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SPIRAL
Science-Policy Interfaces for Biodiversity: Research, Action, Learning
FP7 Collaborative Project
Environment (including Climate Change)

A SPI typology and case studies on factors contributing to successful science-policy interfaces:

A synthesis of SPIRAL WP1 work

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Executive summary

The SPIRAL project aims to understand and address some of the underlying problems of biodiversity science-policy interfaces. This report synthesizes research carried out in work package 1 of SPIRAL, in which our main tasks were to map the SPI landscape, to develop a SPI typology and conduct case studies on specific SPIs to identify factors contributing to or hindering successful SPIs.

SPI mapping and typology: 150 SPIs were mapped across the EU. The mapped SPIs show a considerable amount of diversity, building up a complex SPI landscape. This is in part simply due to the broad definition of the SPI term but also due to the spread of scientific knowledge production and use far beyond the academic domain.

A comprehensive SPI typology with five SPI types was developed to structure the complex SPI landscape: outreaching or inclusive research, science in inclusive governance, interest group, expert group and state agency or institute. Our typology is useful in a number of ways, by: (1) highlighting that different SPI types are required to contribute to the overall biodiversity SPI, (2) enabling a overall picture of the complex and diverse SPI landscape, (3) highlighting fundamental differences of SPIs, for example that they represent attempts to open the science-policy boundary from different sides (either research or policy-making), (4) highlighting guiding concepts for different SPIs such as transdisciplinarity and deliberative/participative approaches to policy-making.

Factors hindering successful SPIs

Unclear or poorly thought-through SPIs: A number of factors contributing to unsuccessful SPIs are related to unclear goals and functions of SPIs. A common problem with SPIs is that insufficient resources are placed at the beginning in terms of understanding the SPI context, resulting in poorly adapted SPIs (often using existing structures) and mismatches between science and policy. Another difficulty is in developing scientific objectives that match the needs of policy.

Power influences: SPIs are messy processes, most of which will encounter power influences at some point or another. In addition, many SPIs are constrained by conflicts between different stakeholders, not only in science and policy. This may be due to poor involvement of sectors other than science.

Lack of resources: Many of the above factors are due to insufficient money and time being placed on SPI activities. In both science and policy, SPIs are perceived as end-of-pipe activities that are needed, but unsupported. In addition, scientific careers are often hampered by SPI activities, considered as a 'bonus' activity, or one carried out by non-scientists. SPI activities can also have knock-on effects on scientific results.

Factors contributing to successful SPIs

Frame the SPI: A SPI is more likely to be successful if it is clearly defined, and embedded within the science-policy landscape. This requires a little "homework" while setting up the SPI. A first step is to map the science and policy landscape within your particular context. Within this screening phase, it may also be worthwhile to ascertain whether a SPI is needed, and if so, what kind of SPI. Once the screening phase has been carried out, it is useful early on in the development of the SPI to contact and start discussions with scientists, policy makers, and other stakeholders to raise with them the main issues of concern and discuss how science can support policy directly.

Ensure continued dialogue and exchange: It is worthwhile establishing a strategy for dialogue and exchange between science and policy throughout the SPI. Dialogue and exchange can consist of a number of options. Ideally, it is useful to discuss with individuals what their preferred mode of dialogue and exchange is. Whatever the format chosen, ensuring that stakeholders in the process are heard and get feedback will enhance the potential success of SPIs.

Broaden involvement: There are clear opportunities in opening up science not only to policy, but to the public. There are a number of different approaches to promote science-public interfaces depending on resources and the context in which science is undertaken including involving NGOs, bringing science more in the public eye, publishing in high-impact journals, improving synergies between projects.

A balancing act: A successful SPI requires balancing the needs, resources and constraints of those involved in the SPI. This will entail talking to those involved in the SPI, creating good working relationships and managing trade-offs. Both science and policy need to be clear about the benefits and risks entailed in SPI activities and create environments and career structures that encourage, rather than hamper, SPIs.

1. Introduction

The failure to make progress in sustainably managing biodiversity has been diagnosed as "a collective failure of the science-policy process" (Larigauderie and Mooney 2010, p. 1). Knight et al. also diagnosed a divide between science and policy-making in the context of conservation biology and termed it the "knowing-doing gap" (Knight, Cowling et al. 2008).

The SPIRAL project aims to understand the problems arising at the science-policy interface (SPI) enhance the connectivity between biodiversity research and policy to improve the sustainable use of biodiversity. This report summarizes research (carried out in work package 1 of SPIRAL) on:

- Mapping the SPIs landscape and developing a SPI typology
- Empirical case studies of two contrasting types of SPIs, namely EU research projects and the development of National Biodiversity Strategies.

2. Mapping the SPI landscape: a comprehensive SPI typology

Following van den Hove (2007, p. 815), science-policy interfaces are "*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*". This definition potentially includes a large array of social processes, actors and organizations. To better understand this range of SPIs, we undertook a mapping exercise to identify national, European and international SPIs. 150 different SPIs were mapped and roughly described by their attributes such as whether they are mandated by policy makers and their duration (SPIRAL 2011). While this mapping was not exhaustive, it provides a useful overview for Europe of the diversity and complexity of currently existing SPIs. While research projects and institutions may interact with policy making, there are institutions explicitly designed for interfacing science and policy making, such as the recently founded Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Other institutions, for example national agencies or the European Environmental Agency have a long standing and mandated role in this field as well. NGOs also increasingly produce and use scientific knowledge (e.g. conducting monitoring, developing indicators and standards) in order to carry out practical conservation actions and strengthen their arguments for nature conservation in the public debate. One explanation for the great diversity of institutionalized SPIs, besides the breadth of the definition, is that biodiversity knowledge is produced in very different ways and organizations and is used in very different institutional contexts. This is in line with the observation of Gibbons et al. (1994) that scientific knowledge has become socially distributed beyond the academic domain. This may require SPIs that are adapted to specific situations of knowledge production or knowledge use.

Figure 1 shows some of the links between scientific and policy-related organizations at the EU and international levels highlighting the complexity of the SPI landscape.

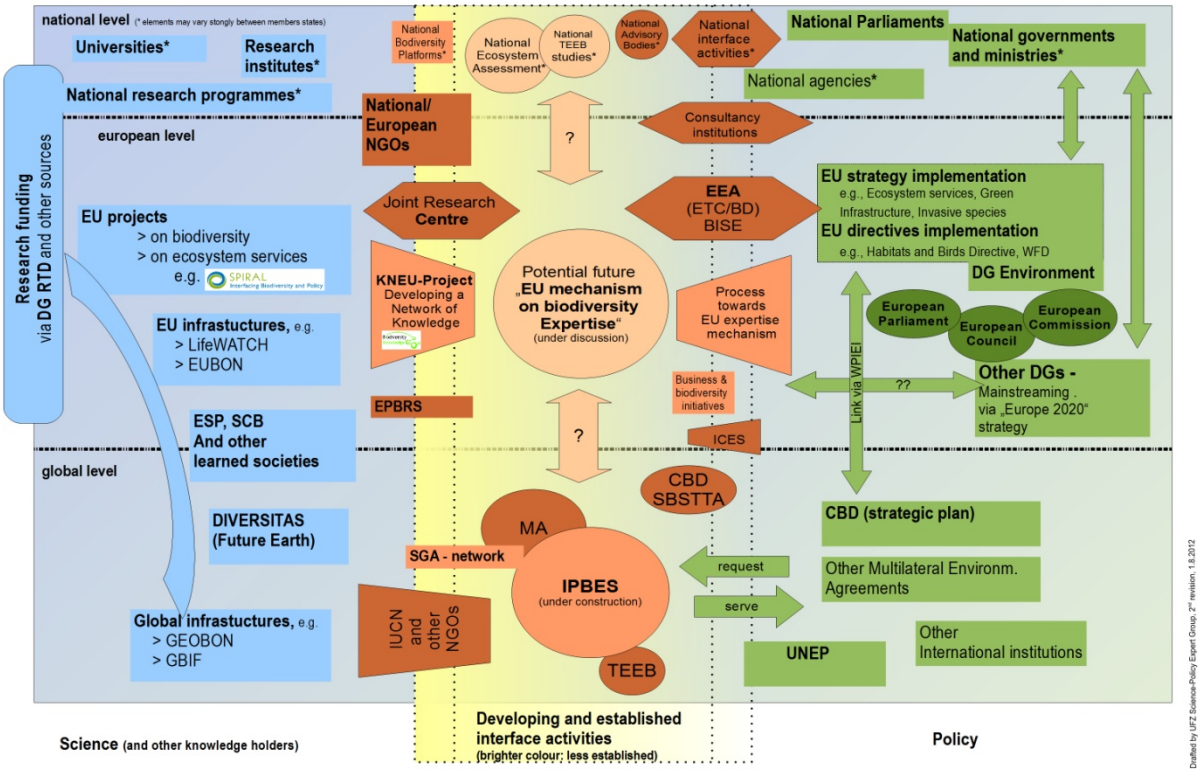

Figure 1: Visual map of the European and international science-policy landscape with some major players.

Based on a first analysis of the SPIs included in the mapping, a SPI typology was developed to structure the diverse SPI landscape (SPIRAL 2011). Table 1 presents the SPI typology including characteristics of each type and where some of the SPIRAL case studies and test cases are situated in the typology.

The increased use of the term 'science-policy interface' in recent research (Van den Hove 2007; Spierenburg 2012) as well as in recent political discourse (e.g. on IPBES (UNEP 2009; UNEP 2010)), indicate that the science-society relationship is a highly topical issue. The SPI term emphasizes *symmetry* of the scientific and policy actors involved in SPIs and their processes with respect to knowledge: they exchange knowledge and engage in joint knowledge construction. Therefore, the SPI term is in contrast with technocratic expert advice, one-way knowledge transfer or asymmetric principal-agent relations between funders and researchers. However, this key aspect can also be found in older and more specific concepts such as transdisciplinarity (Hadorn, Biber-Klemm et al. 2008) and participative or deliberative policy-making (Chambers 2003; Webler and Tuler 2006). The typology can be used to link the topical but generic SPI term to these concepts, making them specific aspects of the general SPI. This enriches the topical but generic SPI term and can avoid reinventing the wheel, instead building on existing concepts (see Table 1).

Table 1 SPI Typology and overview of some SPIRAL case studies and test cases.

SPI Type	Type characteristics	SPIRAL Case Study (examples)	SPIRAL Test Case/further example
Interest Group	Organizations representing interests of civil society (NGOs), e.g. environmental enthusiasts or scientists, and conducting or using research to promote their goals. Examples are environmental NGOs and learned societies. Usually longer duration.		Society for Conservation Biology
Outreaching or inclusive	SPI linking the research process to policy-making: Classical outreach to link new	SPIs of EU research projects	Future revisions of

research	emerging research to policy opportunities or varying degrees of stakeholder inclusion into the research process, possibly influencing the research frame. Short duration (related to transdisciplinarity).		EU research policy.
Science in inclusive governance	SPI linking the policy development process to science with varying degrees of participation. Scientific expertise is directly fed into policy development often alongside non-scientific expertise. Usually short duration linked to the development of a specific policy (related to participative and deliberative concepts of democracy).	Development of national biodiversity strategies	Broad scale approach for an "EU mech. on Biodiversity Expertise in Europe" (see Fig. 1)
Expert group	With participants recruited from diverse organizations including science. Mandated or un-mandated. Mainly assessing existing knowledge. Short duration (one-off assessment) or long-term process (repeated assessments)	National Ecosystem Assessment (UK)	IPBES, TEEB
State Agency or Institute	Public organization with varying degrees of administrative tasks, advising government and conducting and/or funding specific research. Long term duration	No explicit case study in SPIRAL but important components of the studies of NBS and EU projects	INBO, EEA

Most of these different types of SPIs on biodiversity issues still include a variety of approaches. For example, expert groups might be explicitly mandated by a government or other official bodies, or might be linked more loosely to such bodies. However, a great deal of the diversity of SPIs is captured by the structure of the SPI typology. None of the different SPI types represents a 'better' approach: all contribute to interface science and policy in different ways.

3. Case studies on factors contributing to or hindering successful SPIs

We complemented our mapping of SPIs with empirical in-depth research on specific case studies. The analysis of the case studies in WP1 presented below aimed at identifying factors contributing to or hindering successful SPIs in two SPI categories (see Table 1):

- For the "outreaching or inclusive research" SPI category we used the example of EU research projects. The European Union has funded over 80 projects under FP6 and FP7 that investigate biodiversity and ecosystem services[1]. In FP7 from 2007 to 2011, about 40 Million Euros a year were spent on such projects, although with a decreasing tendency (FRB 2011). Against this background of substantial investment in research addressing biodiversity and ecosystem services it is a major goal of the European Commission to ensure that the knowledge produced is relevant, accessible to, and used in, policy making. Therefore, understanding which factors contribute to or hinder a link between EU research and policy-making is important.

- For the "science in inclusive governance" SPI category we used the example of the development of National Biodiversity Strategies. Signatory states of the Convention on Biological Diversity (CBD) are required to develop National Biodiversity Strategies (NBSs) to implement the CBD on a national level. Developing policy to conserve and sustainably use biodiversity requires a considerable amount of scientific knowledge, knowledge about the policy-making system and the implementation context. Therefore, NBS development can profit from a well-designed SPI linking these different types of expertise.

[1] Relevant projects in FP5, FP6 and FP7 are listed in the biota cluster: www.edinburgh.ceh.ac.uk/

Further case studies were conducted in WP2 looking at different categories of SPIs, for example research on the development of the UK National Ecosystem Assessment (SPI type "expert group") – see SPIRAL briefs or the WP2 report on the SPIRAL website[2].

The aim of the case studies was to identify factors contributing to or hindering successes of SPIs. Since "success" implies a valuation this study is essentially an evaluation as defined in the methodological literature (Bortz and Döring 2006; Flick 2006). A qualitative evaluation was carried out, taking the perspective and experience of participants as point of departure. In a qualitative evaluation it is desirable to critically reflect on the views of participants to account for the fact that they only represent a limited sample of all relevant stakeholders. Therefore, the perspective of study participants was supplemented by a critical reflection by the study authors.

The main body of data was collected by means of semi-structured interviews, which were transcribed verbatim and afterwards coded in MAXQDA (VERBI 2010) following a grounded approach (Corbin and Strauss 2008) albeit with a reflexive understanding that categories and their relationships are conditioned in a dialectical manner by the empirical material and the researcher (Charmaz 2006) and are not "discovered" facts.

Science-policy interaction was analyzed in 6 EU member states' NBS development processes (Germany, Switzerland, Romania, Belgium, Finland and Scotland) and five EU research projects (ALARM, EuMon, AQUAMONEY, HERMES and ALTER-Net). We outline the results below in terms of factors hindering or facilitating successful SPIs.

3.1. Recommendations on SPIs in EU research projects

There is no single solution to improving the science-policy interface and many avenues need to be addressed. A key challenge on the policy side is to stimulate the development of science-policy interaction processes and institutions that respond to policy needs in an effective manner.
The following recommendations[3] may contribute to address this challenge:

- Reinforce the strategic dialogue. A long term consultative strategic dialogue between science and policy can contribute to ensuring that policy has access to, and uses, best available knowledge. It can also bring about a better focus of research questions to meet policy needs. This entails reinforcing the capacity to formulate policy needs and questions as well as forward looking approaches and horizon scanning as part of the process.
- Recognise that good interfaces are resource intensive. Too often research contribution to policy initiatives (e.g. involvement in assessments, participation in advisory committees, drafting of policy briefs, information papers to support international negotiations, etc.) is under-resourced. These activities are time consuming and need to be appropriately funded, both by research funders and by policy institutions.
- Increase SPI skills. Find creative ways to increase the skills of staff in policy and research communities operating at the science-policy interface. This could include specific training, dedicated summer schools opened to both scientists and policy-makers, and secondments of policy-makers or scientists.
- Strengthen the role and effectiveness of chief scientists and their units. By working more closely together and in collaboration with scientific networks, chief scientist units in different Directorates General of the EC could strongly support the integration of knowledge across DGs, hence also supporting environmental integration and policy coherence.
- Consider establishing science-policy platforms. Collecting information needs from policy, facilitating the strategic dialogue, and synthesizing research via science-policy platforms could be an effective and efficient way to fill some of the key gaps at the science-policy interfaces.

[2] www.spiral-project.eu

[3] The following recommendations were developed at a workshop on "Better interfacing EU research projects and EU policy-making", organised by SPIRAL jointly with the European Commission Directorate General for Research and Innovation (DG RTD), with the participation of the European Environmental Agency (EEA).

- Remember that there is no one-size-fits-all SPI science-policy interface. A combination of processes will be needed spanning policy levels, policy areas and governance systems. Be creative, learn by doing, and leave space for evolution and adaptation of processes.
- Identify areas of research needing long-term support: As part of the strategic dialogue, policy-makers, the scientific community and civil society should jointly identify research areas and types of research, which need to be maintained in a long-term perspective. This should be reflected in particular in successive calls in Horizon 2020 in order to maintain the research flow, the long-term data sets needed for environmental research, the policy links and the development of the European Research Area.

Environmental research projects recognise their responsibility to contribute to addressing societal problems and the importance of developing strong science-policy interfaces. The following recommendations could help to overcome the challenges that research projects are currently facing:

- Establish a dialogue through the lifetime of the project: Remember that effective SPIs and communication should not be end-of-pipe. In many cases, establishing a dialogue with policy makers and other stakeholders from the onset, and keeping them involved in the formulation or refinement of research questions, can significantly contribute to effective science-policy interactions. Steps to support this include:
- Ensure early links with relevant actors at EU level: Projects should ask the project officer at the EC to support an early meeting with appropriate policy officers from relevant DGs at the start of the project, preferably before the kick-off meeting of the project to allow work package leaders responsible for communication and the project coordinator to meet key individuals face-to-face and understand their information requirements.
- Connect with past and present projects working on related topics: It may be helpful and efficient to cluster projects for science-policy interactions and broader dissemination. Such SPI alliances of projects can enhance joint learning, make it easier for policy makers to engage (fewer meetings) as well as provide a broader picture and a more refined input to policy. This can be top-down driven if supported by funding agencies (see recommendations to funders) or more informal and bottom-up when initiated by projects.
- Produce targeted and attractive briefs: Such briefs are one major policy-relevant product and make them widely and systematically available, e.g. via information systems such as BISE. Briefs need to be targeted and readable, they should link the issues to relevant policies or at least provide a “policy hook”, an explanation as to why this matters, and when appropriate what policy could do about it. Briefs should include a short summary, suggest further reading, and provide a point of contact. Explore innovative ways of producing and updating briefs, e.g. “wiki-briefs”.
- Make use of existing science-policy dissemination channels: Projects should more systematically provide articles to Science for Environment Policy, the news and information service set up by DG ENV and to similar SPI channels. There are more and more peer-reviewed environmental science journals accepting commentaries or papers with an explicit science-policy focus, in which projects could aim to publish.
- Use open policy meetings for dissemination: A number of broader open policy meetings exist (e.g., high level conferences, Bridging the Gap series, Green Week), where projects can improve their impact and recognition. Also joint presentations of related research results from several projects showcasing on-going research can be a good way to reach policy makers.
- Disseminate more broadly: Better dissemination to the wider public is key. Possible actions include: striving for more dissemination through the media, including European ones (e.g. Euronews); production of popular or children's books; using new media such as video via Youtube and social media (e.g. Twitter); using tools such as Eye on Earth. Projects should explore opportunities to use specific partners for dissemination, including NGOs, professional communicators, Science Museums, Aquaria, Planetaria.
- Provide training in science-policy activities: Educating and training researchers in communicating beyond the scientific community is still a major task. This should play a broader role in university education, but could also be part of larger projects or clusters, e.g. via summer schools that address policy, SPI and communication issues.
- Make your data available to other researchers, policy makers, and the public: Options to do this include BISE or Eye on Earth (discussed below). Projects should ensure they set aside enough resources to prepare and upload data to repositories in a format that is appropriate for future uses.

3.2. Reflections on SPIs in the development of National Biodiversity Strategies (NBSs)

Science can be pro-active in driving NBS processes

Bringing biodiversity onto the policy agenda is a key starting point in science-policy interactions. Although the decision to develop or revise an NBS is often driven by political actors or by interest groups, science and its interactions with these actors can play a significant role in starting the NBS process. In Switzerland, for example, the Swiss Biodiversity Forum representing the Swiss biodiversity science community wrote a range of publications summarizing the status of biodiversity in Switzerland and recommending that a Swiss NBS be developed. The forum communicated these publications during meetings with parliamentarians, and their message was also taken up by NGOs. In other countries such a pro-active approach from the science community was less obvious.

Be clear about the NBS process

Whether driven by science or policy, it is essential once the NBS process is up and running to clarify the role and the processes leading to the NBS. Although such processes may be obvious to those in or familiar with policy contexts, they are opaque to most scientists. Unclear arrangements can lead to working practices that do not adequately match the purpose of the NBS. It is therefore very important to be clear about what the NBS is and is not, and also to be very clear about the process leading to NBSs. Although using existing structures and policies can be cost effective and adequate, it is worth considering whether new structures or activities are needed for the purpose of the NBS development and implementation. There is a risk, for example, that existing structures, if poorly adapted to the tasks at hand, end up being allocated isolated tasks leading to confusing and inefficient work and groups following their own line of interest. Pulling all these disparate groups back together in the formulation of NBSs will be difficult to say the least. In the same way, restricting the implementation of NBSs to existing/ongoing rather than new policy activities can also minimise the potential of NBSs.

Encourage participation

Our case studies highlighted that a favoured strategy in the development of NBSs, often involving contentious issues, was to start the process by restrictively including parties holding similar values and knowledge about the environment (for example environmental scientists and NGOs) in order to specify and refine issues. Following on from this more restrictive approach, participation was then broadened to include groups beyond the environmental community. While this helped in the case of Germany to enhance productive problem-oriented work and strengthen support of a policy by the biodiversity community it also increased opposition of those excluded or only included in later phases. During the design and formulation of (draft) strategy documents, establishing a participatory process is therefore an important consideration. It is important, however, that participatory processes are not used merely to legitimise policy, but are genuine efforts to integrate a variety of constructive views, and knowledge in the process. This will require willingness from governments to support such processes, as well as willingness from other potential stakeholders. While this is not new, it is not trivial to achieve in practice since willingness of governments and participants to engage in a serious participation process depend on a range of factors, such as political pressure. An important aspect of increased participation is the need for feedback. Our case studies showed that processes were evaluated more positively when stakeholders felt their input had been taken into consideration. This is not to say that all input should be included in draft documents, but rather to provide feedback to stakeholders explaining whether input was used in the NBS or not, and why. A key consideration with participatory processes is cost. Good participation processes require dedicated resources, including moderation/mediation capacities.

Increase mutual understanding of science and policy

To work together productively particularly under time-bound limiting circumstances like the design of an NBS, requires mutual understanding of constraints scientists and policy-makers have to deal with. This requires a better understanding of the policy-making processes at play in the development of the NBS, which allows custom-fitting knowledge to the specific context set by the ministries and agencies leading the process, to increase the likelihood of uptake. Another important issue is the need to

understand where biodiversity goals may be conflicting with goals of other sectors. Indeed, an NBS process will inevitably highlight different agendas, which need to be considered by policy. Scientific justification is only one facet of a complex social issue, and may lead to scientists becoming "ambassadors" of one side of the political debate. Formulating policies using consensus processes will therefore be more likely to make policies more palatable to wider interests. This is important in the case of NBSs, where implementation through national biodiversity planning will require input from a cross-section of organisations and individuals. Mutual understanding of science and policy can be helped through the involvement of people and institutions acting as facilitators ("knowledge brokers" or linkers). Informal face-to-face interactions between scientists, administrators and NGOs can also be immensely helpful.

Handling different representations of the environment

Although most people are generally in favour of environmentally-friendly policies different representations or framings of the environment can make collaboration difficult. Two strategies were observed in our case studies to deal with different representations. These have close links with the participation section above. The first strategy was to establish or strengthen a community around a certain frame/representation, e.g. biodiversity. In Germany for example, the process was restricted to a group with shared representations and values. This created a strong community feeling within the group. The second strategy (for example in Scotland) was to combine different and often conflicting representations of the environment. These included biodiversity versus nature, holistic versus more focused concepts (ecosystem management versus species and habitats), concepts with a utilitarian emphasis (ecosystem services) versus concepts including a broader value perspective (biodiversity). To bring together people with different representations of the environment they needed to be negotiated and brought together in a careful way for example not omitting species and habitat approaches for an ecosystem approach but linking them. Whilst no strategy is "better", the issue of different representations of the environment does need to be considered, and appropriate strategies identified to address this issue.

4. Factors facilitating successful SPIs

Framing the SPI

A SPI is more likely to be successful if it is clearly defined, and embedded within the science-policy landscape. This requires a little "homework" while setting up the SPI. A first step is to map the science and policy landscape within your particular context. Who will be your policy and science contacts? What policy area(s) are you trying to interface with? What existing research is already out there? It may be useful at this stage (and later in the process) to involve scientists and policy advisers who understand the wider (science and policy) context in the process. Within this screening phase, it may also be worthwhile to ascertain whether a SPI is needed, and if so, what kind of SPI. For example, technical questions/general overview studies on the state of knowledge within a predefined policy frame can be tackled by consultancies/agencies/expert commissions. Developing new knowledge or integrating current and new knowledge may, however, require a SPI within a large consortium with partners across many countries.

Once the screening phase has been carried out, it is useful early on in the development of the SPI to contact and start discussions with scientists, policy makers, and other stakeholders to raise with them the main issues of concern and discuss how science can support policy directly. This discussion may help considerably in understanding constraints and goals of policy and science actors, and reaching a joint understanding of the objectives and functions early in the SPI. This may, in turn, contribute to the development of guidelines for the SPI and lead to clear, targeted outputs or products answering specific policy needs. These strong initial links may also enhance flexibility to react to policy needs and opportunities to take part into discussions, leading to more recognition and credibility of the scientific work by policy and other stakeholders.

Ensuring dialogue and exchange

All too often, SPI activities are "end of pipe" and may not as effective as they could be. If time has been spent setting up good working links between science and policy (see above), efforts should be continued throughout a SPI to make it as successful as possible. It is therefore worthwhile

establishing a strategy for dialogue and exchange between science and policy throughout the SPI. As an initial step, it is essential to highlight the benefits for participants of engaging in the SPI, whatever the chosen format it may take. In addition, involving interested, capable policy makers who are willing to engage with scientists, and, similarly, interested, capable scientists who are willing to engage with policy makers may help considerably.

Dialogue and exchange can consist of a number of options. Ideally, it is useful to discuss with individuals what their preferred mode of dialogue and exchange is. For some, regular, and/or ad-hoc meetings may be preferred. It is important to make events attractive for participants (e.g. not too time consuming, easily accessible). Similarly, tailoring the events to specific audiences helps communication. For example, decision-makers are not necessarily interested in how scientists got to their results. For others, the creation of open accessible platforms, fora, or advisory groups may be the preferred option. Again, however, it is important to take the time to develop these in an efficient manner. It is an art to develop working advisory boards where communication between stakeholders is targeted and two-way. It may, therefore, be useful to involve a consulting company to ensure meetings follow basic rules of interaction. Whatever the format chosen, ensuring that stakeholders in the process are heard and get feedback will enhance the potential success of SPIs.

Broaden involvement

An important challenge when it comes to SPIs is the tendency to forget the other “P”, namely the broader public. There are clear opportunities in opening up science not only to policy, but to the public. Indeed, not only does this have the benefits of highlighting important scientific issues to a broader community, but scientists often feel it is their responsibility to do so, particularly if research is publicly funded. Finally, interfaces with the public can raise public awareness, indirectly impacting on policy.

There are a number of different approaches to promote science-public interfaces depending on resources and the context in which science is undertaken. One way is to increase the involvement of Non-Governmental Organisations (NGOs). These often have very wide membership, and can be extremely interested in results relevant to their interests. Again, as with policy, these NGOs can be bought in early in an SPI process, and can help guide the research to make results useful and relevant to their work, and their members. Another important avenue is bringing science more in the public eye. Engaging in events where biodiversity research is showcased is a good place to start. This could be as small-scale as visits to local schools, or as large-scale as national science events. This may not always be very easy, and it is time consuming, so it is useful to look out for opportunities to maximise the impact of research. These include making the most of scientific topics in the public agenda to increase public impact. For example, major biodiversity events or important reports can spark public interest in particular issues, on which other pieces research can latch onto. Good scientific publications in high-impact journals do trigger public attention, supporting input into policy. Although not given to all researchers, having attractive study subjects (e.g. butterflies) in the media are also beneficial in terms of public awareness. Research becoming public can, however, have unwanted or negative impacts for researchers and stakeholders. It is therefore a good idea, as with policy, to clarify what the research will be used for. Another potential way of attracting more public attention is by improving synergies between projects. Activities linked to public relations can cost a lot of money and drain resources of small project with small overall budgets. Indeed, researchers may not be the best communicators of their research to non-academic audiences and may decide to contract out work relating to communication. By bringing together small projects working on similar issues, resources can be better joined, and results better synthesised and communicated.

A balancing act

To summarise much of the above, the secret to successful SPIs is balancing the needs, resources and constraints of those involved in the SPI. Have a clear idea of these needs, resources and constraints early on in a SPI process can be hugely beneficial and avoid disappointment further down the line. This will entail talking to those involved in the SPI, and creating good working relationships. Of course there are trade-offs. Building relationships takes time, which we all lack. It may, however, mean more fundamental trade-offs. For example, asking a scientist for quick preliminary results to feed into a policy process is a good opportunity to improve relationships between science and policy. Policy gets some needed information, and scientists have made the most of a useful opportunity. This

may, however, harm the credibility of the scientists. This kind of trade-off is unhelpful and can hamper future efforts from scientists to get involved in science-policy interfaces. As such, both science and policy need to be clear about the benefits and risks entailed in SPI activities and create environments and career structures that encourage, rather than hamper, SPIs.

5. Factors hindering successful SPIs

Unclear or poorly thought-through SPIs

A number of factors contributing to unsuccessful SPIs are related to unclear goals and functions of SPIs. To properly develop an SPI requires a considerable amount of time understanding the SPI context. A common problem with SPIs is that insufficient resources are placed at the beginning in terms of understanding the SPI context, resulting in poorly adapted SPIs (often using existing structures) and mismatches between science and policy. For example, mismatches in research planning and execution can result in scientific results being communicated to policy at the wrong time, for example missing key policy windows at which research could have had a bigger impact.

Another difficulty is in developing scientific objectives that match the needs of policy. This can be due to the people in the SPI being poorly identified, for example policy questions not being asked to the right scientists. It can also be the case that policy formulates questions that are poorly defined or difficult to answer by scientists. Discussing questions, and framing them with science and policy stakeholders so that they are achievable yet useful, can save time and avoid frustration. This is, however, very difficult to achieve in practice. By the time kick-off meetings are organised, the project may have already started planning its progress without input from policy. There may also be a lack of time or interest by policy makers to attend to stakeholder meetings or advisory groups.

Projects are often developed with SPI activities planned towards the end. Unless funders place sufficient resources on SPI activities, and emphasise the need to develop SPI activities jointly with policy as early as possible in the project, there will be little incentive for science or policy to interact actively at these early stages. There may also be serious differences in the expectations of science and policy. Policy actors may be surprised to see that a research project they were expecting practical solutions from instead focuses on uncertainties and further research needs. Whilst it is essential to communicate uncertainties to policy, tailoring results better to their needs might be more useful.

Power influences
SPIs are messy processes, most of which will encounter power influences at some point or another. It may be that scientific outputs interfere with policy interests, leading to a bias in policy makers only acknowledging results that fit their current or proposed arguments or policies. This can, of course, hinder new arguments coming into the policy arena, requiring other avenues by which to communicate scientific results. Many SPIs are constrained by conflicts between different stakeholders, not only in science and policy. This may be due to poor involvement of sectors other than science. In certain cases, for example the development of National Biodiversity Strategies, one approach to dealing with contentious issues such as combining biodiversity conservation with other activities, was to restrict participation of certain sectors or groups. This can lead to disenfranchised stakeholders and ultimately the poor implementation of decisions. It can also leave scientists in a position they may be ill-prepared for, namely as advocates of a particular side of the political debate.

Lack of resources

Many of the above factors are due to insufficient money and time being placed on SPI activities. In both science and policy, SPIs are perceived as end-of-pipe activities that are needed, but unsupported. In addition, scientific careers are often hampered by SPI activities, considered as a ‘bonus’ activity, or one carried out by non-scientists. SPI activities can also have knock-on effects on scientific results. Projects contributing to policy more broadly than on an ad-hoc basis lead to trade-offs between policy support and scientific work. It can also be difficult for scientists to assess if knowledge effectively feeds into the policy process. Although scientists know that scientific research is a very small part of all other considerations that feed into policy processes, feedback from policy over what (if anything) is included in a process, and why, may be useful and may motivate scientists interacting with policy in the future.

6. Conclusions

To conclude, there are a considerable number of factors influencing the success of SPIs. Some factors positively influence the success of the SPI, for example knowing the context of the policy-making processes or specific policies increases the degree to which knowledge is custom-fit for policy makers, which increase the likelihood of uptake. Others clearly conflict. For example the requirement for informal face-to-face interactions between scientists and policy makers can be at odds with public transparency. Furthermore, many of the factors themselves represent tensions, for example reflecting about the degree and timing of inclusiveness beyond the environmental community or balancing shared knowledge with knowledge differences to enable simultaneous communication and learning.

A completely successful SPI is therefore unrealistic, as there will always be different perspectives of individuals on the SPI. Different people judge the same individual SPI process differently and therefore also the factors contributing to successes. This has also been found in studies on what constitutes a good participation processes: while context is important even in a single context or case the perception on what constitutes a good process might differ (Webler, Tuler et al. 2001; Webler and Tuler 2006). Considering the context, for example by looking at what SPI type one is dealing with, is therefore important but will not resolve fundamental tensions.

The fundamental tensions of biodiversity SPIs might be difficult to uncover in external evaluations (Flick 2006). By simply externally defining success of SPIs, and then operationalizing and measuring it (see Keller 2010), the perceived success of SPIs by participants will not be adequately captured. More in-depth case studies, such as those analysed in this study, are therefore essential to understand the different perspectives of individuals involved in SPIs, and to identify potential ways forward.

The findings of this research may not solve all SPIs challenges. Indeed, there is no single best configuration of factors that can be designed. A critical conclusion therefore is to acknowledge the tensions arising at the SPI and to handle them in a reflexive way. In this respect, the hindering and facilitating factors identified in this research allows individuals and organisations engaged in SPIs (or wanting to become so) to consider and manage the tensions and trade-offs involved in biodiversity SPIs.

7. References

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