Valuing remote wilderness

Estimating spatially explicit values for the Kimberley coast

Marit E Kragt, Alaya Spencer-Cotton & Michael Burton

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Estimating spatially explicit values for the Kimberley coast

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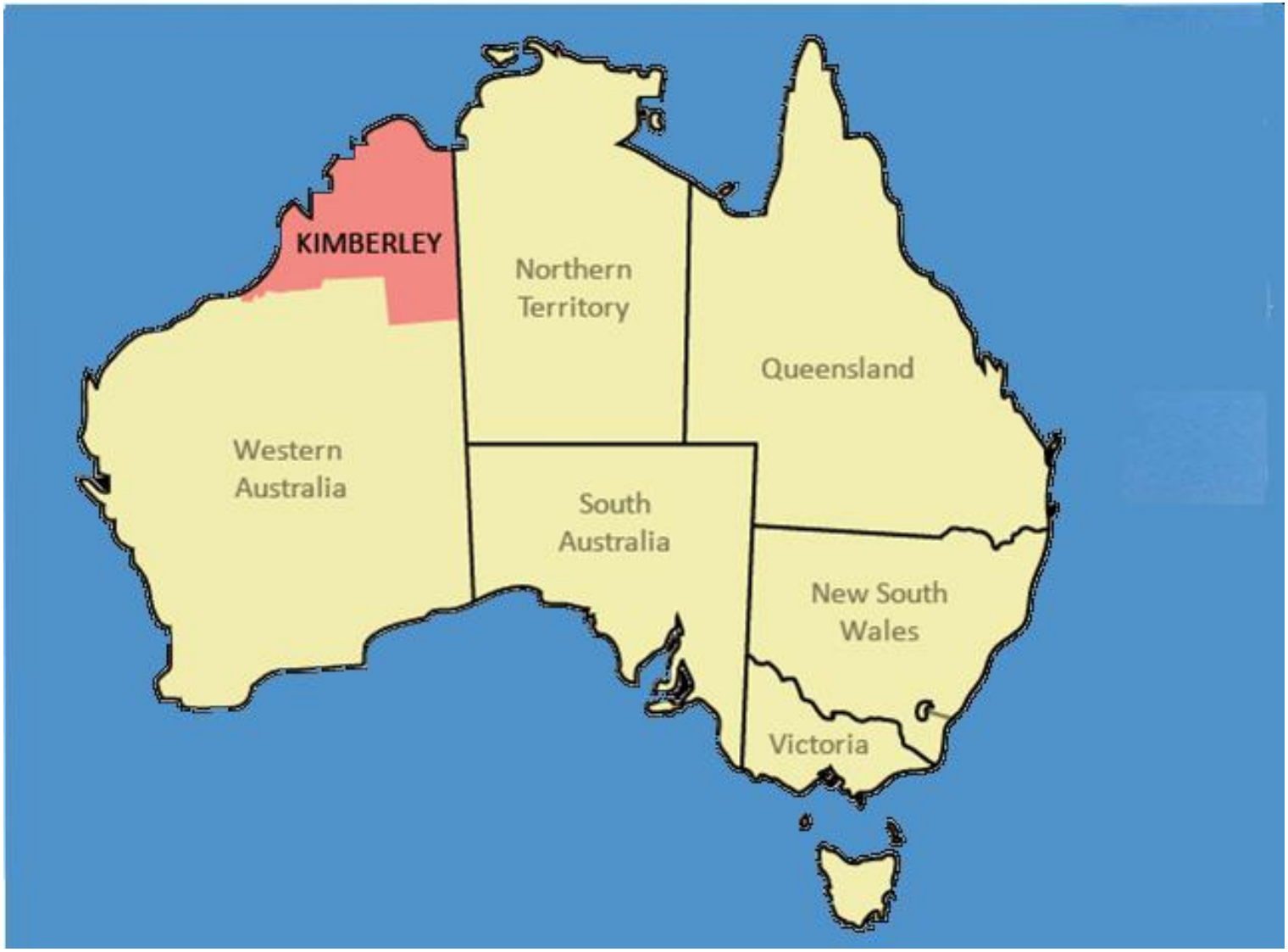
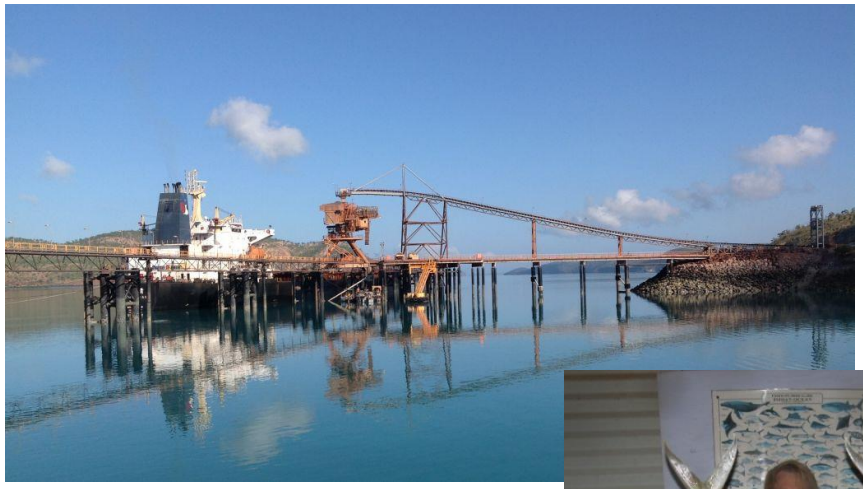
The Kimberley



The Kimberley

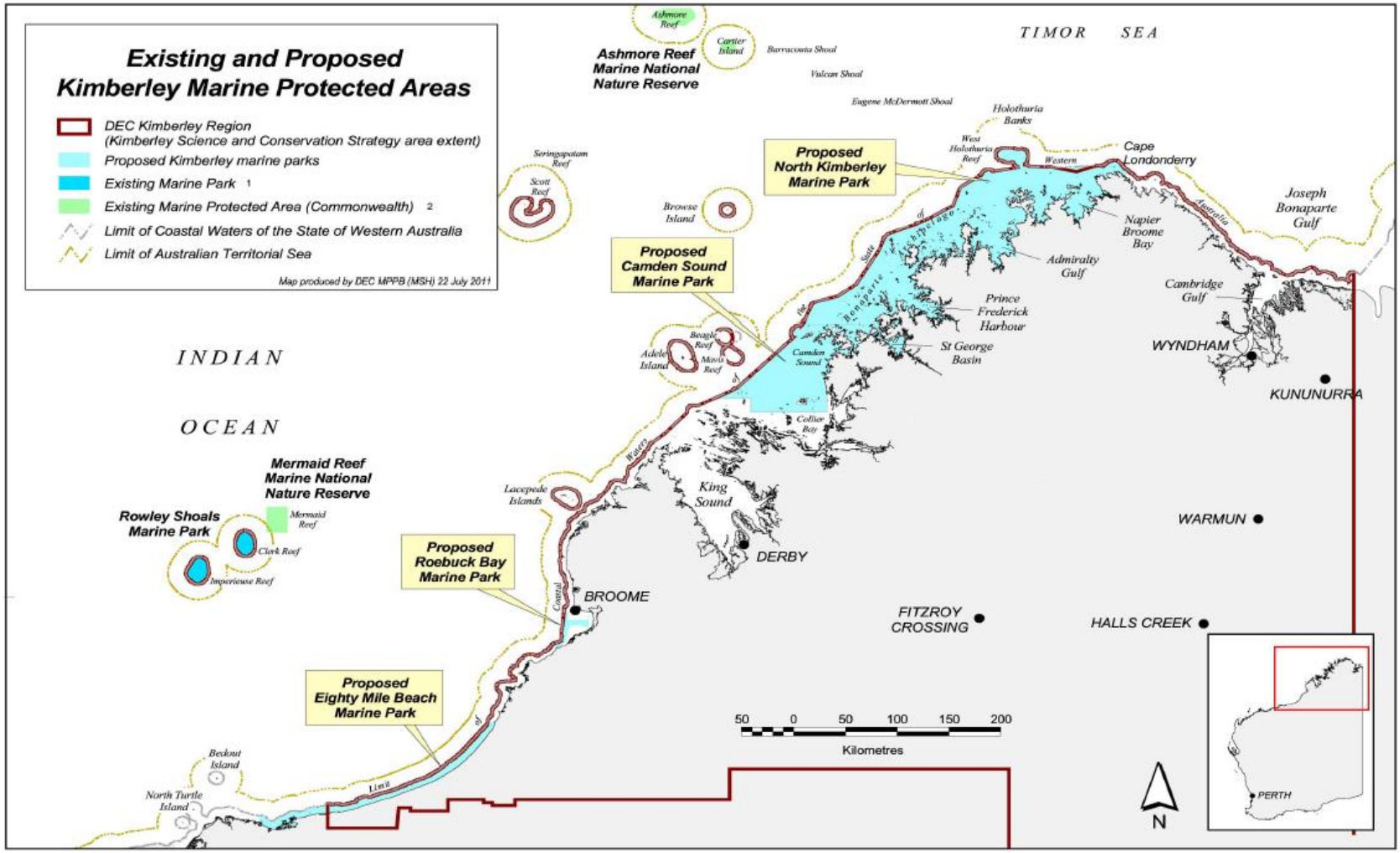
- The Kimberley is remote and relatively undeveloped
  - Tourism destination
  - Rich in mineral resources
  - High conservation values

} Potentially conflicting management options



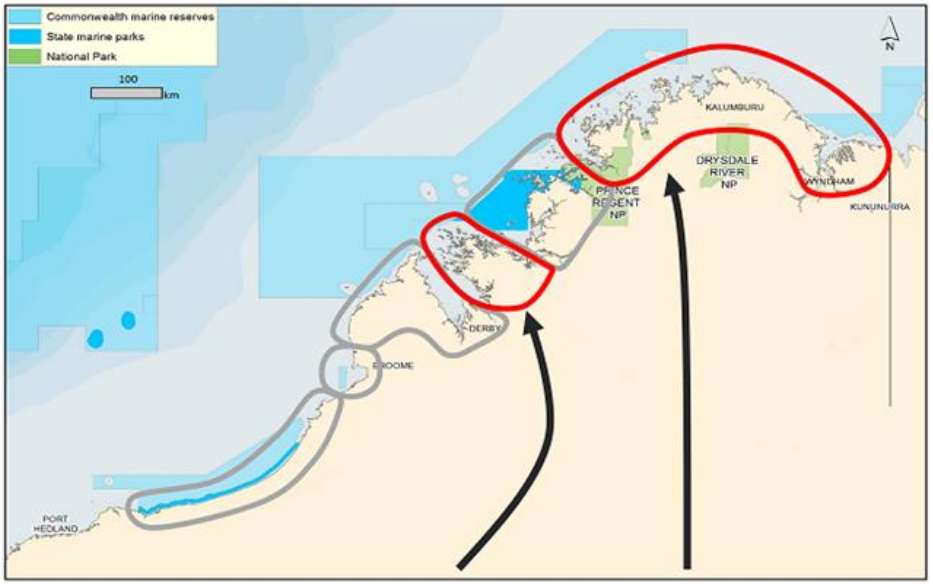
How to value this massive region?

Can we identify values for spatially explicit management; values for ‘sub-regions’?



Our choice experiment

- Split Kimberley region into 6 zones
- Four attributes, spatially defined:
  1. State waters in sanctuary (%)
  2. Recreational facilities (low, medium, high)
  3. Aboriginal rangers (number)
  4. Increased coastal development (yes/no)
- Availability design shows 2 regions in each choice set
- Sampling Kimberley population



Zone	Buccaneer Archipelago	North Kimberley	None
Annual cost to you	$200	$150	$0
Sanctuary area (% State waters already sanctuary)	15% (0%)	30% (0%)	*No new management on the Kimberley coast*
Recreational facilities (existing level)	LOW (LOW)	HIGH (LOW)	
Aboriginal rangers (existing number)	10 (0)	10 (10)	
Increase coastal development	YES	YES	
	OPTION A	OPTION B	OPTION C

Mixed Logit model results_1

	Coefficient	
Costs	- .006	***
Zone 1 constant	- .028	
Zone 2 constant	*base*	
Zones 3&4 constant	.683	***
Zones 5&6 constant	.864	***
Sanctuary area (%)	.029	***
Rangers (#)	.013	***
Rec_med	- .271	**
Rec_high_12	- .075	
Rec_high_3456	- .694	***
Dev_12	- .268	**
Dev_3456	- .722	***
SQ (mean)	- 1.431	***
(st.dev.)	2.288	***
n = 286	(Kimberley residents)	

Alternative specific constants for each zone – what zonal attributes are significant?

Zonal ASCs ✚ for northern zones, significantly different from zones 1&2

Sanctuary area ✚ for all zones

Rangers ✚ for all zones

Recreational development ➖ and significantly different between zones

Development is also ➖ , particularly in northern regions

s and Wildlife 2014

Mixed Logit model results_2

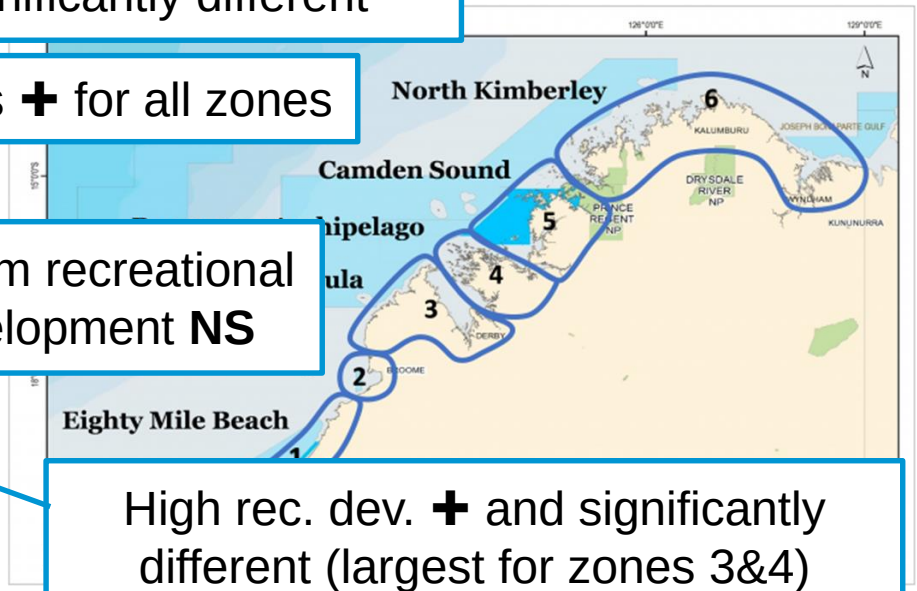
	Coefficient	
Costs	- .006	***
Sanct_1	.021	***
Sanct_2	.022	***
Sanct_3	.038	***
Sanct_4	.037	***
Sanct_5	.025	***
Sanct_6	.031	***
Rangers	.013	***
Rec_med	- .175	
Rec_high_12	- .350	***
Rec_high_34	- .636	***
Rec_high_56	- .307	**
Dev_12	- .494	***
Dev_34	- .813	***
Dev_5	- .155	
Dev_6	- .610	***
SQ (mean)	- 1.861	***
(st.dev.)	2.268	***

Now a model with only zone-specific attributes – which ones are significant?

Sanctuary zones ✚ and significantly different

Rangers ✚ for all zones

Medium recreational development **NS**



High rec. dev. ✚ and significantly different (largest for zones 3&4)

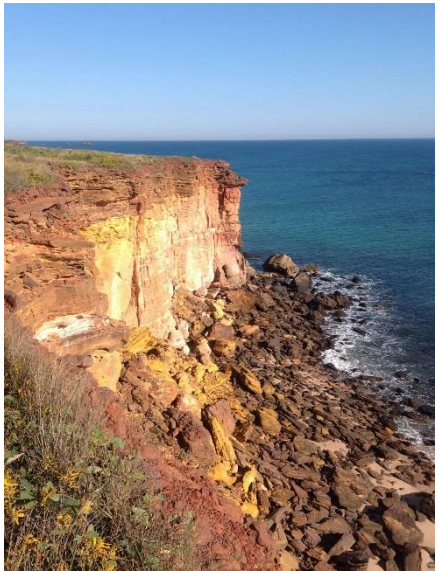
Development ━ in nearly all zones (also largest for zones 3&4)

(Kimberley residents)

Discussion

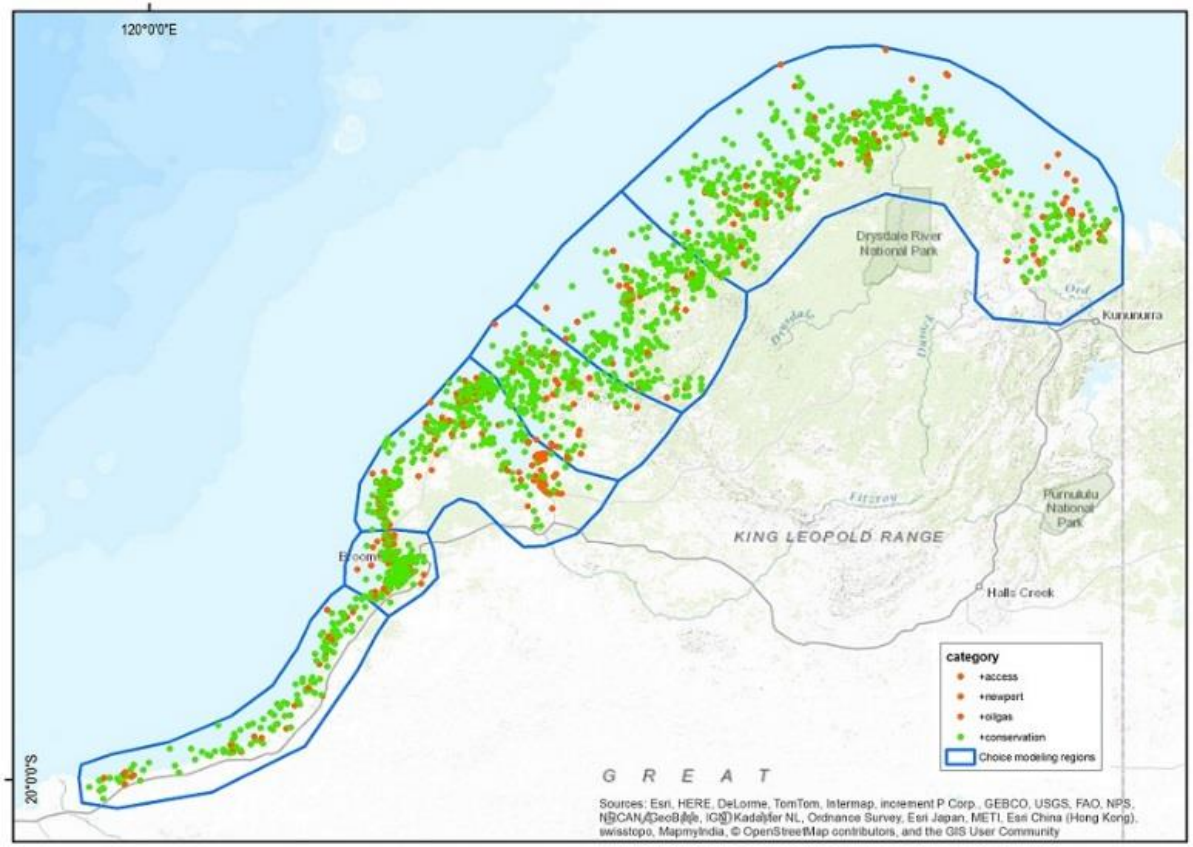
- All zones are valued, but different WTP per zones for sanctuary area, recreation and development
  - Zones 1 & 2 (*Eighty Mile Beach & Roebuck Bay*) → Well-known, already developed
  - Zones 3 & 4 (*Dampier & Buccaneer*) → Highly anti-development, because well-known as ‘untouched’ wilderness?
  - Zones 5 & 6 (*Camden Sound & Nrth Kimberley*) → Very remote and not as well known?

- How should we interpret a model with zonal ASCs, given that we had pro-development and pro-conservation attributes?



Further work

- How do zones' characteristics affect values?
- How do respondents' characteristics (eg. location) affect values?
- How does the PPGIS affect values?



THANK YOU

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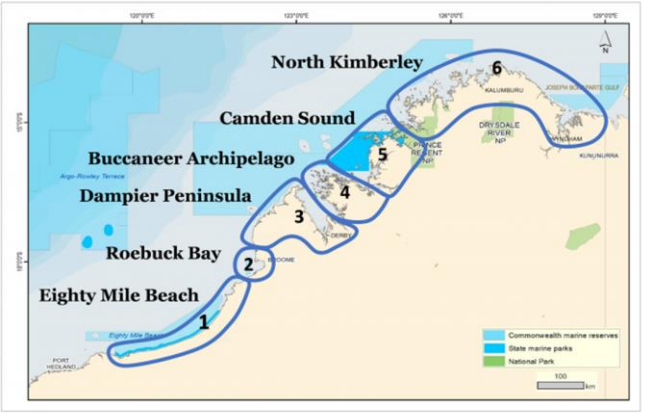
WTP for different zones based on ML2

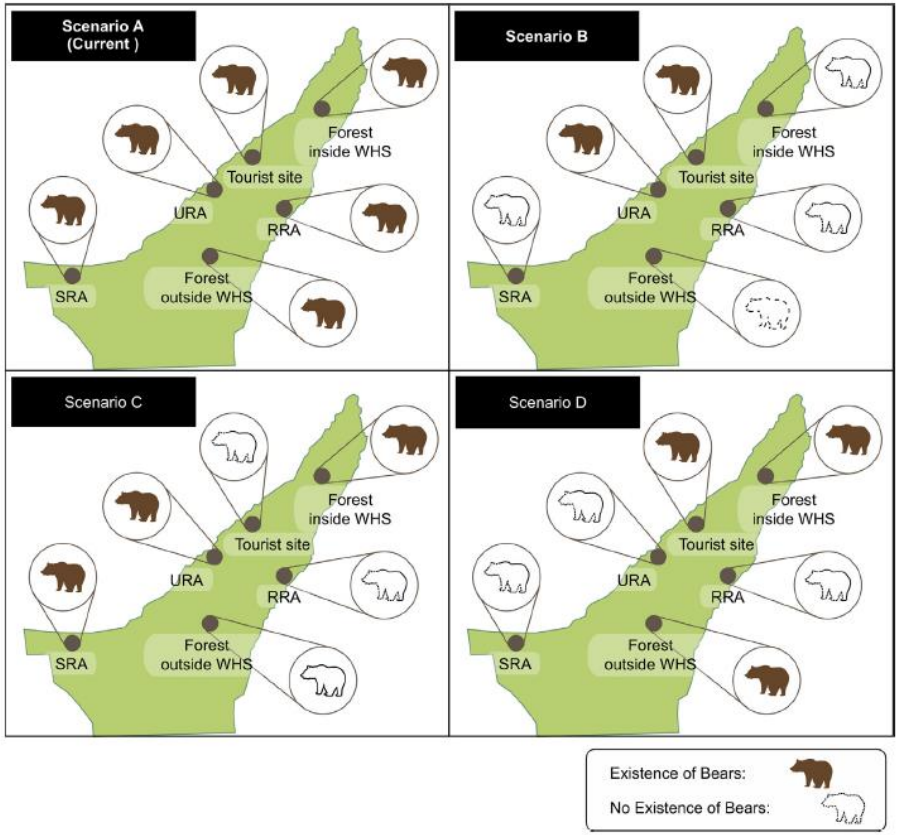
	Mean WTP	
Sanct_1 (%)	3.60	***
Sanct_2 (%)	3.70	***
Sanct_3 (%)	6.52	***
Sanct_4 (%)	6.32	***
Sanct_5 (%)	4.22	***
Sanct_6 (%)	5.37	***
Rangers (#)	2.27	***

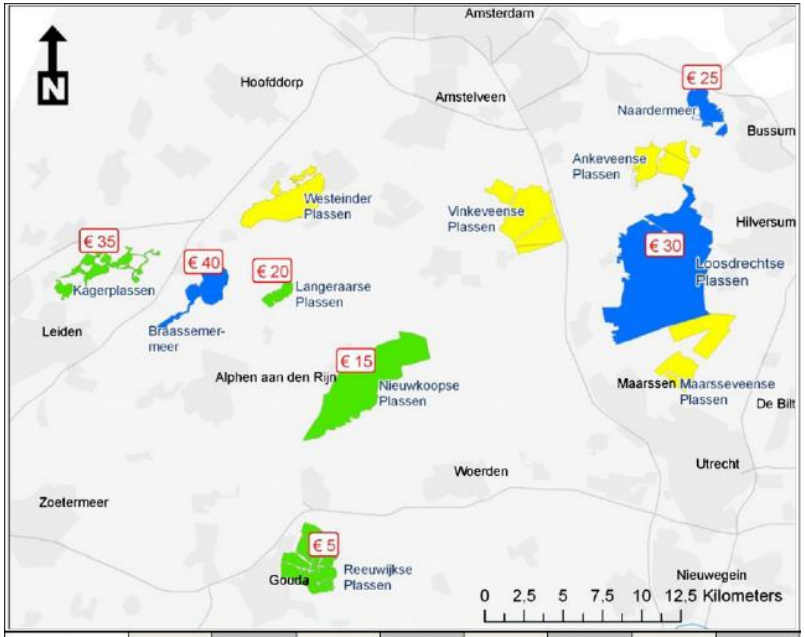
	Mean WTP	
Recr (medium)	-30.0	NS
Recr_12 (high)	-59.9	***
Recr_34 (high)	-109	***
Recr_56 (high)	-52.5	**
Dev_12 (0/1)	-84.6	***
Dev_34 (0/1)	-140	***
Dev_5 (0/1)	-26.5	NS
Dev_6 (0/1)	-104	***



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

There are very few spatially explicit choice sets in the literature





Lake	Kager-plassen	Braasse-mermeer	Lange-raarse Plassen	Nieuw-koopse Plassen	Reeu-wijkse Plassen	Naarder-meer	Loos-drechtse Plassen	None of these options
Improvement level	Green	Blue	Green	Green	Green	Blue	Blue	
Annual tax increase	€35	€40	€20	€15	€5	€25	€30	€0
Choice	○	○	○	○	○	○	○	○

Model with zonal ASCs

Mixed logit model

Log likelihood = -1583.3024

Number of obs	= 5148
LR chi2(1)	= 307.84
Prob > chi2	= 0.0000

choi	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Mean						
cost	-.0060673	.0007516	-8.07	0.000	-.0075404	-.0045942
z1	-.0278963	.1241003	-0.22	0.822	-.2711285	.2153359
z34	.6834543	.1844559	3.71	0.000	.3219273	1.044981
z56	.863635	.1855703	4.65	0.000	.4999239	1.227346
san	.0286361	.0029686	9.65	0.000	.0228177	.0344546
range	.0134789	.0030463	4.42	0.000	.0075083	.0194495
rec2sum	-.2706809	.1250746	-2.16	0.030	-.5158226	-.0255392
rec3_12	-.074979	.1482821	-0.51	0.613	-.3656065	.2156486
rec3sum	-.6943735	.1165416	-5.96	0.000	-.9227908	-.4659563
dev12	-.2679191	.1387463	-1.93	0.053	-.5398569	.0040187
devn	-.7215252	.1000637	-7.21	0.000	-.9176465	-.525404
sq	-1.430643	.2621358	-5.46	0.000	-1.944419	-.9168659
SD						
sq	2.287955	.1990363	11.50	0.000	1.897851	2.678059

Model with zonal attributes only

Mixed logit model

Log likelihood = -1582.7661

Number of obs	= 5148
LR chi2(1)	= 304.81
Prob > chi2	= 0.0000

choi	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Mean						
cost	-.0058384	.0007534	-7.75	0.000	-.007315	-.0043618
san1a	.0210132	.004685	4.49	0.000	.0118307	.0301957
san2a	.0215735	.0046808	4.61	0.000	.0123993	.0307478
san3a	.0380743	.0046257	8.23	0.000	.0290081	.0471406
san4a	.0368972	.0046044	8.01	0.000	.0278727	.0459216
san5a	.0246583	.0048493	5.08	0.000	.0151539	.0341628
san6a	.0313693	.0050163	6.25	0.000	.0215376	.041201
range	.0132358	.0030543	4.33	0.000	.0072494	.0192222
rec2sum	-.1749115	.1210068	-1.45	0.148	-.4120804	.0622575
rec3_12	-.3498641	.1310609	-2.67	0.008	-.6067386	-.0929895
rec3_34	-.6360897	.1350119	-4.71	0.000	-.9007081	-.3714713
rec3_56	-.3065713	.1269303	-2.42	0.016	-.5553501	-.0577924
dev12	-.4936594	.1204133	-4.10	0.000	-.7296651	-.2576537
dev34	-.8130404	.1232684	-6.60	0.000	-1.054642	-.5714387
sea5a	-.1544675	.1654102	-0.93	0.350	-.4786655	.1697304
sea6a	-.6100687	.172284	-3.54	0.000	-.9477391	-.2723984
sq	-1.860572	.2360668	-7.88	0.000	-2.323254	-1.397889
SD						
sq	2.268283	.1999217	11.35	0.000	1.876443	2.660122