What is needed for the design of adaptive policy appraisal?

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Abstract (max 250 words):

Addressing complex environmental problems, such as the loss of biodiversity and climate change, requires the effective use of scientific knowledge in the policy appraisal process. However, communication between scientists and policy-makers is often insufficient and does not take into consideration the complexity of the socio-ecological systems in which policy is implemented. The complex nature of these systems dictates that the establishment of simple cause and effect relationships is often elusive, that contingency and random events play a major role, and that the properties of higher levels of organisation cannot necessarily be explained by the sum of their parts. Given these properties of complex systems, what is needed is a new policy appraisal process that explicitly incorporates methodological steps that allow for effective use and generation of scientific knowledge. Methodological steps are needed that assure 1) shared conceptualisation of the system, 2) delivery of relevant transdisciplinary scientific knowledge, and 3) feedback from implementation. In this paper, using case studies, we show if and how these methodological steps have been taken and if yes, how this affected the quality of the appraisal process and the sustainability of the implemented policies. We also address how professional constraints of policy-makers and scientists as well as infrastructural components may affect effective communication at the science-policy interface and thus the prospect of developing a more adaptive framework for policy appraisal.

Summary (max 30 words):

A new methodological framework for adaptive policy appraisal is developed that takes into consideration the integrative, transdisciplinary, contingent and reflective nature of policy-relevant scientific knowledge creation.

Introduction

Policy appraisal is the process of developing a theoretical framework within which decisions on action can be taken. As such, the appraisal process is to inform the policy-maker of what interventions would mostly likely contribute to reaching their policy aims, but also – and increasingly so – to protect the policy-maker against litigation because of non-compliance with environmental legislation. In this paper, it will be elucidated what is needed from a science perspective in order to produce the best possible evidence base for policy appraisal. Scientific methodology has been a very successful way of developing a theoretical framework within which consequences of interventions can be predicted or at least projected. It is therefore no surprise that a scientific approach to policy appraisal, which rests on the principle of taking into account empirical evidence when constructing a theory (Chalmers, 1999), is generally advocated. However, experience over the past 20 years has shown that scientific approaches to answering questions in the policy arena have often fallen short of what is needed to create an evidence base that can help the policy-maker choose between potential interventions. This paper will illustrate how a more effective policy appraisal process can be developed by a closer collaboration between policy-makers and scientists. Because of the

complexity of the theoretical framework required to decide on effective action, a long-term commitment to dialogue is needed to develop such a framework. The policy appraisal process needs to be re-conceptualised as a common journey guided by transparency of decision-making and adaptive learning - a vision for *adaptive policy appraisal*.

A case for adaptive policy appraisal

Adaptive policy appraisal is a process by which policy is evaluated beyond the implementation stage, and where further intervention is planned whenever it is discovered that the policy intervention did not result in the desired consequences. As such, it is imitating the principle of "learning by doing" (Mitchell, 2009). The time has come to re-evaluate environmental policy-making and see if the interventions decided on 20 years ago at the Rio summit have delivered what was expected from them. A resounding response to this question (Tollefson and Gilbert, 2012) is that these environmental policies did not lead to the desired outcomes, or only partially did so. However, if we subscribe to the principle of adaptive policy-making, we now have an opportunity to learn from our mistakes and successes and promote practices that have proven to yield successful policy interventions, in that the policy will actually produce the desired outcomes. One of the most important lessons from such a review is that experience is indispensible to reach policy goals – evidence-based evaluation of environmental policy making over the past 20 years thus makes the case for the adoption of an adaptive framework for policy appraisal.

The case for adaptive frameworks whenever intervention into socio-ecological systems is planned has been made before, and is partially based on some properties of these complex systems (Mitchell, 2009). Complex systems do not usually exhibit clear cause-effect relationships, they are characterised by emergent properties, and they are highly contingent, thus the same action in different contexts can lead to very different outcomes. Importantly, though, these properties lead to a limited ability to predict future dynamics of the system, a deep uncertainty (Mitchell, 2009; Stirling, 2010). In complex systems unknown factors that were excluded from the decision-making framework because of their assumed unlikely impact on the outcome of the policy intervention can emerge as important determinants of system dynamics. These, together with unexpected interactions of known factors, make any prediction of the future inherently fallible, and the continued monitoring of the consequences of the policy intervention a necessity. The more closely outcomes are monitored, the greater the prospect for successful adaptation of the policy intervention.

However, it is important to recognise that for most socio-ecological systems, management interventions and policy implementations have already taken place, thus providing policy-makers and scientists with a learning opportunity. Furthermore, the involvement of multiple scientific disciplines has helped develop scientific understanding on 'how these systems work' (Mitchell, 2009). These sources of knowledge about the system can help narrow the field for future intervention and show what actions will most likely result in the desired outcomes. Based on past experiences, combined with understanding of the current state of the system, a robust evidence base for decision-making can be created. Given the current urgency of addressing environmental problems, specific evidence-based and integrative procedures are needed to tailor knowledge of the system to the needs of adaptive policy appraisal. Such procedures will be based on the following:

successful capturing of current knowledge on the system, successful integration of this knowledge in a comprehensible format that allows policy-makers to evaluate their options, and a continuous effort to improve the process that also requires an effective monitoring programme after implementation. These three elements of methodology are roughly captured in the methodological steps of impact assessment: the screening and scoping, evaluation, and monitoring stages. The following illustrates how these steps are contributing to adaptive policy appraisal.

1. Knowledge capture – developing a framework for the policy decision

Even though this step is clearly recognised in the impact assessment methodology, its importance in any policy appraisal process is often not recognised in practice (Barker and Wood, 1999). Generally, it is assumed that the context of the policy decision is well-known. For example, the policy-maker may think that the desired outcome of the intervention is legally prescribed and thus defined. Alternatively, he/she may think that it is part of the expertise of the person/team carrying out the appraisal process to understand the questions asked correctly and interpret them for the policy-maker. Furthermore, because of the current polarisation in the policy making process, it has become common practice that the pieces of evidence sought after are those that are supporting preferred options of the policy-maker (Clark et al., 2008). The highly fragmented landscape of scientific disciplinary knowledge and approaches contributes to the ability of the policy-maker to remove specific facts from their epistemological context, instead of working on developing a fully integrated picture of the evidence. This leads to a misguided appraisal process that, instead of developing the 'best possible' understanding of the system, simply aims to consolidate the preexisting theoretical framework of the decision-maker. All of these issues indicate that time and effort is rarely spent on this step in the appraisal process - which is often dismissed as 'preliminary' and thus of lesser importance than the 'real thing'.

Policy appraisal is often framed as a process that is legally required and needs to fulfil these legal requirements. This fails to realise the considerable potential of the process for democratic debate and societal learning (Folke et al., 2005). It could be argued that these benefits cannot be obtained from the policy appraisal process and have to take place during the policy formulation phase *before* the appraisal process starts. However, development of a theoretical framework that identifies the elements of the system within which the policy intervention is going to be implemented, and that conceptualises the functioning of that system, is an essential step for policy formulation. It should therefore go hand-in-hand with this early step in the appraisal process. This perception is also supported by experience in SEA and EIA, where it has become best practice to start the impact assessment process early, before plans are fully made and projects fully formulated. This is to foster creativity and to consider options that would cater to a larger variety of societal goals (Folke et al., 2005).

At this first step, current knowledge of the system is reviewed, which is best achieved through a participatory process that allows stakeholders to voice their opinions, understanding and concerns (Dana et al., 2012; Clark et al., 2008). Views from a large variety of scientific experts need to be solicited at this stage, as each of these experts will have a different conceptualisation of the system with different emphasis. Care has to be taken that in this early dialogue the language used is clarified so such conceptualisations can be compared. It is in this first step of appraisal that the foundation is

laid for integration of the knowledge. In order for policy appraisal to be effective – in the sense that it develops the 'best available knowledge' to support the policy decision – it is at this stage that the boxes to be ticked need to be defined. It is the process by which the 'right science' is identified (Dana et al., 2012). Assuming that legal requirements have already provided these boxes makes it impossible – from an epistemological point of view – to create the best evidence base available at any later stage.

Important questions to ask at this stage in appraisal are:

1) What are the boundaries of the system one is working with?
2) What are the elements of the system and their interactions?
3) Are there any identifiable constraints on the system?
4) What is the objective/ what are the objectives of the policy intervention?
5) Is there any evidence based on past interventions that can inform the formulation of policy?
6) What may or may not have changed since the previous policy intervention?

However, it has to be kept in mind that 'the best available knowledge' is likely to be defined as 'evidence-based knowledge' by the scientific community and people buying into the necessity to create an evidence base for policy making, whereas other stakeholders may have higher acceptance of other kinds of knowledge. It is all the more important that a shared conceptualisation is developed so that the goal(s) of the policy appraisal can be clearly identified (Clark et al., 2008), and the potential difference between an evidence-based and a legalistic conceptualisation of the system can be explained early on. If the process becomes politicised, and evidence-based formulation is no longer the objective, then persuasion and exertion of power are the appropriate means of imposing a preferred framework. The scientific process is not needed in these situations and its inclusion will only give rise to misinterpretation and abuse.

2. Effective integration of the knowledge – getting the science right

Once the objectives of the policy appraisal and the overall system parameters are defined, it is then the task of the appraisal team/expert to integrate existing knowledge into a coherent evidence base that can be used to decide on action. Successful integration is apparent from a presentation of the knowledge that is useful to the policy-maker and allows evidence-based evaluation of alternative policy options. In complex socio-ecological systems appropriate presentation of the knowledge required is not just the aggregation of disciplinary knowledge, but of evidence that has been articulated by integration of scientific knowledge from multiple disciplines with stakeholders' values and objectives (Moll and Zander, 2006).

Specific scientific methods for this integration process have been developed over the past decades and are part of a new discipline called *implementation-oriented science* or *sustainability science* (Moll and Zander, 2006). This has developed effective methodologies for assembly and integration of disparate knowledge and understanding of systems, including computer-aided modelling and participatory methods. The two have to be used in combination to make the fullest use of their potential (Hisschemöller et al., 2001).

Principles of integration have been outlined by other authors (Pickett et al., 1994; Mitchell, 2002; Mitchell, 2009; Sayre et al., 2012), and comprise:

- A clear definition of the objective of the appraisal as emerging from the first step of the appraisal process. This definition is necessary to outline an operational methodology to answer the question.
- A hierarchical perspective by which the different levels of organisation are treated as distinct from each other and linked to each other
- The non-exclusiveness of alternative explanations on different levels of organisation
- A clear definition of the scale and domain of the knowledge to be integrated
- The recognition of context dependence of all knowledge, and thus the importance of case-specific and local knowledge

When applying these principles of integration, it is essential that high scientific standards are applied in terms of analytical rigour, plausibility of assumptions and treatment of uncertainty (Dana et al., 2012). The integrated theoretical framework that is developed has not only to present the policy-maker with options for policy making, but also with potential indicators of the success of the policy intervention (Mitchell, 2009). The latter is important to support the next step in adaptive policy appraisal.

3. Monitoring –the harvesting of the fruit

As indicated throughout this paper, monitoring is an essential part of evidence-based adaptive policy making. During the appraisal process it is therefore essential to apply forward thinking and planning for monitoring (Mitchell, 2009). From a scientific point of view, the development of a sophisticated theoretical framework is useless unless it is subject to testing against observation, as is common practice in science. In order to increase the effectiveness of the appraisal process, a scientifically rigorous, multi-disciplinary data gathering effort has to be planned, and continued dialogue with the scientists established. A promise of a test of their theoretical framework not only improves the appraisal process, but will also engage scientists to commit to projections and enhance dialogue on potential unknowns about the system. The continuous monitoring of outcomes of interventions can lead to surprise observations that give indications as to what specific factors and interaction may have been left out from the initial analysis (Pickett et al., 1994; Lindenmayer et al., 2010). In the long run, the theoretical framework will be improved in view of evidence and thus can contribute to scientific theory in itself. Without monitoring there is no learning, and thus no possibility to improve the evidence base for policy appraisal. The same limitations to the available knowledge of the system will likely be encountered in multiple policy appraisals and they will recycle information without adding to the understanding of the issues. Essential questions to ask in this step are:

1) What elements of the system need to be monitored and at what frequency?
2) Who is carrying out the monitoring?
3) How can results from monitoring be interlinked with other data and information?
4) What institutional arrangements can promote (and enforce) long-term monitoring?

These questions are very important to address when discussing monitoring and monitoring of particular environmental policies should be integrated with long-term monitoring of environmental

systems to address fundamental scientific questions; such as, for example, the research in the Long-Term Ecological Research (LTER) Network (Robertson et al., 2012).

Conclusion

In conclusion, the steps identified in this paper for adaptive policy appraisal closely follow impact assessment methodologies. However, as has been illustrated, insights from sustainability science highlight the necessity of maintaining a dialogue between policy-makers and scientists throughout the process and beyond. This necessitates the formation of *knowledge communities* and new institutional arrangements that cut across individual environmental issues, scientific disciplines and political objectives (Clark et al., 2008). Integration between disparate independently-organised units, that often work under distinct paradigms, can accelerate the scientific process needed to produce more evidence-based policy interventions for sustainable development.

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