this type (see Table 2) could have been reported in both databases and an assessment made of how conservative an estimate is likely to be.

The results of this evaluation of the three databases are summarised in Table 6. ENVALUE has several strengths – a relatively broad selection of studies, especially from Australia, relatively detailed reporting of socio-demographics and the changes that are being valued at each site, and an attempt to evaluate the validity of each of the studies contained within the database. EVRI has similar strengths, except that the studies contained are of greatest relevance to analysts in North America. The New Zealand database's greatest strength is for local applications involving recreation; in other respects it is a relatively simple database that has few of the characteristics that one would ideally desire to have within a non-market valuation database.

It is apparent from this evaluation that each of the databases has a number of limitations. The reporting of results tends to focus on mean value estimates, and this will affect the nature of benefit transfer that can be conducted. Validity testing is rudimentary, and other critical information about the precision of value estimates, regression equations, extent of the market and the conservativeness of value estimates are under-reported. Nonetheless, these databases are likely to be a useful starting point for benefit transfer. Particularly with ENVALUE and EVRI, it is possible to screen for potential studies, and to derive mean value estimates that could be used for benefit transfer. However, if an analyst is planning to use more sophisticated forms of benefit transfer it should be anticipated that the original study will need to be accessed. Similarly, original studies may need to be accessed to examine both validity and reliability. Information about many of the important issues that need to be considered when transferring benefit estimates is not presented within these databases. Thus it remains the responsibility of the analyst to collect this information and make the necessary evaluation.

TABLE 6
SUMMARY OF DATABASE EVALUATION

Characteristics	ENVALUE	EVRI	NZDB
1. Broad range of studies	***	****	*
2. Commodity description	*****	*****	*
3. Socio-demographic characteristics	****	*****	*
4. Extent of the market	**	***	*
5. Detailed reporting of results	**	**	*
6. Thorough assessment of validity	**	*	*
7. Details about precision	*	*	*
8. Conservatism of estimate	**	**	*

*****excellent, ****very good, ***good, **average, *limited

7. CONCLUDING COMMENTS

Benefit transfer has been restricted in the past because of the scarcity and difficulty of assessing original estimates. The development of several non-market valuation databases has been an initiative aimed at overcoming this problem. Large numbers of valuation studies have been collected to facilitate the process of benefit transfer.

Benefit transfer is an intricate process. It can be done quickly, but rigour requires much information and a competent analyst. Eight desirable characteristics for an "ideal" non-market valuation database were identified. While the three databases examined here have important strengths, it was apparent that they also have limitations. The databases are effectively non-market valuation "libraries". While information is presented about the value estimates, the commodity that is valued and the population at the study site, much information that is critical for benefit transfer is not reported. Analysts should not expect to be able to simply download value estimates for a cost-benefit analysis from these databases, unless the cost-benefit analysis is particularly rudimentary and of little policy significance. The databases are primarily screening tools that help the analyst identify potential estimates for benefit transfer. The conduct of rigorous benefit transfer would still require the analyst to obtain copies of and evaluate the original study or studies.

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