Report on 'SPIRAL workshop on science-policy interfaces, instruments to change behaviour, and their evaluation criteria'

Rob Tinch, Jari Niemelä & Simo Sarkki

Contents:

Summary

SPIRAL held a workshop (in Brussels, 3-4 March 2011) on science-policy interfaces (SPI), their use of instruments to influence behaviour, and the criteria by which they could be evaluated. This first workshop was primarily exploratory in nature, seeking to draw out some complex research issues relating to the ways in which SPIs can influence behaviour in more or less successful ways, and to ways in which these roles may be assessed.

Stakeholder involvement, clearly vital to the success of SPIs, is not a straightforward issue. If some groups are disengaged, others may consider the SPI as biased. On the other hand, increasing the number of participants in SPIs may reduce the efficient operation of the SPI. Providing motivations for diverse groups of stakeholders to participate may be challenging. Successful resolution of these challenges is an important success factor for SPIs.

In this context, key individuals - translators, champions and strong leaders - may all have important roles to play. Attempts early in the development of SPIs to clarifying different roles and build common understanding about the issues can be important success factors. It was also noted in the workshop that luck often plays a role in effective SPIs, and building capacities and flexibility to take advantage of windows of opportunity can be important.

Independence of SPIs from particular political objectives was generally considered important. However, despite the ideal of neutral and disinterested scientist, in practice SPIs may have to present information in policy-relevant framings and perhaps engage in lobbying. Skilful balancing between independence, stakeholder involvement, and policy connections to achieve relevance (with policy connections), legitimacy (with stakeholder engagement) and credibility (with independence) provide another set of key challenges

Regarding evaluation, it was noted that formal evaluation is quite rare, but can be very useful. Performance should not be assessed too early, as the outcomes from SPI take time to emerge, but process-oriented evaluation can be useful at all stages. Evaluation requires a clear framework of objectives, and indeed one of the benefits of evaluation can be the reflection entailed by the requirement to specify what the goals are.

Future work in SPIRAL will include further exploration of the evaluation criteria and development of metrics for their implementation. Research will consider the relevance of the criteria in different contexts, and in particular how the features of SPIs link to success or failure, and how different objectives may be traded off. This will involve empirical cases, via interviews, and a second workshop late in 2011 that will focus on verification of the developed criteria.

1. Introduction

In response to a widespread recognition of important gaps in biodiversity governance and the integration of biodiversity science and policy, science-policy interfaces are currently being designed, implemented and strengthened at national and international levels, as well as at smaller scales. Major well-publicised examples include IPBES and the TEEB project. The SPIRAL project (Science-Policy Interfaces for Biodiversity: Research, Action and Learning, http://www.spiral-project.eu/) aims to enhance our understanding of science policy interfaces in the context of biodiversity, and to help improve the connectivity of science and policy in biodiversity governance.

In SPIRAL, we define science-policy interfaces as social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making and/or research.

Various instruments or tools for influencing behaviours (for example scenarios, targets, indicators) are used, supported or produced by SPIs. Such instruments may be implemented and used by governments but also by other actors, such as international organisations, NGOs, and private sector actors. The 'target audience' of an instrument could be the general public, business managers, decision makers, policy makers, researchers... anyone whose behaviour and decisions could have a direct or indirect impact on biodiversity. In short, instruments are means of influencing behaviour.

SPIRAL held an intensive workshop (in Brussels, 3-4 March 2011) on science-policy interfaces, their use of instruments to influence behaviour, and the criteria by which they could be evaluated. This workshop is part of an analysis of instruments used to encourage policies and behaviour that reduce negative human impacts on biodiversity.

The workshop aimed to assess ways in which such instruments are developed, supported and used by various science-policy interfaces, leading to an improved understanding of how various instruments work in practice and how science-policy interfaces make use of them.

The workshop also aimed to identify evaluation criteria for science-policy interfaces. The draft set of evaluation criteria produced will be fed into a second workshop, which will be organised late in 2011, and will focus on 'testing' these evaluation criteria in different contexts within which science-policy interfaces and associated instruments operate.

This report present the workshop methodology based on "story-telling" and summarizes the main results of this process. This report also presents key lessons learned from the workshop, going into more details on 'actors', 'motivations', 'institutional frameworks', 'roles', 'instruments', 'role of luck' and 'emerging issues'. This is followed by a discussion of evaluation criteria for SPIs, developed based on the workshop discussions, and identifying potential tradeoffs among the criteria. Results from a plenary session specifically

relating to the development of evaluation methods for IPBES are presented in annex 1.

2. Methodology: Participant 'Story telling'

After general introductions, the workshop began with 'story telling' sessions in which each invited participant briefly (c. 10-15 minutes) described their experience with a biodiversity-related science-policy interface, where a behavioural change was sought. These stories were followed by a discussion (c. 20 minutes) exploring points of interest and seeking to draw lessons from the story. For each story, the listeners were tasked with noting responses to one of a specific set of questions:

- Q1a. What science-policy process is the story about? What were its key features?
- Q1b. What were the objectives of the science-policy process outlined in the story?
- Q2a. Whose behaviour was influenced, and/or whose behaviour was intended to be influenced?
- Q2b. How was this influence exerted (or how is it hoped that this influence will be exerted)?
- Q3 What kind of control did different actors in the SPI have over the science-policy process?
- Q4 Was the science-policy process evaluated (and if so, by whom, when and how)?
- Q5 Were the instrument(s) for influencing behaviour evaluated (and if so, by whom, when and how)?

The participants provided a very diverse range of stories, ranging from major international initiatives drawing on multiple research and policy communities, to specific national and local SPIs, individual projects, and SPIs focussing on a specific issue (table 1).

The following discussion pulls out the common threads and conclusions from the 'story telling' session and other workshop discussions to be used as a means of providing shared background material for development and learning during the workshop.

Table 1: Participants and story titles

Participant	Affiliation	Story about:
Neville Ash	UNEP	The Millennium Ecosystem Assessment
Helen Baker	JNCC, Joint Nature Conservation Committee, UK	Enhancing policy relevance of ornithological data
Ben ten Brink	PBL, Netherlands Environmental Assessment Agency	Strengths of visualising bio-indicators
Aysegül Cil	ECNC, European Centre for Nature Conservation, Netherlands	Local nature protection in the Balkans
Anne Franklin	Royal Belgian Institute of Natural Sciences, Brussels	Integrating biodiversity in development cooperation
Paula Harrison	Environmental Change Institute, Univ. Oxford, UK	Clearing house mechanism for impacts of climate change on biodiversity
Thomas Koetz	DG Research, European Commission	Biofuel discussions at the SBSTTA of the CBD CoP
Martin Sharman	DG Research, European Commission	Research funding for squirrel contraception
Rania S. Spyropoulou	European Environment Agency, Copenhagen	Use of Natura 2000 data and modelling
Hans Vos	Formerly European Environment Agency	The Economics of Ecosystems and Biodiversity (TEEB) assessment(s)
Tony Zamparutti	Milieu, Brussels	Wetland restoration in lagoon of Venice
SPIRAL personel		
Heidi Demolder	Research Institute for Nature and Forest, Belgium	
Ulrich Heink	Helmholtz-Centre for environmental research, Germany	
Sybille van den Hove	Median, Spain	
Jari Niemelä	Univ. of Helsinki, Finland	
Rob Tinch	Median, Spain	
Allan Watt	The Centre for Ecology & Hydrology, UK	

3.   Key things learned from the workshop

The stories told by participants covered a wide range of formal and informal science-policy interfaces. Some general themes arose across the stories, including the importance of **'tipping points'** – critical moments that helped the SPI and/or its influence to move forward. These 'tipping points' included examples where the constraints of institutional framing and inertia were

broken, and cases in which an element of luck played an important role. On the human side, several cases demonstrated the potential importance of strong individuals in key roles such as science-policy **'translators' and 'champions'** of the SPI in strategic locations.

On the other hand, no simple, common and generalisable 'magic bullet' for successful SPIs could be identified. The important themes when explaining success and failure of SPIs in different cases included the role of **constraining institutional frameworks, human factors including competence, clarity of roles, and ability to adapt and take an advantage from 'tipping points'**. Relationships between institutional framings and policy processes can be highly complex and nested. This can shape what is possible, and impacts on how people as members of SPIs can act in different situations. Institutional framing and inertia were keys factors in cases in which SPIs failed to exert influence.

Despite the complexity of factors for successes and failures of SPIs and instruments, we attempted to develop draft evaluation criteria for SPIs, and also to map potential tradeoffs among the criteria (section 4). Given the multiplicity of SPIs and instruments, future work will need to consider how the evaluation criteria and tradeoffs play out in different contexts. Before presenting the draft evaluation criteria we consider the themes identified as important from the workshop discussions.

3.1 *Actors*

Different SPIs are driven by **variety of actors**, and the SPI is generally very **dependent on the individuals** forming it, and the ways in which they interact. The performance of members of the SPIs is crucial in explaining successes and failures of SPIs to influence behaviour. We may think of SPIs as based on rational behaviour, but this requires a wide interpretation: people have different kinds of 'rational' objectives. Thus, even thought there may not be rigid institutional framings, still actors 'bargain' for the construction, form and development of the SPI, following their world view and objectives.

One participant introduced the idea that every individual involved carries a "personal SPI" inside his/her head, and these come complete with individual "institutional frameworks", personalities, backgrounds, skills, knowledge and values that shape interactions with others. Thus, **individuals and their diverse rationalities have key roles in successes and failures of SPIs**.

The combination of different individuals builds up into communities and interfaces, and also brings challenges. People who view the world or work in specific ways can tend to resist, or even be antagonistic to, those who think in other ways. One example given was resistance in a conservation community, trained in the use of field data, to accept modelling and earth observation based alternatives. There is inertia, and only those who really need the results are willing to bridge the gap. There may also be hysteresis, if early efforts are frustrating, fail to bear fruit, or even result in negative

consequences – "once bitten, twice shy" – even though, rationally, it is to be expected that some teething troubles might occur in any novel interaction.

Breaking down inertia and overcoming troubles in initiating new practices are therefore crucial, but can require participants to move outside their 'comfort zones', and **a SPI can only function effectively if there is acceptance and trust among participants**.   Knowledge is not evenly distributed: policy makers have to trust science judgements at some point, while scientists need to trust the policy needs and questions. Trust may take time to develop, but can more quickly be damaged. Consideration of these potential difficulties, and the results of the stories presented, led participants to agree on the potential importance of two features:

- "**Early barrier breakdown meetings**" at which the communities potentially involved in fledgling SPIs can meet to explore areas of contradiction and friction, and seek to find constructive paths to enhance the prospects of the SPI.
- **At all stages, a third-party "translator"** with the role of facilitating interactions and building trust. This translator role requires people with understanding of the different "sides" – their objectives, constraints, views – and the ability to facilitate communication in forms understandable by all parties.

We may consider these features as kinds of instrument seeking to influence the different actors in a SPI to communicate in open and constructive ways. The translator role can be an important ongoing part of a functioning SPI, aiding its operation, performance evaluation and evolution, but it was also stressed that this is more an art than a science: one size does not fit all, and part of the problem is the complexity of putting a diverse group of people together. Getting the best out of the individuals involved in a SPI is heavily dependent on the characteristics and personalities of the participants, as well as on the institutional frameworks and constraints. Working through this to develop a well-timed and well-functioning connection between science and policy is a key to success.

The concept of 'translators' between distinct and possibly divergent groups and objectives links to ideas of boundary objects and boundary organizations as integrators of science and policy (e.g. Guston 2001). Discussions at the workshop suggest that **successful boundary work can not be fully planned, but must be designed to be adaptable to complex situations on a case-by-case basis**. The results of the workshop also suggest that relevant boundaries may exist not only between science and policy, but also between different individuals in both scientific and policy realms.

An important corollary to the observation that SPIs are formed of interacting individuals is that **the success of the SPI can depend heavily on particular strongly motivated and/or strategically placed individuals**. Several of the successful 'stories' involved key individuals who were crucial in initiating an SPI, and/or keeping it going through difficult times, resolving problems, securing funding and so on. In some cases these were intermediaries or

translators as noted above.   In others, the importance of powerful "champions" within funding bodies or policy agencies had been observed by workshop participants.   These 'champions' and 'translators' may not be directly involved day-to-day, but are there to support the SPI at crucial moments. Charismatic leaders, able to bridge constituent communities, can also be important.

3.2   *Motivations*

Motivation for people to participate is essential for a successful SPI: all parties need to see some benefit, personally or professionally, to participation. As scientists, we are especially familiar with the observation that, where career progress focuses primarily or exclusively on research output, participation in SPIs (other than where directly related to research funding) can represent an important time cost for scientists, with no clear 'payback'.   Thus **making incentives for scientists to get involved in SPIs is important** – for example, in the form of formal recognition within performance assessments and career progression, and/or through attaching outreach conditions to research funding.

In the UK, NERC's 'Pathways to Impact' requirement is designed to encourage researchers to make investments in SPIs. "All research proposals submitted to NERC should be accompanied by 'a pathways to impact' – document"[1] that must explain:

- who may benefit from or make use of the research;
- how they might benefit and/or use the research;
- methods for disseminating data, knowledge and/or skills in the most effective and appropriate manner.

Funds are made available to support activities identified in the pathways to impact document. The aim is to ensure that researchers are encouraged and supported to make policy connections as part of the grant, but though all proposals must do this, it is also stated that the pathways to impact document forms a secondary criterion, with scientific excellence and suitability of the applicant coming first. However, this requirement does seek to ensure that these issues are addressed and that resources are planned for outreach activities.

The policy side also needs incentives to participate, and often there can be problems due to lack of funds, and limited interest from individuals under considerable time pressure, for participating in such interfaces. The EPBRS (The European Platform for Biodiversity Research Strategy) can be considered as an example: policy makers are not used to going to such meetings, and getting permission and funding to go can be difficult. Often they do not have time to invest in attending and in preparation. Policy makers

---

[1] http://www.nerc.ac.uk/funding/application/pathwaystoimpact.asp

tend to have very wide briefs, and their bosses' briefs are even broader, so they really don't have time for details of research, except in cases of strong personal interest and time devoted outside working hours. Signals are often swamped at higher levels of the hierarchy, so early career policy makers who could find time to become involved are not being encouraged to do so, and/or find that their reporting back has little visible impact.

3.3   Institutional frameworks and contexts

The actors within SPIs are constrained not only by their individual characteristics but also by the institutional frameworks and career paths in the institutions they represent. The SPI itself, and the instruments it may be able to use, are in turn constrained by the broader framework of the SPI's participating institutions, target audiences and the broader policy contexts it inhabits.

Workshop participants stressed **the importance of mapping and planning for the SPI, aiming to build collective understanding of the social, cultural, economic, and power contexts within which it is to operate**. Building collective understanding and trust takes time, and requires an arena and a policy process within which clear targets can be stated and value can be organised for all participants. Mismatches in SPIs objectives, individual views, and contexts can be persistent, due to institutional inertia, insufficient or divergent understandings of how the system works, and vested interests. So it is important early on to invest in alternative models and work out a structure and form that will meet all the requirements and needs of the various participants as well as fit into the contexts in which the SPI works.

Placing the SPI in the context of (political) decision-making processes is vital. However, ideology within certain institutions can hamper this process. For example the political focus on 'sustainable economic growth' gives rise to serious conceptual problems for scientists working with environmental constraints and thresholds.   The proposed solution for decoupling environment and economy through 'resource efficiency' is feasible only up to a point, and limits discourse to a relatively narrow set of options. Such institutional paradigms can hamper SPIs and their integration in complex issues and contexts.

Co-evolution and dialogue between demand and supply is important. Research funding needs to be aligned with policy needs, and policy makers should acknowledge that research takes time, so getting answers takes time. There can be cases where by the time the answer is there, the question is no longer relevant, because politically important questions have changed. This may reflect a failure in the communication process between a SPI and its policy context: though not all political changes can be planned for sufficiently in advance, yet **it can be possible for a SPI to scan horizons, plan for flexibility and even play a role in shaping the next generation of political questions**.

Participants felt it was important that not all research should be focused on immediate policy needs: independent and "blue skies" research is also important, and should be supported by SPIs. It was seen that **generating evidence on emerging issues and looking ahead of the immediate political game is important**. SPIs can play a role in shaping the next generation of policy needs, including by clear framing and communication of important ideas, whether novel or (academically) well-established. The example of ecosystem services was cited: the approach is not especially new, and many of the related concepts go back several decades in the science literature. But the more recent synthesis has now been taken up strongly by policy actors and stakeholders. And in turn, this has led to a striking increase in scientific research in the field: a form of positive feedback, or 'virtuous circle' of policy interest and research results, that can be nurtured by strong and effective SPIs. There can also be a danger of 'lock-in', however, if SPIs become too strongly focused and grounded in a specific paradigm.

The contexts around the SPI can have an important influence on what arguments are accepted as being valid, and with what weights, and therefore on what arguments are likely to be effective. Of course this will alter the appropriate choices of instruments and strategies for the SPI. In one of the stories, the Venice Lagoon case, the sediment replacement is quite expensive, but nonetheless economics arguments were not particularly relevant. The economic arguments were not seen as important by people on the conservation side, the construction consortium was happy to be paid, and the government did not seem concerned. "Value for Money" is not a particularly salient concept in Italian politics. There is a significant contrast with, for example, the UK focus on 'resource efficiency', leading to much less use of hard engineering solutions.

More generally this is an important **cultural question – what arguments are considered valid and important**? One participant cited Greece, where money is spent on hugely expensive capital projects without much attention to cost, and generally it is "not done" to talk about doing things more cheaply. Thus arguments that may be very important in one part of the world may be relatively minor elsewhere. Similarly, the social status accorded to scientists and to science varies from country to country. In the UK, status is (or perhaps was) high; some other countries would not be so deferential, and the policy side would be less open to accepting relevance of scientific evidence.

There are also **important challenges in bringing all stakeholders into biodiversity and conservation governance and associated SPIs**. In the UK, for example, one of the key issues in biodiversity conservation generally has been getting landowners and farmers on-board, through a combination of demonstrating the importance of ecosystem services to private activities, creating compensation schemes (such as Higher Level Stewardship) to encourage environmentally beneficial land management practices, and emphasising the social and cultural role of landowners in protecting the environment.

The above considerations stress important **critiques to linear models of science-policy interfaces.** 'Translate and transfer' models assume uptake of science by politicians as long as the science is made available for policy makers. In this way 'science speaks truth to power' (Van Kerkhof & Lebel 2006). But science is sometimes too slow to speak truth to power, as the relevant questions for policy have changed before science can supply answers. Science may not be able to provide objective or holistic answers, as the institutional frameworks within which the scientists operate may carry assumptions in form of scientific paradigms. The communication and interpretation of science may differ according to cultural and political contexts, where valuation of science in policy circles varies. And various contextual issues can determine which pieces of science rise up policy agendas, and what science is funded.

Steven Yearley (e.g. 2002), and other constructionists, have emphasized that environmental problems are "socially constructed", meaning that the importance of different questions in policy circles is not based on "material reality" of scientific evidence, but on that how well and by whom different problems are articulated. The evidence can be published by science, but the ways in which different evidence is integrated with policy agendas depends on a complex range of factors. Of course, one important set of factors relate to the existence and functioning of SPIs, and how they interface with policy makers and their agendas.

3.4   *Roles of actors within SPIs*

As noted by individual workshop participants, different actors in the SPI have their own values and agendas. This reflects a more sophisticated approach to SPIs than the old "truth speaking to power" conception noted above. Nevertheless people can play many different roles within any SPI framework. Participants found some interest in Roger Pielke's (2007) categorisations from "The Honest Broker: Making Sense of Science in Policy and Politics". These are:

- Pure Scientist – no interest in the policy decision
- Science Arbiter – answers to factual questions of policy makers, but does not tell what the policy-makers should do
- Issue Advocate – pushing an agenda, closing down and presenting only limited amount of policy options
- Honest Broker – showing policy options, opening up

Pielke also stresses the possibility of 'stealth issue advocacy' – appearing to be an honest broker, science arbiter, or pure scientist, while actually pushing a personal agenda.

The "honest broker" caricature remains in many ways the idealised vision of neutral participants, but in reality there is some disagreement over the appropriate or acceptable forms of behaviour. It was noted that elements such as passion, dreams, and rhetoric can be important in practice for achieving certain outcomes. And there may be a significant disadvantage

in playing a completely "honest broker" strategy if others in the SPI are using advocacy strategies. There was also general agreement on the importance of "knowing your enemies" – and also your friends – in any SPI context: it can be important to build coalitions to support certain agendas, and also to know when not to push a point that is likely to be lost.

Some participants suggested that lobbying SPIs do not work as SPIs since lobbying is a different category of activity. Others argued that NGOs commission and use research, have been effective in SPIs, and in some cases do play the role of SPI. WWF was cited as one example of a successful and important player. **Issue advocacy is not necessarily seen as a bad thing**: the "honest broker" may be an idealised role, but will that make things move? One participant noted that "we have been doing "pure science" for years; are we getting anywhere?"

Others stressed that it can be essential to frame arguments in ways that suggest to policy makers that the results are supporting policy objectives: "politicians are not interested in facts, but in facts that support their views!" So, to **make policy makers interested, scientists need to show how the evidence is related to policy interests**. This rather provocative stance highlights a fundamental tension regarding the actual and appropriate roles of scientists within SPIs, and indeed of SPIs more generally. At various points in the workshop, participants noted that

- SPIs should be evidence-based, linking to clearly defined policy needs.
- Lobbying is a valid part of SPIs that should seek to enhance the integration of science into policy and even shape policy agendas.
- Whether appropriate or not, if SPIs don't lobby, they will be ignored.
- Whatever the ideal may be, it may simply be impossible to depoliticise SPIs, and in practical terms scientists have to work with that.

We may have moved beyond "truth speaking to power", but what replaces it is somewhat nebulous and difficult to pin down. However, there was some agreement that **transparency is important, and that legitimacy and successful functioning of SPIs can be enhanced by the existence of shared ownership and mutual benefits**. Stakeholder involvement and ownership of the process were seen as key success factors, and it was noted that scientific credibility on its own, without (perceived) legitimacy, was not likely to be effective.

3.5 *Instruments*

A wide range of instruments was discussed at the workshop, taking a broad definition. Instruments may be used by governments, international organisations, NGOs, and private sector. **The target audience of an instrument could be the general public, business, decision makers, policy makers, researchers, SPI participants, or anyone whose behaviour and decisions impact directly or indirectly on biodiversity.**

Instruments can be split into:

- process oriented instruments – e.g. platform, procedural rules, facilitator/translator
- product oriented instruments – e.g. targets, indicators, policy briefs, models, economic instruments, baseline values, reference points for indicators, training, assessments

Though this split is not always clear: for example is a conference a process or a product? An alternative split (similar in practical terms, and again there would be overlap) would be to consider **instruments aiming to influence the behaviour of SPI participants, and instruments seeking to influence the behaviour of others.**

The most widespread set of instruments are those seeking to translate or communicate science for policy needs. In many such cases the key features **are clarity and simplicity**, because policy makers are often not trained in all of the specific skills/topics they are in charge of. In this context, visual methods can be extremely powerful, and can therefore also be dangerous – care is required to avoid any misrepresentation and over simplification of messages. Even accurate depictions may provoke political backlash, as happened in relation to the "burning embers diagram", banished from the IPCC policy makers' summary as too powerfully visual and politically charged.

The choice of the level of detail is fundamental: for example, in the shift from raw data to indicators, and then to summaries of several indicators, clarity for policy makers is increased, but detail is lost. There is also a fundamental tension here with the communication of uncertainty, risk, and unknown thresholds. Of course these issues require huge efforts in transparency and making sure the policy side understands what the indicator is showing, and what policies it is relevant to. Making indicators simpler and more meaningful is a key to the whole process.

Questions remain about appropriate tradeoffs between communicating uncertainty and being clear and simple. Translating science in simple and useful terms, while still being transparent about uncertainties, can be difficult. Communicating uncertainty and presenting various options, as in the 'honest broker' model, might diminish the impact of information and its usefulness as a guide to behaviour. There are important questions regarding transparency and communication of uncertainty within a framework of 'simple message policy briefs' specifically tailored for different audiences. The "translator" role is important and challenging here. Scenarios were also considered as useful instruments in context of translation, because of their capacity to engage a wide range of stakeholders, and focus on policy relevant issues, while conveying very different perspectives and exploring areas of substantial uncertainty, but can make complex and uncertain situations appear simpler than they really are.

Trying to include too much detail, or nuance in response to uncertainty, can result in loss of clarity and can even kill off an instrument. The case of the AMOEBA diagram was discussed at the workshop. At the ecosystem level, with 40 familiar species, this was highly visual and effective. Breaking it

down to lots of component parts for sub-areas, and adding representations of uncertainty, stretched it too far: the clarity, and therefore the whole point of the diagram, was lost – perhaps a case of "if it ain't broke, don't fix it".
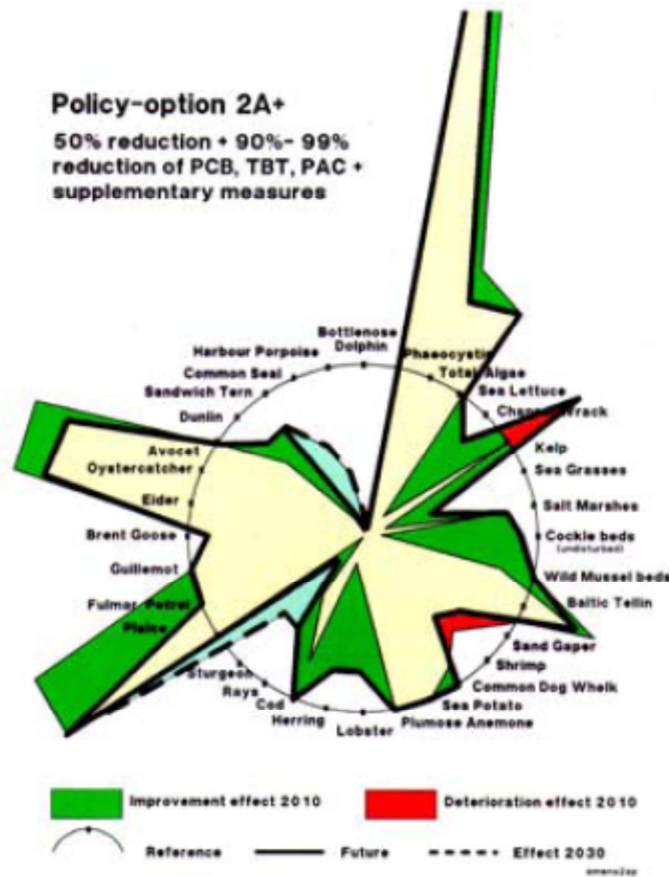

Figure 1: Example of AMOEBA diagram discussed at workshop (Source: ten Brink 1990)

However **there are issues here relating to dynamics in science and policy circles, and striking the right balance between innovation and stability.** Achieving sufficient level of stability can be a challenge, because in science contexts strong emphasis is placed on novelty and publication, and there is always a dynamic towards trying new things. The same thing happens on the policy side, with new post-holders trying to make their own marks. In civil service cultures, and in political positions, where regular rotation of personnel is the norm, this can create a lack of stability. These changes also affect the SPI directly, as participants come and go, and thus investments in building trust, understanding and relationships need to be repeated on a regular basis.

On the other hand, fear of **breaking a working instrument can lead to lock-in and inertia**, even if the instrument in question is demonstrably sub-optimal. For example, in the UK, some biodiversity data series run over 40 years;

14

although there is growing realisation that some indicators are far from perfect, there is resistance to throwing them away (e.g. wild birds indicators) – this is partly because there is inherent value in keeping a time series running, and also because it would be very political to stop the series. So there is a kind of lock-in: there are more and more indicators being added, but old ones are not actually displaced. The Natura 2000 network itself can be seen in a similar light, with resistance to any idea of shifting or trading-off sites, even though it is recognised that climate change is resulting in moving ranges for many of the target species for protection, because of fears that any renegotiation may result in a net loss from conservation in favour of development.

In addition to clear and simple communication tools, **the importance of strong and appealing symbols was stressed**. Conservation interests can be "up against" some powerful symbols – in the Lagoon of Venice case, the symbol was "saving Venice" from flooding through engineering. More generally, conservation faces symbols of economic growth, jobs, new homes and so on. The biodiversity sector has tended to stick to its flagship species symbols, and has resisted adopting others' symbols. In general the main alternative to flagship species and protected areas symbols is the ecosystem services framework, which squares up to the growth/jobs/homes symbols by demonstrating the human welfare derived directly and indirectly through the conservation of biodiversity and ecosystems. This is, however, resisted in many quarters, being seen as a challenge to the moral obligation to conserve (though the two can also be seen as complementary) and because there are concerns about the moral and practical implications of going too far down the monetisation route.

In some cases, where there are clear commercial benefits to conservation, a dual approach can be attempted without the need to invoke any non-market ecosystem services directly: "these actions will save money and protect biodiversity"; or the corporate social responsibility argument, "do it because it pays". This is fine so far as it goes, and quite likely to be successful, but there will always be tradeoffs at some relevant level beyond the simple win-win cases.

Often, an SPI faces multiple targets for communication – academic, policy communities, landowners, industry, and media. In such cases it can be desirable to recognise the different needs and characteristics of these groups, and tailor instruments and outputs appropriately. In the case of the British Ornithological Union, diversifying outputs for different audiences coincided with formal 'Proceedings' becoming too expensive to produce. In addition to publishing key conference papers in the leading journal IBIS, the Committee writes a policy brief based on the conference discussions, also published in IBIS. There is clear recognition of the importance of presenting science in the language of policy makers – shorter, simpler, focus on key messages. Policy briefs and product-oriented instruments targeted for different audiences may square up to the mismatches of the linear model by engaging policy actors in producing the documents, for example through extended reviews or searching for appropriate questions for assessments. This can enhance legitimacy, or conversely, can bring

problems if knowledge production and collection is carried out in biased and non-transparent ways, but results are presented as 'objective' and neutral.

3.6 *"Luck"*

A common feature in many of the stories was an element of serendipity at tipping points or critical moments, where the SPI was able to "break through" institutional constraints and achieve new objectives or success. For example, in the case of the Royal Belgian Institute of Natural Sciences (i.e. Belgium's natural history museum), the fortuitous coincidence of the International Years of Biodiversity (2010) and Forests (2011) and the 50th anniversary of D.R. Congo independence (2010) provided a golden opportunity and funding to achieve a breakthrough in integrating biodiversity concerns into development projects.

But is this really luck? Any SPI that waits long enough is likely to hear opportunity knock at some point. Then, the key feature is the ability to capitalise, and this will depend on characteristics of the SPI, its people (including champions) and its instruments. There may be ways to maximise exposure to opportunities, and to plan for success when opportunities do arise. This is likely to be helped by a broad sense of ownership in the SPI, with individual actors able to bring opportunities to the table in a timely fashion and with an appropriate system of response.

3.7 *Emerging issues*

While recognising the importance of matching policy needs so that research has a policy basis, there was agreement that research funding should not be exclusively policy-led. SPIs also have a role to play in horizon-scanning and creating an evidence base for emerging issues. Here science is viewed as a form of direction, developing evidence that may become useful sometime. It can be difficult to bring emerging issues to the surface and give them an audience, and SPIs can have an important role in knowledge brokerage. It was also noted that policy priorities are often volatile, and that a broad base of science is required in "responsive" mode, ready to deal with new requests. However, it was also suggested that many such shifts are really changes in emphasis and framing, not in fundamental substance (e.g. "resource efficiency" is not a new concept, just a slightly altered perspective on an older one).

On the other side of this coin, scientists come to policy makers with their own ideas and hobby horses (as in the squirrel contraception case): some of these are early warnings and it is important that policy makers take notice – so how, in a SPI, do you tell when to listen to the novel idea, and when you're dealing with a crackpot?

This is one area where the role of the translator can help, to a degree, by explaining and interpreting for all parties. Researchers may not understand the policy priority; policy makers may not understand the evidence base. Part of the translator role is bridging this gap, including by creating and

communicating indicators and other instruments. **More generally, SPIs can act as a reality check and filter for policy makers** – if the group of scientists can see the novel point, then it's probably worth a look. Against this, we can note the risk of paradigm-breaking concepts being rejected by scientists heavily steeped in a particular tradition and world view.

Similar issues can arise with the case of policy lock-in when (the interpretation of) science turns out to be wrong, or incomplete: the example of the carbon-neutrality of biofuels was noted. The EU policy towards biofuels hangs on some evidence that has been progressively discredited, but it is politically very difficult to effect changes in policy once a target is set in place. Better application of checks and balances up front may help to avoid problems, but this can be difficult where the demand for clear, policy-relevant information is pressing.

As well as science issues and evidence, there are also emerging or latent SPIs. In fact all SPIs have latent potentials, until they start to fulfil a certain function: even SPIs with certain well-established functions will have several potential new avenues. Individual networks of contacts, including meta-networks / social networks, can be powerful latent SPIs. An SPI may be absent, or not functioning well, but may then suddenly take off in response to a new policy need or emerging issue. The dynamics of this process are important, and inevitably a bit random, but actions can be taken to facilitate such events – building databases of contacts, skills and interests, clearing house mechanisms – that can in themselves be viewed as instruments used by the initiating SPIs or individuals.

4. Evaluation of SPIs

Science-policy interfaces can be categorised and assessed based on various characteristics, including their:

- structure (institutional arrangements for SPI, e.g. intergovernmental panels like IPBES),
- internal processes (interaction processes leading to creation of outputs and impacts, e.g. procedures to communicate),
- functions (the stated objectives of SPI, e.g. knowledge generation),
- outputs (products of SPI, e.g. reports),
- other instruments or tools that SPIs use to encourage policies and behaviour that reduce negative human impacts on biodiversity (e.g. scenarios, targets, indicators)
- actual impacts on behaviour or policy

Evaluation can be formal and/or informal, internal and/or external. The framework is crucial: some participants suggested that **there should always be peer review involved**, never purely self-regulation, although the value of internal review was also recognised.

The introduction of peer review adds another dimension of actors to the SPIs and this in turn may bring complications. Particular problems can arise if the credentials of the reviewers are rejected by some participants (for example if generalists are reviewing the work of specialists), **although extended peer review was seen as increasingly important.** Extended peer review means that the output is reviewed not only by the science community, but also by other interested stakeholders (Functowicz & Ravetz 1993). Extended review is often partly developed, but it is usually a struggle to get this done: scientists can resist the idea ("who are you to review my work?"), although nowadays there is much more informal peer review by public and media. This 'informal extended review' is not always carried out in a constructive way, and the growing danger of "trial by blog", often involving vested interests, unconstructive criticism, and even *ad hominem* attacks, was flagged as an issue of increasing relevance to SPIs active in high-salience policy domains.

Evaluation can be very difficult in some cases, for three main reasons. Firstly, evaluation has to be done in relation to a set of goals for the SPI, and if these are not clear, it is hard to know how the evaluation should be carried out. Ex-ante work on goals and ambitions is important for evaluating formal structures, though obviously this does not apply to spontaneous SPIs. The goals need to explain the targets, the scale (local-national-global), and perhaps the methods/instruments to be used. Often instruments are more easily considered as processes than as outcomes, especially if outcomes occur only after significant delay.

This leads to the second issue, timing, because the desired effects may be quite long-term, while the evaluation requirement may be more immediate (in order to feed back to changes in the SPI). In such cases, some proxy measures indicating likely future impacts may be needed, perhaps measuring process rather than outcome. Participants noted that the formal evaluation of SPIs should not occur too early – these things take time, and room must be left for the initial phases and teething troubles to pass. However, the value of early evaluations is that they can direct and improve future efforts of the SPI.

Thirdly, the boundaries of assessment can pose problems where the sought impact depends on a complex network of events only some of which are within the (partial) control of the SPI. Again, proxy measures may be needed to show if the SPI has performed its role adequately, irrespective of the actual outcomes depending on wider factors.

The above considerations highlight some of the complexity involved in evaluating the performance of SPIs. Formal measurement may often be hard and/or costly, requiring consideration of complex chains leading to outcomes. In some cases, educated judgement may be a sufficient form of evaluation. For example, in the case of the British Ornithologists' Union, the number and calibre of annual conference attendees, and the strong involvement from the policy side, including a Minister opening and attending a conference, seem to be a sufficient indicator that the SPI is playing a policy-relevant role;

attempting to follow through from conferences and reports to specific policy impacts would be extremely difficult.

In practice, it is difficult to separate evaluation criteria for SPIs from those for instruments: really the objectives are similar, and it is the scale or frame of analysis that differs.

4.1   *Framework for evaluation criteria*

Credibility, Relevance and Legitimacy (CRELE) form a potential framework of evaluation criteria for SPIs (see Cash et al. 2003). Workshop participants were broadly supportive of CRELE as an evaluation framework, but felt that it needs to be operationalised and 'unpacked', in order to be useful.

In general, credibility links to how practices of knowledge production are perceived: are they robust, or do they fail to produce unbiased and accurate knowledge? It should be noted that different actors might perceive credibility differently. Relevance entails the usefulness and usability of the knowledge offered by SPIs. Legitimacy links to inclusivity of the science-policy processes.

There is a sense in which all three characteristics are needed – for example the idea that credibility without legitimacy is unlikely to work. On the other hand, there can be a hierarchy: it could be argued that relevance is paramount – without a clear link in to the policy world, there is little point in evaluating the other criteria, because the SPI will be unlikely to have any practical impact. Then again, a credible and legitimate SPI may evolve to become relevant under certain conditions.

Based on the workshop, we developed an initial matrix for establishing evaluation criteria. On one dimension, we divided the criteria according to overarching credibility, relevance and legitimacy categories. On another dimension, we consider SPIs in relation to their structure, function, process, outputs and outcomes (Table 2). We acknowledge that some of the categories in the table overlap, but consider that these distinctions are nonetheless useful when thinking about evaluation criteria for SPIs. It should be noted that the table only presents categories under which evaluation can be considered – we have not yet established appropriate metrics or indicators for each criterion.

The next step for this thread of research within SPIRAL is the determination of appropriate metrics. In this, we will need to acknowledge that the different criteria might play out differently in different contexts, and some criteria may be more meaningful in some contexts than in others. The criteria have their limitations not only regarding diverging meaning across contexts, but also all the criteria may not be achieved by same SPI. Instead there are likely to be trade-offs between different criteria, as discussed in the next section. Further research in SPIRAL should consider how trade-offs can be overcome, and how appropriate balances can be struck. Identification of criteria and trade-

offs can help creating evaluation procedures for SPIs, and, from a research perspective, may help to explain successes and failures of SPIs.

Table 2: Evaluation criteria for science-policy interfaces

	Relevance	Legitimacy	Credibility
Structure Institutional arrangements that have been set up and developed to achieve the goals of the SPI.	- Structural connections between science (supply) and policy (demand) - Open mindedness to new policy connections - Trust to policy side when they present views on demand - SPI and the knowledge it produced is trusted by policy side - Media relationships - Communication adapted to the scale of operation - Communication is timely in both directions	- Inclusiveness of the SPI structures to new members - Charismatic leaders, able to bridge constituent communities - Incentives for scientists and policy actors to participate in SPIs - Stakeholder involvement and ownership of the process - Incentives for various groups to participate to SPI	- Open institutional framing - Clarity of the roles of members within SPIs - Independency of the SPI from political and other instances - Competence and capability (of decision–making) of SPI members - Acceptance among members to use various kinds of material - Some stability in personel and ideas - Credibility differs for different audiences?
Function Stated objectives of SPI	- Functions address existing gaps and are relevant for society - Used instruments suitable for the purposes of the SPI -Clear and explicit objectives - Methods for review and willingness to change objectives and learn within SPI	- Functions take account variety of perspectives	- Fit for purpose - Functions of SPI meet with the objectives and views of its members - Continuance of SPI within the same objective domain
Processes Interactions leading to the production of outputs and impacts	- Processes open for policy actors - Checking and reviewing policy needs in collaboration with stakeholders - Well timed policy interventions - Ability to anticipate policy interests - Preparing to take advantage from windows of opportunity	- Timing of the interaction, are all parties involved all the time - Sharing knowledge and trust within the SPI - Stakeholder involvement and ownership of the process - 'Early barrier breakdown meetings' - Use of third party 'translator' - Integration of divergent individual world views. - Systems of conflict resolution	- Transparency of the SPI processes - Continuous quality assessment system in place regarding research and knowledge used in the SPI - Continuous evaluation, planned well in advance and built into the framework of the SPI - Inside view, self-assessment - Guidance to use the self-assessment criteria to avoid misinterpretations
Outputs Products (e.g. reports) of SPIs	- Clarity, clear definitions, user-friendliness of the output - Outputs (e.g. reports, but also presentations) for stakeholders in a language and style understandable for different target audiences	- Extended stakeholder reviews	- Reports peer reviewed - Outputs explore the issue not from narrow, but from variety of perspectives - Uncertainties and divergent views are communicated. - SPI is efficient in producing outputs /supporting instruments
Outcomes	- Impact of the SPI in relation to its goals		

4.2 Potential tradeoffs between criteria

There are likely to be trade-offs between the evaluation criteria developed in Table 2. This is a matter for research, in particular through examining how the criteria relate to success or failures of SPIs under certain circumstances. The discussion here is based on thought experiments, and the ideas still have to be explored against empirical evidence. This is one of the goals of the second workshop. Below, we outline some possible tradeoffs among the evaluation criteria presented in table 2.

1. **Systems of checks, audits, review processes and balances enhance credibility, but may reduce timeliness and therefore relevance**. Also building legitimate SPIs with broad incorporation of stakeholders takes time. Thus, legitimacy may suffer, if SPIs aim for relevant policy interventions through rapid responses. Furthermore, an SPI's ability to produce outputs efficiently and in time is seen to enhance credibility and relevance. However, the peer- and extended review processes and exploration of various data and material increase credibility and legitimacy, but can bring challenges to timeliness and efficiency of producing outputs (relevance). Similarly, in some cases a SPI may be pressured by fast policy and media needs, and thus they have to publish premature results. If errors are made, this may decrease credibility of the SPI in the long term.

2. **Increasing relevance through stronger links to policy could decrease some of the legitimacy and credibility of the SPI**. Meeting the needs of policy 'demand' would increase the relevance of the interface. However, legitimacy problems could arise in relation to actors not included in the science-policy links, and who feel that they have something to say about what kind of science and policy should be involved. Credibility could become a problem if various audiences feel that research efforts are too much determined by the policy links, and especially if the produced knowledge seems to be serving some political end. However, good transparency could decrease the problems of credibility rising from close policy-science links.

3. **Enabling new members and interests to get involved in the SPIs can be seen as an important issue for building more legitimacy**. On the other hand, solid expertise and clear roles of different kinds of people within an SPI have positive implications for credibility, and there may be costs (in resources and in effectiveness) to increasing the size of the SPI. **Loss of continuity if roles are regularly reallocated could be a challenge, and/or the competence and capability of the members overall could be diluted**. Thus there could be a tradeoff between legitimacy (inclusivity) and credibility/relevance (continuity and competence) here. On the other hand, there could be advantages to fresh blood and to the insurance value of having spare capacity.

4. It is increasingly recognized that outputs should explore the issues from variety of perspectives and also communicate uncertainties of scientific results to audiences. This can be seen to increase credibility. However, the importance of clear and simple messages is also highlighted. User-friendliness and clarity of messages increase relevance, as different policy actors can have easier access to the results. Thus, **there might be a**

tradeoff between clarity of messages (relevance) and communication of uncertainties and exploring variety of perspectives (credibility).

5. Policy briefs often include policy suggestions. These issues are seen to increase relevance of the SPIs. However, difficulties may arise as these policy recommendations are coming from a certain direction, world view or paradigm. **It is difficult to keep policy recommendations clear of positioned normative content and this exposes SPIs to criticism regarding legitimacy and credibility.**

6. **There might be tradeoff between continuity/stability and learning/change in relation to SPI functions**. Learning and acknowledging policy needs and gaps with SPI functions increases relevance. Policy needs can change rapidly, and thus there is a challenge of continuous update of SPIs in relation to their activities. On the other hand, continuity and stability with the same objectives increases credibility of SPIs in the long run. SPIs become well known and trusted through time. Thus, the tradeoff might exist between continuous update of objectives and modus operandi to meet the policy needs (relevance) and continuity and trust of the SPI (credibility).

7. The importance of strong leaders was taken up in the workshop, and **leadership was seen as important for effective work of SPIs**, as strong leaders can push the issues forward, and hence increase the relevance of the SPI. **However, if an SPI becomes too closely identified by its leaders, this may provide a target for attack for any "enemies" representing other paradigms** or interests, for example claiming that the SPI is not credible or legitimate being dominated by only a few actors, or even via ad hominem attacks.

8. **It was noted in the workshop that third party translators and building common understanding among participants increases legitimacy of the SPI. However, compromise may mask the divergent views of participants on the issue**. Exploring and taking account all the possible view points and problem definitions could take considerable amounts of efforts and time. Thus, there may be tradeoff between emphasizing singularity (efficiency and relevance) and exploration of all perspectives (legitimacy). Similar issues arise with conflict resolution mechanisms and building joint understanding or consensus.

9. It was noted that evaluation should not occur too early and time should be given for SPI to become 'settled'. However, it was also noted that early evaluations could improve the performance of SPI by directing it to better match the policy contexts. Thus, **there might be tradeoff regarding the point of evaluation**. This trade-off could be partly resolved by making early evaluations focus more on processes than outcomes of SPI, and by carrying them out internally.

These are just some examples of possible tradeoffs: as the term suggests, there is a balance to be struck. The "optimal" point in any given situation is likely to be strongly context-dependent, and this will need to be taken into account in developing the framework for evaluation.

5. Conclusions

This first workshop was primarily exploratory in nature, seeking to draw out some complex research issues relating to the ways in which SPIs can influence behaviour in more or less successful ways, and to ways in which these roles may be assessed. The results give rise to some interim conclusions, and to refined categories for further research through the remainder of the project.

Stakeholder involvement, clearly vital to the success of SPIs, is not a straightforward issue. If some groups are disengaged, others may consider the SPI as biased. But increasing the number of participants in SPIs may reduce the efficient operation of the SPI. Providing motivations for stakeholders to participate may be challenging for diverse groups. Successful resolution of these challenges was considered as a key success factor for SPIs. In this context, key individuals - translators, champions and strong leaders - may all have important roles to play. Squaring up to these issues early in the development of a SPI, for example through "early barrier breakdown meetings" to clarify different roles and building common understanding about the issues, can help to avoid problems and feed in to developing communication strategies and placing the SPI in relevant policy contexts.

Independence of SPIs from particular political perspectives is often considered as important. However, despite the ideal of neutral and disinterested scientist, in practice SPIs may have to present information in policy-relevant framings and even engage in lobbying. Skilful balancing between independence, stakeholder involvement, and policy connections to achieve relevance (with policy connections), legitimacy (with stakeholder engagement) and credibility (with independence) provide another set of key challenges. Well-timed and smooth connections between science and policy, and co-evolution and dialogue between supply and demand, lay the foundations for success. It was noted in the workshop that luck plays a role in effective SPIs, and building capacities to take advantage of windows of opportunity can be important.

It is important that SPIs be well grounded in the context of (political) decision-making processes in order to increase relevance. But they can also have a role in horizon scanning and setting research agendas. Maintaining a research programme independent of immediate policy needs is important, because it can explore emerging issues, produce knowledge less constrained by short-term policy framings, and trigger changes in relevant questions for policy actors.

Regarding evaluation, it was noted that formal evaluation is quite rare, but can be very useful. Performance should not be assessed too early, as the outcomes from SPI take time to emerge, but process-oriented evaluation can be useful at all stages. Evaluation requires a clear framework of objectives, and indeed one of the benefits of evaluation can be the reflection entailed by the requirement to specify what the goals are.

Further work for SPIRAL includes elaboration of the draft performance criteria and developing metrics for their implementation. It is likely that the same criteria and/or metrics will not be identically suitable in all cases, but must rather be tailored in context-dependent ways. Research will encompass exploration of the relevance of the criteria in different contexts, and in particular how the features of SPIs link to success or failure, using empirical cases, via interviews and the second workshop, which will focus on verification of the developed criteria. The tradeoffs presented in section 4.2 will also be explored through the empirical assessment.

References

Cash, D.W., W.C. Clark, F. Alcock, N.M. Dickson, N. Eckley, D.H. Guston, J. Jager & R.B. Mitchell. 2003. Knowledge systems for sustainable development, *Proc. Natl. Acad. Sci.* 100 (14): 8086–8091.

Funtowicz, S.O. and J.R. Ravetz. 1993. Science for the post-normal age. Futures 25(7):739-755.

Guston, D.H., 2001. Boundary organizations in environmental policy and science: an introduction. *Sci. Technol. Hum. Values* 26 (4): 399 – 408.

House of Commons Environmental Audit Committee (2007) The UN Millennium Ecosystem Assessment. First Report of Session 2006–07 http://www.publications.parliament.uk/pa/cm200607/cmselect/cmenvaud/77/77.pdf

Pielke, Roger A. 2007. The Honest Broker: Making sense of science in policy and politics. New York: Cambridge University Press.

Van Kerkhoff, L & Lebel L 2006. Linking knowledge and action for sustainable development. *Annual Review of Environment and Resources*. 31: 445-477.

Yearley, Steven. 2002. The Social Construction of Environmental Problems: A Theoretical Review and Some Not-Very-Herculean Labors. In Sociological Theory and the Environment: Classical Foundations, Contemporary Insights. (eds. Dunlap R.E., F.H. Buttel, P. Dickens & A. Gijswijt). Pp. 274 – 285. Rowman & Littlefield Publishers.

Annex 1: Plenary, Evaluation system for IPBES

The SPIRAL workshop included a plenary brainstorming session on a possible design of an in-built evaluation system for IPBES (Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services). The plenary was organized around describing the aims of IPBES (as currently discussed in international negotiations), and considering how these aims or functions could be evaluated.

Four objectives of IPBES were discussed at the workshop. These were:

1) to identify knowledge gaps and identify further research needs regarding biodiversity and ecosystem services,

2) to conduct regular and timely assessments of biodiversity and ecosystem services at global and regional scales

3) to support policy development by helping policy to uptake knowledge,

4) to identify points of improvement regarding IPBES' capacities as a SPI.

Questions to consider regarding evaluation of IPBES included:

- Looking at the questions asked and answered by IPBES, in particular regarding their relevance for society and policy.

- Ensuring traceability and transparency of concepts and results published by IPBES.

- Scanning whether the IPBES' view on knowledge gaps meets results of other assessments.

- Setting up an ongoing internal evaluation for IPBES processes and outcomes.

- Assessing whether IPBES work is seen as relevant for (and by) governments.

- Assessing the independence of IPBES

- Assessing whether IPBES has mechanisms to engage stakeholders in knowledge production processes and takes account of forms of knowledge from outside scientific communities.

- Have the IPBES assessments contributed to changes in policies?

- Have IPBES-initiated processes led to improved capacities of some actors to take account of biodiversity and ecosystem services?

- Quality of the timely and regular assessments should be ensured by peer-reviewing the science backing up the assessment, and the

process for its identification and review, as well as peer-review of the final reports.

- IPBES should use existing documents and policy processes to formulate the questions it is going to address, and surveys on stakeholders to see how the formulated questions correspond with stakeholders' concerns: for example, what is actually meant by "timely and regular".

- Examining what the 'clients' think about the knowledge provided by IPBES.

- Examining outcomes: do policy responses follow? Does IPBES demonstrate what governments can do in addressing biodiversity and ecosystem service issues?

- Do governments participate in IPBES processes? Assessing how governments evaluate their own needs could help understanding the policy demand and knowledge gaps governments have identified.

- How can the increasing number of actors who want to be engaged with IPBES be empowered to take part?

- How do language issues, as well as style of reports, creative use of communication techniques (social media) and so on influence possibilities of knowledge uptake?

- Are the quality assurance procedures, including assessment procedures for non-peer-reviewed literature, working effectively?

- Are the procedures for responding to media and other requests for information in place and effective?

- How can the responsiveness and flexibility of IPBES in relation to other organisations and their objectives be enhanced?

- What are IPBES' direct impacts on the environment, including its own carbon footprint, and how can these impacts be managed?