Economic Valuation of Biodiversity Conservation. Citizens’ Non-use Value for Ningaloo Reef

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This thesis is presented for the degree of Doctor of Philosophy
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I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary institution.

........................................
Flavio Gazzani
Abstract

This research attempts to improve a methodology for integrating environmental concerns of conservation projects in general and valuation of non-use values in particular. The study improves environmental economics analysis by accounting to assess the value of non-market goods using individuals' stated behaviour in a hypothetical setting. In particular, a new approach to Choice Modelling analysis for environmental goods is used in this case study, to obtain the value of biodiversity conservation by separately evaluating the preferences of individuals for the relevant attributes, and in doing so it also provides information that can be used in determining the preferred design for a sustainable use of marine protected areas.

This study is undertaken to explicitly assess on how Western Australian citizens value Ningaloo Marine Park by analysing their willingness to pay for its conservation. Two hypothetical conservation and protection scenarios are used: (i) to estimate the non-use value benefits of different environmental scenarios; (ii) to measure the willingness to pay for conservation; and (iii) to examine the factors that affect the Western Australians willingness to pay for conservation. The results of this study provide inputs in exploring alternative sources of financing the conservation of Ningaloo Marine Park.

A choice modelling survey was carried out in spring 2006, and it was administered to 150 Western Australians contacted on the beach and inside the camping area of Ningaloo Marine Park. The results indicate that there are positive and significant non-use values associated with the environmental, economic, and social attributes of Ningaloo Marine Park’s biodiversity conservation. The impacts of social, economic, and attitudinal characteristics of the respondents on their valuation of Ningaloo Marine Park conservation attributes are significant and conform with economic theory.
The model estimation results, highlight how the socio-attitudinal characteristics, such as higher education level and good biodiversity knowledge were able to strongly affect the willingness to pay for conservation.

In this study the trend of the respondents in favour of the introduction of entrance fee and increase of protection for Ningaloo Marine Park, was very evident. The possibility to introduce an entrance fee could be considered by policy makers in two possible options.

Option 1

Generalizing the result of this study and multiplying the average willingness to pay (WTP) per person $26.12 (the average WTP for the scenario with increased protection to 66% of sanctuary zone) for 220,000 visitors in Ningaloo Marine Park (Tourism, 2007), this option could be worth at least $5.7 million per year. The option of creating an extra 33% of sanctuary zone and an extra injection of $5.7 million per year for conservation, could be an interesting solution, and even more, protect this fragile and unique marine ecosystems for the future.

Option 2

This option reflects the present situation scenario from a biodiversity conservation and protection point of view (33% of sanctuary zone), but introduces the hypothetical entrance fee of $9 per person (the average WTP for this scenario which reflect the present situation). This amount of fee, multiplied by the 220,000 visitors could be worth almost $2.0 million per year for conservation purposes.

Introducing user fees in both options is a way to regulate access to the fragile ecosystems of Ningaloo Marine Park. It may therefore help to prevent overcrowding and other negative impacts on ecosystems due to excessive numbers of tourists, especially during the peak season (July/August). It may also be a way to capture
part of the consumers’ surplus, in order to make the protected area self-sustaining, i.e. to finance management costs and conservation. The introduction of fees will be ultimately a Government decision, but what this study shows is that there is a strong support with the community in this direction.
Acknowledgements

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I also express special thanks to the many Western Australians who responded to the Ningaloo survey and expressed an incredible attention for a future conservation and protection programme for this unique coral reef ecosystems.

Many thanks go to my wife Michela who has been taking care of my young daughter Sofia at my home in Perth.
This work is dedicated with love to my wife Michela and to my daughter Sofia, my spirit of inspiration.
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<tr>
<td>ABCM</td>
<td>Attribute Based Choice Modelling</td>
</tr>
<tr>
<td>ABS</td>
<td>Australian Bureau of Statistics</td>
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<tr>
<td>AGE</td>
<td>Age</td>
</tr>
<tr>
<td>APPEA</td>
<td>Australian Petroleum and Production Exploration Assoc</td>
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<tr>
<td>ASC</td>
<td>Alternative Specific Constant</td>
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<tr>
<td>BIO</td>
<td>Decrease of Marine Biomass</td>
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<tr>
<td>BIOK</td>
<td>Marine Biodiversity Knowledge</td>
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<tr>
<td>CBA</td>
<td>Cost-Benefit Analysis</td>
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<td>CM</td>
<td>Choice Modelling</td>
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<td>CVM</td>
<td>Contingent Valuation Methodology</td>
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<tr>
<td>CS</td>
<td>Compensating Surplus</td>
</tr>
<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Org</td>
</tr>
<tr>
<td>DC</td>
<td>Dichotomous Choice</td>
</tr>
<tr>
<td>DEC</td>
<td>Department of Environmental Conservation</td>
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<td>DEH</td>
<td>Department of Environmental and Heritage</td>
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<tr>
<td>DOF</td>
<td>Department of Fisheries</td>
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<tr>
<td>DPI</td>
<td>Department of Planning and Infrastructure</td>
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<tr>
<td>EDU</td>
<td>Education</td>
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<tr>
<td>ENSO</td>
<td>El Nino Southern Oscillation</td>
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<tr>
<td>EPA</td>
<td>Environmental Protection Authority</td>
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<tr>
<td>EPBC</td>
<td>Environment Protection and Biodiversity Conservation</td>
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<tr>
<td>EVT</td>
<td>Extreme Value Theory</td>
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<tr>
<td>FHPA</td>
<td>Fish Habitat Protection Areas</td>
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<tr>
<td>FISH</td>
<td>Decrease of Income for Local Fisheries</td>
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<td>GBR</td>
<td>Great Barrier Reef</td>
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<td>HPM</td>
<td>Hedonic Pricing Method</td>
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<tr>
<td>HTCM</td>
<td>Hedonic Travel Cost Method</td>
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<tr>
<td>IAICNR</td>
<td>Inter American Institute for Global Change Research</td>
</tr>
<tr>
<td>IID</td>
<td>Independently and Identically Distributed</td>
</tr>
<tr>
<td>INC</td>
<td>Income</td>
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<tr>
<td>ITCM</td>
<td>Individual Travel Cost Method</td>
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<td>IUCN</td>
<td>The World Conservation Union</td>
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<tr>
<td>LAC</td>
<td>Limit of Acceptable Change</td>
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<td>LR</td>
<td>Likelihood Ratio test</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>MEA</td>
<td>Millennium Ecosystem Assessment</td>
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<td>MININ</td>
<td>Loss of Income for Mining and Petroleum Companies</td>
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<tr>
<td>MLE</td>
<td>Maximum Likelihood Estimation</td>
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<td>MMA</td>
<td>Marine Management Area</td>
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<td>MNL</td>
<td>Multinominal logit</td>
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<tr>
<td>MPA</td>
<td>Marine Protected Area</td>
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<td>MPRA</td>
<td>Marine Parks and Reserves Authority</td>
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<td>NMP</td>
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<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<td>NRM</td>
<td>Natural Resource Management</td>
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<td>NRMC</td>
<td>Natural Resource Management Council</td>
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<tr>
<td>NRSMPA</td>
<td>National Representative System of Marine Protected Areas</td>
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<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
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<tr>
<td>OLS</td>
<td>Ordinary Least Squares</td>
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<td>REEF</td>
<td>Reduction of Coral Reef</td>
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<td>RUM</td>
<td>Random Utility Model</td>
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<tr>
<td>SANCT</td>
<td>Percentage of Sanctuary Zone inside Ningaloo Reef</td>
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<tr>
<td>SOE</td>
<td>State of the Environment</td>
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<tr>
<td>SST</td>
<td>Sea Surface Temperature</td>
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<tr>
<td>SP</td>
<td>Stated Preference</td>
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<tr>
<td>TCM</td>
<td>Travel Cost Methodology</td>
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<tr>
<td>TV</td>
<td>Total Value</td>
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<tr>
<td>TEV</td>
<td>Total Economic Value</td>
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<tr>
<td>TWA</td>
<td>Tourism Western Australia</td>
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<td>WA</td>
<td>Western Australia</td>
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<tr>
<td>WAPC</td>
<td>Western Australian Planning Commission</td>
</tr>
<tr>
<td>WTP</td>
<td>Willingness to Pay</td>
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<tr>
<td>WTA</td>
<td>Willingness to Accept</td>
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<tr>
<td>ZTCM</td>
<td>Zonal Travel Cost Method</td>
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