The Value of WA Native Forests and Bushland

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Abstract

EcoNomics™ is an enterprise-wide framework created by WorleyParsons that ensures profitable integration of sustainability into customers' projects and operating assets. The project is to conduct a non-market valuation study based on the environmental, economic and social attributes on Western Australia's native forests and bushland. In particular, the two regions of interest are the Pilbara and the Southwest due to their commodity richness. The need for this data is to service the growing desire across Government and the private sector to have quantifiable data on the value of environmental systems as part of investment planning. The objectives of this project are to acquire biodiversity values on both regions in the form of dollar value per hectare that can then be transferred to a cost benefit analysis across multiple projects with different attributes. A Choice Modelling non-market valuation technique is adopted to obtain these values.

1. Introduction

Resource industries face many challenges, not only to maintain performance and security but to reduce costs, emissions and manage risks while trying to increase revenues to remain profitable. In recent years, these challenges have been magnified due to pressure being applied by external regulatory bodies and the community as expectations on sound project decisions and operations increase with respect to their impacts on existing natural resources and community "assets".

Western Australia is currently Australia's largest resource state with a large mining and petroleum sector. With resource reserves existing in places of biodiversity richness, the problem lies where plans for utilizing that land may not represent the most sustainable approach for the company, the community and the land itself when all options are considered. When conducting a quantitative analysis on potential projects and their development options, it is in a company's best interest to take into account all environmental, social and economic impact costs into their valuations. This is to provide a profitable yet sustainable method in extracting resources that provides a structure that can account more effectively for all parties.

However, it is very difficult to place a value on some of these attributes. Although there has been some research into methods to quantify these values, only recently have these non-market factors begun to be included in project costs and a better understanding of a project's "true" cost has emerged. These values can be quite considerable and thus play an important role in creating a sustainable future.

The Pilbara and Southwest are two of the most active resource and industry related regions in Western Australia due to their commodity richness, and there is still a gap in literature that needs to be filled to provide better base data for undertaking EcoNomics™ assessments.

1.1 Project Objectives and Benefits Analysis

The aim of this project is to conduct a non-market valuation study based on the environmental, economic and social attributes of Western Australia's native forests and bushland. The goal is to identify the values held by the West Australian public for the biodiversity assets of the Pilbara and Southwest of WA. The desired result is to derive a dollar value per hectare for both regions, with a focus on a generic value for utilizing the land. This is so the values can be applied to any project, regardless of the reason for using the land. Due to the scale of the areas, the valuations will be broken down further into types of ecosystems (e.g. coastal & inland). By analysing these two distinct regions, it will give a reasonable gauge of how Western Australians' preferences differ for a relatively unvisited/unknown region (the Pilbara) as compared to a well-known biodiversity hotspot (the Southwest).

By obtaining these values, WorleyParsons will be able to provide more accurate values in estimating sustainable project costs for their clientele. This will allow decision makers to identify optimal solutions for profit and sustainability. Knowledge of these values will have the following benefits:

- To fill the gap in literature by deriving biodiversity values on the Southwest and Pilbara regions of Western Australia
- To perform benefit transfer as part of an input to an overarching business decision-making support service
- Reduce the amount of time it takes to evaluate the environmental, social and economic costs tied to any project in the Southwest and Pilbara
- Prevent repeating the process each time a new type of project arises, saving a lot of time and cost
- Discovering a project's true complete cost

1.2 Literature Review

Non-market valuation techniques originated in the field of economics, and are designed to be used as a tool in assisting valuation practitioners to estimate the value of goods and services that are not directly traded in markets, which includes environmental resources (Riera et al. 2012).

Previous studies have been conducted to obtain non-market values on Western Australia's environmental assets; however, in all reported cases they have been tied to a specific location or purpose e.g. the removal of flora and fauna to make way for a new mine. By making the valuation specific to an area or act, the user is able to produce a more accurate value for the desired project however this restricts the data from being transferred to other locations or for different practices.

A benefit cost analysis by Gillespie Economics was conducted for the extension of the Warkworth Mine located 15km southwest of Singleton in the Hunter Valley. The proposal required an Environmental Assessment (EA) in accordance with the New South Wales (NSW) *Environmental Planning and Assessment Act, 1979*. The study adopted a Choice Modelling method to obtain monetary estimates of the values that people from NSW placed

on key environmental, cultural and social impacts of the proposal. The results of the analysis showed that respondents were willing to pay $0.41 per household to avoid a hectare of ecologically endangered vegetation communities (EEC) from being cleared and $0.28 per household for every hectare of existing EEC protected in the region (Gillespie Economics 2009).

There have been several recent academic works dedicated to exploring society's preferences on the quality of mine site rehabilitation. A particular study on public preferences for timeliness and quality of mine site rehabilitation in the case of bauxite mining in the Southwest shows that the public place a relatively high value on the re-creation of vertebrate habitat. Using a Choice Modelling approach, the study showed that the public placed a value of $40,000 per hectare on rehabilitation costs (Burton, Zahedi & White 2012).

A similar academic study was undertaken to evaluate the public's preferences on iron ore mine-site rehabilitation in the Pilbara region. A Choice Modelling approach was applied to provide estimates of the benefits of rehabilitating mine-degraded land. The study found that respondents were willing to accept a reduction of $2.80 million in royalties per percentage of improvement in species rehabilitation. The results also indicated that respondents' would be satisfied to forgo $8.68 million in royalties for every year taken off to complete the rehabilitation (Hammond 2011).

Although all case studies have attempted to discover the value people place on biodiversity in their interested regions, the data cannot be transferred if the next project site doesn't include the same environment or resource act. The two latter cases are tied to rehabilitation, whereas the goal of this project is to obtain biodiversity values for land in its current condition prior to implementation of a project.

2. Methodology

2.1 Non-Market Valuation

Non-market valuation is a method that allows the measurement of society's preferences towards potential changes in environmental outcomes (Bennett 2011). Choice Modelling (CM) is a method that allows an analyst to assess preferences across a range of attributes simultaneously. This project will adopt a Choice Modelling approach to estimate society's values.

Choice Modelling originates from the market research and transport literature and has only relatively recently been applied to environmental studies (Bateman et al. 2002). The model involves survey respondents revealing their values for environmental changes by making choices between numerous alternative future management scenarios (Bennett 2011). By analysing these choices, conclusions can be drawn about the trade-offs people are willing to make for different environmental outcomes. The trade-offs are proposed in monetary terms and thus are interpreted as a respondents' willingness to pay. The Choice Modelling approach can tell us four things about non-market values (Bateman et al. 2002):

1. Which attributes are significant determinants of the values people place on non-market assets
2. The implied ranking of these attributes amongst the relevant population(s)
3. The value of changing more than one of the attributes at once
4. As an extension of the above, the total economic value of a resource or good

2.2 Choice Modelling Design

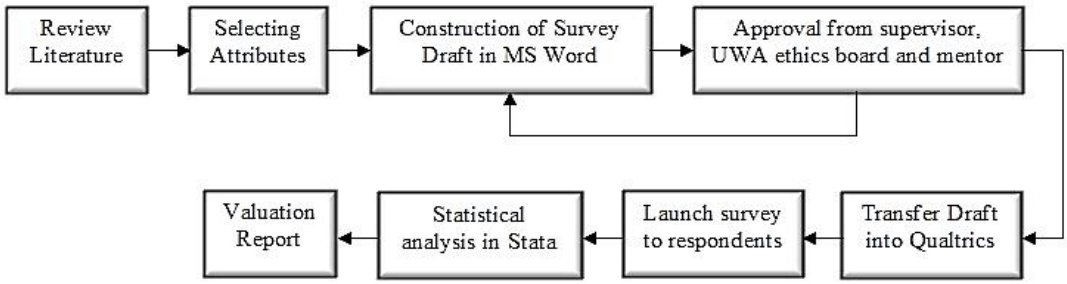


Figure 1 Process map of the construction, distribution and analysis of the survey

Figure 1 outlines the methodology followed throughout the project. The method involves presenting respondents a series of questions containing a set of alternatives, and asking them to choose their most preferred (Bateman et al. 2002). The choice sets vary in levels of attributes according to their environmental outcome. The common stages for designing a Choice Modelling survey are (Bateman el al. 2002):

1. Selection of attributes
2. Assignment of levels
3. Choice of experimental design
4. Construction of choice sets
5. Measurement of preferences

The attributes selected kept in mind that the client clearly requested generic attributes that would allow the values to be transferred throughout the two regions. Thus the attributes selected focused on characteristics of the land that would commonly appear when analysing any project in the two regions:

- Size of area
- Lifetime of project
- Type of ecosystem
- Quality of land
- Once-off payment trade-off

The size of area was an easy decision as the respondents' value had to relate back to a dollar value per hectare as originally stated in the project objectives. The lifetime of projects, especially resource extraction, vary greatly in lifespan due to irregular patterns of resource deposits, thus it allows the user to adjust these values according to the life of the project. Due to the size of the Pilbara and Southwest, a large variety of ecosystems are possible, hence the need to further breakdown these areas into coastal and inland. From there, two of the most common ecosystems in each area were selected to show survey respondents. The quality of land was chosen as not all areas that are up for proposal are in the exact same condition, and one would expect that respondents would place a higher value on land in better condition. The attribute adopted was the Keighery Condition Scale which defines the different levels of quality vegetation can represent. The once-off payment trade-off attribute was expressed as a one-off payment in taxes paid by households to replace royalties if the project did not proceed.

After the attributes were selected, levels of each attribute were assigned, table 1 shows the levels assigned for the Pilbara region. To reduce the number of scenarios to be presented to the respondent, the experiment implemented a fractional factorial design.

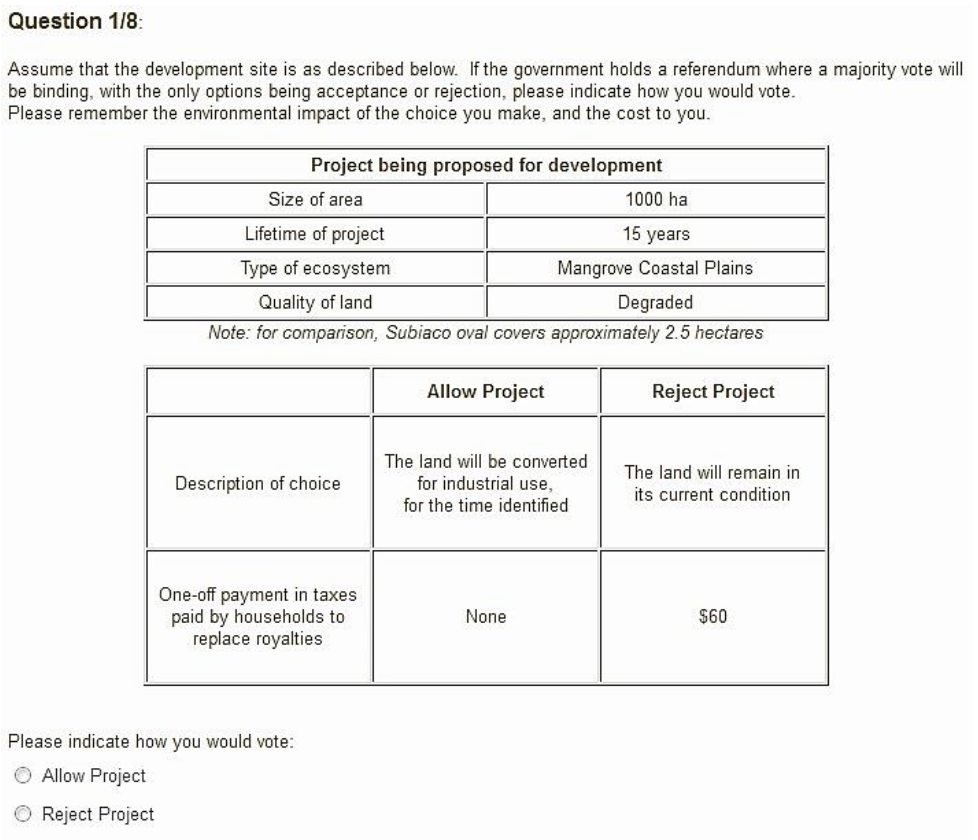
Attributes	Pilbara Levels
Size of area (hectares)	100; 500; 1000
Lifetime of project (years)	5; 15; 30; 100
Type of ecosystem	Hummock Grasslands; Acacia Woodlands; Mangrove Coastal Plains; Non Mangrove Coastal Plains
Quality of land	Pristine; Excellent; Very Good; Good; Degraded; Completely Degraded
Once-off payment trade-off ($)	20; 40; 60; 100; 200; 400

Table 1 Attributes and levels used in Pilbara survey

Each survey was packaged into three blocks containing 8 questions each, making a total of 24 questions per survey. Each respondent was shown only one block containing eight questions. Here it must be carefully designed so that the respondents should not be asked to undertake a survey that is too long or difficult, as it may result in inaccurate answers.

A significant issue is whether to use a two choice or three choice alternative model. Studies have shown that by having three choice alternatives instead of two, more robust models can be constructed (Rolfe & Bennett 2008). However, the decision was made to stick with a two choice scenario due the structure of the question the respondent was being asked.

Once the survey was constructed, it was then transferred into a computer program known as Qualtrics. The program allows the user to construct a survey exactly the way they intend the respondent to visualise it. It also allows the user to launch the survey to the respondents and receive results which can then be transferred into Microsoft Excel. Figure 2 shows an example of a question that respondents were asked.



Question 1/8:

Assume that the development site is as described below. If the government holds a referendum where a majority vote will be binding, with the only options being acceptance or rejection, please indicate how you would vote.
Please remember the environmental impact of the choice you make, and the cost to you.

Project being proposed for development	
Size of area	1000 ha
Lifetime of project	15 years
Type of ecosystem	Mangrove Coastal Plains
Quality of land	Degraded

Note: for comparison, Subiaco oval covers approximately 2.5 hectares

	Allow Project	Reject Project
Description of choice	The land will be converted for industrial use, for the time identified	The land will remain in its current condition
One-off payment in taxes paid by households to replace royalties	None	$60

Please indicate how you would vote:

○ Allow Project

○ Reject Project

Figure 2 Survey question example

3. Results and Discussion

The survey was distributed using an online panel through the company ORU. The number of respondents per survey was three hundred i.e. one hundred complete sets. Analysis of the results for the Pilbara is currently underway, and the Southwest is expected to soon follow. All data will be analysed using the computer program, Stata. From the results, we'll be able to determine preferences of West Australians towards biodiversity trade-offs. The survey group was targeted towards the average range of the West Australian population spread across the state.

4. Conclusions and Future Work

This project intends to find biodiversity values that the West Australian community hold towards the Pilbara and Southwest. It is expected that these values will vary greatly as one is a secluded resource region while the other is a well-known biodiversity hotspot. At this point in time, we are on track to achieving our goal of obtaining generic biodiversity values for both regions. Due to limitations on the budget and restriction on the complexity of both surveys there are a few attributes that have been missed such as European or Aboriginal cultural values, impacts on water quality and impacts on specific species would also be of interest.

6. References

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