Implications of geographical scope in valuing wilderness management in the Kimberley

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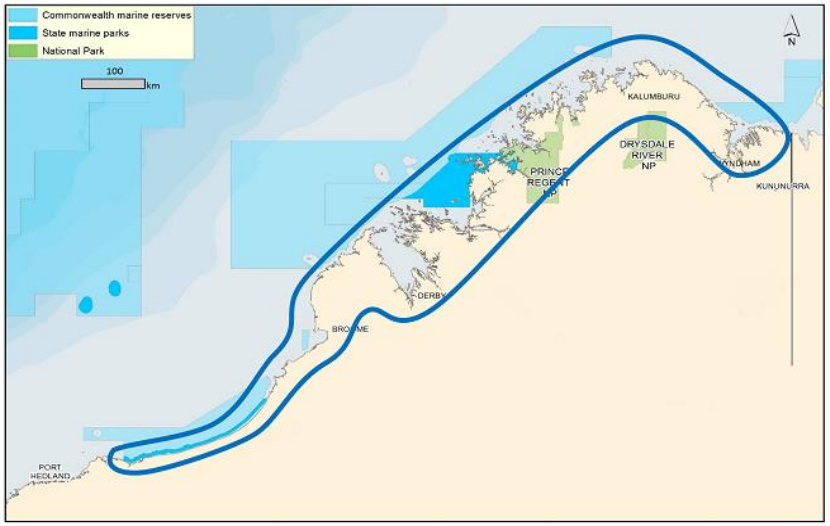
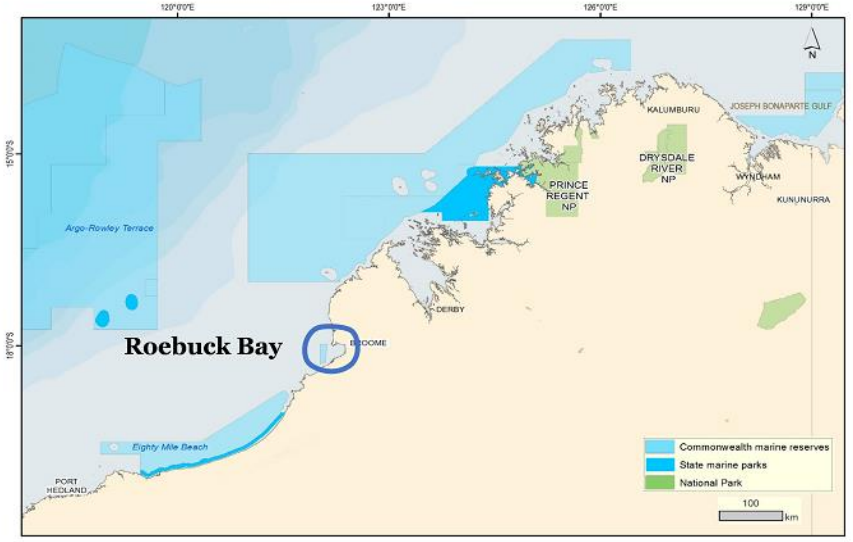
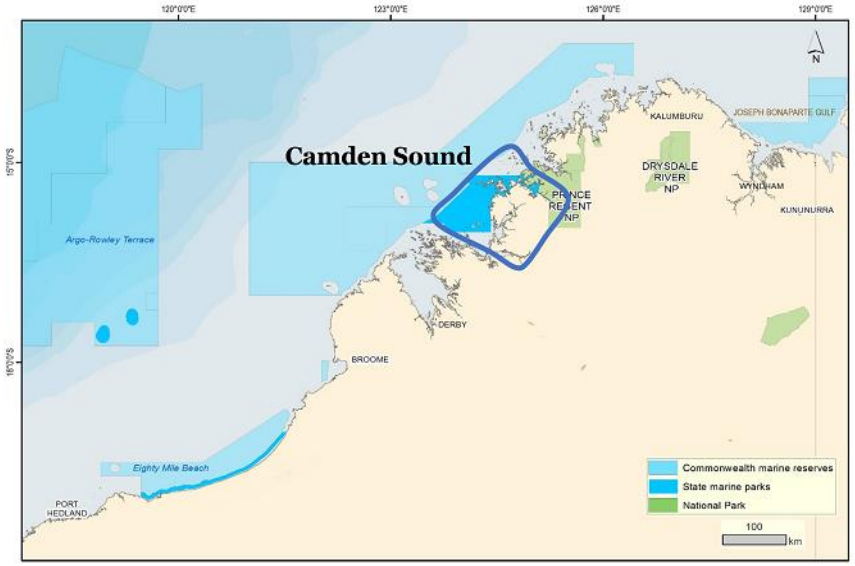
Discrete choice experiment valuing Kimberley management actions

Spatially explicit split surveys







How do values change with geographical scope and attribute scale?

~ Geographical Scope: geographical context of the choice

~ Scale: quantity of changes within the choice

CHOICE EXPERIMENT

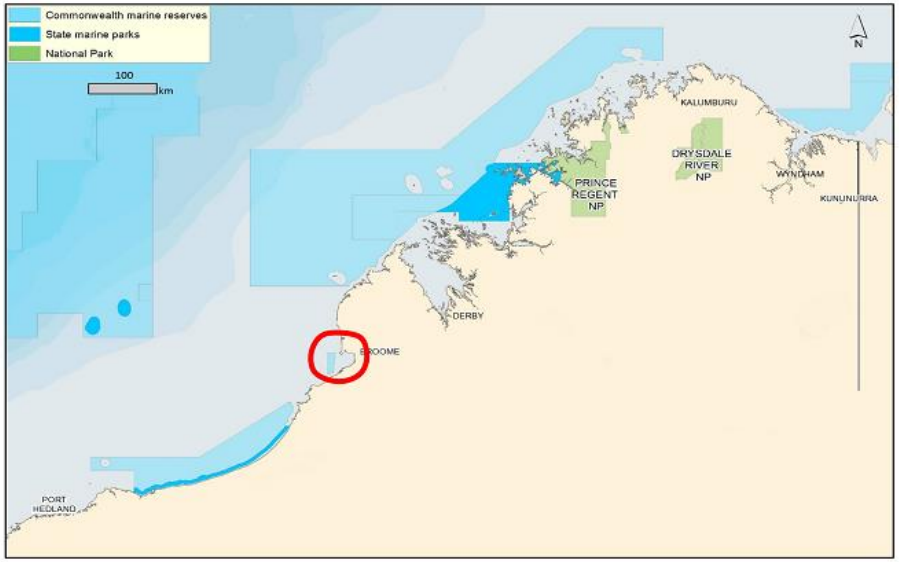
1 Sanctuary area
% of State waters

2 Recreational facilities
Low, Medium, High

3 Aboriginal Rangers
Number #

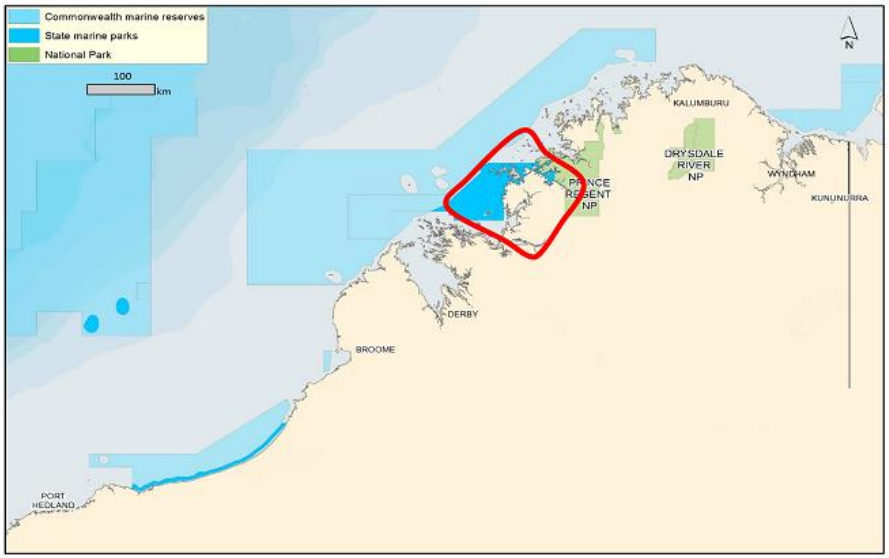
4 Increase coastal development
Yes, No

5 Personal annual cost (increased taxes)

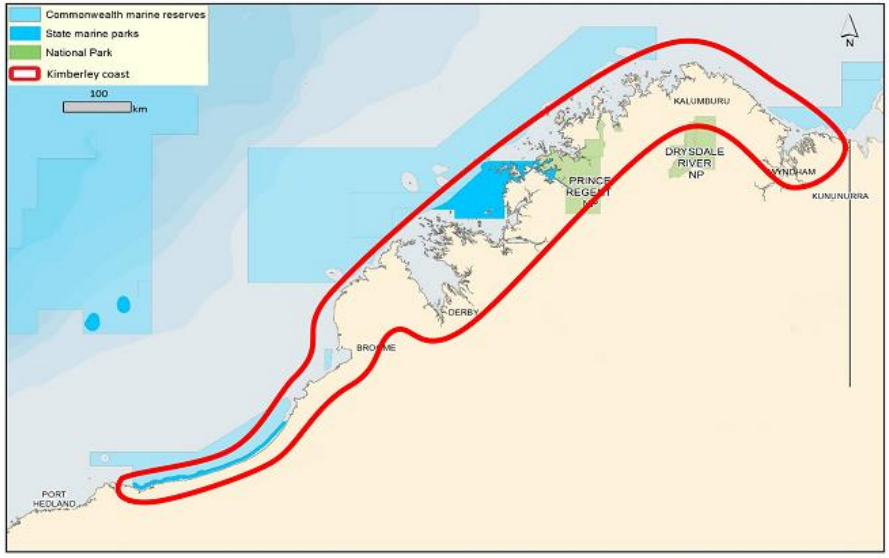


Source Maritime Constructions, photo by David Wilcock Photography.

Zone	Roebuck Bay	Roebuck Bay	None
Annual cost to you	$50	$100	$0
Sanctuary area (% State waters already sanctuary)	15% (0%)	30% (0%)	*No new management on the Kimberley coast*
Recreational facilities (existing level)	MEDIUM (MEDIUM)	HIGH (MEDIUM)	
Aboriginal rangers (existing number)	14 (4)	34 (4)	
Increase coastal development	NO	YES	
	OPTION A	OPTION B	OPTION C



Zone	Camden Sound	Camden Sound	None
Annual cost to you	$50	$100	$0
Sanctuary area (% State waters already sanctuary)	25% (10%)	40% (10%)	*No new management on the Kimberley coast*
Recreational facilities (existing level)	MEDIUM (LOW)	HIGH (LOW)	
Aboriginal rangers (existing number)	22 (12)	42 (12)	
Increase coastal development	NO	YES	
	OPTION A	OPTION B	OPTION C



	OPTION A	OPTION B	OPTION C
Annual cost to you	$50	$100	$0
Sanctuary area (% State waters already sanctuary)	18% (3%)	33% (3%)	*No new management on the Kimberley coast*
Recreational facilities (existing level)	LOW (LOW)	HIGH (LOW)	
Aboriginal rangers (existing number)	54 (44)	74 (44)	
Increase coastal development	NO	YES	
	OPTION A	OPTION B	OPTION C

- Attributes and attribute levels are the same

Modelling approach

Fixed parameters apart from status quo ASC

~ Heterogeneity

Start with separate parameters for all attributes in each sample

~ Tested for differences

Socio-demographic's not included

~ Comparing 'average' values across sample

Recruitment using a commercial online panel

Roebuck Bay RB n=153
Camden Sound CS n=151
Kimberley Coast KC n=152

Mostly Perth metro

MIXED LOGIT	Coefficient
Cost	-0.014***
Cost*Kimberley Coast	0.004***
Sanctuary Area	0.017 ***
Rangers	0.007 ***
Recreation Medium	0.202*
Recreation High	0.004
Coastal Development	-0.260 ***
RANDOM PARAMETERS	
KC*SQ ASC Std Dev	-1.896 *** 2.667 ***
RB*SQ ASC Std Dev	-1.514 *** 2.456 ***
CS*SQ ASC Std Dev	-1.895*** 2.478 ***
No of Observations McFadden R2	2736 (n=456) 0.13

*** Significant at 1% **Significant at 5% * Significant at 10%

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McFadden R2	0.13

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Findings

Consistency of values across regions

Values for management in the two smaller regions were not statistically different

- Roebuck Bay
- Camden Sound

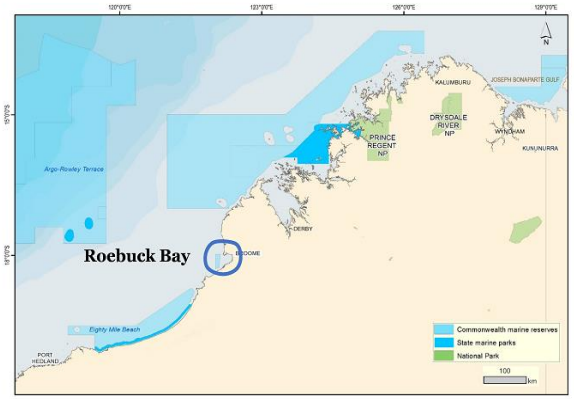
Values at different geographical scope

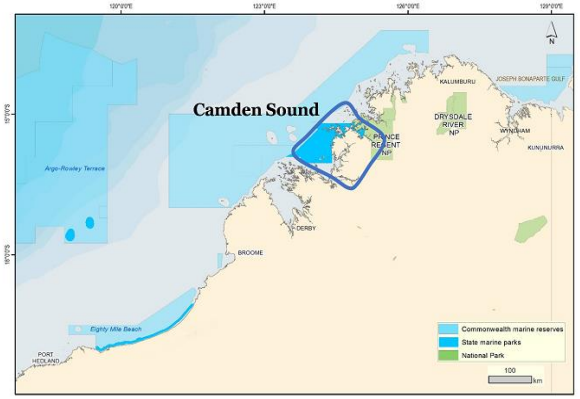
Respondents were willing to pay more for management in the whole Kimberley Coast

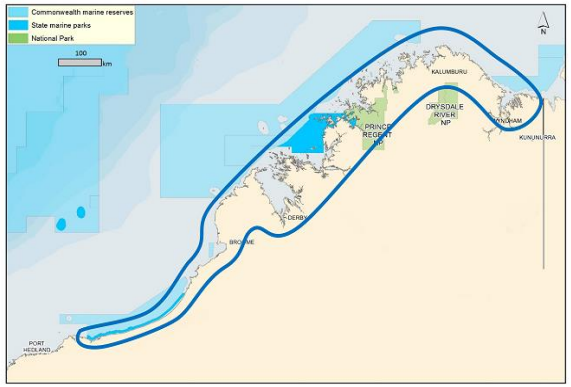
36 % more (1.4 times)

~ Not proportional to region size

~ Same increase for absolute and proportional attributes







Map source: Geoscience Australia 2014, Department of Parks and Wildlife 2014

WTP Estimations ($/year)

	Roebuck Bay Camden Sound	Kimberley Coast
Sanctuary Area (%)	1.20 ***	1.63 ***
Aboriginal Rangers (#)	0.53***	0.72***
Recreation Medium	14.23*	19.31*
Recreation High	0.30	0.41
Coastal Development	-18.35***	-24.91***

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DISCUSSION

SCOPE DIFFERENCES:

- Geographical scope
- Iconic nature of KC

SCOPE INSENSITIVITY:

Diminishing marginal utility

- Effect of using the same costs levels (sends an implicit price signal)
- Reflection of support or otherwise– Kimberley iconic/hotly debated

SCALE INSENSITIVITY:

- Willing to pay more for Rangers in KC

Implications for management/further work

- Challenge is to understand how values for management outcomes change when changing scope and scale.
- How can we identify values for management that can be transferred to different scope and scales for integration into management?
- Do we always need to be spatially explicit about management values?

Thanks

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Photo Credits

Parks and Wildlife Yawuru Ranger Preston Manado conducting a bushtucker walk through Dabadabagun (Minyirr Park). Source WA Department of Parks and Wildlife

Aerial photos by Alaya Spencer-Cotton

How would you describe yourself in relation to the Kimberley?
N=4 Kimberley Resident

48% - Have visited the Kimberley in their lifetime

	Roebuck Bay	Camden Sound	Kimberley Coast	PANEL	WA
				456 Respondents	
Age ^ (sample over 18 yrs)				Approximately age representative	
Female	58.17*	61.59	60.53	60.09%	49.47 % (ABS 2011)
University Educated*^				26.10 %	15 % (ABS 2010)
Income median income bracket *^	$65-77,999	$52-64,999	$52-64,999	Median household income bracket $65,000-$77,999	Median WA household income $85,176 (ABS 2013)
Environmental Economic Paradigm	3.32*	3.09*	3.14*		

***Significant difference between samples**
***^Distributions are significantly different from each other**

Variables	Description	Levels
Sanctuary Area	Sanctuary area of state waters in zone (%)	0%, 15%, 30%, 40%
Recreation	Improvement to average recreation facilities levels	Low, Medium, High
Rangers	Number of aboriginal rangers	0, 5, 10, 30
Development	Coastal development dummy variable (1 = development)	Yes (1), NO (0)
Cost	Annual household cost ($)	$0, $10, $50, $75, $100, $150, $200
SQ	Alternative Specific Constant (status quo)	

Mixed logit model

Log likelihood = -2212.3188

Number of obs	= 8208
LR chi2(3)	= 663.00
Prob > chi2	= 0.0000

choi	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Mean						
cost	-.0141917	.0006484	-21.89	0.000	-.0154625	-.0129208
kc_cost	.0037388	.0009689	3.86	0.000	.0018398	.0056378
san	.0169917	.0018883	9.00	0.000	.0132906	.0206927
range	.007487	.0023859	3.14	0.002	.0028107	.0121634
rec3	.2018843	.1214294	1.66	0.096	-.0361129	.4398814
rec4	.0042528	.0814	0.05	0.958	-.1552883	.1637939
dev	-.2603995	.0583722	-4.46	0.000	-.374807	-.145992
kc_sq	-1.895614	.3099203	-6.12	0.000	-2.503046	-1.288181
rb_sq	-1.513983	.2709642	-5.59	0.000	-2.045063	-.9829029
cs_sq	-1.895011	.2795906	-6.78	0.000	-2.442999	-1.347024
SD						
kc_sq	2.666672	.3177856	8.39	0.000	2.043824	3.289521
rb_sq	2.455225	.2779499	8.83	0.000	1.910453	2.999997
cs_sq	2.477961	.2852727	8.69	0.000	1.918837	3.037085

WTP Estimations (95% Confidence Interval)

		Roebuck Bay Camden Sound	Kimberley Coast
Sanctuary Area	1 % increase in Sanctuary Area in State waters	$1.20 *** (0.94-1.46)	$1.63 *** (1.23-2.02)
Aboriginal Rangers	Per Aboriginal Ranger #	$0.53*** (0.21-0.85)	$0.72*** (0.27-1.16)
Recreation Medium	Improving recreation facilities to Medium	$14.23* (-2.63-31.08)	$19.31 ((-3.69)-42.32)
Recreation High	Improving recreation facilities to High	$0.30 ((-10.94)-11.54)	$0.41 ((-14.86)-15.67)
Coastal Development	Allowing more coastal development in the region	$-18.35*** ((-26.34)-(-10.36))	$-24.91*** ((-36.01)-(-13.82))

*** Significant at 1% (P<0.01), **Significant at 5% (P<0.05), * Significant at 10% (P<0.10)

Tests for Error Variance GMNL
M1 (LL -2211.8)

(Std. Err. adjusted for clustering on idd)

choi	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Mean						
mcost	1	(constrained)				
kc_mcost	-.2634256	.0617006	-4.27	0.000	-.3843566	-.1424947
san	.1197394	.0133059	9.00	0.000	.0936604	.1458184
range	.052821	.016436	3.21	0.001	.0206071	.0850349
rec3	1.421579	.8596753	1.65	0.098	-.2633531	3.106512
rec4	.0302341	.5735573	0.05	0.958	-1.093918	1.154386
dev	-1.835051	.407474	-4.50	0.000	-2.633685	-1.036416
kc_sq	-13.405	2.277332	-5.89	0.000	-17.86848	-8.941507
rb_sq	-10.61438	1.903324	-5.58	0.000	-14.34482	-6.88393
cs_sq	-13.38031	1.973926	-6.78	0.000	-17.24914	-9.51149
Het						
const	-1.952385	.0456871	-42.73	0.000	-2.04193	-1.86284
SD						
kc_sq	18.7031	2.376556	7.87	0.000	14.04513	23.36106
rb_sq	17.38132	2.07259	8.39	0.000	13.31912	21.44352
cs_sq	-17.40166	2.110102	-8.25	0.000	-21.53738	-13.26594

M2 (LL -2211.6)

(Std. Err. adjusted for clustering on idd)

choi	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Mean						
mcost	1	(constrained)				
kc_mcost	-.3087589	.128024	-2.41	0.016	-.5596814	-.0578364
san	.1168289	.0151092	7.73	0.000	.0872154	.1464424
range	.0514063	.0167568	3.07	0.002	.0185636	.0842489
rec3	1.398163	.8402543	1.66	0.096	-.2487055	3.045031
rec4	.0252619	.5552369	0.05	0.964	-1.062982	1.113506
dev	-1.770714	.4251188	-4.17	0.000	-2.603931	-.937496
kc_sq	-12.41015	3.262577	-3.80	0.000	-18.80468	-6.015614
rb_sq	-10.57708	1.906795	-5.55	0.000	-14.31433	-6.839834
cs_sq	-13.61076	2.054977	-6.62	0.000	-17.63844	-9.583078
Het						
const	-1.881361	.1902976	-9.89	0.000	-2.254337	-1.508384
rb	-.0562153	.1994953	-0.28	0.778	-.4472189	.3347883
cs	-.0935047	.2025332	-0.46	0.644	-.4904624	.303453
SD						
kc_sq	17.45299	3.840897	4.54	0.000	9.92497	24.98101
rb_sq	17.14752	2.154083	7.96	0.000	12.92559	21.36944
cs_sq	-17.71866	2.269957	-7.81	0.000	-22.16769	-13.26963

Likelihood-ratio test — LR chi2(2) = 0.30

(Assumption: m1 nested in m2) — Prob > chi2 = 0.8621