

Informing Management Strategies for a Reserve: Results from Valuation Surveys

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Presentation Outline

- Objectives of Study
- Discrete Choice Experiment Method
- Econometric Models
- Results
- Management Implications
- Conclusions

Nha Trang Bay MPA, Vietnam



Site description:

- Located south-central Vietnam.
- Highest biodiversity: coral, other species.
- Serious decline in biodiversity.
- Main commercial activities: Fisheries, Aquaculture, and Tourism.

NTB MPA:

- Established in 2002
- Area: 160 km²
- Regulated zones: core zone, buffer zone, and transition zone.
- Main objectives: Improve local residents livelihoods & Conserve biodiversity.

Problems, Reasons, and Solutions

Problems:

- ✓ Failed to fulfil its objectives: very low biodiversity recovery.
- ✓ Environmental pollutions: solid waste and seascape disturbance.

Reasons:

- ✓ Lack of funding
- ✓ Inefficient regulations for protecting
- ✓ MPA core zone too narrow.



Solutions:

- ✓ Expanding the core zone
- ✓ Changing management policies

Raised questions:

- ✓ How to finance for sustaining and running the NTB MPA?
- ✓ Increased user fees is possible way?
- ✓ If yes, how much are they willing to pay?

Study Objectives

- Using a discrete choice experiment (DCE) method to elicit national tourists' willingness to pay for an improvement in biodiversity and environmental quality in the NTB MPA.
- Answering the question: whether a potential price premium is sufficient to cover costs connected to such improvements.

Discrete Choice Experiment (DCE)

- Be one of stated preference techniques
- Allow to value multiple attributes and their changes.
- Theoretical basic:
 - Characteristics theory of demand (Lancaster, 1966)
 - Random utility theory (McFadden, 1974).
- Random Utility Model

$$U_{nit} = V_{nit} + \varepsilon_{nit} = \beta_n x_{nit} + \varepsilon_{nit}$$

DCE (cont.)

- Mixed Logit Model.
- Probability that individual n will choose option i :







$$\Pr(i_n | x_n) = \int \prod_{t=1}^T \frac{\exp(\mu \beta'_n x_{nit})}{\sum_{j \in C} \exp(\mu \beta'_n x_{njt})} f(\beta) d\beta$$

The DCE Design

Attributes and levels used for the DCE Design

Attribute	Coral cover	Environmental quality	Job loss	Cost
Variable name	Coral	Environment	Job loss	Cost
Description	The average cover of live hard coral within the MPA	Visible waste and floating traps/cages within the MPA	The number of lost jobs for fishermen	Increase in ticket price of sea/islands tour (1000 VND)
Status quo (SQ)	13%	Bad	0	0
Level 1	20%	Bad	0	20
Level 2	30%	Medium	50	50
Level 3		Good	100	100
Level 4			200	200

Example of the choice card

Attribute	Status quo	Plan A	Plan B
<u>Coral</u> : the average live hard coral cover within the MPA	13% 	30% 	20% 
<u>Environment</u> : visible waste and floating bottles and cages within the MPA	Bad 	Bad 	Good 
<u>Job loss</u> : the number of lost jobs for fishermen	0	50	200
<u>Cost</u> : increase in ticket price (VND)	0	20.000	50.000
I prefer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The DCE survey

- Conducted in April, 2015
- Face-to-face interviews
- Sample size: 150 Vietnamese tourists visiting the NTB MPA

Estimated Results - Mixed Logit Model

Parameters	MXL	
	without correlation	with correlation
Fixed parameters		
cost	-0.004(0.002)**	-0.005(0.002)**
Random parameters		
coral	0.065(0.015)***	0.111(0.018)***
coral_SD	0.080(0.012)***	0.093(0.015)***
med.env	0.939(0.143)***	1.134(0.188)***
med.env_SD	0.950(0.202)***	1.587(0.209)***
good.env	1.648(0.228)***	2.052(0.307)***
good.env_SD	1.090(0.238)***	2.258(0.334)***
job loss	-0.00001(0.0008)	0.0007(0.0009)
job loss_SD	0.006(0.001)***	0.006(0.001)***
Likelihood ratio index	0.126	0.171
Log-likelihood at convergence	-855.22	-804.64
Number of observations	900	900
Number of parameters estimated	9	15
AIC	1728.45	1639.28
Likelihood ratio test		101.17***

Marginal Willingness to Pay Estimates

- Marginal WTPs is the amount of money individuals are willing to pay for one level improvement of the attribute, all else being constant.

$$WTP_k = -\frac{\beta_k}{\beta_c}$$

WTP estimates generated by the MXL model with correlation (USD/trip/person)

Attribute	2.5% quantile	Median	Mean	97.5% quantile
Coral	0.667	0.973	0.988	1.975
med.env	5.731	9.956	10.272	24.107
good.env	11.807	17.956	18.418	39.021
job loss	-0.008	0.006	0.007	0.034

Consumer Surplus Estimates

Obtained ΔCS estimates for a range of policy scenarios:

$$\Delta CS = -\frac{1}{\beta_c} \left[\ln \left(\sum_{j \in C} \exp(V_{njt}^1) \right) - \ln \left(\sum_{j \in C} \exp(V_{njt}^0) \right) \right]$$

Scenario	Attributes			ΔCS (USD/trip/person)			
	Coral cover	Environmental quality	Job loss	2.5% quantile	Median	Mean	97.5% quantile
SQ	13%	Bad	0	0	0	0	0
Scenario 1	20%	Bad	50	-0.336	0.373	0.415	1.809
Scenario 2	20%	Bad	100	-0.734	0.679	0.761	3.505
Scenario 3	20%	Bad	200	-1.532	1.292	1.453	6.879
Scenario 4	20%	Good	50	11.992	18.321	18.833	40.600
Scenario 5	20%	Good	100	12.086	18.627	19.179	42.049
Scenario 6	20%	Good	200	12.134	19.228	19.871	44.221
Scenario 7	30%	Bad	50	-0.244	0.472	0.514	1.999
Scenario 8	30%	Bad	100	-0.644	0.777	0.860	3.658
Scenario 9	30%	Bad	200	-1.442	1.386	1.551	7.073
Scenario 10	30%	Good	50	12.063	18.417	18.932	40.809
Scenario 11	30%	Good	100	12.158	18.722	19.278	42.216
Scenario 12	30%	Good	200	12.204	19.322	19.970	44.396

Management Implications

- Confirm there is sustainable financial source to fund environmental quality improvement in NTB MPA.
- Respondents have strong preferences for environmental quality
 - Necessary to have more effective means for collecting and handling waste.
 - Policies to regulate juvenile lobster fishing and aquaculture within the MPA.
 - Expanding the MPA core zone associated with reef areas
 - Efforts for monitoring and enforcement.

Management Implications (cont.)

- Core zone expansion policy
 - Reduce short-term benefits for local fishermen.
 - Get more benefits in long-term.
- To soften the negative short-term impacts
 - Use a 'payment for environmental services' scheme to compensate for local fishermen.
 - Financial supports for alternative income generations of local fishermen

Conclusions

- Environmental protection and biodiversity conservation are not only good ecological policy, but good economic policy as well.
- Stakeholders preferences to new management policies.
- Necessary for a full benefit-cost analysis.

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Thank you and Questions

