Decision Support Systems to Inform Marine Policy

VALUING NATURE NETWORK

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Aim

Use interdisciplinary methods to develop a prototype, 'proof-of-concept' Bayesian Belief Network (BBN)-based tool, to communicate to policymakers the simultaneous impacts of a marine policy on marine health, economic output and social wellbeing.

Research

- 14 academics (economists, planners, marine scientists, policy analysis) formed an interdisciplinary team of researchers.

- The team conceptualised and populated a BBN (Figure 1) for a representative fishing community (West Indian Ocean) from existing datasets and academic and stakeholder expertise, reflecting the mixed nature of data available to marine decision makers.

- The impact of implementing a Marine Protection Area (MPA) was evaluated based on four community state scenarios with differing dependencies: Baseline, Poor Ecosystem, Subsistence-only fishing and Heavy fishing.

- Using the BBN we predicted outcomes for social wellbeing, marine health and economic value.

Findings

- Implementing an MPA changes the likelihood of different outcomes in all sectors (see Table 1).

- Including non-market values in the model allowed loss of fishing revenue to be balanced out by (monetarised) benefits of marine protection.

	Status of sector	Sector		
		Social Wellbeing	Marine Health	Economic Value
			(% probability)	
No MPA	Low	48	62	36 (49)*
	Med/high	52	38	21 (13)*
With MPA	Low	53	40	39 (53)*
	Med/high	47	60	23 (11)*

Table 1. Impact of an MPA on the status of social wellbeing, marine health and economic value of a subsistence-only fishing community, estimated using a BBN.
* Figures in brackets are without the inclusion of non-market economic values

- The BBN provided a focus for interdisciplinary conversation and application. Its reductionist nature caused friction initially although, on balance, it was accepted as available method with which to address this type of policy problem.

- A significant challenge remains in defining values.

- Future discussion should ensure the cultural values and perceptions are included prior to any attempts to measure value.
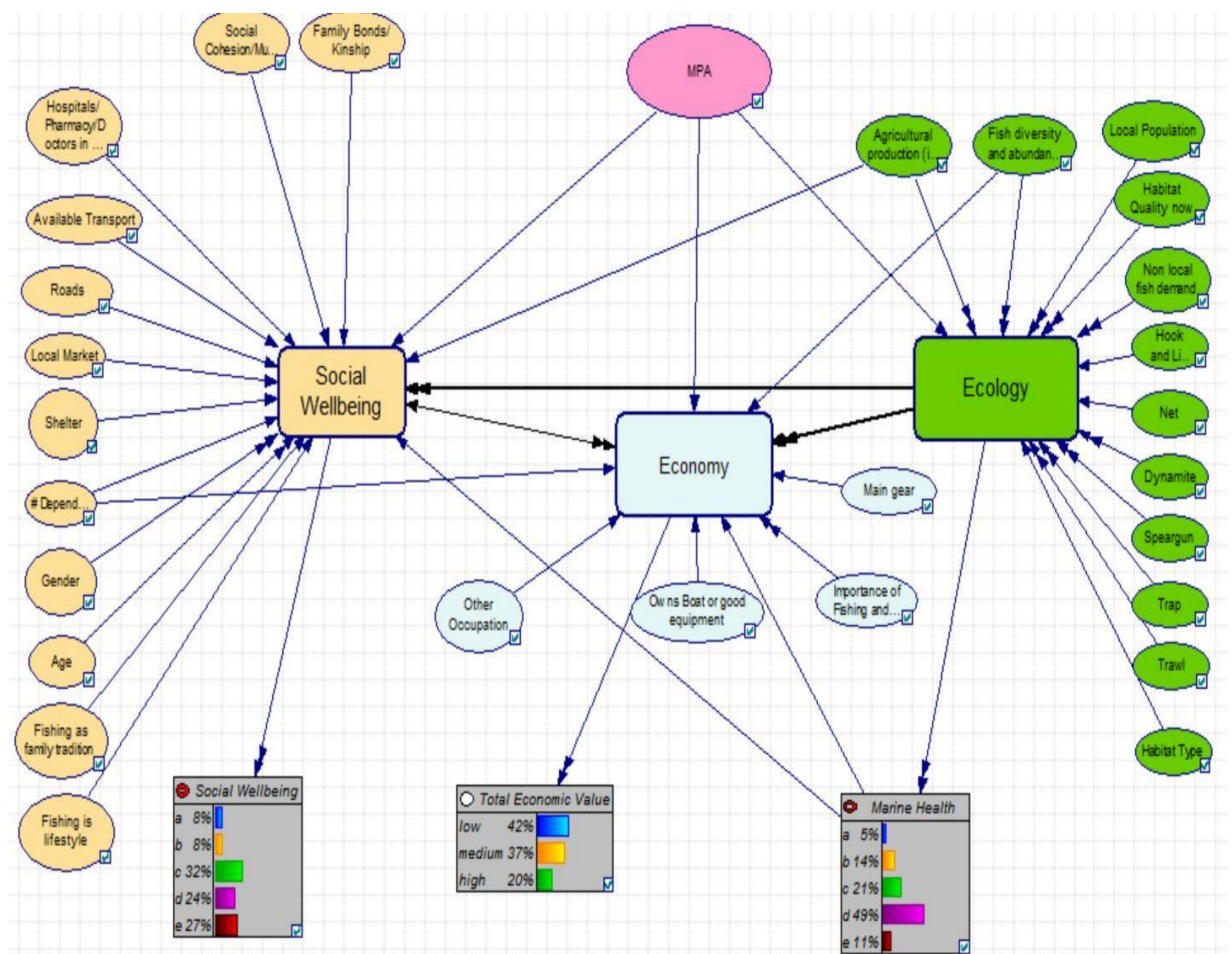

Figure 1. The BBN model: the impacts of an MPA on the three sectors of social wellbeing, economic value and marine health

Conclusions

- BBNs have the potential to visibly communicate significant policy impacts across different sectors and could assist in, for example, demonstrating the effects of a co-location approach in zoning/policy decisions.

- BBN is a holistic, iterative, problem-focused tool that can incorporate and include different types stakeholder input at all stages of the evaluation process.

- BBN models can form a decision support tool if custom-created with policy-maker input from the start.

Next steps

- Temporal discrepancy between policy cycles (< 5 years) and the long term effects on marine health and social and economic wellbeing will need to be reconciled.

- Apply BBNs to multiple as opposed to single policy evaluation.

- Further develop interdisciplinary working skills to maximise academic advancement and policy support.