4.6. Applying expert knowledge for ecosystem services-quantification

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Ecosystem services (ES) are a complex field of study. The application in practice poses several additional challenges. Although ES quantifications can built on existing experience, methods and data (see Chapters 4.1-4.5), specific human-environmental system settings, policy frameworks and characteristic ES need to be considered thoroughly. Expert involvement can provide information in cases where other sources are lacking, efficiently generating results and validating maps. Moreover, structural expert involvement in trans-disciplinary projects can improve effectiveness of projects which are geared at real world impact. This chapter provides basic considerations on expert involvement and puts forward some guidelines to tackle challenges related to trans-disciplinary mapping.

Why experts?

Expectations towards ES science and application are very high. The global socio-ecological challenges which researchers are aiming to tackle are both urgent and important. Still, the amount of trust and public resources going to ES studies and mapping is relatively high compared to their current impact on solving real world problems.

Applied ecology and sociology are considered complex fields, combining several disciplinary frameworks, ways of thinking and related methods. ES, at the crossroads of applied ecology, economy, sustainability science and social sciences, can be defined as "super-complex". Super-complex or so-called wicked problems require engagement of several theoretical disciplines and practitioners in actual implementation from the very onset of the problem-solving process.

What looks like just a simple ES map is often a complex combination of selected quantitative data, proxies and expert estimates, qualitative judgements, theoretical assumptions, technical choices and communicative visual goals (see Chapters 3.3 and 6.4). The quality of the actual mapping process directly determines the qualities of the map in all its aspects (credibility, relevance, clarity, usefulness; see Chapter 5.4). Creating a map which lives up even to minimal real world application ambitions obliges the involvement of 'experts' to legitimise, clarify, improve and validate maps to be relevant for any specific application context.

What makes an expert?

Delineating who is an expert and who is not is not straightforward. From the above, it is clear that, when solving real world problems, merits of diploma and discipline are not enough by far. A bright GIS technician is certainly a required expert, but without complementary input from the ecology expert, the modeller, the economist and the social scientist, there is actually nothing to map or to interpret. Also, without the local

or topical experts to put the socio-economic and natural science theories into a specific context, maps will be hard to validate. Moreover, without the expert who connects specific policy demands, cultures and know-how, implementation of the maps into actual solution strategies will rarely happen. And finally, deciding on societal importance of issues or values of specific ES to decide upon trade-offs requires input from policy makers and/or the direct end-users of these services.

All these types of knowledge are indispensable for the mapping process, and not necessarily related to education level or strictly technical skills. The central idea is that all experts - or knowledge-holders - need to be thoughtfully engaged.

Selective expert engagement

From the point of view of a technical mapping project, involving experts is often regarded as costly, tedious and complicated. We will show that structural expert involvement will add value to the whole process of map creation and effective problem-solving. Three examples of selective engagement are discussed here. The section, following this discussion, returns to address the more profound expert engagement of trans-disciplinary research.

1. Experts plaster the holes in your data
The most commonly heard argument for engaging experts is to provide 'educated guesses' and estimates of ES supply, locations or contexts where a given dataset or model is not providing quantitative information. Indeed, this is a highly effective way of filling in missing data to obtain a dataset which allows the creation of a map. The explicit assumption is that these estimates are 'second choice' and 'less reliable', and best replaced by model outputs as soon as these become available. Note that this technical argument disregards the fact that quantitative models (see Chapter 4.4) have originally been compiled and designed by experts. Often they are applied/extrapolated to another context by implementing expert-based modifications and assumptions. In addition, many aspects of ES mapping are simply not quantitative in the natural science sense: economic data, valuations, ecological quality estimates - they are all based to a large extent on qualitative expert estimates. Collaboration among diverse and multiple experts from the onset could help to avoid the disciplinary bias of the experts that happen to steer the mapping process.

2. Experts generate quick results
A second pragmatic reason to involve experts is that they provide quick access to a broad range of knowledge and comparable ES maps can be obtained in a relatively cost-efficient way. Indeed, with a minimum of resources, maps can be obtained, with known reliability and high credibility (provided that some basic rules are followed concerning which experts to select, the representativeness of this selection and how to evaluate expertise levels). A process model-based quantification (tier 3; see Chapter 5.6.1) does not necessarily deliver more useful or 'true' results than a tier 1 (expert-based relative scoring) or a tier 2 quantification. In an optimum case, several approaches (tiers) can be applied for the same ES in one region and the results can be triangulated in order to cross-validate and increase reliability. There is a risk that an overly pragmatic approach ignores existing data and models already available. In addition, involved experts are frequently frustrated when the highly detailed and complex knowledge they hold is reduced, for example, to a comparable scoring format for predefined indicators. Much more potential lies in the combination and comparison of diverse approaches from different mapping tiers (see Chapter 5.6.1) and quantification methods (see Chapters 4.1-4.4), from the start.

3. Experts fix your credibility

A third common application of expert engagement is ensuring the local or topical validity of the maps created. This concerns local ecological knowledge or elicitation of societal values, but it can also entail spatial validation and adaptation of resulting maps. Although the type of validation can vary, this step is essential for any map which is meant to provide reliable and credible input to decision-making.

The difficulty with such methods and related results is that these often do not come in before the end of a study. Experts are confronted with an end-product which is not always part of a clear process or linked to a recognisable problem. Maps represent highly complex and variable data types, combinations and technical choices in a single, static 2D representation (see Chapter 3.2). Apart from assessing the overall plausibility of the result and 'recolouring' local corrections, information to (re)calibrate models or assess credibility of assumptions made is very hard to obtain. Moreover, if a map turns out not to be useful at all, it is often far too late to change course.

A stakeholder analysis, a knowledge-needs inventory and an engagement strategy at the start of an ES mapping project allows the involvement of key experts (including local/topical experts) and guarantee validation and credibility in order to develop an effective map product.

All three selection-perspectives are pragmatic and instrumental to improve quality, efficiency and effectiveness of mapping projects. Still, these perspectives regard the mappers as project owners, mandated to select 'other experts' for a certain purpose and within a restricted window of engagement. In the next section, we show that a trans-disciplinary approach not only combines the advantages mentioned above, but provides additional benefits for the effectiveness of a mapping project.

Structural engagement of experts

Mapping ES in the context of real world problem-solving needs to go further. Structural engagement of experts departs from a different paradigm. The underlying principle is that there is no *de facto* distinction between experts and laymen, or between stakeholders and researchers. All people involved in, or potentially affected by, the ES mapping project are stakeholders as well as experts in a certain aspect.

Such a trans-disciplinary viewpoint has two immediate consequences: first, the researchers mandated to perform the mapping project depart from a humble attitude (see Chapter 5.4). Second, experts/stakeholders outside of the actual project team are 'promoted' to the level of potentially indispensable knowledge-holders and project-owners. These include people commissioning the project, topical experts on certain ES, technical experts on different methods, experts on local or thematic context into which the mapping project is framed and people actually depending on ES.

The above does not mean, of course, that every mapping project should involve large numbers of experts throughout the project in order to be effective. The actual number of experts is not the issue here, but it is their competence, diversity, qualification and role they have in the project. In the following section, a theoretical illustration of a mapping project's cycle is presented. This example imagines an ideal project without issues of policy restrictions or budgetary constraints.

1. Scoping

This first phase sets out clear project goals, adding requirements and conditions for

well-defined final map products as well as concerning inclusion of various viewpoints in the process. A broad and realistic selection of experts is made to join the project team and co-design, conduct, steer and evaluate the mapping project.

Questions to answer:
Why is the project needed? Which problem needs to be solved? Who are the end-users of the maps? What are the maps going to be used for exactly? Who will be affected by the envisioned solution? How dependent are different people/groups on the human-environmental system, how large is the potential impact on their well-being? What power or representation do they have, to what extent can they govern their own environment?

Expertise needed to answer these questions:
- Experts from policy and administration commissioning the project;
- Experts from the end-user side concerning format and requirements of the map (see Chapter 5.4);
- Technical expertise on policy and defining client demand for product development;
- Experts on various stakeholder points of view, directly or by representatives (e.g. NGOs);
- Technical expertise on stakeholder analysis and participation of special groups.

2. Method selection and project design
This phase develops an agreed-upon work plan, project governance structure and workload distribution.

Questions to answer:
What methods and data do we need to create the product? What methods and know-how do we need to set up the process accordingly?

Expertise needed to answer these questions:
- Experts from different disciplinary fields;
- Technical mapping experts;
- Specialist experts on detailed sub-topics (e.g. certain ES, habitats, land use practices, stakeholder groups);
- End-user experts to follow up on map usability;
- Policy experts to follow up on relevance;
- Stakeholder representation to follow up on different goals and conditions;
- Technical expertise to design and facilitate participation and feedback process between product developers, end-users, commissioning bodies and stakeholders.

3. Creating reliable maps
This phase produces maps with transparent reliability, conscious decisions affecting interpretation and best available knowledge, while safeguarding purpose, usability and local/thematic specificities.

Questions to answer:
How can we include and combine various data types? How can we determine reliability of different types of data and knowledge? How can we select data and communicate reliability? How do we make technical choices which impact the outcome (e.g. interpretation of maps)?

Expertise needed to answer these questions:
- All experts and stakeholders need to reach agreement on choices concerning reliability within the particular project;
- Different experts on similar topics need to triangulate and cross-validate methods and results;

Technical experts need to design and facilitate efficient decision processes and communicate decisions.

4. Implementation of the maps
This phase ensures effective implementation of the products as well as adherence to the agreed goals. Ideally, this phase runs throughout the project, in order to test early versions of the maps and adapt methods (or goals) based on these tests.

Questions to answer:
How can we ensure effective application of the maps in the envisaged solution/instrument? How can we evaluate distance to target?

Expertise needed to answer these questions:
– All experts and stakeholders need to agree on engagement in implementation and criteria for evaluation;
– End-user experts need to test application and provide feedback.

Solutions and recommendations

- Clear goals. Being effective requires the right product, produced in the right way. Clearly formulated goals are essential.
- Diversity. The best people should be identified with the diverse skills and knowledge types needed. Consider them equal regardless of their diplomas and promote this attitude.
- Facilitation. Do not think that a trans-disciplinary process will run itself. Project facilitation is a skill, and skilled people will be needed to keep the process running smoothly.
- Parsimony. Do not overdo it. Weigh costs and efforts against stakes. Be pragmatic when needed, but without forsaking the project goals. Adapt unrealistic goals to more realistic objectives.
- Testing and evaluation.
- Do not expect that your team will produce a perfect product at the end of the project. Look for the weaknesses in the project and address them. Test maps as soon as possible and avoid the trap of self-evaluation. The sooner a weakness or failure is identified, the greater chance there will be of finalising your project with a high level of success and impact.

Further reading

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