



Ministry for the  
**Environment**  
Manatū Mō Te Taiao

## Valuing New Zealand's Clean Green Image

The Ministry for the Environment commissioned PA Consultants to carry out this study (funded by the Contestable Research Fund of the Ministry of Research, Science and Technology) to provide an estimate of the value for New Zealand's export trade of our clean green image.

There is considerable discussion about New Zealand's clean green image, but relatively little solid information about its value. This was clear from an earlier study which the Ministry commissioned through the Sustainable Management Fund, *Green Market Signals*, published in 1999. The current study is, in part, a response to the suggestions received from industry groups and others at that time.

The aim of this current study is to quantify the extent to which particular New Zealand exports benefit from positive perceptions about our environment. The project focuses on three export sectors: dairy, inbound tourism, and organic produce. It assesses the potential consumer reaction to an illustrative decline in New Zealand's cleanness and greenness.

The empirical work done in this study reinforces the qualitative evidence that our clean green image is valuable, and provides some useful insights into the size and nature of that value. The results are of course not definitive – no contingent valuation study can ever be so – but they do strongly indicate a significant vulnerability of export value (through reduction in product quantities likely to be purchased by consumers) in the event of a (hypothetical) degradation of New Zealand's environment.

While the research's approach and findings have been robustly peer reviewed, like all empirical economic estimates, the conclusions rest on assumptions and a specific methodology. That said, the study certainly provides food for thought. Main findings are as follows:

- New Zealand's clean green image does have a value. Environmental image is a substantial driver of the value New Zealand can derive for goods and services in the international market place.
- The study suggests this image is worth at least hundreds of millions, possibly billions, of dollars – aggregating value elements from dairy, tourism, and organic produce, and extrapolating to other sectors such as meat.
- New Zealand is relatively clean and green. This is mainly attributable to our low population density resulting in relatively benign environmental pressures.
- However, there are environmental problems that are sufficient to raise questions about the sustainability of the value of New Zealand's exports attributable to its environmental image. There is a risk that New Zealand will lose value that is created by the current environmental image if we are not vigilant in dealing with the problems that could threaten the image.

**If you would like to discuss this report further, please contact Dr Ralph Chapman, Manager of the Strategic Policy Group, Ministry for the Environment, at (04) 917 7444 or email him at [ralph.chapman@mfe.govt.nz](mailto:ralph.chapman@mfe.govt.nz).**

## **APPENDIX A: THE NON MARKET VALUATION OF ENVIRONMENTAL ATTRIBUTES**

### **A.1 OVERVIEW**

Valuation of environmental attributes is a process that entails several key steps, including:

- Identification of WHAT is to be valued;
- SPECIFICATION of what is to be valued;
- CHOICE of a valuation method;
- DESIGN of the process for applying the method to the item to be valued;
- Data COLLECTION;
- Data ANALYSIS; and
- REPORTING.

In this appendix, we provide an overview of each of these steps with particular emphasis on the valuation of environmental image. Note that the precise nature of the application of this process depends on the particular context of the investigation.

### **A.2 IDENTIFICATION OF WHAT IS TO BE VALUED**

There are two prime components of this step, the nature of the item to be valued and the context within which that valuation takes place.

#### **A.2.1 Items to be Valued**

A key decision within any exercise of this type is to determine what precisely it is that is to be the subject of the valuation exercise. For example, the focus may be on New Zealand's clean green image generally, or changes in the quality or image of specific environmental components.

Valuation of image is the simpler of the two. It requires alternative images to be described to purchasers of NZ products. The purchasers are then asked to describe their purchase behaviour contingent upon the proposed hypothetical state of New Zealand's environment.

Valuation of individual components is a more difficult task. It requires a great deal of pre-testing and selection of a satisfactory statistical design to ensure that values are retrievable from the data. It also requires a larger sample size, so it is more expensive.

This immediately poses something of a dilemma. Clearly, the more detailed valuation of components is more useful in terms of providing quantitative insight into where effort should be applied to obtain the largest benefits from expenditures on environmental improvement. However, this needs to be traded-off against the additional expense involved in obtaining the valuation.

## **A.2.2 Context**

In thinking about the application of valuation methods, we have to be particularly conscious of the context in which the exercise is going to take place. As discussed in the body of this report, the markets of interest along with the point in the value chain to be targeted may well be quite diverse in terms of the characteristics they display. This has implications for the valuation method.

Contrast, for example, the market for agricultural produce and the market for tourism. These markets show quite different characteristics. Tourists visiting New Zealand do so in discrete trips. They typically make a dichotomous decision, choosing either to come to New Zealand or not. Commodity markets differ because purchasers decide not only whether to purchase our products, but how much to purchase. This difference in choices implies that different methods need to be applied to these two types of export.

In addition, these markets may also differ in terms of where in the value chain, environmental drivers enter the purchase decision. Arguably, tourists (the final consumers) make the decision about whether to purchase a vacation in New Zealand (although tour operators and wholesalers may also intermediate). However (at least some) agricultural produce is sold to businesses who undertake further processing, or market the goods to consumers. This difference has implications for whose behaviours are important to understand for the purposes of this study.

## **A.3 SPECIFICATION OF WHAT IS TO BE VALUED**

Having determined what it is to be valued, it is necessary to specify as precisely as possible the alternative states that are going to be the subject of the valuation process. This is particularly important when dealing with matters as abstract as “image”.

Specification is necessary because valuation approaches require that we specify some new (hypothetical) image and then gauge the market’s response to that image. Although we might attach labels to these alternative states, such as “unclean”, “dirty” or “filthy”, use of these simple descriptors is inadequate because different people will have their own perceptions of what they mean. Consequently, it is not possible to relate the measured values back to any particular state of the environment and the results become meaningless for policy purposes.

## **A.4 CHOICE OF A VALUATION METHOD**

In simple terms, we want to know how much of various products or services New Zealand will sell whenever our image takes on specified states. This knowledge may then be combined with information on producer benefits to derive a value to New Zealand (in the relevant markets) of the hypothesised changes in image.

There are a range of methods that may be used to assist in the valuation task. The choice of method depends on the characteristics of the valuation problem. In the next few paragraphs below, we outline the methods available and provide an assessment with respect to their applicability to the valuation of the environmental drivers of New Zealand’s exports.

At the broadest levels, there are two main types of predictive processes that can be employed to assist in valuation tasks of this type; revealed preference approaches and stated preference approaches. Revealed preference approaches rely on observations of actual market behaviours to make inferences about behaviour and value, while stated preference approaches create some form of hypothetical situation and ask people to predict their behaviour in that situation.

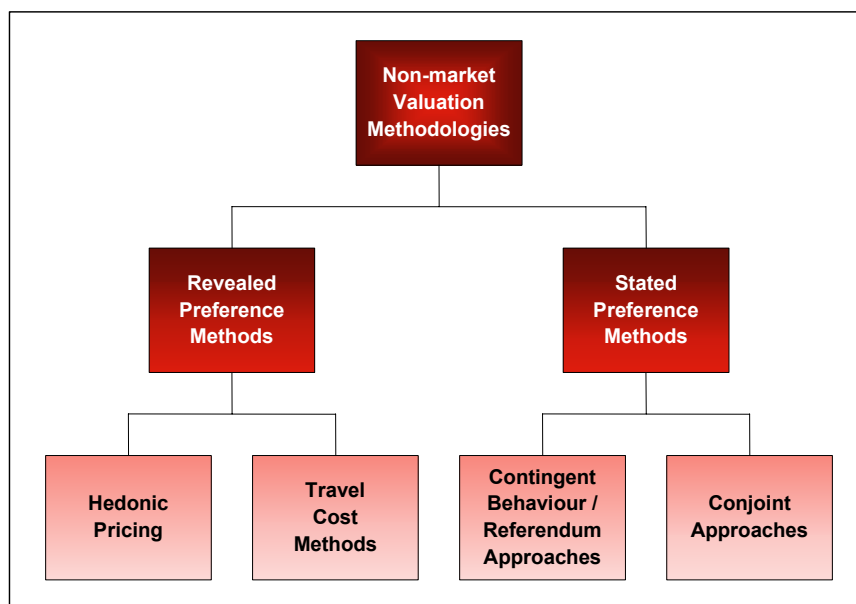
The most common revealed preference methods are travel cost methods and hedonic pricing. Travel cost methods involve the analysis of the costs incurred in travelling to a particular (environmental) destination. While they are theoretically applicable to areas such as tourism, practical difficulties rule them out for international contexts.

Hedonic approaches are applicable in cases where people evaluate characteristics of alternatives before making a purchase decision and the outcomes of those purchase decisions are observable in the market place. Application of the hedonic approach would require that the characteristics of a large number of alternatives be available, as well as the choices made by individuals. For example, in order to value New Zealand's image for tourism it would be necessary to identify for each market the image and other characteristics of all possible holiday destinations, as well as the prices of holidaying in those destinations, in order to infer the marginal value of the image characteristic. Measurement of destination characteristics is problematic for conceptual and cost reasons. Objective measurement of image is also problematic. Should those problems be surmountable, there remains an identification problem. These considerations rule out the hedonic approach in this context.

The inapplicability of revealed preference approaches forces reliance on stated preference approaches. The two most common of these are contingent behaviour (valuation)/referendum approaches and conjoint approaches. Conjoint approaches mimic the hedonic approach, but present people with a small set of options with specified characteristics and then require a statement about the preferred option or ranking of options. The approach is statistically complex and is expensive to implement, but does allow identification of the relative worth of characteristics.

Contingent behaviour/referendum approaches compare behaviour between some specified base (usually the status quo) and some specified alternative. Referendum approaches are used for dichotomous decisions (eg holiday in New Zealand /do not holiday in New Zealand), while contingent behaviour approaches are employed where the behaviour of interest is quantitative in nature (how much product would be purchased). These approaches are relatively cheap and can provide quality information with relatively small sample sizes. The taxonomy of non-market valuation processes is summarised in Figure 1 below.

**Figure 1: Taxonomy of non-market valuation methodologies**



## **A.5 PROCESS FOR APPLYING THE METHOD TO THE ITEM TO BE VALUED**

Once the preferred valuation method has been determined, it is necessary to focus on the data requirements and the data collection methods.

### **A.5.1 Data Requirements**

The stated preference approaches require the target population to be surveyed in a way that allows them to express their expected behavioural responses under the specified hypothetical conditions. The core information required is the respondent's prediction of behaviour under the various scenarios. However, it is also useful to collect personal/business information to help in verification of the sample and to identify how behaviours change within sub-groups.

### **A.5.2 Data Collection Methods**

Data collection for stated preference techniques requires presentation of information to a survey participant, coupled with a request for the participant to process that information to formulate a response and to report the outcome. In other words, data collection is a two-way communication exercise and the method chosen must reflect the nature of the information that that must be communicated as well as providing the respondent with suitable opportunities for information processing and decision making.

The methods used to collect the data are determined by communication, time, cost, location and sampling matters. Principal data collection methods include postal and other written surveys, in-person interviews on-site, in public locations (e.g. shopping malls), or at the participant's home, telephone interviews, and computer-based surveys.

Most social scientists prefer in-person interviews to allow optimal communication. This approach typically achieves higher response rates than the others and allows the interviewer to control the flow of information, to use visual aids that are not available using other approaches, and to clarify issues during the process. The down side is that personal interviews can be expensive (particularly those undertaken at home or in the workplace), and they can be susceptible to interviewer bias.

Postal surveys, telephone interviews and computer-based surveys do not require the surveyor to make physical contact with the participant, so are applicable in cases of spatial separation. Computer-based surveys allow the best control of information flow to the participant, but are also reliant upon the participant having access to a computer that is able to process the software utilised in the survey process. Telephone surveys allow good information control, but are more expensive than written surveys and are prone to low response rates. They do not allow the use of visual aids.

### **A.5.3 Sampling Framework**

The sampling framework identifies who the target population is and how they will be sampled. This part of the assignment is very context specific.

### **A.5.4 Sample Size**

The sample size necessary to obtain predictions of the impacts of image changes within specified bounds is most easily identified for the referendum approach for which there is a binomial response.

The precise size of the sample needed for a given level of required accuracy is a function of the propensity of the population to change their behaviour in response to the change in environmental image. The most uncertain outcomes arise when the estimated proportion is 0.5. In that case a sample size of 100 cases yields a 95% confidence interval of 0.1. In other words, the true proportion is in the range (0.4-0.6). Increasing the sample size to 400 cases reduces the confidence interval to 0.05 (true value is in the range =0.45-0.55). Other proportions mean that smaller sample sizes may be used. For example if the estimated proportion is 0.2, then the 95% confidence interval for a sample of 100 is  $0.2 \pm 0.08$ .

Estimation of confidence intervals for continuous responses is somewhat more complex because the volume of product sold to each individual changes.

## **A.6 DATA COLLECTION, ANALYSIS AND REPORTING**

The remaining steps of the process involve the data collection, analysis and reporting.

Data analysis is relatively straightforward for referendum data in the image valuation context. Survey responses are used to determine the proportion of current purchasers who would remain in the market at each of the hypothetical scenarios. If referendum data is used to value components then discrete dependent variable models (such as logit and probit models) must be utilised. These models produce functions that can be used to describe the proportion of the present market, given any combination of component characteristics. Modelling is straightforward, and can be undertaken using most statistical software packages.