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About this project

Name

Whole Decision-Network Analysis of Coastal Ecosystems (WD-NACE) (NE/i002448/1)

www.espa.ac.uk/projects/ne-i002448-1

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Time frame

October 2010–September 2012

Objective

This project defined formalised descriptions – or 'models' – of key human-environmental interactions. These interactions produce feedbacks that pose challenges to the sustainability of ecosystem services and livelihoods, and need to be understood systematically.

Summary

Working with decision makers at different levels in Kenya and in Bangladesh, this project integrated local knowledge about ecosystem health and resource use. This allows a better understanding of how people – working individually and within social networks – generate, share and select knowledge, before finally acting upon it (their 'Decision Network').

Multiple models are needed to understand the whole system, but dynamic models help with understanding linkages and illustrated feedbacks at the local level. They also help facilitate co-learning among different stakeholders.

The decision network

Knowing why people choose to use resources in particular ways is essential to achieve sustainable management.

Coastal Kenya and Bangladesh support the livelihoods of millions. This puts vital natural resources under increasing strain. In Kenya, unsustainable fishing and destruction of habitats are of particular concern, while shrimp farming in the mangrove forests of Bangladesh is in danger of permanently altering coastal ecosystems. Take Kenya's Gazi Bay: its artisanal fishery supports many livelihoods, with more than 100 fishers currently operating in and around the lagoon and reef, using 15 motored and 50 unpowered small fishing vessels plus a few larger boats. The fishing grounds, public beach and busy fish landing site are under the authority of the Gazi Beach Management Unit (BMU) which is made up of representatives from the local fishing and fish and shell trading communities.

Whilst the environmental impact of fishing is widely acknowledged, there are differing views as to what conservation measures are appropriate to sustain the fishery and the reef. Some want to see the banning of certain types of fishing gear or the establishment of protected areas. But, ask those directly dependent on the fishery what they think and they will tell you that, despite increasing human pressures and declining catches, there are few alternative livelihoods to provide for their families.

This situation is complicated by the fact that certain types of social structures have negative effects, as fieldwork here has revealed. Power relations produce inequalities in access to natural, social and financial resources, making it difficult for poor people to achieve security from poverty and affect choices about fishing gear use, sometimes creating undesirable environmental trade-offs. Identifying environmental problems is only half the battle. Solutions lie in understanding how people's actions contribute to them and creating a shared understanding of this amongst all interested parties.

Capturing people's knowledge

The first step is finding what information people are using to make their decisions – the state of the environment, the current financial situation, their standing in the community – and a structured way of communicating this between levels of decision making. To address these challenges this ESPA project developed some conceptual tools and models, building upon existing information in the Gazi Bay region, working with local teams, connecting with policy makers, practitioners, and the poorer men and women who depend directly on these ecosystem resources.

Throughout 2011 and 2012, relevant economic, social and behavioural data were gathered and then 'mapped' to create a picture of the social networks involved in decisions. With input from partners and local experts, this was used to conceptualise a first 'agent-based model' of the BMU's area. The next stage was to 'code' the behaviour of the actors: simulations were used to visualise aspects of fishers' routines and to explore different scenarios, seeking proof of concept for an 'artificial laboratory', informed by coastal stakeholders.

Reframing and testing peoples' knowledge

Once they had co-created the pilot conceptual model of the 'domain' and an agent-based simulation version, the team took them back to the Kenyan fishers, policy makers and policy advisors to check on how well these matched their experiences or not, and test whether it could be used by them to investigate policies aimed at reducing poverty and managing ecosystems sustainably.

A workshop was held in Ukunda, where BMU members and other representatives were able to run the model to explore impacts of different gear usage on the fish stock; generate a number of possible scenarios; articulate feedback loops; and come up with discussion points that could be incorporated to make the model better suited for use in real situations. This involved stakeholders not just in data gathering, but in planning use of the data and helped identify what additional data were needed. The fishers weren't just data points within a model, but co-creators of the model – as a result they felt real ownership of it.

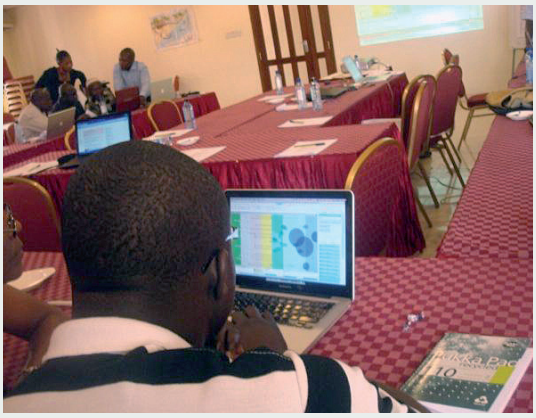
Co-creation of useful, usable knowledge

Parallel work was carried out with shrimp and paddy farmers in Bangladesh. Here, important communication roles are often played by individuals and by NGOs, and so this time the team also talked to local politicians and to NGO partners to collect feedback on the model.

WD-NACE was intended to provide primary decision makers at multiple levels of governance with a useful framework to help provide understanding of the critical social and ecological elements of resource use, and the complex inter-relationship between them. The model was praised as a dissemination tool as it successfully revealed issues through discussion and feedback among participants and by generating 'what-if' scenarios. It also helps facilitate co-learning among different stakeholders.

Next steps

Kenya partners in particular, the BMUs, CORDIO, and KMFRI staff – as well as partners in Bangladesh – feel a real sense of ownership of these models. They are all very keen that there is continued work in this area as they have proven the utility of this participatory modelling approach as a way of creating better communication and shared understanding.



New knowledge

- These models, using locally collected data and a participatory approach, proved very useful for communicating and explaining; especially when they are used with an intuitive platform like NetLogo and the associated 'Behaviour Composer' tool developed by the Modelling4All project at Oxford University.
- The models proved very popular with fishers and other stakeholders, and improved understanding of all stakeholders of which data is needed, and which feedbacks of the linked system are understood least.
- The models allowed a meaningful exploration of a set of desired outcome states for a future system. Making these models more democratic (by using participatory modelling) helped with identifying critical social power imbalances.

Creating impact

- Field data collected by the team improved the agent based models and the other conceptual model used in WD-NACE, thereby allowing local government officials and locals to work together to better understand ecological status and to come up with adaptive co-management strategies.
- Because of high interest in the use of some of these methods, the highly participatory agent-based approaches, in particular, workshops, were organised by local research institutes (CORDIO, BCAS and CEGIS) who have also initiated study groups to build capacity and take the work further.

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