biodiversa

The ERA-NET promoting European research on biodiversity

Annex 1

Practical method note 6

Co-development of research outputs with stakeholders

CO-DEVELOPMENT OF RESEARCH OUTPUTS WITH STAKEHOLDERS

Researchers may choose to engage with stakeholders at a number of levels, including: **informing** them of project findings; **consulting** with them and seeking their views on the research process; **involving** stakeholders in the research in various ways (e.g. to provide data); or **collaborating** with stakeholders fully as members of the research team to co-develop research outputs (Table 1.1 of the *Handbook*).

There are a number of examples of collaborative research on biodiversity in which researchers and stakeholders have worked closely to develop outputs together. For example, this *Handbook* provides detailed guides to participating in scenario development, ranking stakeholders with regards to the level of required engagement and participation and multi-criteria analysis, and workshop design and facilitation, all of which may be used to co-develop research outputs. A number of other examples are given here, to illustrate how researchers can collaborate more fully with stakeholders in your research.

BUILDING MODELS WITH STAKEHOLDERS

There are a number of ways that biodiversity researchers may engage stakeholders in the development of models as part of their research. Broadly, they can be grouped as qualitative, semi-quantitative and quantitative approaches:

- **Qualitative approaches** to developing models with stakeholders focus on the development of conceptual models that describe stakeholder perceptions of the systems or issues being studied. The process may be based on qualitative analysis of interview transcripts (see practical method note 1) participatory mapping (see practical method note 3 or the development of schematic diagrams (e.g. spider diagrams or mindmaps), and either developed as a group or developed individually at first, and then common elements brought together. Insights from conceptual modelling can then be used to inform the development of numerical, process-based computational models, for example helping to identify key components or relationships that need to be captured in the model.

- **Semi-quantitative approaches** include Dynamic Systems Models and Fuzzy Cognitive Mapping (also sometimes referred to as 'mediated modelling'). This process starts by creating conceptual models with stakeholders and then attempts to quantify as many relationships as possible within the model. These may range from robustly quantified relationships, described by regression equations, to estimated line-and-curve relationships based on stakeholder knowledge; or relationships may be characterised simply as positive or negative. Where little is known, relationships may be left un-quantified, and researchers and stakeholders can then adjust different model parameters to identify particularly important relationships or tipping points, which can direct and focus future research to further quantify the model.

- **Quantitative approaches** include Agent-Based Models and Bayesian Belief Networks. To create an Agent-Based Model, stakeholders work with researchers to define decision-rules. Decision-rules map observations to appropriate actions and can be used by individual people (or agents) involved in the modelling process to inform how they interact with one another and the natural environment. Alternatively, these decision-rules may be derived statistically from

interviews with stakeholders. Agents are then directed to behave according to these decision-rules, making it is possible to observe how agents interact with each other and the information about the natural environment; for example altering land use or land management practices that have consequent impacts on biodiversity. Bayesian Belief Networks are probabilistic models that can be used with stakeholders to explore uncertainty in natural systems if certain variables are known (e.g. characteristics of land management regimes) and other variables are not known (e.g. land use change). These models can use quantitative data (e.g. area of land holdings) or qualitative data (e.g. from interviews with land managers).

CASE STUDY

EXPERIENCES FROM BIODIVERSITY RESEARCH

CO-DEVELOPING MODELS

Including management actions in models: Examples of building models with stakeholders in biodiversity research include the scenario-based climate-fire-vegetation models developed with stakeholders involved in fire management in the FIREMAN project (see Appendix 1 of the *Handbook* for details). The researchers obtained valuable information from stakeholders about how they would undertake fire management under various future climatic conditions (e.g. how prescribed burns would be conducted on moorland in the Peak District in England). The modelling provided prediction for questions of genuine interest for moorland managers concerning the effects of burn intervals and intensities on vegetation composition, structure and biodiversity. The process had the advantage of allowing stakeholders to think about management on much longer timescales than normally considered and to establish a much more-detailed understanding of the potential effects of climate change on the environment and management.

Similar benefits were experienced on the MOTIVE project, where stakeholders working in European forestry management were involved in the development of models for adaptive forest management under climate change. As well as engaging with ideas about climate change, which was not part of their usual agenda, the stakeholders were involved with developing models directly relevant to their local context that provided valuable output for informing management.

Be clear about how models will be used: It is important that stakeholders understand how the models they help develop will be used both during and after the project. One of the aims of the MOTIVE project was the development of tools for adaptive forest management. There was an assumption by some partners in the project that the models produced with stakeholders would be interactive and transferable between users so that stakeholders would be able to use them to inform their management following the project. In reality, the models developed were highly complex and while results of model runs were communicated to stakeholders and were a useful source of information, in most cases the models are not tools that can be easily used by stakeholders that do not have expertise in modelling.

CO-DEVELOPING DECISION-SUPPORT TOOLS

Decision-support tools may be used with stakeholders as part of the research process, for example economic tools such as Cost–Benefit Analysis and choice experiments, quasi-economic tools such as Multi-Criteria Analysis (see practical method note 11), and spatial tools such as participatory mapping, GIS (see practical method note 3) and 3D scenario visualisations. They may also be an output of the research process that supports stakeholders to make decisions based on research-based evidence beyond the life of the project.

For example the Integrated Valuation of Environmental Services and Tradeoffs (InVEST) software is a GIS-based decision-support tool that uses land use/cover patterns to estimate levels and economic values of multiple ecosystem services, biodiversity conservation, and the market value of the commodities provided by the landscape. The InVEST approach starts by engaging with stakeholder to identify scenarios before running a range of biophysical and economic models to estimate benefits and trade-offs that can inform decision-making.

Decision support tools influencing policy: 'Choice experiments' are a survey-based valuation method where participants choose between different scenarios by stating preferences for different attributes. The results can be used to support decisions about natural resource management. Researchers in the CONNECT project worked in partnership with a government agency to co-develop appropriate attributes for a choice experiment that was carried out with the general public in the Netherlands to understand how they valued changes in and around a fresh-water lake. The government agency approached the researchers and asked specific questions which aimed to inform decisions about land use in the area. This process required research expertise to develop a suitable method to collect the data. The advantage of this approach is that the results could directly feed into policy about land use in the area. An example of a 'choice card' used to elicit values of the public for the lake area is showed below.

	OPTION 1 No increase in dike height	OPTION 2 Increase in dike height	OPTION 3 Increase in dike height
Flood probability	Once every 1,000 years (3% in 30 years)	Once every 1,000 years (3% in 30 years)	Once every 10,000 years (0.3% in 30 years)
Type of shore	No shores 	Shores next to dike 	Shores off the coast 
Bird population	Decrease of 30%	No change	Decrease of 10%
Annual local tax	No change	60 Euro per year MORE	100 Euro per year MORE
You prefer:			

A choice card used for a survey of the public in the CONNECT project.

CASE STUDY

EXPERIENCES FROM BIODIVERSITY RESEARCH

COMPLEX METHODS ARE NOT ALWAYS ACCEPTED

The HUNT project also used a choice experiment to explore the preferences of shooters towards game management in Scotland and attempted to involve stakeholders in its design. This is a contentious issue involving people with strong opposing views. Despite extensive consultation, the stakeholders remained mistrustful of the method, suspecting a hidden agenda, tensions arose and some stakeholders refused to participate. Very early consultation is required where more complex methods, such as choice experiments, are used to ensure that stakeholders properly understand their purpose.

Ensuring the usability and legacy of a decision support tool: Work Package 1 of the BESAFE project (at the time of writing) is in the early stages of designing a web-based tool in collaboration with stakeholders which will be used to inform policy makers and stakeholders involved in decision making about biodiversity, on the effectiveness of different types of arguments used for biodiversity protection over a variety of governance levels and socio-economic settings. By collaborating with a stakeholder panel, researchers aim to create a web-based tool that: provides material of interest on both a general level and for specific contexts; is accessible for people working at different governance levels; and exists in a format that can be used and taken over by stakeholders after the end of the research project. To meet these requirements, researchers deemed it essential to involve stakeholders in the development of the tool.

CO-DEVELOPING MANAGEMENT PLANS

There are also examples of biodiversity research where researchers and stakeholders work together to develop management plans for specific locations, based on evidence from research and local needs and priorities.

Agreeing on an adaptive protocol: Researchers and stakeholders in the Ecocycles project worked together in a consultative forum to develop adaptive protocols for improving the management of rodent outbreaks in agricultural land in Northern Spain. Farmers use poisons to control outbreaks and prevent crop damage, but it causes unintentional deaths in birds and other mammals, and had caused conflict with conservationists and hunters. A series of sensitively facilitated meetings turned adverse arguments into a more rational approach to controlling outbreaks. Stakeholders agreed upon an aim of producing a specific project output that would help them tackle outbreaks in the future. The resulting protocol was not written to provide definite solutions, but to guide recommended management actions under a range of circumstances given the existing scientific knowledge and uncertainties.

A note of caution about management plans: A stakeholder with extensive experience of biodiversity research warned that proposing a detailed management plan during the course of a research project was not advisable. Stakeholders may feel such plans will put pressure on them to make unwelcome changes to their management and refuse to engage. It can also be unrealistic to produce a management plan with sufficient detail over the short time-scale of a research project. Management change is a gradual process that requires evidence from many sources. The stakeholder expressed a preference for being involved in the co-production of policy briefs that can have a more realistic impact (see practical method note 4).

1 InVEST (Integrated Valuation of Environmental Services and Tradeoffs).
Available from: http://www.naturalcapitalproject.org/InVEST.html [Accessed June 5 2014].

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For further information on this report, contact:

Helen Baker (helen.baker@jncc.gov.uk) or Matt Smith (matt.smith@jncc.gov.uk)