

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.

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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.

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Abbreviations and Acronyms

ABCM	Attribute Based Choice Modelling
ABS	Australian Bureau of Statistics
AGE	Age
APPEA	Australian Petroleum and Production Exploration Association
ASC	Alternative Specific Constant
BIO	Decrease of Marine Biomass
BIOK	Marine Biodiversity Knowledge
CBA	Cost-Benefit Analysis
CM	Choice Modelling
CVM	Contingent Valuation Methodology
CS	Compensating Surplus
CSIRO	Commonwealth Scientific and Industrial Research Organization
DC	Dichotomous Choice
DEC	Department of Environmental Conservation
DEH	Department of Environmental and Heritage
DOF	Department of Fisheries
DPI	Department of Planning and Infrastructure
EDU	Education
ENSO	El Nino Southern Oscillation
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
EVT	Extreme Value Theory
FHPA	Fish Habitat Protection Areas
FISH	Decrease of Income for Local Fisheries
GBR	Great Barrier Reef
HPM	Hedonic Pricing Method
HTCM	Hedonic Travel Cost Method
IAICNR	Inter American Institute for Global Change Research
IID	Independently and Identically Distributed
INC	Income
ITCM	Individual Travel Cost Method
IUCN	The World Conservation Union
LAC	Limit of Acceptable Change
LR	Likelihood Ratio test

MEA	Millennium Ecosystem Assessment
MININ	Loss of Income for Mining and Petroleum Companies
MLE	Maximum Likelihood Estimation
MMA	Marine Management Area
MNL	Multinomial logit
MPA	Marine Protected Area
MPRA	Marine Parks and Reserves Authority
NMP	Ningaloo Marine Park
NOAA	National Oceanic and Atmospheric Administration
NRM	Natural Resource Management
NRMC	Natural Resource Management Council
NRSMPA	National Representative System of Marine Protected Areas
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
REEF	Reduction of Coral Reef
RUM	Random Utility Model
SANCT	Percentage of Sanctuary Zone inside Ningaloo Reef
SOE	State of the Environment
SST	Sea Surface Temperature
SP	Stated Preference
TCM	Travel Cost Methodology
TV	Total Value
TEV	Total Economic Value
TWA	Tourism Western Australia
WA	Western Australia
WAPC	Western Australian Planning Commission
WTP	Willingness to Pay
WTA	Willingness to Accept
ZTCM	Zonal Travel Cost Method