Project no. GOCE-CT-2003-505298
ALTER-Net

A Long-Term Biodiversity, Ecosystem and Awareness Research Network

Biodiversity science-policy interfaces: lessons learned

Ben Delbaere & Agnes Bruszik (Editors)
Authors: Wouter Van Reeth, Heikki Toivonen, Frédéric Gosselin, Jacques Baudry, Leon Braat, Karl Baadsvik, John Linnell, Angheluta Vadineanu, Jana Sedláková & Irene Bouwma

WPI5-2005-01

Instrument: Network of Excellence
Thematic Priority: Global Change and Ecosystems (Sub-priority 1.1.6.3, Topic 6.3.III.1.1)
Due date of deliverable: September 2005
Submission date: December 2005
Start date of project: 1st April 2004
Duration: 5 years
Deliverable lead contractor: European Centre for Nature Conservation
Revision: 1.0

www.alter-net.info

Biodiversity policy science interfaces: lessons learned

CONTENTS

Short summary

Science needs to be more policy-relevant. Environmental policy must be based also on scientific knowledge. These requirements are increasingly included when research requirements are formulated or new policy is developed. This is certainly the case for policy and science that deal with biological diversity. Especially within ALTER-Net it is important that the research that is undertaken and the scientific knowledge that results from it is contributing to biodiversity policy.

In order to reach such requirements science-policy interfaces are developed at local, regional, national and international levels. Such interfaces aim at providing a structure and a tool for bringing scientists and policymakers closer together, to enhance their understanding of each others world and to improve both science and policy. But creating such interface is not easy. No single recipe exists to construct an effective mechanism.

The current report collates examples from seven European countries, from international developments and from selected sectors in society. These examples focus on how science-policy interfaces are developed, who takes part, what tools are most effective and what bottlenecks exist. Are they working? And what can we learn from them so that we can apply this in ALTER-Net?

Conclusions are drawn from the common elements in the examples and recommendations are formulated to develop a durable science-policy interface for ALTER-Net.

The current report was produced as part of the ALTER-Net activities. Funding for ALTER-Net is provided by the European Commission's Sixth Framework Programme for Research and Development.

List of contributors

Karl Baadsvik, Norwegian Institute for Nature Research

Jacques Baudry, National Institute for Agricultural Research, France

Irene Bouwma, Alterra, the Netherlands

Leon Braat, Netherlands Environmental Assessment Agency, the Netherlands

Ben Delbaere, European Centre for Nature Conservation

Agnes Bruszik, European Centre for Nature Conservation

Frédéric Gosselin, Institute for Agricultural and Environmental Engineering Research, France

John Linnell, Reidar Andersen and Håkon Hustad, Norwegian Institute for Nature Research

Jana Sedláková, Institute of Landscape Ecology, Slovak Academy of Sciences

Heikki Toivonen, Finnish Environment Institute

Angheluta Vadineanu, Department of Systems Ecology, University of Bucharest, Romania

Wouter Van Reeth, Institute of Nature Conservation, Flanders, Belgium

Introduction

Increasingly international and national policies need to be accountable, legitimate and effective in reaching their goals. Scientific evidence can help identify if policies indeed do so. Policy also requires scientific input when defining goals and objectives.

Scientific research is increasingly required to integrate more into society. Scientists are asked to carry out policy-relevant research and to help answer questions of politicians. Also, scientists are confronted with their responsibility towards society and need to act as part of it, rather than as an independent observer.

Too often both worlds of science and policy are regarded as very different and separated. These observations indicate that there is a need to develop strong mechanisms for interaction between science and policy and for enhancing communication and involvement for mutual benefits. One such mechanism is the development of a science-policy interface.

Science-policy interfaces can be defined 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" (van den Hove & Sharman, 2006).

This 'lessons learned report' was generated via a decentralized research design. Its intention was to allow a maximal range of views and approaches to surface, clustered around a general working definition of what constitutes a science-policy interface. The frameworks presented in Chapter 1 are the result of debates during two workshops in the first half of 2005 and of an additional literature review during work on the case studies that are presented in Chapter 2. The frameworks offer a first synthesis of evidence on how science-policy interfaces can be defined (section 1.1) and how we expect them to operate (section 1.2). In addition some frameworks are presented to support the comparative analysis of the case studies discussed in this report (section 1.3). They can serve as the starting point to let the 'skeleton' models and more thick description of the case studies interact to develop an improved understanding and enhanced practice that can benefit both researchers and policymakers.

Chapter 2 contains examples of biodiversity science-policy interfaces from seven European countries, two international processes (Convention on Biological Diversity and European biodiversity research policy) and from the sector of forestry in the US and Canada. The case studies provide a wide range of examples of mechanisms and procedures that help us understand why science-policy interfaces are needed, how they are designed and implemented, who is involved and what tools are used to make them effective. Importantly the case studies tell us what is working and what is not.

Conclusions based on the observations from the case studies are listed in Chapter 3. These conclusions, in turn, are translated into eight tips for developing a durable science-policy interface in ALTER-Net, listed in Chapter 4.

1 How does a science-policy interface work?

Wouter Van Reeth, Institute of Nature Conservation, Flanders, Belgium

1.1 What are science-policy interfaces?

1.1.1 General characteristics

When engaging in research commissioned by policymakers tensions between research and policy communities are not uncommon. The ‘two-communities theory’ proposes an under-utilization of science by policymakers, due to the fact that scientists and policymakers tend to live in separate worlds. Both communities act on different and often conflicting values, face different reward systems and use different languages (Caplan, 1979). In terms of research focus there may be a difference between the knowledge needs of the policymakers and those of the researchers. In terms of research output, researchers may strive for a valid and accurate description and explanation of biodiversity trends and their causes. Policymakers tend to desire practical and feasible solutions to control that trend. In terms of the used discourse politicians typically hope for a message that underlines the positive results of their policy and supports their cause in political debates. Biodiversity researchers being both knowledgeable and often passionate about their research, may rather desire to the sound the alarm when they are confronted over and over again with evidence of biodiversity loss.

The idea that a researcher can avoid these tensions by being neutral and objective or by positioning himself above the more normative approaches of the policy world has since long been challenged (van den Hove & Sharman, 2006). Positivist assumptions of a value-free scientific research programme or scientific method fly in the face of all kinds of normative influences on a scientist at the individual, professional and institutional level. For instance, entomologists spending large amounts of their professional and free time gathering evidence on the dispersion of butterfly species have observed in Flanders a regional loss of 25% of the species during the last decades. How can they be expected to be neutral to societal evolutions that trigger shifts in land use (e.g. increased traffic and mobility, changes in farming) and affect the viability of these populations? Or, at the institutional level, with increasing specialization in academic research, how can research teams be expected to not favour the continuation of their own subfield or subdomain when a new political majority with a new agenda is to allocate funding for research contracts?

With this gap between research and policy communities in mind, science-policy interfaces face the challenge to build a bridge, thereby avoiding two extremes: the ‘scientification’ of politics, which might at times make more sense but would be undemocratic; and the politicization of science, which might be democratic but may not always make sense.

Given the dynamics to which both scientific research and policymaking are susceptible, the balance which a science-policy interface tries to maintain can be expected to be dynamic as well. A science-policy interface will constantly have to adapt to the changing conditions of science and policy caused by progress in scientific knowledge and methods, by shifts in political power and priorities and by new events in the social or natural context. Secondly, policy workers as well as researchers look at the world from a specific perspective and with a certain bias. Consequently, any common basis for understanding and interaction can be expected to require a participatory approach in which

> ‘**Institution**’ is a concept commonly used in social sciences and does not just refer to organizations. It can be defined as a more or less stable set of social rules that is applied where people interact, thus creating predictable and recognizable patterns of interaction. Examples include families, schools, churches, companies, universities and governments. Those rules may be formally written down, or exist merely as informal codes of behaviour in the heads of people.
>
> ‘**Institutionalisation**’ then refers to the gradual process through which such institutions come into existence. The stability of institutions does not imply that they are completely rigid or unchangeable. To the contrary: where individuals or groups interact, institutions are partly reproduced, and partly transformed. An example is ‘language’. Its use keeps it ‘alive’ and thus reproduces it. But it also transforms it: now and then new words or grammatical rules come into existence, while others change or disappear altogether.

communication to share and exchange common or different views are essential (van den Hove & Sharman, 2006). This then would imply that researchers share some ownership in policy processes while policy workers share some ownership in research processes. This raises the question how far that participation can go before each of them falls out of its specific role. Thirdly, 'policy' and 'science' have thus far been referred to as homogeneous constructs, while in reality they may more accurately be viewed as 'houses with many rooms'. The knowledge needs of a professional in a government agency may be very different from those of an elected politician, even if both can be labelled as 'policymakers'. The scientific method, discourse or research agenda of a sociologist or a biologist doing research on 'nature' may be not less different, and their quest for a common language not less challenging. The characteristics of a science-policy interface can therefore be expected to vary, depending on 'whose policy' and 'whose science' it is to connect. The answer to the question 'what constitutes a good science-policy interface' may therefore be as diverse as the types of policy workers and scientists there are to connect. Finally, scientific publications not seldom interpret science-policy interaction as the use of scientific information in policymaking. There is less emphasis on the impact that policymakers can have in some stages of the research process. To the extent that there is a tension between both communities, any sustainable form of interaction will have to work in both ways. Science-policy interfaces then should allow for a two-way process of mutual influences, and not be designed solely to inject research that was conducted in isolation of the policy community into policymaking.

In summary, we view adaptability, participation, diversity and mutuality as general but essential characteristics in our framework on science-policy interfaces.

1.1.2 Towards a definition of science-policy interfaces

Science-policy interfaces have been defined as 'social processes that encompass relations between scientists and other actors in the policy process, and that allow for exchanges, co-evolution and joint construction of knowledge with the aim of enriching decision-making' (van den Hove & Sharman, 2006). Such actors can be conceived as freely thinking individuals who act on rational motives. At the same time their behaviour is likely to be influenced by an institutional context from which they draw meaning, power and legitimacy (Giddens, 1984). This institutional context may in part be determined by an actor's educational background (e.g. biology, sociology, law) or his professional position (e.g. appointed professor, elected politician). Based on his academic training a biologist may interpret nature as an ecosystem with a certain degree of biological diversity. For a sociologist 'nature' might just mean any city park where people can relax in their free time, regardless of the habitats or species that these areas contain. A report on the loss of biodiversity may be interpreted as a valid and legitimate observation by an ecologist working as an academic. The same report may be perceived as a threatening assessment by an elected politician, who may feel that the efforts that have been done during his tenure were insufficiently appreciated. When analysing, comparing or designing the interactions between scientists and policy workers in a science-policy interface, both the actors' individual choices as well as the institutional context (politics, science & society) within which they typically operate, will have to be taken into account.

From sociology, with input of other disciplines like policy sciences, public administration, accounting and organization theory, different theoretical frameworks have been advanced to study the types of interactions that are typical of science-policy interfaces. Giddens' structuration theory has been used to analyse why government agencies may decide to adopt certain discourses and processes to underpin their decision making (Macintosh & Scapens, 1990; Roberts & Scapens, 1985; Van Reeth, 2002). The 'arrangements approach' builds on similar theoretical constructs to analyse evolutions in the content and organization of nature policy in its institutional context (van Tatenhove *et al.*, 2000; Wiering *et al.*, 2001; Bogaert, 2004; Crabbé & Leroy, 2004). Policy arrangements are a temporarily stable way of working in which 'actors' use 'resources' to interact. In these interactions they use certain 'discourses' and follow certain 'rules'. By interpreting science-policy interfaces as 'arrangements' we can define their building blocks as follows:

1. **Actors**: which individuals or types of organizations participate in a science-policy interface? E.g. elected officials, staff departments, executive agencies, university scholars, scientific agencies, NGOs, professional interest groups, consultants.

2. **Rules**: what is the frequency of interaction, to what extent are scope and formats of documents formalized, which stages of the research and policy processes are formalized or fixed?

3. **Resources**: how are budgets and other power sources (staff, access to information) distributed among the actors, what is the term of mandates or contracts, which actor has which level of authority with regard to supply and demand of information (e.g. advice, mandatory advice, decision, veto)?

4. **Discourse**: what language, ideologies, paradigms and value systems characterize the content of the interaction in a science-policy interface? E.g. natural-science or social-science based, conservationist or functionalist, mono- or multi-sectoral. Which educational backgrounds and types of organizations dominate the interaction? How do these affect the format and style of the demanded and supplied information?

These four dimensions are not mutually independent but rather intertwined and sensitive to changes in the political or societal context. For instance, if new actors enter a science-policy interface after elections, the discourse may be expected to alter as well. A new government's budget policy may affect the distribution of resources within a science-policy interface, or governmental reform may alter the rules of interaction. Because of this interdependence and context-dependence, the arrangements approach suggests that science-policy interfaces will be dynamic and always in motion, as already mentioned earlier. It also implies that an analysis of science-policy interfaces needs to look at the context as well, including the position of other stakeholders like professional interest groups and the public at large.

1.2 How may science-policy interfaces be expected to operate?

The previous section briefly outlined the general characteristics and building blocks of a science-policy interface. It revealed however little of how science-policy interfaces actually operate and what they may accomplish. The general definition adopted earlier mentioned 'processes (…) that allow for exchanges, co-evolution and joint construction of knowledge' (van den Hove & Sharman, 2006). This definition suggests some sense of purpose, and thus a common goal to which the actors participating in a science-policy interface would be willing to contribute. To what extent can we expect this purposeful rationality and willingness to contribute in reality?

Social sciences, and policy sciences in particular, have proposed alternative paradigms and theories on the rationality of policy processes and on the strategic behaviour of actors. Depending on which theory that one chooses to analyse policy or research processes, a different 'reality' becomes visible. It is not only the facts that shape a theory; often the paradigms and theories that we use also determine which facts we see or don't see. We discuss three alternative 'lenses' through which policy processes and science-policy interfaces may be analysed: a cybernetic cycle, a political arena and an institutional process (Leroy *et al.*, 2006).

1.2.1 Science-policy interface as a cybernetic control cycle

The cybernetic control cycle became a dominant framework in organization and management theory during the second half of the twentieth century. Its roots go back to ideas of 'scientific management' early in the twentieth century that had a normative ambition to steer and control industrial production processes (e.g. automobile industry) and the behaviour of labour force. Under the influence of systems theory this paradigm pervaded through several social sciences, including political science and public administration.

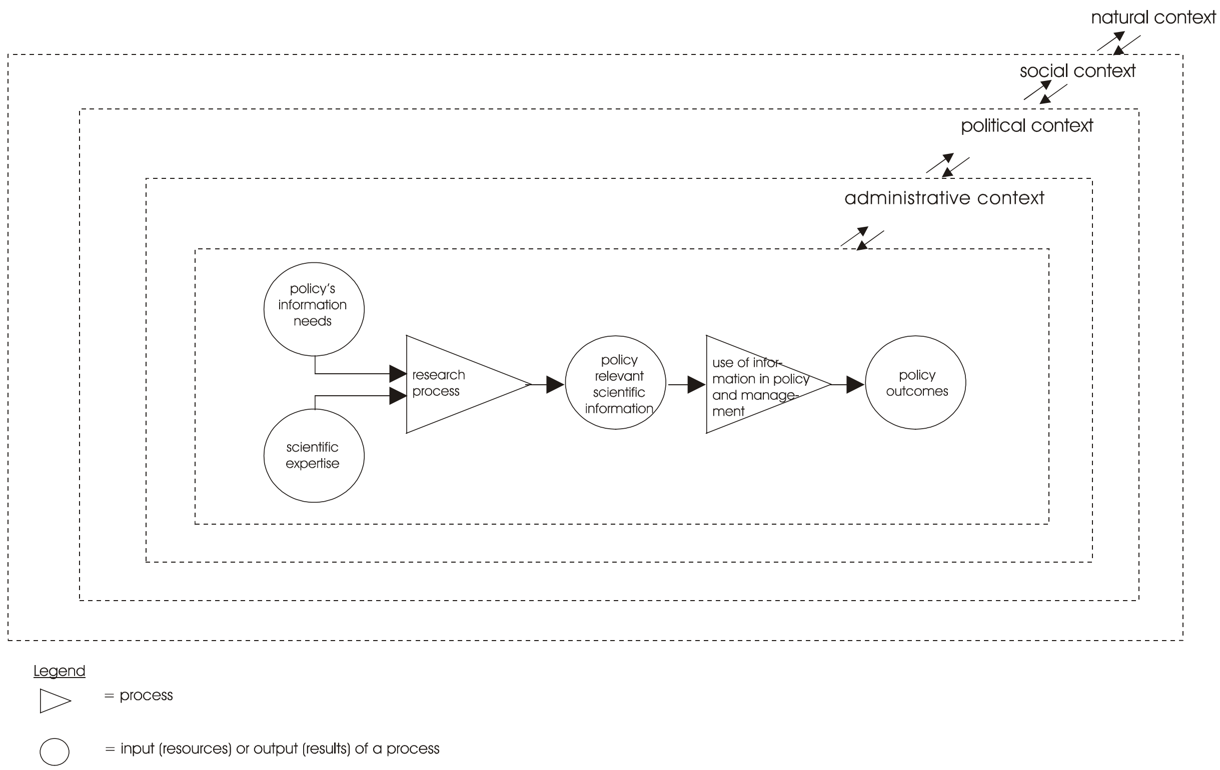


Figure 1: Cybernetic model of a science-policy interface

The cybernetic perspective analyses policy or research activities as an input-output-outcome process through which some set of pre-defined objectives can be achieved. Its analytical clarity, transparency and predictability give it a sense of control which has been very appealing to practitioners wanting to use it in their daily practice. Also in more recent decades, where the legitimacy of government and the accountability of public organizations has been questioned, policy and management theories and government reforms have embraced this model throughout the world, as a remedy to modernize old-fashioned and outdated governmental practices (e.g. in 'new public management').

According to this approach a science-policy interface would revolve around a recurrent but linear process (Figure 1). On the one hand, policymakers' information needs constitute an input into a research process, the output of which is policy relevant information. This output in turn serves as an input into a policy process, leading to more appropriate policy output and outcomes. For instance, the European Union has decided that biodiversity needs adequate protection via a network of designated and protected areas, known as the Natura 2000 network. To operationalize and implement this policy, the European Commission (DG Environment) asked researchers to list the habitats and species in need of protection (policy's information needs as research input). The research could result in a list of habitats and species and possible management and conservation approaches, which is then accepted by policymakers as a basis for designating and protecting specific areas (research output = policy input). The policy process eventually results in the effective protection and conservation of the listed biodiversity (policy output and outcome). The origin of policy's information needs and scientific expertise are supposed to depend on the administrative, political and social context, but are usually not elaborated at great length in this approach.

The appeal of the cybernetic approach to science-policy interfaces lies in its simplicity and straightforwardness. On the other hand, the model also leaves a great number of practical issues unanswered: Who is to determine policy's information needs? What scientific knowledge is labelled as expertise? Also the research and policy processes are regarded as black boxes, giving little or no clues as to how they should be understood or applied in daily policy or research practice.

1.2.2 Science-policy interface as a political arena

The rationality and straightforwardness of the cybernetic perspective is often felt to be contradicted by the 'irrationality' of real life politics or the unpredictability of real life research. When political decision making leads to complex compromises that are not believed to be effective or efficient, policymakers are said to behave irrationally. However, when taking a closer look at the incentives that politicians face, their actions and choices may be more rational than would appear at first sight. Political decision making often affects the regional or sectoral distribution of funds, for instance between agriculture, industry and environment. A politician who is held accountable in a recurrent process of region-based or sector-based elections has an incentive to maximize the policy returns for his region or sector. She or he will accordingly have an incentive to defend or advocate regional or sectoral interests. This can lead to policy choices which may seem irrational or sub-optimal from the general interest's point of view, but which are perfectly rational and even desirable from a regional or sectoral point of view. This tension between general and particular interests is by no means the exclusive characteristic of policy communities. Also within the research community academic disciplines tend to form competing clusters that strive for the development of their own particular 'knowledge sector' or 'area of expertise'.

Maximizing regional or sectoral returns requires some leverage during the decision making process. Acquiring power to control policy processes then can become an intermediate objective for policymakers as well as for researchers. In the perspective of the political arena the behaviour of actors is first and foremost strategically motivated. The cybernetic perspective implicitly assumes that policymakers and researchers cooperate in a 'loyal' fashion towards some common policy goal, e.g. halting the loss of biodiversity in 2010. However, from the political arena perspective, researchers or policymakers will at least to some extent also try to maximize particular interests with regard to their own sector, region or field of expertise. The key difference between the cybernetic and the political perspective is therefore one of single and converging versus multiple and competing rationalities.

In such a political arena the development, dissemination and use of scientific information are not neutral activities. Research on the relationship between biodiversity and human activities (e.g. agriculture, industry or other forms of land use) will expose information that may support or undermine these activities. In situations where biodiversity conservation supports particular interests, biodiversity research may be expected to be used (when available) or developed (when not available) by the stakeholders involved. In situations where biodiversity puts severe constraints on particular interests, stakeholders may perceive any research exposing declines in biodiversity as threatening and illegitimate. It will then depend on the relative power distribution between those defending the particular interests and those doing research on biodiversity, whether results of such research will be developed, disseminated and used.

The central constructs in the political arena perspective are the degree of consensus between multiple goals and rationalities, and the distribution of power among researchers, policymakers and other actors. Based on these constructs, hypotheses can be developed on the sustainability and likely outcomes of science-policy interfaces. This approach is illustrated in Table 1.

Table 1: Science-policy interaction in a political arena

	Biodiversity goals support interests of policymakers	**Biodiversity goals conflict with interests of policymakers**
Power biodiversity researchers < power policymakers	Biodiversity research is used for policymaking	Biodiversity research is not used for policymaking
Power biodiversity researchers > power policymakers	Biodiversity research is used for policymaking	Use of biodiversity research is forced by researchers

The matrix generates alternative hypotheses on the use of biodiversity research for policymaking under variable conditions of goal conflict & power distribution. Depending on these variables policymakers and researchers may choose different forms of strategic behaviour to prohibit or force the use of scientific information in policy processes. Science-policy interfaces however operate in two directions. Similar models then can also be built to explain or predict the alignment of biodiversity research with policy goals.

Of course more complex or subtle models of interaction can be developed by relaxing assumptions or increasing the number of exogenous variables. For instance, policymakers and researchers may try altering their power positions to increase their influence. A researcher can try using the media to make the results of her research public. The degree of consensus or the distribution of power can also change because of new events in the social context. For instance, an environmental scandal that resonates throughout the media and affects public opinion may increase the (perceived) importance of biodiversity-related research in a political arena. In this way it may even affect the power position of a researcher in a policy process, for instance as an expert testifying before a parliamentary committee.

Several theories have been advanced to overcome the obstacles that are posed by goal conflict and power struggles (Van de Graaf & Hoppe, 1992; Leroy *et al.*, 2006). Some theories focus on the barriers that need to be overcome to allow research findings to penetrate the policy agenda and inform decision making (e.g. model of Bachrach & Baratz, 1970). Other theories regard research and policy to belong to separate parallel 'streams'. Decisions in which policymakers use research findings can occur in situations where these streams meet and overlap. Some models regard such decision making processes as rather organic and randomized and speak of 'organized anarchies' where solutions look for problems (e.g. garbage can model of Cohen, March & Olsen, 1972). Other models allow a greater role for 'policy entrepreneurs' who can channel these streams and create 'windows of opportunity' in which policymakers can inform research, or researchers can inform policymakers (e.g. stream model of Kingdon, 1984).

1.2.3 Science-policy interface as an institutional process

The institutional process perspective includes elements of the cybernetic and political (actors behaving with a certain purpose or rationality and exercising power) but also extends it with new elements. This results in a richer but also more complex frame of analysis.

In the two previous perspectives the concept of 'biodiversity' was considered to have an unequivocal content, meaning the same thing to all stakeholders involved. In reality however, biodiversity may mean a lot of different things to different people. To laymen the concept may have no meaning at all. Or, when explained, it may be just interpreted as 'nature' or simply as 'green', regardless of whether that refers to exotic trees in a clean and accessible park or autochthonous trees in messy natural forests. For biologists on the other hand, biodiversity will have a more complex meaning, including diversity at the species and genetic level. Policymakers may adhere to various meanings, depending on their educational background and professional position and experience. The professional planner inside the bureaucracy may choose to rely on a more scientific approach of biodiversity, while the elected official may adhere to an interpretation that is meaningful and understandable to those on whose votes he relies. These images or interpretations of biodiversity, and the language in which they are communicated or framed, are the 'discourse' through which actors communicate. Such discourses may vary not only between policy communities and science communities, but also within science and policy communities. Examples include the sociologist's vs. biologist's definition of 'nature', and that of a conservation manager working on the field vs. that of a member of a ministerial cabinet.

The discourse that is used to communicate on biodiversity is one of the characteristics that define 'how things are done' in a science or policy community. Such practices become part of what sociologists call the institutional identity of such a community. As outlined in section 1.1.2, such institutions can be analysed by looking at the actors or stakeholders that participate in them; the rules or procedures through which they interact; the resources or power they have at their disposal; and the discourse through which they communicate.

Institutions do not emerge overnight, but are the result of a gradual and incremental process. In that sense, institutions are not a synonym of 'organizations'. However, each organization (university, hospital, government agency) will exhibit a process of institutionalization that shapes the culture and style of interaction within that organization and with the outside world.

Science-policy interfaces can be seen as 'arrangements' that link actors, discourses, rules and resources from different institutional backgrounds (Figure 2). Actors draw on these institutional structures to communicate meaning, to exercise power, or to make normative judgements (Giddens, 1984). This is not to suggest that there is a one-sided influence from institutional context to agents, to the contrary. It is through interaction with other stakeholders that human agents reproduce these structures and institutions. Just as a language becomes 'dead' when it is not used anymore in any form of live interaction, so the interpretive frameworks, rules and norms fade out of existence unless they are used and reproduced in some regular or frequent form of interaction.

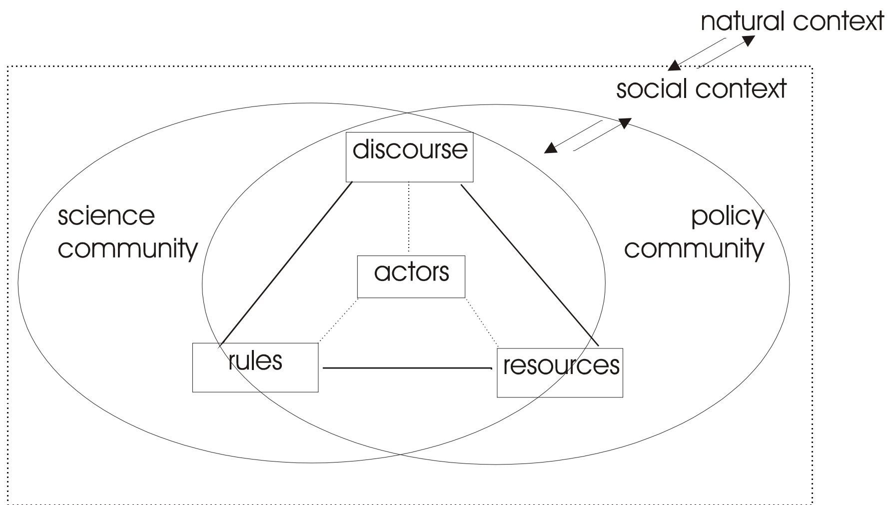


Figure 2: Institutional model of a science-policy interface (Caplan, 1979; Bogaert, 2004)

Where this institutional approach offers a rich framework for an after-the-fact analysis of the complexities and dynamics of science-policy interfaces, it offers to a lesser extent specific recommendations on how to organize them or make them sustainable. These links can be organized bottom-up or top-down; they can be implicitly anchored in practice or in more formal explicit legislation.

In general terms the institutional approach suggests that a science-policy interface will be functional and sustainable to the extent that it is useful in reproducing the discourses, power and values of the contributing actors. Actors will then find the interface useful to the extent it is compatible with their own discourse, procedures and other 'institutional habits'. How this compatibility can be achieved or increased in practice, will be context- and therefore case-specific.

The institutional perspective fits well with the general characteristics outlined in section 1.1.1. For instance, the interaction between incompatible discourses can be facilitated to the extent that an interface is adaptable to changing circumstances and allows participation and mutuality. A policymaker with professional experience in academia may have the advantage of being able to understand the discourse of researchers; an academic with professional experience in a government agency is likely to have a better feeling of the rules and discourse of policymakers, than a researcher who has never left the university campus.

Analysing science and policy communities and the science-policy interfaces between them as an institutional process entails a broader perspective than that of the cybernetic or political approach. The increased complexity of the variables and relationships between them however often requires an in-depth qualitative case study approach. This style of research is not always attractive for policy workers who look for an easy-to-use cookbook with practical and unambiguous recipes on how to organize science-policy interfaces. A second complication with the institutional perspective is that the descriptive variables (actors, discourse, rules and resources) are interdependent. A change in participants may bring about a change in discourse; a change in rules and procedures may bring about a change in resources and power. How to organize a science-policy interface if everything changes everything? Finally, the interdependence also poses a challenge in terms of construct-validity: how to operationalize these constructs to use them in empirical research. Or in other words: how would you discern a 'rule' from a 'resource' when they would look you in the face?

1.3 *Effectiveness or ‘success’ of science-policy interfaces*

This section builds on the theories synthesized in the previous section to develop some frameworks and scales for comparative analysis of science-policy interfaces. The idea is to use these frameworks in the next stage of ALTER-Net work package I5, for a more systematic comparison of the case studies that were developed for the workshops in 2005.

1.3.1 Alternative images of effectiveness and success

The purpose of a science-policy interface is typically understood as to bridge the gap between scientists and policymakers. On the one hand this ought to lead to research results that are more attuned to the information needs of policymakers. On the other hand it should facilitate the use of scientific information in policymaking, leading to better policy outcomes. An effective and successful science-policy interface then would be one which achieves these objectives. This interpretation of effectiveness however is based on the cybernetic approach to science-policy interfaces. When applying other perspectives like the political arena or the institutional process, the criterion of effectiveness takes on a different meaning (Table 2).

Table 2: Alternative images of effectiveness and success

	policy → science	**science → policy**
cybernetic cycle: success as improved policy outcomes	To what extent does the science -policy interface help in making science better answer policy’s information needs?	To what extent does the science -policy interface help in improving the quality of decision making and the policy outcomes?
political arena: success as improved control	To what extent does the science -policy interface help policymakers to control scientists?	To what extent does the science -policy interface help scientists control policymaking?
institutional process: success as institutional reproduction	To what extent does the science -policy interface help science in supporting and reproducing policy-makers’ discourse, rules and resources?	To what extent does the science -policy interface help policy in supporting and reproducing scientists’ discourse, rules and resources?

The consequences of these alternative images on what constitutes an effectiveness or success are not without importance for the design, analysis and evaluation of science-policy interfaces. For instance, a science-policy interface can be very effective in supporting the particular interests of a scientist or policymaker (political arena) while not resulting in policy that leads to a more effective biodiversity policy (cybernetic cycle).

1.3.2 Comparative research on effectiveness of science-policy interfaces

To some extent the degree to which science-policy interfaces achieve their intended purpose, from a cybernetic, political or institutional point of view, can be assessed via empirical research. If we assume that a science-policy interface intends to link supply and demand of policy-relevant scientific information, the extent to which supply and demand ‘meet’ can be mapped. This is illustrated in Table 3, which can be used to map and compare case studies of science-policy interfaces. The horizontal axis (4 columns) indicates the extent to which scientific knowledge penetrates in the policymaking process. The vertical axis (4 rows) indicates the extent to which policy’s demands for information affect (biodiversity) research. Table 3 maps effectiveness from a cybernetic perspective. In order to compare science-policy interfaces from a more political or institutional perspective, the stages in the four columns and rows would have to be redefined accordingly.

Table 3: Mapping the effectiveness of science-policy interfaces

		science → policy (policymakers about science)			
		I. are aware of its content ⇔ have read it	**II.** talk about it ⇔ knowledge ∈ policy discourse	**III.** use it for decision making ⇔ knowledge ∈ policy process & documents	**IV.** results in better policy and management
policy → science (scientists about policy)	**I.** are aware of its content ⇔ have read it				
	II. talk about it ⇔ policy ∈ science discourse				
	III. use it in designing research strategies ⇔ policy requirements ∈ research reports				
	IV. results in more research applicable for policy people				

Ideally (still from a cybernetic perspective) the ambition should be to move from the upper-left to the lower right corner of the effectiveness chart. However, the mapping table reveals little about why some science-policy interfaces may be more effective than others. Such explanations require a more in-depth case analysis. As suggested throughout the previous section, science-policy interaction cannot be walled off from the context in which it takes place. It may however be possible to develop context-specific propositions which can be tested via qualitative case study research. The following types of questions can be useful avenues for empirical research and hypothesis building.

1. Which actors are involved in the science-policy interface? (underlying proposition: some actors may be able to interact more effectively than others)
2. What products are used? (underlying proposition: some products may result in more effective interaction than others)
3. What is the content of the message? (underlying proposition: some contents may be more suitable for interaction than others)
4. How is the interaction organized? (underlying proposition: some organizational arrangements may be more inducive to effective interaction than others)

References

Bachrach, P. & M.S. Baratz (1970) *Power and Poverty: Theory and Practice.* - New York and London: Oxford University Press

Bogaert, D. (2004) *Natuurbeleid in Vlaanderen. Natuurontwikkeling en draagvlak als vernieuwingen?* doctoral dissertation. Katholieke Universiteit Nijmegen. Nijmegen. the Netherlands

Caplan, N. (1979) The two-communities theory and knowledge utilization. *American Behavioral Scientist*. 22(3): 459-470.

Crabbé, A. & P. Leroy (2004) *Op weg naar vernieuwd lokaal waterbeleid.* Interim research report. Universiteit Antwerpen - Steunpunt Milieubeleidswetenschappen. Antwerpen, Belgium

Giddens, A. (1984) *The Constitution of Society. Outline of the Theory of Structuration.* Polity Press. Cambridge, UK

Leroy, P., K. Bachus, H. Bruyninckx, A. Crabbé, & J. Gysen (2006) *Vademecum Beleidsevaluatie.* Universiteit Antwerpen - Steunpunt Milieubeleidswetenschappen. Antwerpen. Belgium. publication forthcoming

Macintosh, N.B. & R.W. Scapens (1990) Structuration Theory in Management Accounting. *Accounting, Organizations & Society* 15(5): 455-77.

Roberts, J. & R.W. Scapens (1985) Accounting Systems and Systems of Accountability - Understanding Accounting Practices in Their Organizational Contexts. *Accounting, Organizations & Society* 10(4): 443-56.

van de Graaf, H. & R. Hoppe (1992) *Beleid en politiek. Een inleiding tot de beleidswetenschap en de beleidskunde.* 2nd ed. Coutinho. Muiderberg. the Netherlands

Van Reeth, W. (2002) *The bearable lightness of budgeting. The uneven implementation of performance-oriented budget reform across agencies.* doctoral dissertation. K.U.Leuven. Leuven. Belgium

van Tatenhove, J., B. Arts & P. Leroy (2000) *Political modernisation and the environment. The Renewal of environmental policy arrangements.* Dordrecht, the Netherlands

Wiering, M., A. Crabbé, P. Leroy & B. Arts (2001) *Kennis voor beleid natuurlijk. Stroomlijning van het wetenschappelijk natuuronderzoek in Vlaanderen.* Nijmegen University Press. Nijmegen. the Netherlands

2 Case studies

The previous chapter has described the theoretical and conceptual background that is involved when discussing science-policy interfaces. This chapter 2 brings together a range of case studies from countries, specific sectors or from the international biodiversity research and policy field. The aim of these case studies, which all but one have been provided by ALTER-Net parties, is to use the case to illustrate how the science-policy interface is working or not working, what kind of output and outcome is reached by interfacing, what is working well and why, what does not work so well and why not, and who is involved in the process. For each case some conclusions and recommendations are formulated that will help distil lessons learned for ALTER-Net.

2.1 Integrating biodiversity research with policy - experiences of the Finnish Biodiversity Research Programme (FIBRE) 1997-2002 (Finland)

Heikki Toivonen, Finnish Environment Institute, Finland

2.1.1 Introduction

In December 1995, the Finnish Council of State made a Decision-in-principle concerning action on the research and safeguarding of biological diversity in Finland. The main purpose was to initiate the preparation of a National Biodiversity Action Plan (NBAP) and thus implement actions requested after the ratification of the Convention on Biological Diversity. The Decision-in-principle also stated that the Academy of Finland (the national system of research councils) should head the preparation of a multidisciplinary research programme on biological diversity. The six-year Finnish Biodiversity Research Programme, FIBRE was launched in 1997, and it was also included in the Finnish NBAP for the years 1997-2005.

2.1.2 The FIBRE Programme - objectives, funding and topics

The objectives of FIBRE were:

- to produce internationally high-quality interdisciplinary and applicable research on biological diversity (biodiversity) with special focus on research needs created by the CBD;
- to focus on the analysis of social and economic mechanisms that enable the inclusion of biodiversity into decision making;
- to train biodiversity experts;
- to enhance international collaboration in biodiversity research.

In Finnish conditions FIBRE was a great research programme, both in terms of funding and number of projects, but also in terms of a variety of financing bodies representing research councils, foundations, ministries and environment-interested stakeholders. The total budget was € 20 million, plus € 6 million as in-kind contributions by participating research institutes. Funding was provided by the following organizations:

- Academy of Finland (47 % of funding)
- National Technology Agency Tekes (15 %)
- Ministry of Agriculture and Forestry (15 %)
- Ministry of the Environment
- Maj and Tor Nessling Foundation

- Ministry of Transport and Communication
- Ministry for Foreign Affairs
- Finnish Forest Industries Federation and
- Central Union of Agricultural Producers and Forest Owners

The research programme was directed by the Steering Committee nominated by the Academy of Finland, and representing funding organizations, scientific expertise and programme coordination. Both end-users and researchers were included. The Academy appointed an external coordination body (in the University of Turku) through an open competition.

The projects receiving funding in FIBRE were selected on the basis of competition and scientific merits. The programme had two phases (1997-1999 and 2000-2002), and contained 73 consortia or research projects representing following topics:

- forest biodiversity and forestry, conservation biology, and systematic biology: 37 projects;
- aquatic environments and biodiversity: 18 projects;
- agrobiodiversity, traditional rural landscapes and urban environments: 10 projects;
- biodiversity issues and developing countries: 4 projects;
- other projects (environmental law): 4 projects;
- the integrative project The Applicability of Biodiversity Research (BITUMI) (2000-2002).

2.1.3 Assessing success and impact of the FIBRE programme

At the end of the programme FIBRE was evaluated, and an assessment on its national impacts was made (Anon., 2003; Otronen & Tirkkonen, 2003). The following criteria were used in the evaluation:

- scientific quality;
- functioning of the Programme, coordination;
- collaboration and networking;
- applicability of research and importance to the users;
- success of the implementation of the programme goals and objectives.

In general the international evaluation team assessed that knowledge on biodiversity has substantially increased during the programme, and it had also initiated novel types of research within the societal sciences and the humanities in Finland (Anon., 2003). However, projects that bridge the gap between the natural and social sciences were not common (partly caused by current educational and career incentives), and there were areas of research that end-users referred to as insufficiently studied. These included the fields of biodiversity management in commercial forests, habitat requirements of threatened species, and links between biodiversity and ecosystem functioning.

Training of biodiversity experts in FIBRE was successful. Approximately 600 research personnel, as well as technicians, have participated in FIBRE projects, and altogether 139 doctoral students and 20 post-docs were financed through the programme. However, relatively few new experts had multidisciplinary education and mostly they represented traditional discipline-oriented doctoral studies. Enhancement of international cooperation in biodiversity research was also successful. Various events were arranged with international organizations, and FIBRE researchers participated at national preparatory work for the CBD COP and SBSTTA meetings. The FIBRE co-ordination also had a central role in initiating and arranging the Symposium "Northern Dimension of Biodiversity" held at Ivalo in 1999 during the Finnish EU presidency. The

European Platform for Biodiversity Research Strategy (EPBRS) was initiated as a result of recommendations emerging from that meeting.

The opinions of end-users and the research community on the importance and applicability of the results differed in some aspects. End-users expressed e.g. that FIBRE produced plenty of theoretical knowledge and dissertations, but there was some lack of applicability. Some end-users commented that FIBRE results were not readily applicable without further interpretation. Interaction between the researchers and end-users were not deep and systematic enough. On the other hand, many stakeholders said that FIBRE has been instrumental in helping stakeholders to formulate and articulate their own research needs.

The participants (70, about half of them researchers and half end-users) of the Finnish National Platform for Biodiversity workshop on research activities during the Finnish NBAP 1997-2005 assessed that FIBRE research has been useful and important (> 90 % of participants), and that FIBRE has helped Finland in implementing the Convention on Biological Diversity at the national level (Niemelä, 2005). However, some topics were evaluated less important, like research on GMOs or on the forest certification. Many said that criteria in certification are not defined by research but by political agreement. Taxonomy was regarded important, but difficulty in finding funds for research was recognized. The same concerned also threatened species and restoration of habitats (Niemelä, 2005).

The evaluation of the Finnish NBAP 1997-2005 and its proposals made following conclusions (Hildén *et al.*, 2005). During the NBAP period biodiversity research was supported substantially, and knowledge on biodiversity has increased to remarkable extent. The new knowledge has had impact in the political decision making, but that varied greatly from one field to another. The increase of financing in some key areas or in areas where knowledge is insufficient, is still, however, urgently needed. There is also a need to make the utilization of research results in decision making process more effective.

Areas where new knowledge is needed were given in assessments (Niemelä, 2005; Hildén *et al.*, 2005): use of GIS data in biodiversity research; ecology of small populations, particularly dispersal and local extinctions; socio-economic research related to biodiversity (conflict solving, incentives, trade-offs); genetic diversity; restoration and ecosystem management; studies on ecosystem functioning and ecosystem services; biology of threatened species; and interlinkages between biodiversity and climate change.

2.1.4 Dissemination of FIBRE results

FIBRE made many efforts to bridge the gap between biodiversity research and biodiversity policy. The dissemination of results was given a special attention. That was done in many different ways, as listed by Otronen & Tirkkonen (2003):

- research collaboration between end-users and researchers;
- FIBRE researchers act as experts in national bodies;
- the funding bodies have special access to research knowledge, particularly to projects they finance;
- events organized by FIBRE and BITUMI;
- specialist training;
- networking;
- publications;
- Internet; FIBRE results were presented in LUMONET, the Finnish national CBD Clearing-House Mechanism (www.environment.fi);
- teaching programmes in universities and schools;
- media and newspapers.

FIBRE had also a specific project to help and to interpret research results, BITUMI (The Applicability of Biodiversity Research). BITUMI was a kind of boundary organization between researchers and end-users to disseminate and to interpret results more efficiently. Four thematic groups consisting of FIBRE researchers and end-users were formed (forest ecosystems, aquatic ecosystems, agricultural and cultural environments, and developing countries) to discuss about research projects and their results. Three book projects were initiated under these groups. These books treated central themes of the programme: forest biodiversity (Kuuluvainen et al. 2004), biodiversity of aquatic environments (Walls & Rönkä 2004), and biodiversity of agricultural environments (Tiainen et al. 2004). The aim of the books was to demonstrate results from research projects of the programme and give advice on policies and management practices. Resulting books contained altogether more than 1000 pages, and are useful as text books and have been used as course books at universities. They also had an important educational role, close to 150 researchers made popularization of their results. The books were, however, only partially successful in giving advice on environmental policies. Many articles included some discussion on policy implications but these remained mostly general. That was to some extent caused by difficulties to find consensus on the policy relevance of results from individual projects and trends in biodiversity. As the research programme had been officially finalized at the end of 2002, publication date was also too delayed. BITUMI researchers have also communicated FIBRE results in the Finnish CBD Clearing House Mechanism (LUMONET, Finnish web pages: http://www.ymparisto.fi/default.asp?contentid=154718&lan=fi; English pages: http://www.ymparisto.fi/default.asp?contentid=163099&lan=fi&clan=en).

Some problems in dissemination of scientific results were highlighted in interviews by end-users. Scientific knowledge is published mostly as scattered primary publications in international journals, which are difficult to find, and which policy-makers rarely have time to read. Some said that research knowledge is too abstract and too difficult to tackle. End-users also said that many times the momentum to introduce scientific knowledge to policy is very short because of the changing situations on policy arenas. The researchers felt that the political will to adopt scientific knowledge is essential.

2.1.5 How to make integration between research and policy better?

Three major approaches have been suggested to make the integration better:

- applicability of research results requires that it should be kept in mind already in the planning phase of the project and taken into account during the whole project cycle;
- applicability is not favoured by the scientific evaluation of proposals by scientific experts, therefore funding bodies should have possibility to choose some projects;
- permanent body should be established for interface of researchers and end-users.

Regular involvement of end-users in the research projects will educate them in longer term to be more realistic about possibilities and uncertainties of scientific work, to interpret results, and to define their expectations. For researchers involvement of end-users gives possibility to understand policy expectations but also policy processes better.

Because applicability (or multidisciplinarity) is not favoured in the ordinary scientific selection process of research projects, some stakeholder have preferred more targeted research programmes. An example of this is the new Finnish biodiversity research programme MOSSE, which was initiated after the FIBRE. MOSSE is based on more practical information needs than was FIBRE. The programme includes more than 60 projects which receive funding mostly from the Ministry of Agriculture and Forestry and the Ministry of the Environment. The total budget for MOSSE, which is being implemented from 2003 to 2006, is approximately € 9 million. In MOSSE programme the funding ministries made the final selection of projects from the proposals. The scientific level of proposals was first reviewed by high quality scientists, after that ministries made decisions largely on the basis of expected applicability of the projects. MOSSE research groups should also give data from their results during the projects, and the results are reported widely in the Internet. For example, interim results from the research programme can be found on the MOSSE web site (Detailed

Finnish pages: http://www.mmm.fi/tuet/tutkimuksen_rahoitus/Monimuot_tutk_ohjelma/inde; short English pages:http://www.mmm.fi/metso/international/MOSSE_english.html) or in published report (Otsamo, 2005).

Both research and utilization of scientific knowledge in decision making should be more clearly integrated in a process, where knowledge is produced and evaluated by both researchers and end-users. The ideal situation would be if the end-users are included in the whole project cycle and correspondingly the researchers are included in all phases of the policy-making process. This may need permanent interfaces between scientists and decision makers.

EPBRS (2004) has recognized that researchers are not familiar with the discussion with the policy-makers and end-users: 'Linking science with policy, and working on policy-oriented research is still a process that many scientists are not familiar with or not willing to endorse. There are several reasons for this, including lack of time (policy related tasks are not rewarded in an academic or research career), lack of resources, lack of awareness of the wider political and societal framework, and lack of experience in communication with decision makers and non-scientist stakeholders.' On the other hand, lack of time and lack of knowledge on character of the scientific work make this discussion difficult to end-users.

Problems in permanent bodies to enhance the science-policy interface are in the representativeness of these organs. Often they are small in size in terms of number of participating policy-makers and scientists. Instead, science community and end-users by large should be involved in the communication. Electronic platforms, e-conferences, national clearing house mechanisms of the CBD etc. should be used. Also major strategies and policies in the planning phase should be commented on electronic forums. This makes the planning procedure more transparent, and makes a wider involvement of the science community possible.

Acknowledgments

I would like to thank Professor Jari Niemelä, Chair of the Finnish National Platform for Biodiversity, for fruitful discussions.

References

Anon. 2003. Finnish Biodiversity Research Programme FIBRE 1997-2002. Evaluation Report. – Publications of the Academy of Finland 3/2003. 32 pp.

EPBRS 2004. Review on 'Research, identification, monitoring and exchange of information' in the European Biodiversity Strategy. A report from the European Platform for Biodiversity Research Strategy (EPBRS).

Hildén, M. et al. 2005. Assessment of the Finnish National Biodiversity Action Plan 1997-2005. Draft Report in Finnish.

Kuuluvainen, T., Saaristo, L., Keto-Tokoi, P, Kostamo, J., Kuuluvainen, J., Kuusinen, M., Ollikainen, M. & Salpakivi-Salomaa, P. (Eds) (2004) *Metsän kätköissä – Suomen metsäluonnon monimuotoisuus*. Edita

Publishing Oy.
Niemelä, J. 2005. 4.2. The importance of the biodiversity research in safeguarding the Biodiversity (in Finnish). In Hilden et al. 2005. Assessment of the Finnish National Biodiversity Action Plan 1997-2005. Draft Report in Finnish.

Otronen, M. & Tirkkonen, J. 2002. The national impact of the Finnish biodiversity research programme FIBRE. University of Turku, 48 pp.

Otsamo, A. (ed.) 2005. MOSSE puolimatkassa – monimuotoisuuden tutkimusohjelman (2003-2006) välitulokset. [Interim results from the biodiversity research programme MOSSE] Seminar Report (Hanasaari 17-18.11. 2005). In Finnish, summary in English. 255 pp.

Web sites:

- Finnish Biodiversity Research Programme (FIBRE) – http://fibre.utu.fi
- Applicability of biodiversity research – http://fibre.utu.fi/bitumi

- Forest Biodiversity and Monitoring Programme in Finland – http://www.mmm.fi/metso/international/MOSSE_English.html

Tiainen, J., Kuussaari, M., Laurila, I.P. & Toivonen, T. (Eds) (2004) *Elämää pellossa – Suomen maatalousympäristöjen monimuotoisuus.* Edita Publishing Oy. Helsinki.

Walls, M. & Rönkä, M. (Eds) (2004) *Veden varassa – Suomen vesiluonnon monimuotoisuus.* Edita Publishing Oy.

2.2 The Nature Report as a science-policy interface in Flanders (Belgium)

Wouter Van Reeth, Institute of Nature Conservation, Flanders, Belgium

2.2.1 Introduction

Interaction between the research and policy community with regard to biodiversity is a diverse phenomenon. Both communities may be considered as houses with several rooms, various windows and multiple passageways. In Flanders the policy community with regard to nature and biodiversity consists, inter alia, of the minister and his cabinet, the Administration of Environment, Nature, Land and Water Management with its various divisions, and the parliamentary Committee of Environment and Nature. In addition to these agents who are most directly involved, various other agencies dealing with spatial planning, agriculture, road and water infrastructure have organizational components whose core business is at the heart of nature policy. The research community is composed primarily by universities, two scientific government agencies being the Institute of Nature Conservation and the Institute of Forestry and Game Management and, increasingly, consultants. The focus of this case study is the Institute of Nature Conservation, and more specifically its 'Nature Report' that is presented to the policy community on a biennial basis.

2.2.2 Scope of this case study

Being a Flemish scientific agency the Institute of Nature Conservation (IN) occupies a somewhat special place between the universities, whose core research task is fundamental research, and the Ministry of the Flemish Community and the Flemish public agencies who coordinate and implement nature policy. Being a government agency staffed by civil servants with a research position, it is the IN's mission to conduct more applied policy-oriented research to inform or operationalize policy plans, to support conservation management and to evaluate the state of nature and the effectiveness of policy instruments.

Many of the IN's research activities are conducted on a short- or medium-term project basis, commissioned by ministries or agencies involved in nature conservation. This project-based policy-oriented research constitutes an essential part of the science-policy interaction in Flanders. The committees and meetings that guide and monitor these projects are important fora in which policy workers from government departments and agencies and academics meet to develop, confront or share ideas. Mapping and analysing the diversity of these interactions would fall beyond the scope of this case study, which is why this project-based science-policy interaction is not the focus of this case study.

Instead we focus on a science-policy interface that was created in 1997 and entrusted to the IN: the Nature Report. Its task, as enacted in statutory legislation is to:

1. describe and evaluate existing nature in Flanders
2. assess the expected evolution under constant or planned policy
3. evaluate the implemented policy.

2.2.3 Research method

Analytical framework on science-policy interaction

Discussions during two workshops of ALTER-Net work-package I5 (Wageningen, January 2005 and Braila, May 2005), and earlier research on the use of information for policy-making were combined to produce an analytical framework on science-policy interaction. The framework is described more extensively in section 3. It is primarily intended as a vehicle to improve our knowledge and understanding of 'effective science-policy interaction' and is therefore by no means definitive. This case study is meant to serve as a first 'test' on the descriptive and analytical power of the framework, which is expected to be adapted and moulded further, after review and debate in Work Package I5.

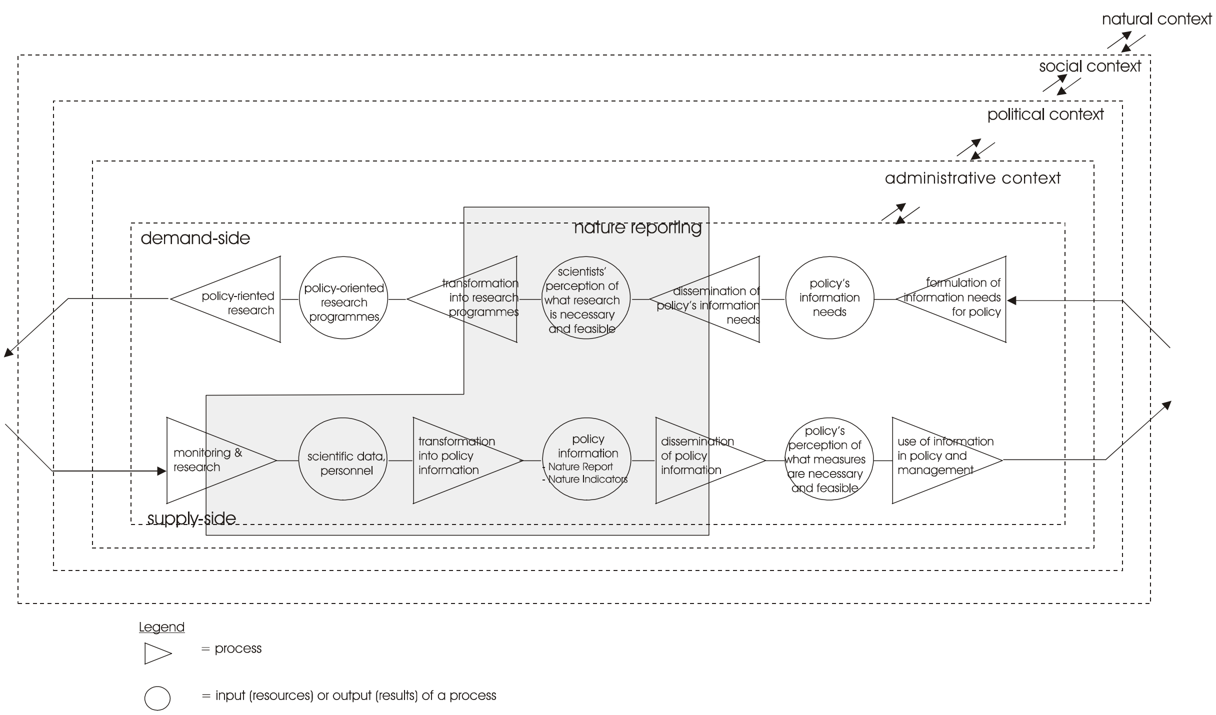


Figure 3: Nature Reporting as a science-policy interface

The layers of context discussed in this case study are those of the political and administrative systems within which Nature Reporting in Flanders takes place (paragraph 4). While we consider the natural and social context to be relevant to understand and explain the effective functioning of science-policy interfaces, no empirical data were collected on these levels of analysis. Therefore they are not treated as such in this case study.

The biennial Nature Reporting process covers only a small part of the entire process in which the policy community's information needs are formulated, disseminated to the research community and applied into research programmes. The Nature Reporting team does not have a budget to engage in extensive research, nor does it control the research programme of the scientific agency of which it is a part. The Nature Report therefore only covers a part of the demand-side and tries to link this demand with already existing data. This demand-side is discussed in paragraph 5.

The Nature Report covers a larger part of the supply-side of the science-policy interaction. It does not control research or monitoring, but it does entail a limited amount of original research on primary data. The bulk of time, however, is spent into transforming existing data, through analysis and reformatting, into information that is intended to be understandable and relevant to the policy community. The output of this process is the 'policy information' in the form of a Nature Report. Since May 2005, a website of Nature Indicators is also made publicly available (www.natuurindicatoren.be). This, however, is not the end of the Nature Report's supply side, as the team members henceforth distribute and disseminate this information to various policy sectors and target groups through articles and presentations.

Data collection

This case study builds on a research project called 'Impact Analysis' that intended to assess the perception and appreciation of the Nature Report 2003 by its target group, consisting of policy workers, scientists and nature lovers. The first part of this research consisted of a survey to assess general perception and appreciation of usefulness, objectivity, clearness, et cetera. The second part consisted of 40 interviews, selected among various target groups ('user profiles') to gain a deeper understanding of why the report was appreciated or not, and which elements of the product or procedure were amenable to improvement (Van Reeth, 2004b).

The analytical framework contains objects of analysis that were not previously included in the impact analysis of the Nature Report. These additional objects of analysis are commented upon, based on participatory observation by the researcher of the nature reporting process from Spring 2003 until Summer 2005.

2.2.4 Political and administrative context of the science-policy interface

Figure 4 gives an analytical overview of the types of actors that compose the policy and science communities with regard to nature and biodiversity in Flanders. We shall discuss in brief the general characteristics of the political and administrative context in which the scientists and policy workers interact.

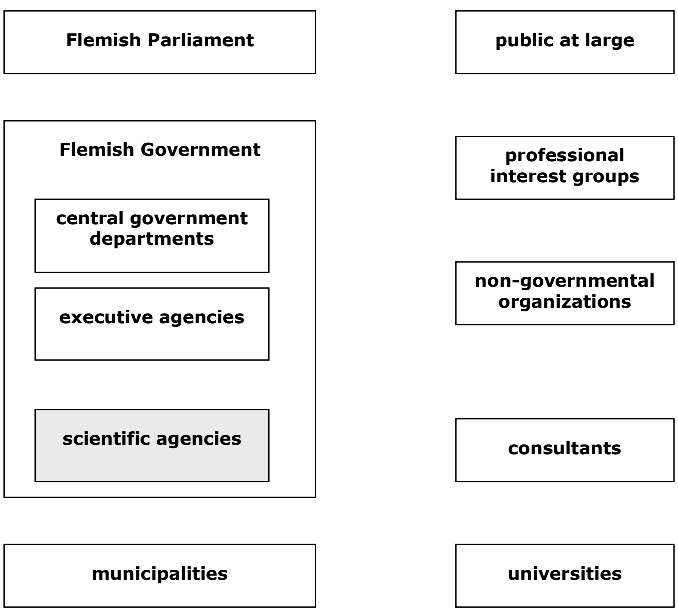


Figure 4: Agents in the social, political and administrative context of the Flemish nature policy

Political context

Political control of Flemish nature policy rests with the Flemish Government, namely the minister of Public Works, Energy, Environment and Nature. The government in turn is controlled by the Flemish Parliament that has a Committee for Energy, Environment and Nature. Since various aspects of nature and biodiversity touch upon other policy domains, also the ministers of agriculture and of spatial planning are rather often involved in decision making with regard to nature and biodiversity.

The Flemish political system is characterized by a 5-year coalition government, although ministerial portfolios tend to be reorganized at times under influence of federal political circumstances. In Flemish political culture the political parties constitute the core of political decision making. With regard to the power balance between the executive and legislative branch, the executive branch (government) is rather dominant compared to the legislative branch. As a result, the group of 'trustees' that surround the ministers in their cabinets and who often (though not always) adhere to party lines, tend to take the initiative with regard to major policy initiatives. Since 1992 the policy portfolio of environment and nature has been governed by the Christian-democratic party (CD&V), who also controlled agriculture. From 1999 until 2004 there was an intermezzo in which the green party (Groen!) controlled both portfolios.

Administrative context

The central government department of Environment and Infrastructure houses the 'Administration of Environment, Nature, Land and Water Management' that coordinates Flemish nature policy. However, the 'executive agencies', two of which are directly involved in the implementation of nature policy, do more than merely policy execution and have a rather strong autonomy in terms of policy development. Also for budget negotiations they interact directly with the ministerial cabinet, rather than with the department.

The scientific agencies engaged in nature and forestry research occupy an institutional position that puts them at arm's length from ministries and agencies, universities and consultants. Being part of the government and staffed with staff that is partly funded by the government's budget and partly by research contracts, their mission is to conduct more applied policy-oriented research than universities who typically have fundamental research as their core-activity. Their government-funded part 'protects' them to some extent from the pressures of the market, allowing them to focus on a longer time-scale than consultants, who typically require rather short-term projects that result in quick wins. The agencies' statutory legislation also grants them operational autonomy to put them at a sufficient distance from the line agencies and departments, thus safeguarding their autonomy and objectivity in the conduct of research and evaluations. The 'policy-orientation' of the scientific agencies' research is endorsed by an annual 'work plan' that is to be negotiated with the Division of Nature (central department), and approved by the minister. This combination of relative autonomy, policy-orientation, medium-term focus and continuity were elements in the decision to allocate the task of writing a 'Nature Report' to the Institute of Nature Conservation, one of the two scientific agencies active in nature and forestry research.

2.2.5 The demand-side: capturing the information needs of the policy community

Collection of policy community's information needs

This section analyses the dissemination of policy's information needs and how it affects scientists' perception of what research is necessary and feasible. As an indication of this perception we focus on the blueprint of the Nature Report, which the reporting team drafts at the start of the reporting process.

No formal or explicit listing of the policy community's information needs is made at the start of the reporting process. The reporting team however prepares a draft table of content ('blueprint') that is primarily based on four sources, two of which refer to information demands (1-2). The other two (3-4) are rather supply based.

1. Scanning of information needs formulated by international policy (e.g. Conventions), European policy (e.g. Directives) and Flemish policy (Environmental Policy Plan and Environmental Annual Programme).
2. Informal contacts with colleagues in the central departments of the ministry and executive agencies, to solicit issues and topics worth exploring and reporting on.
3. Consultation of colleagues in the scientific agencies on which topics could be included in the report.

4. The team's own appreciation of which policy initiatives in Flanders are worthwhile reporting.

This blueprint is then submitted to a steering committee that convenes two to three times per year. The steering committee is composed of representatives of the central government departments, executive agencies, and scientific agencies, universities and the largest subsidized NGO active in nature organization.

Participatory observation of this process in 2003-2004, when preparations for the Nature Report 2005 started, showed that once the blueprint is presented to the steering committee only limited alterations are made. Some of the members of the steering group do consult with the senior staff of their organization while others voice their personal views on what is policy relevant. In addition it is no exception that one quarter to one third of the members of the steering group is absent.

In summary, the reporting team is rather independent in determining the topics discussed in the report, which was one of the incentives to house the drafting of the report in a scientific agency in the first place, rather then in a central government department. However, the steering committee's active oversight in the process of capturing the information needs of the policy community is rather limited.

Since 2004 a number of measures have been taken to increase and formalize the external input in this stage of the reporting process:

1. A representative of the planning team that coordinates the Environmental Policy Plan and the Annual Environmental Programme at the administrative level joined the steering committee so as to increase the dialogue between the nature reporting process and the environmental and nature planning process.
2. The steering committee's operating regulations were altered so as to increase the incentive for regular presence.
3. An external panel of 30 people was created whose input in the drafting of the blueprint is solicited via e-mail and then forwarded to the steering committee.

The impact analysis conducted in 2003-2004 revealed four requests that were shared by many policymakers with regard to the format and style of the information reported:

1. both in Flanders as internationally there is an increasing demand for indicators to convey clear but concise messages, rather than descriptive lengthy narratives;
2. the information provided by a scientific agency should not just report the state of nature, but rather clarify underlying causes of the observed trends, and give recommendations that are of practical use to policymakers;
3. the Nature Report should not only highlight where biodiversity is declining, but should focus more on the positive effects of policy, because those sustain political action.

Based on these requests the following measures were taken with regard to the output of the reporting process (Section 2.2.7):

1. the development of a website of Nature Indicators which are updated on a six-monthly basis;
2. increased use of the DPSIR-framework (Driving force, Pressure, State, Impact, Response) to summarize the information in a cause and effect format;
3. the use of smileys to indicate where policy has met its targets, or where not.

2.2.6 The supply-side: producing and disseminating policy information

Input in the reporting process

Educational background and capacity of the reporting team

The budget base of the Nature Report consists of the personnel budget of seven research FTEs (full-time equivalents) and one administrative FTE and a biennial budget for publication expense. For the Nature Reports 1999 and 2003, the team consisted entirely of natural scientists. For Nature Report 2005, the educational background is presented in Figure 5. 86% of the Nature Reporting Team has an educational background in natural sciences (biology or (bio-)engineering), 14% in economic and policy sciences, and 0% in law sciences). Lacking a budget to outsource research or hire in more interdisciplinary expertise, the Nature Report has faced difficulties in capacity building and reporting with regard to the economic and social aspects of biodiversity.

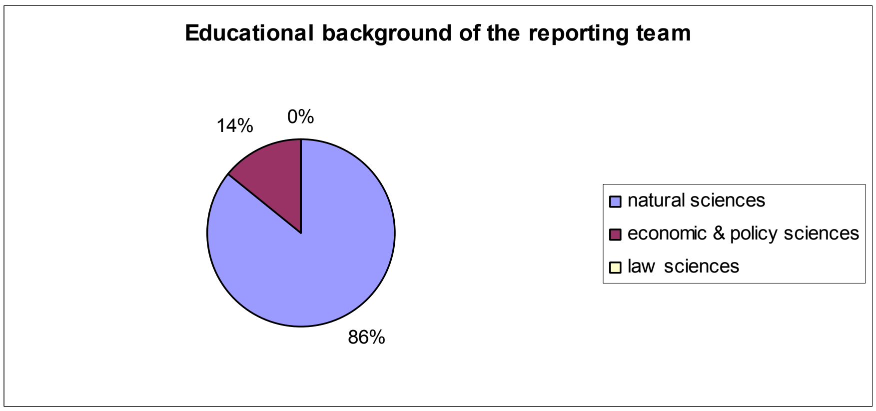


Figure 5: Educational background of the reporting team

Data availability and data-access

For the purpose of this case study no audit of the monitoring or other data collection processes was conducted. The sufficiency of monitoring evolutions of species and habitats and of evaluation of policy instruments is repeatedly mentioned in the various chapters of the Nature Report. Compared to countries like the Netherlands or the UK Flanders does not have a highly developed tradition of monitoring trends of species among naturalists. Waterfowl is an exception, with trend data going back for three decades. Second, there also is no overall monitoring programme that bundles monitoring activities of the different executive and scientific agencies and that of the NGOs, so that the monitoring capacity is rather fragmented across the policy and research community. Thirdly, the monitoring and data collection that does take place strongly reflects the educational background of the scientific agencies, which is almost exclusively composed of natural scientists. This bears on the reporting capacity with regard to interdisciplinary issues such as cost-effectiveness of policy issues, or public attitudes toward biodiversity.

The members of the reporting team do acknowledge the benefit of writing the report from within a scientific agency like the IN. It allows for flexible, frequent and informal contacts with a body of over one hundred researchers, which is believed to be much more difficult if the report were written from within a central government department.

Production of the Nature Report

This section analyses the process of (collection and) transformation of scientific data into policy information (Figure 3). This process is divided into a research and write-up stage, followed by a review stage in which there is more, and at times also more intense, interaction.

Research and write-up process

Figure 6 shows how the research and write-up stage has increasingly become an interaction between researchers of the scientific agencies, universities and policy workers. Although the participation of academics and policy workers is by and large based on a voluntary basis, the reporting team has managed to get a stable input from the academic world. Due to the lack of funding to support original research however, the report is limited to collect whatever academic research is available.

The participation of policy workers has significantly increased. This interaction is believed to be beneficial to the use of the report's information during the policy process, in that the participation by policy workers in the write-up stage increases the legitimacy. The oversight role of the reporting team and the ensuing review process are to expected to safeguard the validity of the conclusions.

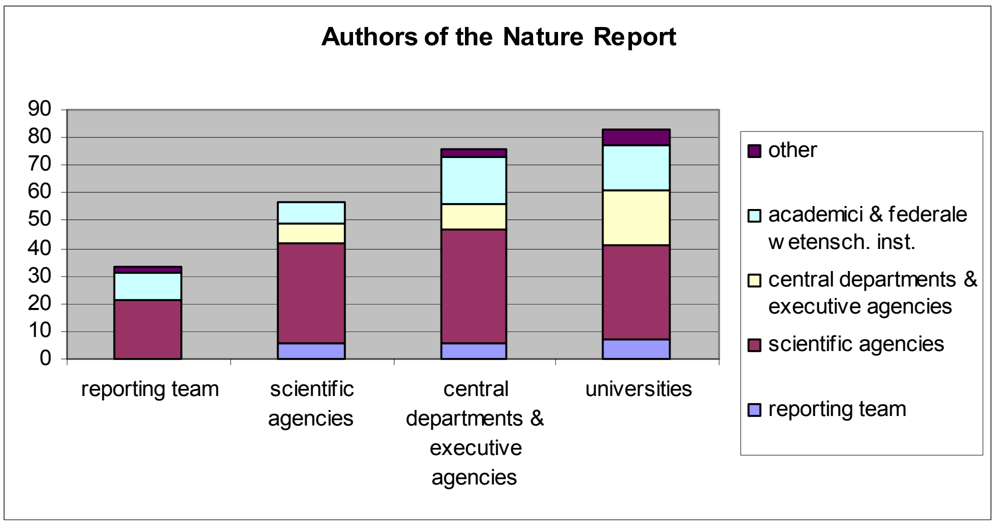


Figure 6: Science-policy interaction during the write-up of the Nature Report

The increased participation of policy workers does however entail a tension with the Nature Report's independence and objectivity. For instance, a chapter about the implementation of compensation payments to farmers has been written by a policy worker from an executive agency who coordinates the implementation. In such cases, the separation between line management and reporting, which was a fundamental reason to allocate the Nature Report to a scientific agency, rather than to the central department, is obviously challenged. It is believed however that by submitting drafts of the chapter to an open review process, in which scientists, naturalists attached to NGOs and policy workers partake, can create the transparency necessary to avoid all too subjective and biased information in the report.

Review process

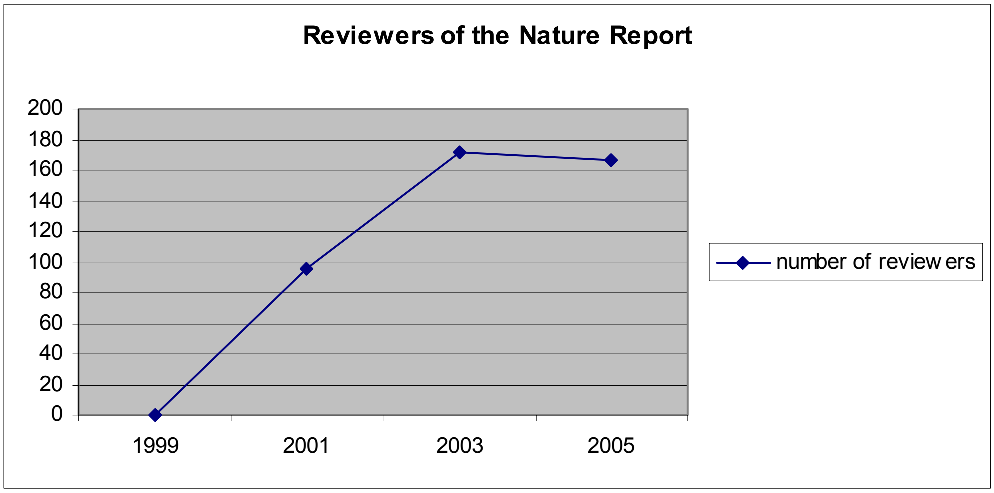


Figure 7: Participation in the review of the Nature Report

The first Nature Report 1999 was by and large an internal exercise by the scientific agency, with the participation of a handful of external academics. As of the second Nature Report a Nature Reporting team was installed to exercise a stronger control over the transformation of scientific data into policy information. The review by a large group of readers, from scientific, government and non-profit communities, was to support this control and prevent that the Nature Report's information would be biased or mono-sectoral. Building up a network has taken time, as Figure 7 shows, although the group of reviewers for the last two reports has been stable.

Interviews with policy workers from executive agencies outside of the nature protection-sector (forestry, agriculture, etc.) indicated that the Nature Report traditionally had a rather 'dark green' approach, focusing on biodiversity in a strictly biological sense and neglecting to some extent other aspects of nature like recreation and economic functions (Van Reeth, 2004b). The perception was that the review did allow for debates in which multiple stakeholders could voice their concerns and that in recent reports these concerns were more taken into account than before. The interaction and transparency among different stakeholders in the review process do bring competing values and norms to the surface. By including these debates in the production phase of the Nature Report it is believed that the final report will bear a stronger consensus among the factions for which the report is relevant.

Output of the reporting process

Nature Report and Nature Indicators in brief

The four Nature Reports have so far been quite voluminous publications of respectively 206, 323, 305 and 457 pages. The following measures were taken to make this large volume of data accessible to various users:

- a stable structure of seven parts, divided in brief chapters (4-6 pages) with a fixed format of three paragraphs (see above);
- an executive summary at the start of the report;
- the core message of each chapter in 'bullets' at the start of each chapter;
- the use of indicators and 'smileys', which are kept up-to-date on a website, to indicate progress towards policy objectives (primary target group = policy workers);

- a synthesis of the report in an illustrated brochure of 30 pages in layman's language (primary target group = public at large).

The website Nature Indicators was launched in May 2005. The website can be accessed via different search entrances that follow the structure of the Nature Report, the Environmental Policy Plan, the Annual Environmental Programme or a thematic alphabetical structure. Access via a self-defined search term is possible as well.

Format of the Nature Indicators

The indicators are presented into causal chains according to the DPSIR-framework (Figure 8). Every indicator is presented in a separate information sheet, maximum two pages, which contains:

- a graphical presentation of the indicator;
- policy target (Environmental Policy Plan, Annual Environmental Programme or other);
- trend & distance to target;
- explanation of the observed trend;
- expectation of the future evolution.

Format of the Nature Report

The Nature Report consists of seven parts, which can be linked to elements of the DPSIR-framework:

I. Species (I)
II. Biotopes (I)
III. Areas (I)
IV. Environmental themes (P-S)
V. Sustainable use (D)
VI. Protection & Restoration (R)
VII. Society (D/R)

The link between DPSIR and the Report structure is illustrated in Figure 8.

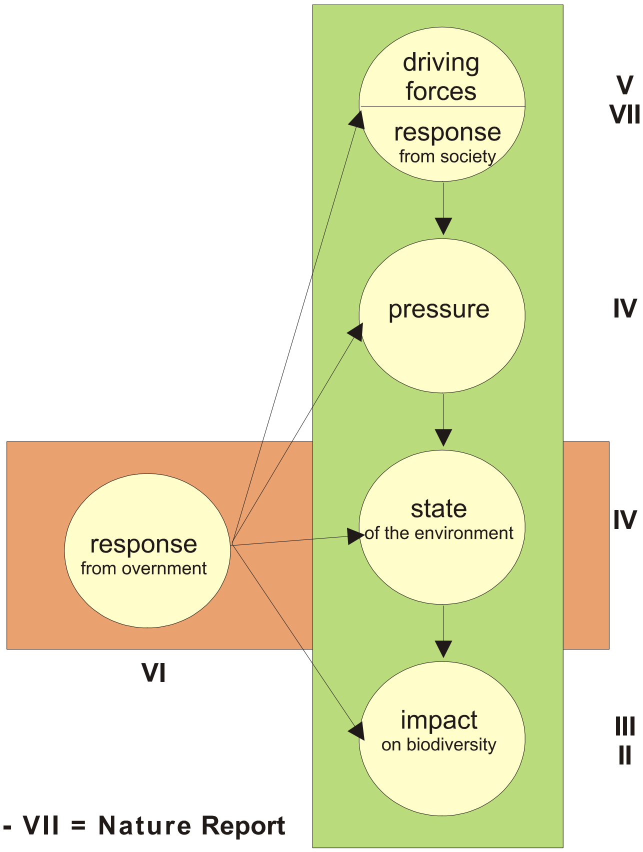


Figure 8: DPSIR and the Nature Report

Every part contains chapters which follow a fixed format:

- State of nature: A description of the state of nature & biodiversity with regard to the discussed topic (e.g. dunes, wetlands, farmland, ecological networks …)
- Policy: A description of the distance-to-target, and if possible an evaluation of the causes and consequences of observed policy implementation
- Knowledge: A listing of the gaps in knowledge that exist with regard to the topic

The Nature Report does not strictly follow the format structure of the Nature Policy Plan, or any other existing format of the government organization or the budget programme. As such, there is no 1:1-relationship between the sections and chapters of the report and existing policy formats. In the policy paragraph however there is an explicit link the objectives mentioned in the Environmental Policy Plan and the Annual Environmental Programme.

Dissemination of the reporting products

The Nature Report in the Policy Cycle

The Nature Report is written on a biennial basis, in line with the environmental planning cycle which consists of a five-yearly environmental policy plan, an annual environmental programme and a biennial environmental report (DABM 1995, Section 2.1.2). A separate Nature Report was mandated by new legislation in 1997 (Natuurdecreet 1997, Section 10, §1).

This new legislation also mandated a five-yearly ‘nature policy plan’, which is produced as an integral, but distinctly visible chapter of the Environmental Policy Plan (Natuurdecreet 1997, Section 11).

Although the Environmental Report was written on an annual basis since 1998, the Nature Report has continued its biennial frequency. During recent discussion in the Steering Committee that oversees the reporting process biennial reporting was maintained based on the following considerations:

1. A report with a five-year frequency, that would thus systematically ‘feed’ into a new policy plan, was not considered to be sufficiently frequent to penetrate the policy community.
2. A report with an annual frequency was not considered to be feasible, due to a lack of data on this short term.
3. The report’s budget basis consists of a personnel budget for seven FTEs who work at the IN. Since there is no budget to hire external expertise the authors need to conduct research to underpin the report as well, making an annual reporting frequency not feasible.
4. The policy plan and annual programme have in the past years not really been linked to feed into the budget cycle, nor was it synchronized with the five-yearly electoral cycle. As a result it has suffered with a lack of ‘political ownership’, resulting in irregularities in the frequency of the planning and programming process. Because these irregularities in frequency and lack of ownership the formal plan and programme cycle was not considered a ‘safe haven’ to attach the Nature Report to.
5. Apart from the above pragmatic, budgetary and tactical considerations, the biennial process also reflects the IN’s intention of autonomy and intellectual independence, and the desire of the authors to be ‘researchers’ and not just ‘reporters’.

As a result, the biennial report is considered to be a pragmatic solution to the above considerations, although a tension is recognized because of this non-alignment in the connectivity between supply and demand of information.

The Nature Indicators in the policy cycle

Even though an annual Nature Report was not deemed feasible, the annual dissemination of newly available information was considered both useful and feasible by the researchers. The website Nature Indicators was created with this purpose, to provide the policy community, but also NGOs and all interested citizens, with new information that would become available in the two-year period between the presentation of the Nature Report. The choice was for a six-monthly update:

- One update comes in April, when administrations start to collect information for the development of a new budget proposal and a new Annual Environmental Programme.
- The second update is October, around the start of the new political year and just prior to the budget negotiations in the Parliament.

In this way the planning and budgeting process should be provided with the most recent data and information available.

2.2.7 Effectiveness of the science-policy interface

How to assess effectiveness of a science-policy interface?

At the heart of the science-policy interface as depicted in Figure 3 is the mutual influencing of scientists’ and policy workers’ awareness and behaviour. Policy workers are facing questions which they hope scientists will focus on in their research to come up with useful answers. Similarly scientists convey knowledge and information to researchers of which they hope that it will affect perception and inspire them to act upon it. An ‘effective science-policy’ interface would therefore be one where this mutual interaction is taking place and where biodiversity is benefiting from it.

For the Flemish Nature Report there are no data available that unambiguously show to what extent this mutual interaction is taking place. As such the question of ‘How effective is the Nature Report as a science-policy interface’ cannot be answered at this time.

But even with evidence about the Nature Report’s conclusions or recommendations being used in decision making, it would remain debatable whether the Nature Report actually caused such decisions, or whether it was rather used to support decisions that were taken for other reasons. In complex issues affecting environmental, economic and other interests it is not uncommon to work out a compromise and come up later with a plausible explanation to legitimize it. Similarly, the fact that information from the report is not reflected in the outcome of a political decision does not justify the conclusion that it was never considered. It might just as well be that the ecological considerations voiced in the report were overruled by budgetary or other interests. Hence, analysing policy outcomes as an indicator of science-policy interaction does not seem to be straightforward.

An alternative, albeit simplifying approach, to assess the effectiveness of the Nature Report as a science-policy interface would be to evaluate the readers’ perception of the report’s clarity and usefulness, and to assess the writers’ knowledge of the information needs of the policy community. Of the latter no data were collected. The remainder of this section deals with the perception of the report within the policy community.

Perception of the Nature Report within the policy community

To that purpose the impact analysis of the Nature Report, conducted in 2003-2004, included a survey. The respondents were asked to qualify themselves as policy worker, scientist or member of an NGO. In terms of accessibility of the structure, clarity of the content and usefulness respondents with a research profile assessed the report higher than those with a policy profile (Van Reeth, 2004a).

The findings of the survey were researched more in-depth through 50 interviews with representatives from the different user profiles. A qualitative analysis of the interview transcripts suggested that the policy community is a house with many rooms, in which information needs and perception may vary greatly (Van Reeth, 2004a). Also the way in which the Nature Report is consulted varies considerably even among policy workers. Professionals working in a line agency typically consult only a few of the 40 chapters, namely those which are most relevant for their own job. Civil servants involved in the planning process consult the report more horizontally, to serve as a background document for the drafting of their next plan. Cabinet staff scans the report also more horizontally, though more superficially, due to a lack of time and over-supply of documents to read. They focus especially on evidence of positive results, which may be used as ammunition in political debates with other cabinets. While for the latter, the Nature Report 2003 with its 350 pages contained too much information, professionals interested to learn more about the specifics of a certain policy instrument found the information in ‘their chapters’ to be too general and too superficial.

In order to make the report more accessible ‘at a glance’ to policy workers some amendments in the format were implemented:

1. At the start of the report all indicators are listed, per chapter, with smileys that indicate whether for that indicator the government is on its way to achieve the set goal or not;
2. At the start of each chapter the headlines of that chapter are summarized in three to five ‘bullets’ that allow skimming several chapters in a short time;
3. The bullet-summaries were phrased in a standardized ‘if… then…’ format to outline government’s role and responsibility with regard to the reported phenomenon;
4. The lay-out was professionalized;
5. The indicators were put on a website, where they can be searched via listings that copied from existing plan and programme formats.

Factors affecting the effectiveness of the science-policy interface

Reviewing the ‘components’ of the science-policy interface analysed above, the following elements appear to be having an influence on how effective the Nature Report is as a science-policy interface.

Communication of the policy community’s information needs

At the start of the reporting process there should be an agreed procedure through which policy workers’ information needs are made clear to the researchers. At the same time, the researcher ought to keep a sufficient amount of independence to include issues in the report which might have escaped policy workers attention but which are deemed essential to maintain biodiversity.

Budget / efficiency / quality of the production of information

The quality of the report is undoubtedly related to the quantity and quality of the resources and the process (blueprinting, write-up and review). A scientific input that meets the information needs of the policy community, including interdisciplinary research and interaction with policy workers whose work area is being reported on, are useful to safeguard not only the validity, but also the legitimacy and functionality of the report.

Budget / efficiency / quality of the dissemination of information

Nature reporting does not stop with the delivery of the book, which is the report. In fact, that is the stage where the reporting actually begins. Since one report can hardly meet the specific information requirements of all agencies or sectors involved in nature and biodiversity policy, targeted presentations are helpful in making the report’s content known within the policy community.

Receptiveness of the administrative context

In a policy arena, including the administrative seats that surround it, the use of information is not a neutral process. Even when layered in a language of scientific expertise and objectivity, scientific reporting about the state of nature and evolution of biodiversity touches the interests, stakes and incomes of many. In such a context, information is a source of power, and therefore a valued commodity. Especially the authority to evaluate policy and report on the distance-to-target has been a source of debate among the central department, executive agencies and scientific agencies, with each of these administrative agents using arguments why they are in the best position to report on such matters. During interviews with staff of the organizational unit that controls the environmental planning and programming process chapters of the nature report were criticized not as much for being substandard or inaccurate, but rather for being in the report. Some staff adhered to a strict segregation of reporting on the state of biodiversity being a core task of the scientific agency, and reporting about policy instruments as being a matter of the department.

This debate is to be situated in a governmental reform that was announced in February 2000 but still has not been completed. The ensuing ambiguity about allocation of tasks among departments and agencies, and the position of scientific agencies, has hindered capacity building with regard to policy evaluation and the development of a monitoring and evaluation programme. The perception of the Nature Report and Nature Indicators are also affected by this ongoing organizational struggle. The new administrative units are intended to start operation, with new top managers in 2006.

Receptiveness of the political context

In addition to organizational politics also party politics affect the discourse that dominates the policy community. The Flemish elections of 2004 saw a shift in the coalition of the Flemish government where the portfolio of Environment and Nature was passed from the Green Party to the Christian-democrats. A new policy course, shifting the accent from buying and protecting land to creating incentives for farmers and other sectors on a contractual basis, has increased the demand for research and reporting on the interdependence between nature, agriculture, and other forms of land use.

Influence of social and ecological variables

No empirical data were collected on the impact of sociological and ecological phenomena on the effectiveness of the Nature Report as a science-policy interface. The occurrence of crisis situations such as flash floods or acute pollution of rivers affects the way in which information on the state of nature is received, which my vary from 'exaggerated' and 'overly alarming' to 'right to the point'. This is felt more in interaction with media who may in turn affect the information that politicians request.

2.2.8 Conclusion

It would be beyond the scope of this case study to go into all the details regarding the information needs of the different target groups in- or outside the policy community. It seems however fair to propose that in terms of devising effective science-policy interfaces 'one size does not fit all'. Faced with an audience of different user needs, differentiation of the information products and processes of interaction appears a plausible conclusion. With regard to the Nature Report, three types of output are focused upon:

1. a website of Nature Indicators, that is updated on a half-yearly basis;
2. a Nature Report that is more voluminous but consists of several chapters that can be read independently;
3. targeted presentations by the members of the reporting team, attuned to the specific needs of the target group or policy sector (e.g. agriculture, spatial planning, water management, …).

Secondly, differentiating and attuning the 'output' of the report to the user needs of the target group is a necessary but insufficient condition to achieve effective science-policy interaction. Participation in determining the report's table of contents, and being given a chance to review and debate draft versions appear useful procedures to increase the report's legitimacy ('Is it perceived as fair?') and functionality ('Is it perceived useful?'). Transparency during this review is essential to maintain objectivity and validity of the process.

Finally, the factors affecting the effectiveness of the science-policy interface go beyond those of the product and process characteristics. Information needs, perception and satisfaction may vary according to personal and political preferences. This would render any 'optimal solution' for science-policy interaction a status which should be called 'temporary' at best. A shift in personnel or in the composition of the political coalition may alter the context sufficiently to make the science-policy interface less effective.

References

DABM: *Decreet van 5 april houdende algemene bepalingen inzake milieubeleid*, B.S. 3 juni 1995

Dumortier M., L. De Bruyn, J. Peymen, A. Schneiders, T. Van Daele, G. Weyembergh & E. Kuijken (2003) *Natuurrapport 2003. Toestand van de natuur in Vlaanderen: cijfers voor het beleid.* Announcement by the Institute of Nature Conservation no. 21. Brussels

Dumortier M., L. De Bruyn, M. Hens, J. Peymen, A. Schneiders, T. Van Daele, G. Weyembergh & E. Kuijken (2003) *Natuurrapport 2005. Toestand van de natuur in Vlaanderen: cijfers voor het beleid.* Announcement by the Institute of Nature Conservation no. 24. Brussels

Natuurdecreet: *Decreet van 21 oktober 1997 betreffende het natuurbehoud en het natuurlijk milieu, B.S. 10 januari 1998, gewijzigd door het decreet van 19 juli 2002.* B.S. 31 augustus 2002.

Natuurindicatoren, 2005. Instituut of Nature Conservation. Brussel. www.natuurindicatoren.be (version of 17-05-2005)

Van Reeth, W. (2002) *The bearable lightness of budgeting. The uneven implementation of performance oriented budget reform.* doctoral dissertation, Leuven: Public Management Institute, K.U.Leuven

Van Reeth, W. (2004a) *Impactanalyse Natuurrapport. Tussentijds rapport: eerste conclusies en scenario's.* Brussels: Institute of Nature Conservation, internal report

Van Reeth, W. (2004b) *Impactanalyse Natuurrapport. Eindrapport: conclusies van de interviews en aanbevelingen.* Brussels: Institute of Nature Conservation, internal report

2.3 A forestry example: the case of the Northern spotted owl – Northwest coast of the United States

Frédéric Gosselin, Institute for Agricultural and Environmental Engineering Research, France

2.3.1 Introduction

The case of the Northern spotted owl (*Strix occidentalis caurina*) is worth analysing in this report, even if this is an American case. It is an emblematic example of the difficulties of conserving biodiversity while cutting forests for timber, with a strong stress on research. The main characteristics of the policy-science interfaces in this case are:

(i) a variety of such interfaces, going from mainly scientific reports designed by task forces of scientists that had for some of them a legal value, to suit laws in which scientists were involved, and to the 1993 FEMAT meeting (Forest Ecosystem Management Assessment Team) in which managers, scientists and politicians – including the then President Clinton – met;

(ii) a case in which ecological research has been correctly funded, and is very active. This is a good case of what can be expected when ecological research is active.

The Northern spotted owl (NSO) is a subspecies of owl that lives in forests of the Pacific Northwest states of the USA (California, Oregon and Washington) and in British Columbia in Canada.

It has slowly become by the beginning of the 1990's the symbol of the threatened old-growth forests of the Coastal area in this region, for two main reasons: (i) many studies showed that the spotted owl selected mature and old-growth forests in the landscape and (ii) the territory of one pair of spotted owl is so huge (up to 1,000 ha) that managing populations of owls has a great impact on the protection of old-growth forests. The aim of this paper is to present what went on about the Northern spotted owl – both on a factual and a legal basis – till around 1994[1].

2.3.2 The administrative setting concerning federal forests

Federal forests are managed by 'Agencies' that depend on the federal government. The federal government has the executive power and is roughly divided into the head (the president) and the members (the departments). Each department is headed by a secretary. Three federal administrations mainly share the mission of directly managing federal forests: the U.S. Forest Service (FS, depending on the Department of Agriculture), the U.S. Bureau of Land Management (BLM) and the U.S. National Park Service (NPS), both belonging to the Department of the Interior.

The FS (**Forest Service**) mainly manages federal forests called National Forests, according to the National Forest Management Act. The mission of the FS is very broad: protecting or enhancing wildlife, promoting water quality, growing timber and favouring recreation. Apart from the national headquarters, the FS is administratively divided in the FS system, which manages FS lands and is divided into Regions (Region 6 including Oregon and Washington and Region 5 California), and the FS research. There is also a branch of the FS devoted to the advising of state and private owners.

The BLM (**Bureau of Land Management**) manages federal 'districts' which are not necessarily forested; its main missions are to allow grazing, to produce timber and to extract mineral resources; but some forests also have an emphasis on recreation. The priority of management depends on the region considered. Some of the

---

[1] For further information, the reader is referred to Thomas *et al.* (1993, pp. 32-47), Yaffee (1994) and Gosselin (1996). The interested reader can also find some useful information on the following website: http://pnwin.nbii.gov/nwfp.html .

forests managed by the BLM were historically owned by private owners or communities and are used to finance local communities.

The NPS (**National Park Service**) manages, according to relatively strict rules, National Parks, which are preserved areas.

The U.S. **Fish and Wildlife Service** (FWS), depending on the Department of the Interior, is also a federal executive administration of importance, although it does not manage directly much land. Its main role in the case we study is to apply the Federal Endangered Species Act: the FWS has authority for listed species both on federal and on non federal lands.

The **Environmental Protection Agency** was established in 1970; it first focused on human health risks. But it is now evolving towards ecological risks too.

Federal agencies all do or finance some research. The two main agencies involved in research are the FS and the FWS. The National Science Foundation is also involved in research concerning forested ecosystems.

Congress and the judicial power are also concerned by the case we study. There is no direct control of any federal agency on management of non-federal forests and there are no federal laws that design how such management should be done.

2.3.3 History of the forests and their management

In the 19th century the extensive forests of the region were systematically clear-cut and burned without replanting to make way for agriculture. At that time, some 'federal' lands among the most productive were allocated to settlers and became privately owned. Extraction of timber for commercial purposes began to increase in the late 1800's and early 1900's. The 19th century 'cut out and get out' era of migratory forest harvesting in the United States spawned a political reaction that culminated in a reform movement – conservation. To stop these practices, the Congress authorized the President in 1891 to designate forest reserves. In 1905, these reserves were transferred to the Bureau of Forestry of the Department of Agriculture, the central argument being that it would make reserves profitable, which would yield more liveable towns, stable logging operations, and gains to society. The new National Forests contributed in 1910 to 1.1 % of the Pacific Coast timber production. In 1950, this proportion reached 8 %.

The first reports that worried about rates of harvesting were made around 1920. The Copeland report of 1933 found that 'practically all the major problems of American Forestry center in, or have grown out of, private ownership.' This report, made in a period when harvests were mainly made on private lands, recommended federal acquisition of 91.5 million ha of private lands over 20 years and the federal regulation of private forestry. But Congress voted none of these recommendations. [2]

The Forest Service, that was a very small agency with a low rate of harvesting[3] until around 1950, increased its rate of timber production, partly to fill gaps in timber harvest on private lands [4]. The focus of the Forest Service was no longer the 'sustainability' of the system but answering private industry's needs. This resulted in debates in the 1950's and 1960's about 'the increasing diversity of social values versus the strong commitment of the Forest Service to intensive timber management' and in a series of lawsuits (Forest Ecosystem Management Assessment Team, 1993).

---

[2] The Joint Committee Report of 1941, and the 1948 Forest Reappraisal report.

[3] Indeed, 'up to the 1950's, the Forest Service generally practiced long-rotation forestry with a typical rotation of 120 year or more... The reigning view was that the 'pre-European settlement' forests should be restored... Restoring this normative image of the ideal forest could easily ignore the existing uses and values of local people and the American public.' (Forest Ecosystem Management Assessment Team, 1993, p.VII-16).

[4] Due to the very high material production during World War II, which 'exhausted the timber supply on many private industrial lands', 'for the first time, timber harvests on the federal forests began to rise... In pursuit of increased per-acre yields, the Forest Service dropped its pursuit of 'pre-European settlement' forests... Thus, the agency moved to 'liquidate the old growth' as rapidly as possible... Nevertheless, the Forest Service could not produce as much timber as its proportional land base might suggest because of the low biological potential to grow timber on most of the lands.' This resulted in the predominance of timber values over recreation and wilderness ones. (Forest Ecosystem Management Assessment Team, 1993, p.VII-17).

1972 was a key date for the old-growth forest because a head of the Administration recognized for the first time that there would be a conflict between old-growth forest persistence and wildlife protection on one side and timber harvesting on the other side. In 1973, Congress passed the Endangered Species Act and a task force, composed of qualified specialists, was appointed by the Oregon Game Commission[5] to address endangered species management in Oregon.

In 1974, Congress adopted the Renewable Land and Rangeland Resources Planning Act (RLRRPA). It required the development of national thinking and national planning on the federal lands, including the Forest Service. As an amendment of the RLRRPA in 1976, Congress adopted the National Forest Management Act.

In 1976 too, the Oregon Endangered Species Task Force proposed the first owl plan. In 1977, both the Forest Service and the Department of Interior's Bureau of Land Management (BLM) agreed with this plan and protected respectively 290 and 90 pairs of Northern spotted owls: each of these pairs was to have a core area of at least 121 ha of old-growth forest and at least 50% of the remaining 365 ha devoted to the pair were to be in forest older than 30 years.

A struggle about old-growth forest broke out between conservation groups and the Forest Service in October 1980 when the plan of the Oregon Task Force was also applied by the FS to National Forests in Washington State. In 1981, the Task Force plan was revisited because of new telemetry information. It created much more constraints than before since the new recommendation was that 405 ha of old-growth forest be maintained for each pair within a 2.4 km radius of the nest, together with 121 ha near the nest.

In 1981 the first status review of the Northern spotted owl was done by the Fish and Wildlife Service. The listing of the Northern spotted owl was denied by the FWS, although the report was not that confident in the future of the subspecies[6]. In 1982, a research programme was initiated by the FS, with the contribution of the BLM, about old-growth forest wildlife and especially the Northern spotted owl. This programme is still going on and has generated in the past a lot of the results known about the Northern spotted owl and old-growth forest species.

In 1984 the Forest Service prepared its Regional Guide for its regions but conservation groups appealed it because it did not follow the requirements of National Environment Policy Act. This appeal was finally accepted and the FS had to prepare a supplemental environmental impact statement.

In 1982, the Northwest timber industry is flattened by the worst turndown since the Great Depression (Anonymous, 1990); the result is a decrease of 17,000 jobs in forest products industry in Washington State from 1978 to 1986.

In 1984, the society of American Foresters recognized that there are no silvicultural techniques that allowed maintaining old-growth characteristics. In 1986, private industries become involved in research on the Northern spotted owl. In 1987, the FS Research and Regions initiated the Northern spotted owl research, development and application programme, meant to 'accelerate and coordinate all Forest Service activities concerned with owl habitat and population inventory, monitoring and research.'

Also in 1987 the second petition to list the Northern spotted owl was rejected by the FWS. Environmental groups appealed this decision to the Seattle Federal Court in 1988. The Court determined that the decision not to list the Northern spotted owl was not biologically based and ordered the FWS to re-address the listing decision.

In 1988, the Spotted Owl Subcommittee proposed new guidelines for the whole range of the Northern spotted owl. Those guidelines were tougher than the previous ones[7]. No agency implemented these guidelines. An interagency Agreement was also achieved in 1988 between Bureau of Land Management, Forest Service, Fish and Wildlife Service and NPS. It was used to set up in 1989 the Interagency Spotted Owl Scientific

---

[5] depending on the State of Oregon.

[6] This report stated '... the owl's dependence on large areas of old-growth coniferous forest make them extremely vulnerable. If current trends in old-growth timber harvest continue, the Northern Spotted Owl could become endangered in a relatively short time.'

[7] e.g., protect larger population centers, protect all remaining areas of special concern (as the Oregon Coast Range), regenerate habitat in problematic areas.

Committee, known as the ISC, charged by Congress to ‘develop a scientifically credible conservation strategy for the Northern Spotted Owl.’

In late 1988, the FS published its final supplement to the Environmental Impact Statement. From 405 to 1,215 ha of old-growth were to be protected within from 2.4 to 3.4 km of the core area of every Northern spotted owl territory. The distance between these areas – called SOHAs for Spotted Owl Habitat Areas –, which were generally grouped by 2 or 3, was to be less than 9.7 to 19.3 km.

2.3.4 Injunction on timber sales and the search for solutions outside the ESA

In 1989 and 1991, environmental organizations obtained injunction on all FS timber sales containing suitable habitat because the FS directives violated laws, especially the NFMA.[8]

In 1989, as the situation was blocked because of the many injunctions obtained by conservationists, a compromise was found between conservationists and the FS and BLM for the fiscal year 1990. The EIS of the FS and supplemental plans of the BLM were declared sufficient to prepare timber sales for 1990 in exchange of more owl protection.

In April 1990, the Interagency Spotted Owl Scientific Committee (ISC) report was published. It relied on a review and synthesis of all the current documents, including unpublished scientific work. Its recommendations included the creation of Habitat Conservation Areas (HCAs) containing around 20 pairs of Northern spotted owl, distant of 19.3 km from each other and a matrix that would be managed with rotations of 70 to 100 years. This would result in the reservation of 2.35 million ha not already preserved, and would involve an expected decrease of the federal harvest of around 50% when compared with the levels of the 1980's. On September 21, 1990, a task force appointed by the Bush administration to find alternatives at lower costs to the ISC strategy, issued a press release according to which the FS would operate in a manner ‘not inconsistent with’ the ISC strategy. The FS would later accept to apply the ISC strategy as an interim guideline. The BLM refused to apply the ISC strategy; instead, the BLM would proceed with timber sales under the ‘Jamison’ strategy.

The owl is listed under the ESA

In June 1990, the FWS decided to list the NSO as threatened throughout its range. The key points for this listing were inadequate regulations, decline of habitat and decline of the population.

On May 7, 1991, the FS is required by Court to prepare an EIS that would comply with both NFMA and ESA, within 10 months and in the meantime any timber sale in owl habitat within National Forests is forbidden. In 1991, the Endangered Species Committee was consulted because of a disagreement between the FWS and the BLM on 44 planned sales. BLM asked for exemption from the ESA. In 1992, the Endangered Species Committee agreed for 13 of these sales, in exchange of the BLM's promise to implement the recovery plan as soon as possible. But the Clinton Administration later declined these exemptions.

In 1991, critical habitat was designated by the FWS. ‘The Fish and Wildlife Service initially proposed 4.7 million ha of critical habitat. After a public comment period, this total was reduced to 3.3 million ha. After further public comment, the Fish and Wildlife Service's final determination of critical habitat designated 2.8 million ha arranged to minimize impacts on private lands.’ The same year, the report of the Scientific Panel on Late-Successional Forest Ecosystems, composed of four scientists, was published.

On May 14, 1992, the Draft Recovery Plan for the Northern spotted owl was published. Non-biologists were in the majority in the recovery team; however, the strategy closely resembled the ISC one. The Recovery Plan has not been adopted yet.

Shortly after, the Secretary of the Interior released an Administration sponsored ‘Owl Preservation Plan’. ‘Their effort, dubbed by some as the ‘Extinction Plan’, mimicked the Draft Recovery Plan but severed about 50 % of the range of the Northern spotted owl’. Secretary Lujan recognized that the institution of this plan would require changes in both the ESA and NFMA.

---

[8] See judge Dwyer's opinion further.

At the beginning of 1992, ‘all BLM timber sales in spotted owl habitat were shut down by Federal District Court for failure by BLM to prepare an EIS on the impacts of old-growth logging on spotted owl welfare’ (Thomas & Verner, 1992).

In 1992, the FS EIS, based on the ISC strategy, was submitted and rejected once more and timber sales on FS lands were enjoined until a correct impact statement is done. Judge Dwyer ‘ruled that this plan carried significant and unacknowledged risks to the owl, and also that the Forest Service had neglected to consider the other species inhabiting old-growth forests’. ‘Timber interests, already hostile to the Thomas[9] Strategy, were outraged by Dwyer's rulings. Their calls for congressional intervention and modification of the Endangered Species Act intensified. Conservation biologists who participated in or supported the Thomas (ISC) Strategy also questioned the 'extremism' of the environmentalist litigants’. The same year, the FWS was enjoined to prepare an EIS about owl's critical habitat and the FS formally adopted the ISC strategy (Thomas & Verner, 1992).

2.3.5 The Forest Ecosystem Management Assessment Team and the Northwest Forest Plan

In April 1993, the Forest Conference was organized in Portland by the new Administration. As a result of promises made to timber workers and conservationists during the Presidential campaign, President Clinton asked federal and state scientists to meet and propose options that could solve the NSO issue, considering not only the Northern spotted owl, but also other species depending on the forest and socio-economic considerations. As a result, in July, the report of the FEMAT, the team entitled by the new Administration to propose new options, became public.

An EIS (Environmental Impact Statement) concerning the option selected by Clinton administration (option 9) was drafted and 105,000 comments about it were received. This EIS was adopted in February 1994, which resulted in what was called the Northwest Forest Plan[10]. This Plan mostly concerned the federal forests in the Northern spotted owl range. The main decisions made in this plan were:

(i) to transform most of the federal forests into different kinds of reserves: riparian reserves which are mostly bands of variable width left untouched to protect riparian ecosystems; and late-successional reserves, whose individual size can be very big (serveral tens to hundreds thousand ha), whose aim is to allow the continued existence of old-growth forests, for the numerous species believed to be closely associated with late-successional forests in the area (they are 1 098 – excluding arthropods –[11], among which the northern spotted owl and the marbled murrelet (*Brachyramphus marmoratus*), both listed under the ESA). Overall, 77% of the forested federal land base was included in reserves...

(ii) to manage differently the remaining land, called matrix, with a great emphasis on minimum rotation duration, and on retention of trees during final cuts: 15% of the trees are to be retained during final cuts, 2/3 of which being in aggregates of at least 0.2 ha; snags were also to be preserved;

(iii) to try new ways of managing forests in about 5% of the federal land base in 10 Adaptive Management Areas (AMAs); the aim of these areas were "to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives" [12]. While points (i) and (ii) above were mostly prescriptive and targeting short-term ecological, legal and social objectives, these AMAs had the aim of helping the long-term viability of the plan through development of knowledge and testing new ways of managing the land both in ecological and socio-economic terms. We will briefly discuss the outcomes of this process in section 2.3.7.

---

[9] [i.e., the ISC]

[10] For further information, see http://pnwin.nbii.gov/nwfp.html and Tuchmann *et al.* (1996)

[11] according to Forest Ecosystem Management Assessment Team (1993) in Gray (2000).

[12] Record of decision (ROD)ROD (1994).

2.3.6 New research results on the northern spotted owl

Recently, ongoing research on the population biology and demography of the northern spotted owl revealed surprisingly new results on the viability of this subspecies in various types of habitats[13]. The main finding in terms of habitat is that, at least in the southern part of its range populations of northern spotted owls are viable only if they live in territories that mix old-growth or late-seral forests with younger forests. The most obvious explanation of this result would be that the main prey of the spotted owl in this region the dusky-footed woodrat (*Neotoma fuscipes*) occupies edges either between old forests and young forests or young forests.

The management implications of these findings are important: they show that the stress in the Northwest Forest Plan on big reserves of late-successional forests is suboptimal — at least in the southern part of the range – compared to a strategy that would have mixed – at the scale of tens to hundreds of hectares – managed forests with old-growth and late-successional reserves – a strategy rather close to the original SOHAs.

Finally, new demographic analyses of the NSO show that its demographic decline is still continuing, particularly in the North of its range[14].

2.3.7 Science-policy interfaces in the case of the spotted owl

Indirect interactions between science and policy are very important

The relationships between science and policy in the case of the spotted owl included many top-down and bottom-up interactions – where policy is at the top and science at the bottom –, which cannot really be defined as interfaces; top-down actions included the funding and coordination of numerous research projects by e.g. the Forest Service; bottom-up ones included the effects of the publication of scientific results and analyses, which made decision makers shift management plans (e.g. radio-telemetry data on the use of habitat by owls in the beginning of the 1980's; demographic model results that promoted clumped reserves instead of nest site by nest site management). These unidirectional 'actions' were of primary importance to the evolution of the issue, even if these actions were mostly indirect: at some times, politicians did not hear scientists' messages about the unsustainability of forest logging, or the persistence of old-growth forests; but the public debate made use of these arguments and made politicians or managers shift, either by agreement or through lawsuits.

Laws that involve science are crucial

These indirect interactions of policy and science were made possible by the laws – especially federal laws as ESA, NEPA, NFMA – that gave a great importance to the scientific soundness of decisions. Before these laws were taken mostly in the 1970's, there were several cases of expert panels or scientific task forces alarming politicians on the long-term impacts of the continuation of management. These were apparently not really heard, until laws constrained management plans to be scientifically sound. I do not have enough information to say if specific science/policy interfaces worked to write these laws. But what is clear in this case is that the requirement of non-contradiction of political decisions and management plans with scientific results implied very strong constraints on the possible decisions taken. This renders every management plan that is not scientifically credible a plan that is not legally acceptable[15]. These laws are therefore strong promoters of the interaction of science and policy, or more exactly of taking into account scientific knowledge into political decisions.

Parts of these laws – especially the NFMA – have recently been changed. According to environmentalist organisations, this change will make the NFMA less stringent on biodiversity objectives, on public

---

[13] Franklin *et al.* (2000) and Olson *et al.* (2004). See also the comments on the first study in Lindenmayer & Franklin (2002, p. 212).

[14] Cf. http://www.reo.gov/monitoring/trends/Compiled%20Report%20091404.pdf .

[15] cf. Yaffee (1994) in Lindenmayer et Franklin (2002)

involvement according to NEPA, and on the taking into account of results from science[16]. If these evolutions persist, it is possible that the involvement of science into policy concerning federal forests will shrink in the near future in the USA.

What about real interfaces? Stronger interactions between science and policy

Closer to policy-science interfaces, although mostly in the short run, were the various committees and task forces that were created. These committees generally incorporated mainly scientists and therefore did not really serve as interfaces. However, they produced proposals, management plans and guidelines that generally took account of the state of the knowledge, and served as a basis to public debate. Actually, these recommendations were not always adopted because (i) laws were not completely respected (e.g. the ISC report 'countered' by the listing of the owl under the ESA); (ii) consensus and political will were not strong enough (e.g. the Draft Recovery plan on the Northern Spotted Owl not being adopted); or (iii) the taking into account of scientific knowledge was not strong enough, or knowledge had evolved too much by the time the report was published.

However, a committee that seems to have had a long-term impact on management is the FEMAT; the reasons why it was more successful than the others – apart possibly from its multi-disciplinarity, the involvement of many scientists, and its global scientific non-unsoundness – is simply to my point of view because of the political willingness of the Clinton administration: indeed, the objectives for the work of this team were rather clear and the conclusions of the team were afterwards applied by the Administration. Also, this process helped to recognize the political nature of the problem, as well as the different value systems beneath it. Indeed, according to the social team of the FEMAT, one of the basic reasons of the spotted owl problem is our inability to recognize political issues and values and our will to hide them behind pseudo-scientific methods [17]. This particularly resulted in a management envisioned only through the extraction paradigm between say 1950 and 1980, and in our inability to take into account 'non-quantitative' values of forest. The FEMAT and the subsequent Northwest Forest Plan helped in correcting it, with maybe too much a stress on conservation that was linked to scientific non-criticability in ecological terms. The FEMAT however incorporated in the plan a process to correct this 'bias', with the development of Adaptive Management.

Are weak interactions between science and policy more useful than strong ones?

Adaptive management is, for part of it, an effort to integrate better science into management. Although the definition of adaptive management is in itself a problem (cf. following), let us adopt the following definition:

> 'An approach to managing natural systems that builds on learning –based on common sense, experience, experimenting, and monitoring– by adjusting practices based on what was learned' (Bormann *et al.,* 1999).

In this respect, it can both be viewed as an attempt to make scientists at least produce useful results, and as one to make management use more clearly scientific methods in order to learn more from management istelf. The most scientific version of adaptive management – which is called active adaptive management by Aldridge *et al.* (2004) and parallel learning by Bormann *et al.* (1999) – would therefore constitute one of the tightest integration of science with management or policy (Gosselin, 2004), a case of strong and durable interaction between science and management/policy. We here do not have the place to go further on the pros and cons of Adaptive Management in general, but we would like to learn some points from the Pacific Northwest experience. Adaptive management was indeed one of the big originalities of the plan, as well as one of the least successful, at least in the short term (Pipkin (1998) in Stankey *et al.,* 2003). This justified a

---

[16] cf. http://www.wilderness.org/OurIssues/Forests/nfma.cfm and http://www.fs.fed.us/emc/nfma/includes/rule%20.pdf; the Northwest Forest Plan would also be threatened (cf. http://www.wilderness.org/OurIssues/Forests/pacific.cfm).

[17] 'Many factors contribute to the intransigence of this conflict, but a key reason is the failure of the natural resource management profession (as well as society in general) to acknowledge its fundamentally socio-political and value-based character' (Forest Ecosystem Management Assessment Team, 1993, p.VII-23).

review of the work done in Adaptive Management Areas[18], which highlighted the following difficulties encountered:

(i) adaptive management does not mean the same thing to the different people involved; this lack of common definition involves difficulties in defining the training necessary for this adaptive management, the objectives and indicators to be defined to assess whether something has been learned... Also, in not defining the kind of adaptive management we want, we could confound it with simple risk and error procedures (Aldridge *et al.,* 2004; Gosselin, 2004);

(ii) no strong administrative support from the institutions: coordinators have been designed for each AMA, but they lack the means to do the job: in terms of objectives from the hierarchy [19], budget, training, support staff, time allocated to coordination, awards and other clear supports from the institution... Most coordinators estimated they spent only 20 to 25 % of their time in this role... This lack of institutional involvement might be associated to the legal background that forces them to be risk-averse. However, they could have worked with the regulatory agencies to find conditions to make risky experiments...

(iii) the culture of both the FS and the BLM, the two main institutions involved, is marked by prescriptive approaches and standardized rules[20], which greatly constrains innovations and makes more difficult the work of AMA coordinators;

(iv) adaptive management might question too much the assumptions in the Northwest Forest Plan. When proposing management plans for most natural resources, we are too much used to considering its premises as answers and not as hypotheses or questions – and we sometimes have good reasons to do so [21]. Adaptive management questions this and is thus not completely welcome by persons that also have to apply the plan...

(v) finally, there is a need to build – or to have – functional social networks, implying scientists, managers and citizens, before adaptive management can be efficient[22].

Despite these strong barriers to adaptive management, some AMAs are making landscape-level ambitious experiments[23]. A very good reflection has also occurred on the concept of adaptive management (Bormann *et al.,* 1999). However, I am slightly surprised that the strongest tests of the underlying assumptions of the Northwest Forest Plan have come out of these AMAs (cf. section 1.1.7.)[24].

This last remark could promote another vision of integration between science and policy, actually a weaker one. The option of weak interactions would stress the involvement of science through law and in the long-term, but would leave policy and science partly independent, with their proper time scales, evaluation modes and objectives, with simple tools to connect them, among which: laws, funding, meetings and training, and the public debate. It is indeed possible that strong integration between science and policy might be precluded, not only by different cultures, different reward systems, but also – a point most often stressed – by the different time scales of both, and by the intrinsic way of functioning of science. Indeed, let us come back to the new results brought by research (cf. section 1.1.7.) and ask why they not appear in previous studies on the Northern spotted owl. Different reasons can be given to account for this surprisingly new result, which are all of fundamental importance when thinking of the interaction between science and policy/management:

---

[18] reported in Stankey *et al.* (2003). The following points come from this article.

[19] This was apparently due to a communication problem between the hierarchy and field staff (cf. Stankey *et al.*, 2003, p. 44).

[20] the 'can-do' spirit mentioned in Gray (2000) .

[21] 'It is also possible that, becasue of the relative calm brought by the NWFP in the wake of such contentious ideological battles, many people simply do not want to revisit the issues and refine or modify approaches... Thus it appears that agencies are becoming frozen into the relatively protective interim practices set out in the NWFP.' (Gray, 2000).

[22] An idea also defended by Gray (2000).

[23] Cf. examples in Gray (2000), Stankey *et al.* (2003), and the more official Haynes et Perez (2001).

[24] but this could however be a question of time scale, some AMA landscape level projects really questioning the Northwest Forest Plan, but with first results in at least one decade...

(i) long-term and more numerous data allow to find significant results that could not be found in the first place. This rejoins the question of the difference between statistical significance and biological/management relevance, a recurrent theme in the biometric literature. By the way, one of the new studies stresses the relatively low portion of variability explained by habitat variables and calls for further studies (Olson *et al.,* 2004);

(ii) these new results could also depend on the way researchers ask questions to frame data analyses. The first study that showed these new results purposely included different shapes – among which quadratic shapes – of habitat quantity effect on spotted owl demographic rates (Franklin *et al.*, 2000). This greatly favoured the finding of these results. This way of proceeding is very much in link with the philosophy of multiple working hypotheses (Chamberlin (1965) in Anderson, 2000). Another point is also of importance: the results found depend on the ecological or management gradient being studied: would a study compare purely old-growth territories to purely young forest, the result would probably be a preference of the spotted owl for purely old-growth; but when mixed territories are included, it becomes possible to find a preference of spotted owls for mixed territories;

(iii) the new results also depend on the quantity being studied. These new studies are probably among the first on spotted owls that study the impact of habitat quality not only on presence of owls, survival rates or fecundity rates but on population growth rates. Previous analyses on population growth rates of the spotted owl mostly tried to find out if on average the populations were declining or not – without any link with habitat variables.

(iv) these new results can also rely on the use of new statistical procedures, not available before (Franklin *et al.*, 1996).

Finally, new results from science can come from new concepts, mechanisms... being identified. All these elements show that surprises, evolutions, shifts are to be expected from science, but generally not in the short term. This does not necessarily fit well into a strong integration of science and policy, at least in the case of the Northwest Forest Plan, where mentalities seem to be risk-averse and very satisfied with the presently consensual situation (cf. above). In these conditions, it is perhaps a good thing to let some freedom to researchers, although it will clearly be difficult for them to test landscape level strategies. Fortunately, the 'mere' collection of data without a clear experimental design and their clever interpretation allowed going further and questioning part of the assumptions behind the Northwest Forest Plan (cf. 1.1.7).

Learning more from management is clearly critical, since we realize that we lack knowledge on some key management questions. This is partly why the concept of adaptive management has emerged. Adaptive management however faces great difficulties when put into practice (cf. above and many other studies). These difficulties are mostly administrative, legal, cultural and social. I think an appropriate solution is the dynamic and pragmatic solution proposed by Gray (2000), i.e. that of first developing small scale projects with the aim of building trustful social networks that are a necessary condition for future landscape level, more ambitious active adaptive management. In other places, the 'science as usual' alternative could be promoted, with two supplements: (i) develop laws that involve science into management (but not so as to systematically become risk-averse...); (ii) let field managers and local communities try some new things, whether planned at the landscape scale or not, but with the constraint of consigning in some way what is being done, in order to allow future retrospective studies[25] and to allow variations of management in the landscape, from which studies as those in section 1.1.7 benefited.

2.3.8 Summary

With respect to science, much money was devoted to the Northern spotted owl research and it seems obvious that such expenses will not be affordable for every threatened species. Concerning the biology of the spotted owl, its territoriality and 'detectability' rather favour research while its huge home ranges, the 'undetectability' of 'floaters' – i.e., non-territorial birds – and the relatively steep, sometimes roadless, landscape in which it lives, rather complicate its study. On the whole, scientifically speaking, we cannot say that the spotted owl represents other potentially threatened species. Indeed, despite the limits of our

---

[25] As promoted by Bormann *et al.* (1999).

knowledge of the spotted owl, if habitat loss is the main problem, as we think it is, we thought we knew relatively well in which directions to go or other species, that are less well known, first decisions will be tougher to take. However, some conclusions can be drawn from the case of the spotted owl that can be useful in conservation biology in general:

1. Research gives us part of the answer, not the whole of it and research is a relatively slow process; thus,
2. research must be planned from the beginning in the long term (at least 5 to 10 years), with periodic re-orientations according to the results found;
3. in such applied cases, part of research should be part of a more general process of adaptive management;
4. however, it seems useful to let part of research not directly integrated with policy/management and produce new — partly surprising — results.

The problem about adaptive management is that, since it is new, we cannot rely on past experience to develop it. Thus, I think the general attitude that we should have relative to it is an adaptive one, that is, we must try and experiment the process of adaptive management and then criticize it and change it if necessary;

Concerning management (including politics), the case of the NSO was particularly harsh, with very strong industrial interests, a well organized opposition of conservation organizations, a rather weak political power and agencies that had no clear direction. Thus, on this point, if the case of the spotted owl can be solved, it will be of great interest for species that will be threatened in years to come, especially if new structures are created that would allow to treat problems sooner. However, some cases will still be more complicated than the NSO. The salmon issue for example is thought to be a potentially tougher problem due to the numerous activities concerned, such as silviculture, agriculture, fisheries, hydro-electric production.

Laws are a powerful tool to link science and policy; when laws request that science is involved in the planning process, it strongly prevented situations where politicians simply did not take into account scientific results, analyses or warnings... It is also true that this requirement for scientific compliance can yield risk-averse managements and policies, as well as the use of tools that sometimes are not justified[26]. A balance must therefore be found on this point, for example in not requiring viability of every native species at the scale of each individual National Forest – as required by the 1976 version of the NFMA – but for instance at the state level, associated with strong public monitoring tools.

References

Anonymous, 1990.

Aldridge C.L., M.S. Boyce & R.K. Baydack (2004) Adaptive management of prairie grouse: how do we get there?, *Wildlife Society Bulletin*, 32/1: 92-103.

Bormann B.T., Martin J.R., Wagner G.H., Wood G.W., Algeria J., Cunningham P.G., Brookes M.H., Friesema P., Berg J. & Henshaw J.R. (1999) Adaptive management, in Sexton W.T., Malk A.J., Szaro R.C. & Johnson N.C. (Eds), *Ecological stewardship. A common reference for ecosystem management,* Oxford, England, Elsevier.

Chamberlin, T. (1965) The method of multiple working hypotheses, *Science*, 148: 754-759.

Forest Ecosystem Management Assessment Team (1993) *Forest ecosystem management: an ecological, economic and social assessment*, Portland, OR, U.S. Department of Agriculture; U.S. Department of the Interior.

Franklin A.B., Anderson D.R., Forsman E.D., Burnham K.P. & Wagner F.F. (1996) Methods for analysing demographic data on the Northern spotted owl, *Demography of the Northern spotted owl*, 17: 12-20.

[26] See for example the position of Ludwig (1999) on the use of Population Viability Analyses within the ESA.

Franklin A.B., Anderson D.R., Gutierrez R.J. & Burnham K.P. (2000) Climate, habitat quality, and fitness in Northern Spotted Owl populations in northwestern California, *Ecological Monographs*, 70/4: 539-590.

Gosselin F. (1996) *A journey into the country of spotted owls*, Paris, ENGREF.

Gosselin F. (2004) *Intégrer recherche scientifique en écologie et gestion dans le cadre de l'ingénierie écologique: intérêts et limites*, Ingénieries EAT, n° spécial 2004.

Gray A.N. (2000) Adaptive ecosystem management in the Pacific Northwest: a case study from coastal Oregon, *Conservation Ecology*, 4/2: 6.

Haynes R.W. & Perez G.E. (2001) *Northwest Forest Plan Research Synthesis*, Portland, Oregon (USA), U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Lindenmayer D.B. & Franklin J.F. (2002) *Conserving forest biodiversity: a comprehensive multiscaled approach*, Island Press.

Losos E. (1993) The future of the US Endangered Species Act, *Trends in Evolution and Ecology*, 8: 332-336.

Ludwig D. (1999) Is it meaningful to estimate a probability of extinction?, *Ecology*, 80/1: 298-310.

Olson G.S., Glenn E.M., Anthony R.G., Forsman E.D., Reid J.A., Loschl P.J. & Ripple W.J. (2004) Modeling demographic performance of Northern spotted owls relative to forest habitat in Oregon, *Journal of Wildlife Management*, 68/4: 1039-1053.

Pipkin J. (1998) *The Northwest Forest Plan revisited*, USDI, Office of Policy Analysis.

Record of decision (ROD) (1994) *Amendments to Forest Service and Bureau of Land Management planning documents within the range of the Northern spotted owl*, Washington, DC (USA), US Department of Agriculture.

Stankey G.H., Bormann B.T., Ryan C., Shindler B., Sturtevant V., Clark R.N. & Philpot C. (2003) Adaptive management and the Northwest Forest Plan - Rhetoric and reality, *Journal of Forestry*, 101/1: 40-46.

Thomas J.W., Raphael M.G., Anthony R.G., Forsman E.D., Gunderson A.G., Holthausen R.S., Marcot B.G., Reeves G.H., Sedell J.R. & Sllis D.M. (1993) *Viability assessments and management considerations for species associated with the late-successional and old-growth forests of the Pacific Northwest*, USDA.

Thomas J.W. & Verner J. (1992) Accommodation with socio-economic factors under the Endangered Species Act. More than meets the eye, in anonymous (Eds), *Transactions of the 57th North-American Wildlife and Natural Resources Conference*, p. 627-641.

Tuchmann E.T., Connaughton K.P., Freedman L.E. & Moriwaki C.B. (1996) *The Northwest Forest Plan. A report to the President and Congress*, Portland, Oregon (USA), USDA, Office of Forestry and Economic Assistance.

Yaffee S.L. (1994) *The wisdom of the spotted owl: policy lessons for a new century*, Washington, D.C., Island Press.

2.4 Interface between science and policy in the biodiversity realm: narratives from France

Jacques Baudry, National Institute for Agricultural Research, France

As illustrations of interfaces between science and policy regarding biodiversity, the present paper provides three narratives rather than case studies at different levels of policy design and implementation. It starts at the national level with research programmes on biodiversity in the ministry in charge of the environment. The second narrative is at the NUTS3 level (NUTS are EU statistical units where NUTS1 is a country, NUTS2 a region and NUTS3 is a lower administrative entity, depending on the country). Finally, it attempts to present the experience of a former consultant in environmental management who became a researcher.

2.4.1 The research programmes of the ministry in charge of the environment in France

In terms of research, the role of the *Ministère de l'Ecologie et du Développement Durable* (MEDD – Ministry of Ecology and Sustainable Development) is to finance programmes that produce results to help in the design, implementation, and evaluation of public actions in nature conservation and natural resources management. For all programmes sponsored by the MEDD, the objective is, beyond the production of publications, to provide scientific basis for decision making in public policies as well as in changes in techniques and practices in land use and management. As such, the MEDD manages the interface between science and policy. To achieve this objective, research programmes are under the scrutiny of both the scientific community and the stakeholders at large.

The ministry makes first decisions on the topics of the programmes; each year one or two calls for research proposals related to biodiversity are launched. Once the theme is decided, two groups of experts are set up: a scientific council and a steering committee. The scientific council is composed of scientists in the field and the steering committee of representatives of various bodies of stakeholders and land managers, including the services of the ministry in charge of the policies attached to the theme. They both participate to the writing of the call, so that the research questions are new and policy relevant. Thence, the call addresses specific scientific questions and specific fields of policies. Proposals must refer to policies and to potential interactions with stakeholders.

For the selection of projects, the scientific council meets first so as to rate proposals according to their scientific merit. Then, the steering committee makes the final selection. It may decide that good scientific proposals are policy irrelevant and reject them. Both groups make recommendations to accepted research teams, including on the relationships with policies and stakeholders. During the course of the programme, research teams meet at least once in seminars where the members of the scientific council and the steering committee are invited. The purpose of the seminar is to foster interactions and to prepare the deliverables of the programme (the deliverables of individual projects are set in proposals). Two programme coordinators ensure the collective organization and production of deliverables. One coordinator is from a scientific institution, the other from the ministry.

During the course of the programme, both the scientific council and the steering committee proceed to the evaluation of research outputs of the different projects.

At the end of the programme, the coordinators organize a symposium open to both the scientific and stakeholder communities. The teams present their research results; then the coordinators usually produce a book with the scientific results and a booklet with the main points relevant for policymakers and land managers.

This organization aims at facilitating the interfaces between science and policy at various levels at both the programme and projects scales.

As an example, I present the DIVA (Public Action, Agriculture & Biodiversity) programme (Box 1.); (http://www.rennes.inra.fr/sad/diva/).

Box 1: DIVA (Public Action, Agriculture & Biodiversity) programme

The programme is under the responsibility of the Department for Research and Future Studies at the Directorate of Economic Studies and Environmental Assessment of the Ministry of Ecology and Sustainable Development, with the support of the INRA-Sad-Armorique Research Unit. The programme has a steering committee and a scientific council.

The members of the **steering committee** come from:

- the Ministry of Environment and Sustainable Development (Directorate of Economic Studies and Environmental Assessment, Directorate of Nature and Landscapes, Directorate of Water, Diren (Regional Direction for the Environment) assembly, Directors of National Parks assembly, National hunting and wildlife office;
- the Ministry for Research: Directorate for research, Directorate for Technology;
- Ministry for Agriculture, Food, Fisheries and Rural Affairs: General Directorate for Education and Research, General Directorate for Forest and Rural Affairs, Representative of the Directions Départementales for Agriculture

and Forest, Bergerie Nationale;

- Other bodies: The European Topic Centre of the European Environment Agency, France Nature Environment (National Federation of Associations for Nature Protection), *Espace Naturel de France* (National Federation of Conservatories for Natural Spaces), Federation of French Regional Nature Parks, French Institute for Biodiversity, and the chairman of the scientific council.

The **objectives of the programme** are to set scientific references to design and implement public actions as responses to protect biodiversity and to consider it in agricultural changes.

Two calls for proposals have been launched (February 2000 and November 2001), with the following items:

- social characterization and representation of biodiversity as related to agriculture;
- interactions between ecological and farming processes in a diversity of situations;
- setting, following and evaluating policies related to agriculture and biodiversity at the regional, national and international levels;
- local initiatives and implementation of policies at the local scale.

The projects

The EU European Community Biodiversity Action Plan is the framework for public policies that can have biodiversity as an objective or the modification of the aims of other policies such as the Common Agricultural Policy.

- The project of the S. Maljean-Dubois team '*Laws and Regulations from EU to Local Implementation'* deals with the translation of policies into regulations; they do so by studying the evolution of interactions between law and policies. The role of agriculture in environmental protection is analysed as well as the importance of contract as a mean to regulate the relationships between farmers and society.
- The X. Poux's project '*Trans-border comparisons (France/ UK) of implementation of biodiversity action plans in national policies'* questions the integration of biodiversity in the design of common agricultural policies. The project aims at understanding how France and the UK, mobilizing different means and actors, have adopted contrasted strategies concerning the integration of biodiversity into various components of the CAP.

At the level of the small region, the practical implementation of these policies depends upon participatory groups within which partners (farmers, administration and associations for nature protection) interact. The functioning of these groups is at the core of the project led by J.P. Billaud and P. Steyaert *'Farm Scale and Landscape Scale Implementation of Policies in Marshlands'* in the marshlands of Charente, western France. They compare the implementation of Natura 2000, which stems from a naturalistic point of view, and land management contracts at farm level based on an agricultural standpoint. Through their land use practices, farmers are those who concretely influence biodiversity dynamics. It is thus crucial to decipher the ways in which they regard biodiversity and what are the consequences on the evolution of their practices, either in the case of individual decisions or within the framework of negotiated contracts with environmental managers. This is the subject of the project of the R. Larrère and Ph. Fleury team, in the Northern Alps *'Biodiversity action plans in sub-alpine meadows'*.

The consequences of policies and land use practices on the dynamics of flora and fauna are studied in six other projects:

- The J. Lepart team in their project on *'Effects of land abandonment on biodiversity, ecological restoration and grazing management'* analyses the way changes in agriculture in the Mediterranean countryside affect biodiversity. The team relates the evolution of cover of dominant plant species such as Scot's Pine to land use practices within farms.
- In those pastoral landscapes, the management of scavengers (vultures) implies specific policies. F. Sarrazin and his team investigate how the management of sheep carcasses in response to regulations on squaring can influence local populations of scavengers and how farmers perceive this squaring role of vultures ('*Management of dead sheep and vulture protection').*
- The Mediterranean zone has a rich weed flora associated to crops. This flora is threatened by land abandonment. T. Tatoni's project *'Protection of weed populations, role of grazing in seed dispersal'* aims at understanding the effects of pastoralism as a means to maintain open space and as a way to disperse weed seeds by sheep movements.
- The project of the team of E. Garnier on '*Plant biological traits changes under grazing extensification'* also considers the fate of biodiversity in marginal land dominated by grassland. The project investigates the response of species diversity and functional types to diminishing anthropogenic pressure in contrasted agro-ecological situations.
- In a region of intensive cereal cropping, V. Bretagnolle and his team in *'Annual crops/ perennial cover in*

foodwebs' use empirical and experimental approaches as well as simulation models to demonstrate that avifauna of high heritage value (bustard, harrier, etc.) depends, overall, upon the constant availability of food resources. Land under permanent or long term vegetation, such as grassland, is a refuge for insects and small mammals; thus, they must be a priority for nature protection. The project studies how the Contracts for Sustainable Agriculture, set-aside land 'environment and wildlife' or Natura 2000 are satisfactory responses to this objective.

- The team of J. Baudry working on '*Relative weight of field margin management and landscape structure on plants and carabids' (*http://www.rennes.inra.fr/sad/diva/index_en.htm) studies assemblages of plant species and of various groups of invertebrates (Carabids, Lepidoptera) as well as aquatic invertebrates in bocages (hedgerow landscapes) with various hedgerow densities. The main objective is to test the cumulative effect of farming practices over several years, more specifically on field margins. Comparisons with open landscapes are made.

Programme functioning

For the functioning of the programme, common tools have been set up, such as Internet and intranet sites, a poster and a leaflet. Seminars for participants to the projects are organized each year. Originally two seminars were planned, but due to a strong demand from the participants, a third one is scheduled. The final seminar, open to the public, will be held in 2006.

In addition to the coordination, two trans-project initiatives have been launched:

- Reflexivity: researches on the relationships between biodiversity and agriculture have been developed for several years. A common reflection on the evolution of questions and research design is led by C. Mougenot from the *Fondation Universitaire Luxembourgeoise*, Belgium;
- Law and policies: S. Maljean-Dubois, from the National Centre for Scientific Research (CNRS), is in charge of a series of seminars on European laws and biodiversity for the research teams of the programme.

In my view, this type of organization permits to benefit from the flexibility of independent projects, usually run by teams that have experienced of working together previously, and the integration of those projects within a programme with a minimum of transaction costs. Rather than designing common data collection procedures that suppose a focus on one or two questions, several aspects of biodiversity are dealt with, in various manners.

Past experiences have been positive both in terms of scientific production and in terms of information flows between stakeholders and scientists (both ways).

2.4.2 An experience in the 'département' of Ille-et-Vilaine (Brittany, France)

Land consolidation is an important public policy to improve the practice of farming, as it reduces costs of machinery, energy and so forth. The negative aspect is its impact on landscapes and, overall, hedgerow removal. In the mid 1990's a conflict arose between the administration in charge of land consolidation projects and environmentalists. The latter went to court and the projects were stopped. To put an end to the conflict the General Council of the *département* proposed to set up a discussion group with all the stakeholders (environmentalists, administrations, farmers etc.) and a scientist. The role of the scientist is to participate to technical discussions on the practical issues of land consolidation and environmental management. The environmental issues are broader than biodiversity, as water quality, for instance, is a major problem in the region. There is no research project per se, as the scientist runs his own research independently; of course it is related to the subject. The scientist has to propose general principles for action based on sound science. The objective is to contribute to the design of the regional policy as well as to its implementation and evaluation. The scientific question is if existing conceptual models are robust enough to be part of policies and used to analyse any landscape in the region?

2.4.3 Being a researcher and a landscape designer, how does that contribute to the interface between science and policy? A personal experience

Despite all the possible problems and bias of a narrative based on one's experience, it worth recounting how I had to deal with both sides. I started to work in 1978 as a consultant when the law on environmental impact statement started being enforced in France in the context of land consolidation projects. Hedgerow conservation was, as it still is, the main issue. Two years before, a large symposium had been the ending point of a multidisciplinary programme on the role of hedgerows in western France. Results in ecology, agronomy, climatology, geography etc. were plentiful, but mostly at a very local scale, the hedgerow scale.

Climatologists and hydrologists had worked at a broader scale, but did not provide many clues on how to design a landscape. Thousands of hedgerows in a municipality were rated individually. Was the objective to maintain the good ones, how many? On the other side, the administration in charge of the land consolidation project wanted to know what was the best or acceptable density of hedgerows in m/ha. Science and policy were at odds.

The development of landscape ecology has led to improvements on both sides. On the scientific side, it provides a view of ecological functions at a broader scale, hence individual hedgerows have a role within a network, on the policy side, and assessment of impact is more based on process than on patterns.

When starting to coordinate a new programme on hedgerows and their function in landscapes financed by the Ministry of Environment, I made two decisions to build a better interface between science and policy:

1) the projects of the different disciplines must be on the same sites (landscapes);
2) a hedgerow was defined according to its manager, not on structural or ecological characteristics. Therefore, we started to understand the interactions between various landscape processes: those related to land use patterns and those driven by ecological functions. Because policies are implemented by people, it is of utmost importance to understand the consequences of their actions, as individuals and as groups.

2.4.4 Conclusion

The interface between science and policy regarding biodiversity must be looked at within a changing context: a shift from an emphasis on reserving nature, segregating biodiversity conservation from other activities, to an integration of biodiversity management in multifunctional landscapes. This was emphasized by the last IUCN world congress ‘Beyond boundaries’. This implies that all policies dealing with land use impact biodiversity one way or another. Science must be interdisciplinary, of course, linking social and biological sciences and scientific enquiries must be so that their outcome can be linked to a process driven by policies or activities. The cultural biodiversity that ALTER-Net addresses must be understood in its social and historical context as well as its ecological context.

Experience also shows that the construction of the interface necessitates the participation of stakeholders acting at different scales all along the research process, not only to ask questions but also to understand how science works. That does not mean scientists must address the societal questions in a straightforward manner. Most issues necessitate new theoretical insights, new concepts, and novel models. Policymakers may take those novelties to build policies in different ways (i.e. shifting from a focus on species to a focus on habitats and networks).

2.5 The Netherlands Environmental Assessment Agency: Biodiversity Assessments in Policy Evaluations and Outlooks

Leon Braat, Netherlands Environmental Assessment Agency, the Netherlands

2.5.1 Introduction

The Netherlands Environmental Assessment Agency (MNP) is a government agency which has been instituted to provide independent and neutral evaluations and outlooks of environmental and biodiversity policies. The independency is written in law. The agency is expected to answer questions of the Cabinet, but may add additional information and is independent in the choice of methods of research. All results will be published if quality allows.

The MNP is one the four independent assessment agencies in the Netherlands. These agencies all have a role to play in giving substance to the World Bank's People-Planet-Profit concept, with the Social and Cultural Planning Office of the Netherlands (SCP) dealing with ' People', the Netherlands Bureau for Economic Policy Analysis (CPB), with ' Profit' and the Netherlands Environmental Assessment Agency (MNP), along with the Netherlands Institute for Spatial Research (RPB), with the 'Planet'.

It is the primary task of the MNP to advise the Dutch government on a wide variety of environmental issues from a scientific base built on knowledge and expertise. Policy-makers use MNP research findings to develop, implement and enforce environmental policy. MNP underpins policy through its monitoring, modeling and risk and impact assessment results. Operating within the bounds of the Environmental Management Act and the Nature Conservation Act, the MNP has assumed the role of charting the current status of the environment and nature in collaboration with a range of scientific institutes and other national assessment agencies to support a broad, but ecologically based, political and social discussion.

The MNP teams share their knowledge and expertise with national and regional governments, and with supranational bodies around the world. Functioning as the interface between environmental science and policy-making, MNP provides assessments, recommendations and evaluations on a wide range of environment-related topics in close cooperation with international networks. Topics include sustainable development, the quality of the urban and rural environment, specific environmental problems such as climate change, biodiversity loss, environmental health and issues influencing the quality of the environment, like transport and agriculture.

2.5.2 Role of Dutch government and MNP

Since 1997 the Dutch government has actively contributed to these consistent global and regional indicator development in the CBD, OECD and Europe. MNP, in conjunction with the Central Bureau for Statistics in the Netherlands (CBS) and various NGOs implement these indicators. The indicator on the abundance of selected species is based on a wide range of species in an extensive national monitoring program (NEM). To provide overviews on the state and trends at the species and the ecosystem level, composite indicators have been developed and are reported in the Nature Outlook2 and Nature Balance. They consist of the Species Assemblage Trends Index (STI), the Red List Index (RLI) and the Natural Capital Index (NCI). The latter provides an overall picture of the homogenization process as a result of habitat loss and loss of quality within the remaining ecosystems in The Netherlands. The NCI is calculated for natural and man-made ecosystems separately. The above composite indicators are also discussed in the CBD and recommended for adoption.

2.5.3 National Policy Assessment and Biodiversity indicators

To develop and pursue an effective environmental policy the Dutch parliament and policy-makers need to know the current state of the environment and the expected trends. Current policy can also be adjusted in the light of this information. The National Policy Assessment and Sustainability (NMD) Team delivers products to support decision-making by policy-makers.

A 'Nature Outlook' report is published every four years. It explores possible and probable futures for nature and the landscape in the context of economic, land-use and environmental scenarios. Alternative future policies are evaluated with respect to their contribution to nature values, landscape quality and costs.

One of the most important issues to support policy makers is the development of a small number of simple and feasible biodiversity indicators that adequately express the homogenization process. Such indicators are also needed for the implementation of the goals of the Convention on Biological Diversity (CBD). In The Hague 2002, the Parties agreed to significantly reduce the rate of loss by 2010 at the global, regional and national level. Shortly afterwards the European Union and pan-Europe agreed upon a halt of the loss of biodiversity by 2010 ("ministerial process Environment for Europe", Kiev, 2003). In 2004 a global agreement was achieved on a small number of indicators for immediate testing in order to review the progress towards the 2010-target and guide policy makers in finding effective measures. Four global indicators have been selected on the state of biodiversity to evaluate the progress towards the 2010-target, for immediate testing:

1. Trends in extent of selected biomes, ecosystems and habitats

2. Trends in abundance and distribution of selected species
3. Change in status of threatened species
4. Trends in genetic diversity of domesticated animals, cultivated plants, and fish species of major socio-economic importance.

In May 2004 the 'Message of Malahide' listed a first set of European Biodiversity Headline indicators to evaluate the progress towards the 2010-target at the European level similar to the above listed CBD indicators. The European Council urged the European Commission to develop, test and finalize this set by 2006. The use of similar indicators at the global, regional and national level is recommended by the CBD for efficiency and consistency reasons.

2.5.4 The Natural Capital Index

The Natural Capital Index happened also to be useful in European and global integrated environmental outlooks. To solve the problem of lack of data on species abundance at these levels NCI has been estimated on the bases of pressures, the so-called NCI-pressure. The Natural Capital Index is an aggregated indicator for loss of biodiversity. The quantity aspect is represented by area of ecosystems, terrestrial as well as aquatic. The reference for the area aspect is a chosen historic distribution of areas for the ecosystems for the Netherlands. The quality aspect is represented by the abundance of populations of a representative set of species. The 100% reference of the quality aspect is the distribution of species populations in a, sometimes reconstructed, intact ecosystem.

2.5.5 International relations and the Global Biodiversity Model

MNP collaborates with other biodiversity institutes to enhance the knowledge on biodiversity, such as with ALTERRA-Wageningen, CBD, ECNC, Potsdam Institute for Climate Impact Research (PIK), Potsdam, Germany, UNEP GEO-3, UNEP/GRID-ARENDAL, Wageningen University and GLOBIO (Mapping human impacts on the biosphere).

The MNP is also involved in modeling the change in global biodiversity. It cooperates in this project with UNEP-WCMC (Cambridge, UK) and UNEP-GRID (Arendal, Norway). A recent development is to link change in biodiversity to the supply of goods and services, following the recently published Millennium Ecosystem Assessment (United Nations, 2005).[27] Subsequently the alleviation of poverty in developing countries may be linked to the management of biodiversity.

2.6 Large carnivores and human communities: From research to policy through stakeholder involvement (Norway)

John Linnell, Reidar Andersen and Håkon Hustad, Norwegian Institute for Nature Research, Norway

2.6.1 Large carnivores are on the national political agenda in Norway

After more than 100 years of state sponsored bounties, Norwegian management goals for large carnivores have changed from extermination to conservation. Changes to legislation have allowed natural expansions of all four species (wolf, bear, lynx and wolverine) to occur, aided by the fact that Norway's borders with Sweden, Finland and Russia provide contact with larger source populations. While the species seem to be ready and able to live in the modern Norwegian landscape, a wide range of conflicts have arisen that cast doubt on the willingness of large segments of the Norwegian public to tolerate these species back in their neighbourhoods. These conflicts have reached the highest political level, and during the 1990's alone the

[27] http://www.millenniumassessment.org/en/index.aspx

national parliament debated two white papers on large carnivore policy. As the 21st century opened the stage was set for another parliamentary processing of a white paper.

2.6.2 From research to policy advice

The modern era of large carnivore research started in Norway around 1990's with radio-telemetry based field projects on wolverines and bears. By 1999, individual projects were underway, focusing on all four species. The emphasis was on ecology and population dynamics, with secondary studies of genetics. In addition, social scientists had begun focusing on the human dimension and a series of management orientated evaluations of conflict reduction measures and monitoring techniques had been conducted. In 2000, a new coordinated project (Large Carnivores and Human Communities - RoSa from '*Rovvilt og Samfunn*' in Norwegian) began (with a 5-year horizon) with funding mainly from the Research Council of Norway and the Directorate for Nature Management that served as an umbrella for research on lynx, wolves, bears and the human-dimension. From the start, RoSa intended to conduct management related research, and to focus this work an advisory group of stakeholders was recruited. While this group provided a forum for interesting discussions, very little concrete came from the early meetings. Then in 2001 the government was required to produce a new white paper on large carnivore management, in connection with which it was considered important to summarize the scientific knowledge that had accumulated since the last white paper in 1997. A large proportion of this work fell to scientists working within the RoSa project. In meetings with the Ministry of Environment and the Directorate for Nature Management it was also decided to expand the role of the advisory group and bring them more actively into the policy design process. It should be underlined that neither the researchers nor the advisory group had a mandate to develop management plans. Rather, the idea was to summarize existing knowledge (both scientific and experience-based), and to provide advice concerning the consequences that this knowledge had for management. In other words, the mandate was purely advisory.

2.6.3 The process

In its final form the advisory group consisted of representatives from the hunters association, a forest owners association, the sheep farmers associations, the Sami reindeer herders association, the national farmers association, representatives from two county wildlife management offices, the mayor of a municipality within wolf range, WWF-Norway, Friends of the Earth Norway and an anti-carnivore advocacy group, in addition to scientists from ecological and sociological disciplines. In order to induce a constructive dialogue it was agreed that none of the members were formally representing their employers or organizations. Rather they were there as individuals, bring with them their respective experiences. During a 12 months period in 2002-2003 this advisory group met four times in various locations, although email was used to exchange documents in between meetings. The basic work form was that the meetings provided a forum for the open exchange of ideas. Researchers working on each of their respective topics presented key results to the advisory group who provided feedback. This feedback was especially important in helping the researchers communicate their conclusions in a way that was understandable to the layperson, and in ensuring that the issues of interest to the various stakeholders were actually incorporated. The advisory group was not actually required to approve the research reports, but their input shaped their form in a positive manner. RoSa researchers produced a total of 12 technical reports during this process.

In order to place this research into a management context, the advisory group embarked on a process to write a common report that summarized the implications of this scientific knowledge, together with the stakeholders' experience, for future large carnivore management. The summary report contained a brief summary of the status of present day management, and then pointed out a range of key points that future management should consider. In order to stay within their mandate the group could only suggest elements and aspects that decision makers were encouraged to consider. The content focused on identifying the consequences of different potential management strategies for different stakeholders. One of the interesting elements here is that it soon became apparent that no strategy would be best for all stakeholders. This in itself reflected the changing view of large carnivore - human conflicts which developed because of the discussions within the advisory group. The earlier focus on the issue of large carnivore-livestock depredation was diluted by an increasing focus on the conflict with hunters for game, the social conflicts where large carnivores became symbolic for a wide range of urban-rural issues, and the conflict with conservationists who felt that large carnivore conservation was not being taken seriously.

In order to establish some common ground, the advisory group also developed some recommendations for ‘criteria for success’, which any future management strategy should include, and which were considered important, or at least acceptable by all those concerned. These were, (1) Increase the predictability of management, (2) Increase the local acceptance for management, (3) Reduce depredation, (4) Include the concerns of stakeholders that do not have livestock, (5) Ensure a favourable conservation status for Norwegian large carnivores. In addition, a number of principles were established for geographically differentiated management, where the input from the advisory group was central in finding ways to balance the competing demands of different stakeholders.

The conclusions from the advisory groups work were printed in a report that all advisory group members signed. This joined the 12 technical reports from the RoSa project, and a range of technical reports from other institutes, and formed a solid background for the Ministry and the Directorate as they prepared the white paper. The white paper was presented in December 2003 and it was clear that a lot of what the advisory group had suggested had been taken into account in the government’s proposal. Although there were clear deviations from some of the principles that RoSa had developed for some issues, it was apparent that the work had been taken into account. During spring 2004 the minority government had to negotiate for support from the opposition parties, but in May 2004 they secured a majority for a revised white paper, that still kept many of the elements of the original proposal. At present, the Directorate has completed one of the required regulations for large carnivore management and are working on a second focused on compensation for depredation.

2.6.4 Why did it work?

We believe that a few key elements of the process were instrumental in the relative success of the RoSa process.

- The members of the advisory group were not formal representatives of their organizations - this allowed a more open and flexible discussion. The selection of individuals was also vital.
- Multi-day meetings were held in remote locations (including a lighthouse 10km from the coast), with good catering. This facilitated close social interactions between individuals from diverse backgrounds, and helped people see their counterparts as individuals, not just representatives of a different interest group.
- The common mission to prepare a document within a relatively short period of time helped to focus the group on a common goal.
- A clear mandate from the Directorate for Nature Management helped confine the group’s role to providing advice. Furthermore, the Ministry had set clear limitations on the range of future management scenarios that would be discussed in the future white paper which excluded many of the more extreme alternatives.

2.6.5 Did RoSa help?

In retrospect many of the principles that were developed became part of present day policy. It also seems clear that the differences between the competing stakeholders were reduced, and mutual understanding of each other’s positions increased. However, it is clear that mutual understanding is not the same thing as agreement, and the carnivore debate today is still very polarized, and heated. It is strange that the government made a number of controversial decisions on issues that where against the advisory groups recommendations (even where the entire advisory group, from both pro and anti carnivore sides, was in agreement). Such cases provide insight into the power of lobby groups to argue their cases, totally independent of expert advice. As always the devil is in the details - and it remains unclear if the new policy as it is being enacted will reduce the conflict level. For example, in response to RoSa recommendations the government has set detailed goals for future large carnivore populations. However, if it is appropriate for elected members of parliament to be involved with details such as deciding if there should be 5 or 6 breeding bears in a given county remains to be seen. There has also been much debate about if a national goal of 3 wolf packs in a country that could support several 100 is a serious contribution to wolf conservation.

On the balance, we believe that RoSa has helped develop the outlines for a functional compromise-based policy in a manner that builds on both scientific and experience-based knowledge, and that has allowed important stakeholders to have a say. The way in which the policy is currently being enacted will certainly change over time, and adapt to changes in circumstances and changes in the relative strengths of the various lobby groups. As scientists, we believe that the process with the advisory group was instrumental in ensuring that our results were integrated closely into the policymaking process. This advisory group helped the scientists to focus on issues that were regarded as being important from the point of view of various stakeholders groups - and helped the scientists understand the way certain issues were perceived from the stakeholders' points of view. Together, we were able to outline potential compromises that would be acceptable to many interests. However, it is important to remember that the bottom line will always come down to politics, and that sometimes decisions will be made based on non-scientific premises.

2.7 Science and Policy interface for biodiversity conservation, ecological reconstruction and overall sustainability goal: a case study lower Danube river system (LDRS) (Romania)

Angheluta Vadineanu, Department of Systems Ecology, University of Bucharest, Romania

2.7.1 Introduction

The LDRS (comprising the river stretch of 840 km, between the Black Sea and the Iron Gate II man made reservoir together with the associated floodplains, inner and coastal deltas) functions as a key component of the second largest river system in Europe (Figure 9). It serves as a buffer system between the river catchment (~ 817,000 km^2) and the sea, bearing also the ecological footprint of the economies of the direct riverine countries: Romania, Bulgaria, Serbia and Montenegro, Ukraine and the Republic of Moldova. In late 1950's the LDR wetlands extended, in the Romanian territory, over a total surface of about 10,000 km^2 along the lower river stretch of 840 km (Figure 9). That consisted of four major wetland ecosystem units: i) Coastal Danube Delta extended over 5193 km^2, from which 1015 km^2 are covered by the Razim-Sinoe Lagoon complex; ii) floodplains (701 km^2) developed along river stretch of 92 km long, between coastal and inland Danube delta; iii) Inland Danube delta which has developed along the river stretch between km 170 and 365 and between Southern Romanian Plain and the Dobrogean Plateau, over a total surface of 2413 km^2 and iv) the floodplains developed on the Romanian territory, along the Danube river stretch, between km 365 and 840 or between Inland Delta and Iron Gate II man-made lake with a total surface of about 1500 km^2 (Vadineanu *et al.*, 2001).

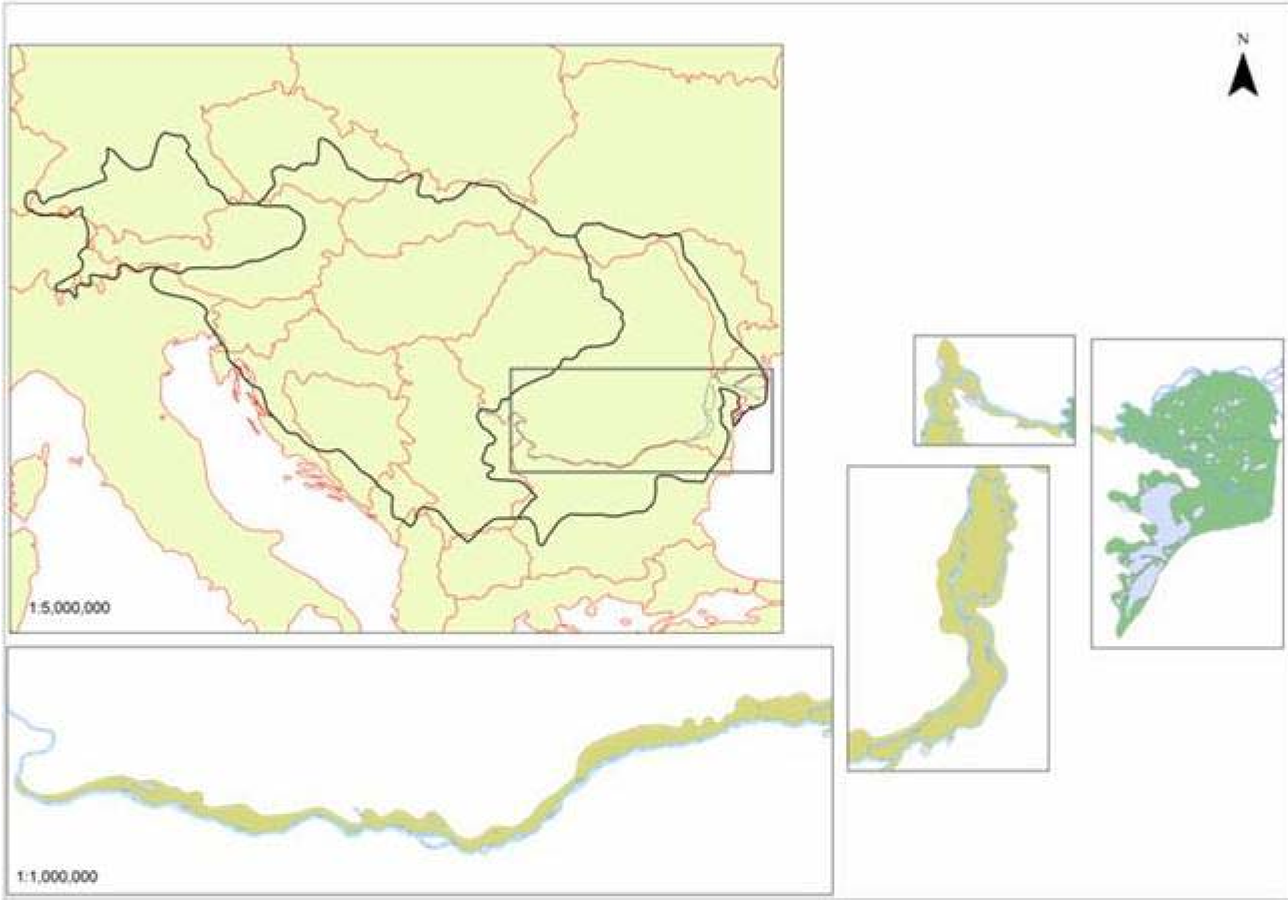


Figure 9: Danube River Catchment and Major units of the Lower Danube River System (LDRS)

2.7.2 Conceptual frame, analytical approach and methods

In the last ten years, the research staff of the Department of Systems Ecology and Sustainability / University of Bucharest (DSES/UNIBUC) has focused a significant part of the research effort on the assessment of the impact of past policies and management activities upon the structure and most relevant functions of LDRS and some subcatchments (e.g. Neajlov River Catchment, Prahova River Catchment) from Lower Danube River Catchment (LDRC). The structural and functional impacts were further assessed in terms of changes in the flow of resources and services dependent on: production, regulation, support and information functions.

In order to undertake such work, first it was necessary to design and start implementing the conceptual frame of the Decision Support System (DSS) (Figure 10), which was viewed as the interface between science (research and monitoring infrastructure) and policy and decision making cycle. In particular, special attention was given for building the Information System (Figure 10B) by integrating reliable data and information related to the structure and functioning processes of LDRS and LDRC, and major strategies and policies applied at different space and time scales in the Danube River Catchments. The data and information sources were provided by DSES – UNIBUC (main source) (Cristofor *et al*, 1992; 1993; Risnoveanu *et al*, 2003; 2004; Navodaru *et al,* 2002; Antipa, 1910; Vadineanu *et al*, 1992; 1993; 1997; 2000; 2001, 2003; 2004; Botnariuc & Beldescu, 1961, Sarbu *et al*., 1997; De Groot, 1992; 2002), Institute of Biology / RAS, Danube Delta Research and Management Institute, Geo-Eco-Mar Institute, Environmental Research and Engineering Institute.

For identification and assessment of LDRS' functions we have used the analytical framework (Figure 11), FAP[s] toolkit (Maltby *et al.*, 1996; Janssen *et al.*, 2003; Burgess *et al.*, 2001) and the integrated data and information within the IS.

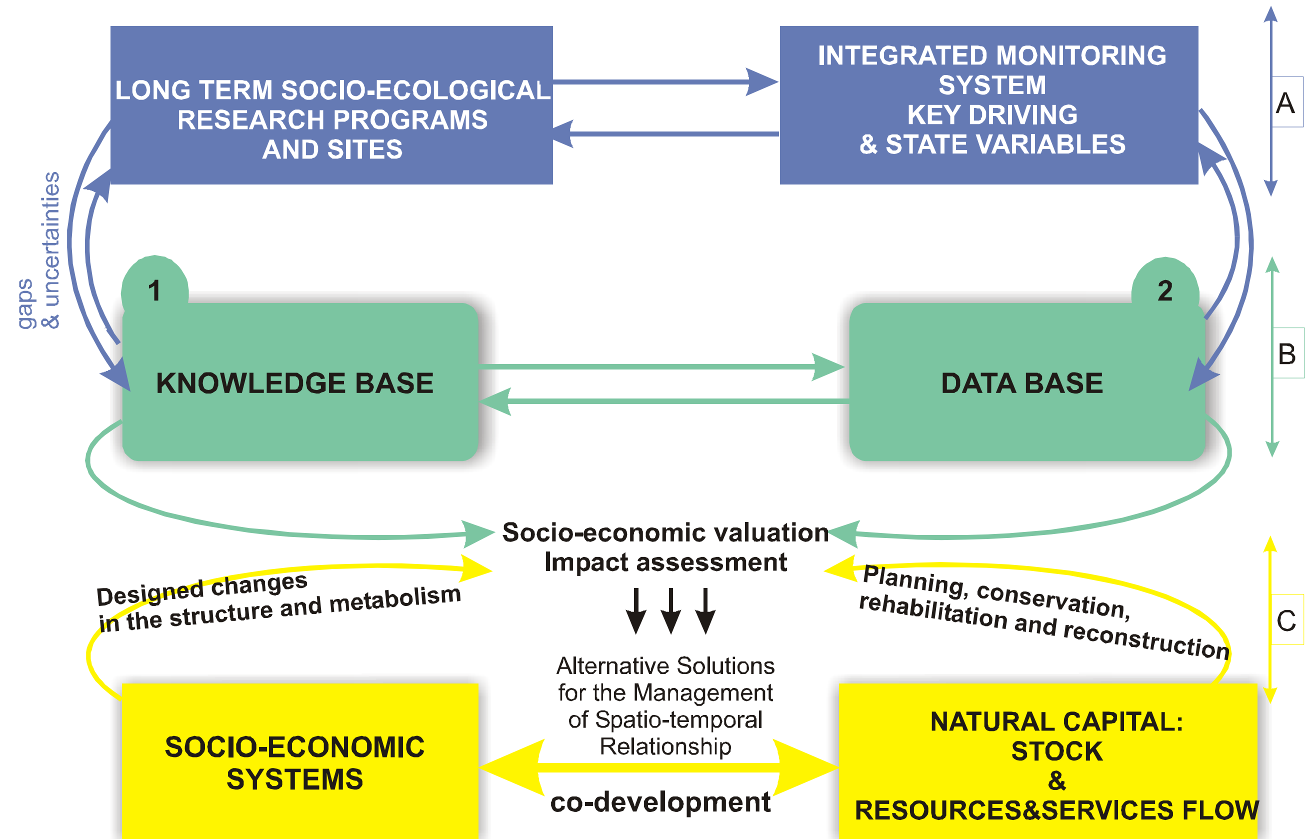


Figure 10: The flow diagram showing the relationships between: A) research and monitoring infrastructure; B) information system (core of the Decision support system) and C) adaptive management for co-development (sustainability) of SES and biophysical structure of NC within LDRS

For establishing the links between applied policies and management plans, which generate the human drivers (D) and pressures (P), on one side, and the state (S) and changes (impact - I) in the LDRS, on the other side, as well as for identifying the new targets for future policies (responses -R), the analytical DPSIR model has been adopted (EEA, 2001).

For the major types of biological systems we have estimated the production rates for the biological resources with economic significance to which have been applied the appropriate market prices while for the retention of nutrients we have used the average values (140 kg/ha for Total Nitrogen (TN) and 8 kg/ha for Total Phosphorus (TP) estimated for Coastal and Inland Delta (Vădineanu & Postolache, 1998) and the cost of removal in water treatment systems (7 USD/kg of nitrogen and 15 USD/kg of phosphorus).

The economic decision making which serves the conservation of biophysical foundation and the achievement of the overall goal of sustainability, requires the bioeconomic valuation of the full set of ecosystem's functions and their respective resources and services. However the Total Economic Value of a particular river system (TEV) is highly dependent on the type of resources and services provided, the turnover rate of each resource, the quality and availability of biological data and the methods used for economic valuation. In addition most of the methods are dependent on the market conditions, economic situation and the level of education and information of stakeholders (Turner *et al.*, 2000; Nunes & van den Berg, 2001, Barbier, 1993).

Table 4 shows which functions, resources and services and what methods have been considered and applied for the estimation of economic value of natural and seminatural components from LDRS. Having established the economic values and the major structural and functional changes at the level of ecological foundation it was possible to discriminate on the advantages and disadvantages of the former policies and management plans.

Furthermore, by taking into consideration the medium and long-term objectives of the national policies and International agreements and conventions (Box 2) relevant for conservation of biodiversity and sustainable development in the LDRS and LDRC we use the economic values of natural and seminatural wetlands, for designing the specific targets and the effective measures for the future sustainable management in that region.

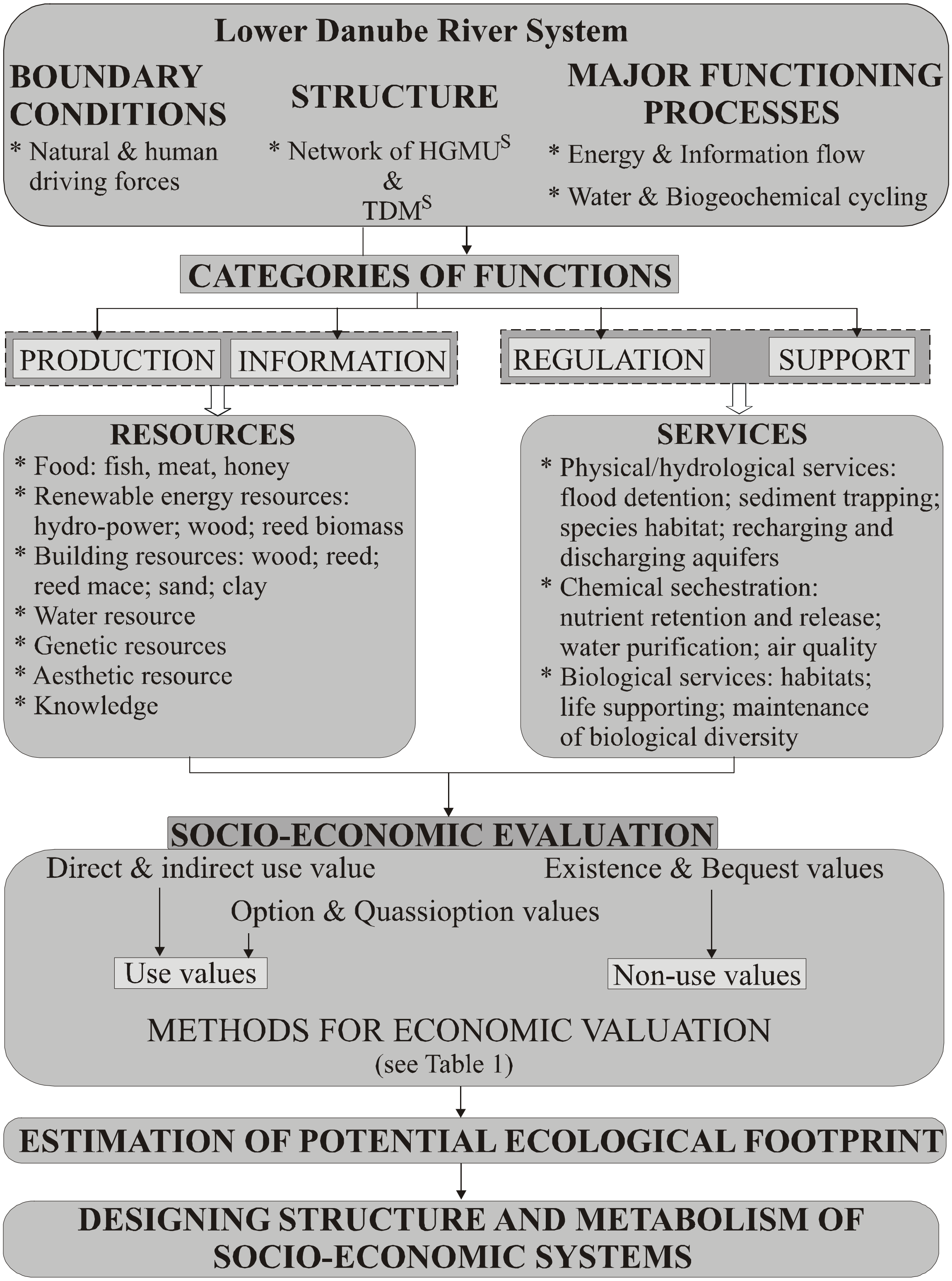


Fig.3 - A proposal for ANALYTICAL FRAMEWORK of River and Stream Functions, Services and Resources, and Socio-economic EVALUATION

Table 4: The functions of LDRS and main types of resources and services with social economic significance, and methods applied for economic valuation

LDRS Functions	Type of Resources Services	Economic valuation method				
		Direct market pricing	Avoided cost	Replacement cost	CV* (WTP)	Group valuation
Production	Fish catches	+				
	Reed and reed mace	+				
	Livestock	+				
	Timber	+				
	Crops	+				
	Others: honey, medicinal plants, mushrooms	+				
Regulation	Flood detention		+	+		
	Nitrogen retention			+		
	Phosphorous retention			+		
Support	Habitat				+	+
	Species richness and food web support				+	+
Information	Recreation**	+			+	

* Contingent Valuation - Willingness to Pay

** Tourist days - the potential for ecotourism established according with the carrying capacity of the area (bird watching, fish games, leisure) and WTP spending.

Box 2: International conventions, initiatives and programmes for the conservation and sustainable use of biological and ecological diversity to which Romania is part, and that are directly relevant for LDRS

Conventions at the global level:

- The Convention on Biological Diversity
- Convention on Wetlands of International Importance, Especially as Habitat for Waterfowl (Ramsar)
- Convention on Migratory Species (Bonn)
- Agreement concerning the conservation of the small cetaceans from the Mediterranean Sea and Black Sea

Conventions and strategies at Pan-European level:

- Bern Convention concerning the Conservation of the European Wildlife and natural Habitats
- Pan-European Biological and Landscape Diversity Strategy
- EU-Habitat Directive - 92/43/CEE
- Birds Directive - 79/409/CEE
- EU-Water Framework Directive/2000/60/EC

Convention at the regional - European level:

- Bucharest Convention for the protection of the Black Sea against pollution (Bucharest, 1992)
- Convention on the cooperation for the protection and sustainable use of the Danube (Sofia, 1994)

Initiatives and programmes:

- Bucharest agreement on the establishment of Danube River Green Corridor
- Environmental Programme for the Danube River Basin (World Bank-GEF, EU-PHARE, ERBD)
- Action Plan for the Black Sea Rehabilitation (UNEP/UNDP/World Bank)

More recently the social research and analysis have been integrated as a major dimension in the conceptual and analytical framework. That is focused on stakeholders identification and classification, on their attitudes, perception and behaviour regarding biodiversity conservation and ecosystem's functions valuation.

2.7.3 Main achievements

A first draft of DSS for LDRS management, containing the Information System (IS), the network of primary and secondary stakeholders, a set of tools, norms and standards, and the guidelines allow for:

i) interactions among scientists, policy and decision makers, end-users and public in each phase of the policy cycle – policy formulation, implementation and evaluation;

ii) feeding the policy and decision cycle with high quality data, information and knowledge (supplied by both scientific and traditional information and knowledge);

iii) description of the reference (RS) and current state (CS) of the LDRS as well as the trend of changes and the major drivers and pressures (Table 5);

iv) evaluation of functioning processes and estimation of major resource and service flows as a function of the key drivers and pressures in natural, seminatural and man-controlled (established polders) ecosystems;

v) first estimation of the economic value of the LDR Wetlands' functions, using Small Islands of Braila as a pilot area

vi) development of the management plans for Danube Delta Biosphere Reserve and Small Islands of Braila National Park;

vii) development of a green scenario targeted towards the goal of sustainability as an alternative to the 'business as usual' scenario promoted strongly by the scientists from the Academy of Agricultural Sciences and few other powerful stakeholders; and

viii) first assessment of the attitudes, perception and behaviour of the primary and secondary stakeholders.

Table 5: Major drivers and pressures, all related to the policies and management activities applied at different spatial scales (from local to Danube river catchment), the Reference state (1950^s) and the impacts on structure and functions of LDRS

Drivers	Pressures	Space scale	Reference State (1950^s)	Impacts
• Land reclamation	• Conversion of floodplain into intensive agro-ecosystems	All	• Biophysical Structure: Almost 10,000 km^2, of natural and semi-natural wetlands (including Razim-Sinoe lagoon system)	• Erosion of biophysical structure
• Increase of crop production and livestock	• Over exploitation of natural resources (e.g. fish)	All	• Mezo-trophy	• Eutrophication
• Commercial energy production in hydropower plants	• Introduction of alien species (e.g. Asian cyprinids, Canadian poplar)	Local and regional	• Production function: a) annual fish catches: 20-30/ktons; b) > 500 ktons of reed and reed mace; c) up to 2 x 10^5 m^3 of timber; d) ~ 150 ktons of crops and animal products	• Production function: dramatic reduction of fish productivity and catches (below 7 ktons per year)
			• Regulation function: a) flood detention capacity of > 12 km^3; b) nitrogen retention: 120-140 ktons/y; c) phosphorous retention: 6-10 ktons/y	Regulation function: reduction of water storage capacity upstream coastal delta by more than 5 km^3 and thus the flood duration and water retention time; reduction of nitrogen and phosphorous retention capacity by 40-45 ktons and respectively 2-3 ktons/y.
• Increase waterway transport capacity	• Intensification of auxiliary energy and material inputs into food production systems	All	• Support function: a) habitats for 1688 plant and 3735 animal species, in particular spawning, feeding or nesting habitats for migratory fish and bird species; species richness, including many ponto-caspian relics	• Support function: reduction with almost 78 % habitats for spawning, feeding and nesting fish and bird species.
• Urbanization and Industrialization	• Point and diffuse emission • Hydrotechnical works	Mainly at regional and river catchment	• Information function: complexity and uniqueness of LDRS a huge recreation & knowledge potential	• Information: reduction of the recreation potential upstream coastal delta.

2.7.4 First estimation of the economic value of the LDR wetlands' functions

The pilot floodplain area (217 km^2) was SIBr (Small Island of Braila) a remnant of Inland delta which preserves major structural and functional characteristics of LDRS at the reference state.

By taking into consideration the average rates of main production and regulation functions and the respective resources and services as well as their market price, the average economic value have been estimated for each function (see Table 4 for methods and Table 6 for monetary values). Taking into consideration the habitat and biological diversity and the way the population in the region is willing to pay for the maintenance of that area or to spend on recreation have been also estimated the economic value of support and information functions (Table 6). It can be noticed that the production function of renewable resources delivered by natural or traditionally-managed wetlands has been estimated at an aggregated economic value per ha per year of 310 USD while for the three regulation functions for which we had reliable data (Vadineanu & Postolache, 1998) the estimate of aggregated value was of 1200 USD/ha/year.

In spite of many economic difficulties the local population was faced during 'economic transition', the will to support the maintenance of habitat and biological diversity in SIBr was exceptionally high. This is very encouraging and is a strong argument against those who support the idea that poor people give less value to nature (Vadineanu *et al.*, 2003).

Table 6: The average economic values of SIBr major functions, resources and services (numbers indicate USD per hectare per year at the rate recorded in 2002)

Functions	Resources/ services	Average per resources/ service	Aggregated value for function
Production	• Fish yield	70	310
	• Timber, reed and reed mace	20	
	• Animal products (including hunting)	166	
	• Crop*	44	
	• Honey, herbs, mushrooms	10	
Regulation	• Nitrogen & Phosphorous retention	1100	1200
	• Flood detention	100	
Support	• Habitat	70	110
	• Species richness & food web support	40	
Information	• Recreation/ Tourism	109	109

*from extensive/ traditional agriculture.

The economic value for each category of SIBr function as well as the total economic value (TEV) of one hectare of wetland ecosystem per year (1729 USD), established for this pilot area, falls into the wide range of reported data for different wetlands, and specific market and economic conditions (Carpenter, 1998; Costanza *et al*, 1997; Turner *et al.*, 2000).

Although we are aware of the fact that we have produced only the first rough estimates, which in fact underestimate the value of such rich and productive river system, they are nevertheless reliable bioeconomic indicators for assessing the advantages or disadvantages of the past policies and management activities and for designing holistic and sustainable goals and targets for future scenarios and policies.

Due to the lack of such evaluation and inappropriate structure and metabolic rate of the local and regional economic systems the production, regulation, support and information functions have been under used or even totally neglected by scientists in the last half of the 20th century, which encouraged policy and decision makers from that time to perceive the floodplain of LDRS as 'wastelands'. Thus, instead of adapting and developing the socio-economic system, according to their natural foundation, policy and decision makers chose to transform the natural and totally self-maintaining ecological foundation into a human dominated and highly dependent on energy and material inputs. The cost for extensive transformations (about 4000 km^2) of LDR floodplains reached at the end of 1980s the total amount of 4 billion USD (Vadineanu *et al*, 2003).

The huge cost of floodplain transformation (4 billion USD) and the cost for intensive production of crop (650-900 USD per hectare per year in that established polders) to which we have to add the monetary loss due to cutting off three valuable ecosystem functions (regulation, support and information) made the former policy and management applied in the LDRS, one of the most inefficient economic activities.

Recent evaluation shows that such type of management of LDRS brought in the 1980s a loss equivalent to 500 million USD per year (Vadineanu *et al*, 2004).

This type of analysis brought very strong arguments which are currently used for formulation of a new policy and management plan for LDRS and LDC.

2.7.5 Green Scenario for the Management of LDRS and LDRC

Bearing in mind the effects of changes in the status of LDRS and the North-Western Black Sea there are strong arguments for promoting a new type of management able to support a more sustainable socio-economic development in the region.

To achieve the overall aim of sustainable socio-economic development or to create the conditions for balancing the dynamic relationships between natural capital and socio-economic systems in the area of the LDRS and North-Western Black Sea there is a need for a clear political commitment and operational agreements which have been reached through a variety of initiatives on the part of Romania.

It is essential to recognise common objectives for the hierarchy of scales: local (e.g. SIBr wetland system), regional (e.g. LDRS) and macroregional (Black Sea catchment) which will allow the establishment of the overall frame for adaptive management. Sound management will require:

i) an information base to support decision making;

ii) monitoring and research activities to update and strengthen the information-base;

iii) rehabilitation and conservation of biodiversity;

iv) rehabilitation of wetlands as self-maintaining and productive units;

v) rehabilitation of the productive capacity and most valuable renewable resources (e.g. fish resources; alluvial forest);

vi) pollution abatement, in particular nutrient diffuse pollution at the macro-catchment scale;

vii) sustainable use of natural resources.

The above requirements have a high degree of complementarity and strong direct and indirect links with each other. These requirements should be translated into a holistic conceptual frame and a coherent set of strategic objectives which, in turn have to enable development of the institutional infrastructure and the adaptive management plan at the appropriate time and space scale. That would allow the identification and assessment of direct and indirect as well as the local, remote and cumulative effects of any strategy, policy and project regarding the socio-economic development. That would allow also for problem identification dealing with the overall goal of sustainability and the integrated social, economic and ecological analysis of the alternative solutions.

Drivers

Concerning the LDRS and the North-Western Black Sea the most visible long-term objectives for policymakers should be linked to the need for pollution abatement and rehabilitation of the Black Sea (especially reduced eutrophication) and biodiversity conservation in the coastal Danube Delta.

In this respect the Black Sea and Danubian country representatives reached at the end of the 1990s, a consensus stating that the long term goal is to bring the trophic and overall pollution status of the Sea and consequently of the coastal Danube Delta to a condition characteristic of the 'reference' system recorded in late 1950s and early 1960s. A medium term deadline of 2010 has been established which asks all Danubian countries to limit and maintain nutrient emissions at the levels recorded in 1997. This may help to keep the Danube discharges into the Black sea at or even below 300kt of total nitrogen and 16kt of total phosphorous per year (Vadineanu *et al.,* 1998; EPDRB, 1995).

It means a 40% reduction of the total discharges recorded for the late 1980's. In order to achieve the intermediate and long term goal dealing with rehabilitation of the trophic state of the Black Sea it was agreed that a set of complementary and low cost measures should be identified and applied at the scale of Danube River catchment. However, taking into consideration the significant contribution of Romania to the total discharges, the above measures or some particular ones should be applied more specifically in the lower Danube River catchment (EPDRB, 1995; Vadineanu *et al.*, 1998; 2001).

The estimates of the nutrient balance carried out for the late 1980's and the beginning of the 1990's have indicated that half of the nutrient inputs to the lower Danube river stretch were supplied by agricultural sector and that both erosion and base flow contribute nutrients from the top soil. Historically the LDRS has played a significant role in nutrient dynamics through retention and processes such as (sedimentation, denitrification and removal by renewable resource exploitation) (Vadineanu *et al.*, 1998).

Policies and measures

The cost-effective and affordable measures to manage nutrient flows should focus on: the increase of agricultural landscape diversity by developing multifunctional farming systems and a network of ecotones in the lower river catchment; rehabilitation and reconstruction of former wetlands in the LDRS and retention of nutrients in their soils together with sustainable use of renewable resources.

By promoting multifunctional farming systems and an extensive network of ecotones it may be possible not only to achieve very effective diffuse pollution control but also significant improvement in habitat connectivity and biodiversity as well as more favourable conditions for integrated pest control.

Similarly, by wetlands reconstruction it is expected not only to increase the nutrient buffering capacity of the LDRS, but also achieve significant improvement in the productive capacity of a wide range of renewable resources such as forests. There would be benefits also to the North-Western Black Sea system.

To assure the effectiveness of such measures there is a need for reliable data and knowledge of the current decision making processes which might be improved to integrate both the users and public concerns into viable management plans over the range of scales from local to regional.

With reference to the established goal for 40% reduction of total nutrient discharges into the Black Sea this is equivalent to of 189Kt of TN and 14Kt of TP. Since 27% of TN and 23% of TP discharged into the Black Sea have point and diffuse sources within Romanian territory, it is estimated that Romania has to achieve a reduction of 51Kt of TN and 3.2 Kt of TP per year.

The main target needs to be diffuse emissions from agricultural land, by promoting and integrating into the current process of agricultural reform and rural development, the management measures identified earlier.

The related benefits include biodiversity rehabilitation and conservation, habitat reconstruction, soil erosion abatement, improvement of productivity and quality of natural resources, strengthening the rural economy and ensuring sustainable use of rural landscapes. It is expected that a successful scenario implementation to bring a significant reduction in diffuse nutrient emissions from the agricultural sector which may account for 50 % of total nutrient reduction, which Romania has to achieve by 2010.

A second management approach is based on the reconstruction of former wetlands. The direct target for this scenario is related to the need for a significant increase of buffering capacity against nutrient pollution.

The key questions ideally aimed to bring about increased retention capacity achieving more than 40 % of total nutrient reduction are:

- what surface area is necessary?
- what types of wetland?
- what kind of spatial distribution?

Preliminary data from an extensive study of the LDRS (Vadineanu *et al.*, 2001), suggests that a minimum 1500 km^2 of former flood plains should be reinstated for achieving multiple goals (see below). This still would represent only 30% of the former floodplains. Some 1200 km^2 of wetlands need to be recovered in the LDRS (200 km^2 in the Coastal delta; 100 km^2 along the right side of river stretch downstream Braila and 900 km^2 in the Inner delta) and 300 km^2 along the left side of the river stretch between Iron Gate (Calafat) and Calarasi (Figure 9).

By implementing this solution it is expected to achieve an increase of retention capacity of the LDRS by 22.5 Kt of TN (18Kt of TN by the LDRS alone) and 1.3 Kt of TP (1Kt of TP by the LDRS). This would bring about more than 90% of the total reduction required in nutrient discharges, which Romania has to achieve by 2010.

A rough estimation of the cost for applying the above scenario is about 500 million USD of which 250-300 million USD is required for wetlands reconstruction and rehabilitation. The additional and more expensive measures, like waste-water treatment plants may also contribute to the final goal of nutrient pollution abatement.

Wetland rehabilitation is expected to help not only in pollution abatement but also to meet other major objectives of sustainability. A significant increase of fish catches (up to 12-14 ktons per year) is expected as a result of the increase of nursery and productivity functions for semi-migratory and migratory fish species. Increases of other renewable resources, like: timber, reed and reed mace biomass, hay, medicinal herbs, honey are also anticipated. That expected effects would allow also reintroduction of the traditional and extensive farming systems of crop and vegetable production and animal raising, adapted to the ‘natural’ hydrological regime of the river.

Biodiversity conservation in the LDRS and North-Western Black Sea will also benefit. The estimates of the impact of restoration on local and regional socio-economic systems, in particular on fishery, farming and tourism sectors indicate a potential net benefit which might exceed 250 million Euro per year (Vadineanu *et al*, 2004).

2.7.6 Brief statements on the assessment of stakeholders’ attitudes regarding two alternative scenarios for future Management of LDRS

Data from a more intensive social research carried out by the staff of DSES/UniBuc revealed that the local population does not see an integrated and long-term strategy and policy that clearly promotes their interests and rights for a better life. They are blaming central authorities, especially those which avoided the interview, that promote only sectorial and short term interests of individuals and small groups of wealthy people who don't belong to local communities.

There are two parallel initiatives (scenarios) regarding the future of large polders established in the Lower Danube Wetlands/floodplain system:

a) the strategy and management plan developed by the Academy of Agricultural and Silvicultural Sciences and promoted by the Ministry of Agriculture and Forests which is focused on maintenance current drained surface by ‘rehabilitation and reconstruction’ of the flood defence, irrigation and drainage systems, and soils amelioration; and

b) the strategy and agreement (signed by the Ministers of Environment from countries in the Lower Danube Catchment in 2000/Bucharest) known as Lower Danube River Green Corridor (LDRGC), which envisage the extensive wetland reconstruction.

The most influential and powerful stakeholders considered by this study, both policy and decision makers, and land-users, are strongly supporting the sectorial strategy and policy promoted by Ministry of Agriculture, Forest and Rural Development and thus, are against wetland reconstruction.

The actual political, social and economic situation, combined with misinterpretation of LDGC objectives, by the most influential and powerful stakeholders, together with the lack of information, communication and public participation during project formulation, make the implementation of LDGC in the near future, a very critical task.

Based on more extensive data (DSES/UniBuc - unpublished) most subsistence farm owners (who have their properties outside of polders) are or might be in favour of extensive floodplain restoration, if they are well informed about the potential benefits for their future welfare, and are properly involved in the policy development and implementation.

Using sound scientific information which has been accumulated in the last 5-6 decades (including traditional knowledge of local people), complemented with those produced in the most recent social and ecological economic research, a comprehensive programme in support of LDGC project has to be designed and implemented.

That should rely on some key instruments and tools like information, communication and public participation. The information and communication should be focused on those aspects emerged from proper cost-benefit analysis of both scenarios regarding the future of LDWS, carried out in a holistic manner and in terms of ecological economics.

The positive and negative experiences, especially those related to public awareness, stakeholder involvement in decision making and how to protect and promote the rights and interests of the local population are currently assessed in order to improve the acceptance of LDRGC or Green Scenario.

In summary we assume that for the time being the major challenge is to bring together the various social, economic and ecological priorities within a shared vision which will ensure engagement and long term support of scientists, politicians, decision makers and especially the local populations.

References

*** EEA, 2001, Environmental benchmarking for local authorities: from concept to practice. Report Nº20, Copenhagen.

*** EPDRB, 1995, Strategic Action Plan for Danube River Basin. 1995/2005, 109 pps., Vienn.

Antipa, Gr., 1910, Regiunea inundabila a Dunarii. Starea ei actuala si mijloacele de a o pune in valoare (Danube floodplains: Actual Status and means of valorification), Instit. Arte Grafice Carol Gobi, 317 pgs., Bucuresti.

Baboianu, G., 1998, The Danube Delta Biosphere Reserve: Nature protection and sustainable development. Proc. 2th International Seminar for Managers of BRS of the European MAB network, Stara Lesna, Slovakia, p. 23-27.

Barbier, E.B., 1993, Sustainable use of wetlands: Valuing tropical wetland benefits: Economic Methodologies and Applications. The Geographical Journal 159(1), p. 22-32.

Botnariuc, N., Beldescu, D., 1961, Monography of the Crapina-Jijila complex of shallow lakes, Hydrobiologia (Romanian Academy) 11, p. 161-242.

Cristofor, S., Vadineanu, A., Ignat, G., 1992, Importance of floodplains for nitrogen and phosphorous dynamics in the Danube Delta, Hydrobiologia, 251, p. 143-148.

Cristofor, S., Vadineanu, A., Ignat, G., Ciubuc, C., 1993, Factors affecting light penetration in shallow lakes (Danube Delta), Hydrobiologia, 275/276, p. 493-498.

Navodaru, I., Buije, D.A., Staras, M., 2002, Effects of hydrology and water quality on the fish community in the Danube Delta lakes, Internat. Rev. Hydrobiol., 87 (2-3), p. 329-348.

Nunes, D.L.A.P., van den Bergh, N.J.C., 2001, Economic valuation of biodiversity: sense or nonsense ? Ecological Economics 32, p. 203-222.

Risnoveanu, G., Postolache, C., Vadineanu, A., 2004, Ecological significance of nitrogen cycling by tubificid communities in shallow eutrophic lakes of Danube Delta, Hydrobiologia, 524(1), p. 193-202.

Risnoveanu, G., Vadineanu, A., 2003, Long term functional changes within Oligocheta communities from Danube River and delta, Romania, Hydrobiologia, 506/509, p. 399-405.

Sarbu, A., Cristofor, S., Vadineanu, A., Florescu, C., 1997, Changes in submerged macrophytes in the Danube Delta, Acta Botanica Horti Bucurestiensis (1995/1996), p. 85-91.

Turner, R.K., Bateman, J.I., Adger, N.W. (Eds), 2001, Economics of Coastal and Water Resources: Valuing Environmental Functions. Kluwer Acad. Publ., Dordrecht.

Vadineanu, A., 2004, Adaptative management of socio-ecological complexes: An Ecosystem Approach, ArsDocendi/Bucharest University Press, Bucharest.

Vadineanu, A., Adamescu, M.C., Cazacu, C., Bodescu, F., Danielescu, S., 2001, Past and future management of the Lower Danube wetlands.Working paper,75 pgs., DEPARTMENT OF SYSTEM ECOLOGY, UNIVERSITY of BUCHAREST.

Vadineanu, A., Adamescu, M.C., Vadineanu, R.S., Cristofor, S., Negrei, C., 2003, Past and future management of Lower Danube Wetlands System: a bioeconomic appraisal. The Journal of Interdisciplinary Economics,14, p. 415-447.

Vadineanu, A., Cristofor, S., Ignat, G., 1992, Phytoplankton and submerged macrophytes in the aquatic ecosystems of the Danube Delta, during the last decade, Hydrobiologia, 243/244, p. 141-146.

Vadineanu, A., Cristofor, S., Ignat, G., Ciubuc, C., Risnoveanu, G., Bodescu, F., Botnariuc, N., 2000, Structural and functional changes within the benthic communities of Danube Delta lakes. Verh. Internat. Verein. Limnol. 27(5), 2571 - 2576.

Vadineanu, A., Cristofor, S., Iordache, V., 2001, Biodiversity changes in the Lower Danube River System, In Gopal, B., Junk, J.W., Davis, A.J. (Eds) 'Biodiversity in wetlands: assessment, function and conservation', vol. 2, p. 29-65, Backhuys Publ., Leiden.

Vadineanu, A., Cristofor, S., Romanca, G., Ignat, G., Iordache, V., Sarbu, A., Ciubuc, C., Florescu, C., Teodorescu, I., Postolache, C., Adamescu, C.M., 1997, Functional assessment of the wetlands from the Lower Danube River Systems, Limnologische Berichte (Donau 1997), p. 463-466, Wien.

Vadineanu, A., Postolache, C., 1998, Nutrient balance in the Lower Danube River Catchment. Final Raport, EU/AR/102A/91.

2.8 Integrating biodiversity research and protection into policy processes in Slovakia

Jana Sedláková, Institute of Landscape Ecology, Slovak Academy of Sciences, Slovakia

The Slovak Republic has introduced a number of legal measures that directly or indirectly regulate conservation of biodiversity and use of its components. The right to have a healthy environment is also proclaimed in the Constitution of the Slovak Republic. It demands all citizens to preserve and protect the environment of which biodiversity is an inseparable component. Slovakia is also a member of some international conventions and initiatives dealing with fauna and flora protection. Participation in these conventions also determines activities in biodiversity protection and research.

2.8.1 The National Biodiversity Strategy of the Slovak Republic (NBS)

Having recognised the importance of the conservation of biological diversity for preserving life on the Earth, the Government of the Slovak Republic agreed to sign the Convention of Biological Diversity (CBD) in May 1993. The Slovak Republic became a Party to the CBD on 23rd November 1994.

From 1994 to 1995 series of studies on biodiversity in Slovakia were prepared. These studies contained information on the state of biodiversity, a review on legislative norms related to the biodiversity conservation and use of its components, a description of institutional frameworks dealing with biodiversity issues and an evaluation of state of biotechnology and biosafety (Straka, Guziová 1998). The National Biodiversity Strategy (NBS) of the Slovak Republic was adopted by the Government of the Slovak Republic on 1st April 1997 and endorsed by the National Council of the Slovak Republic on 2nd July 1997.

As a part of the NBS implementation was prepared the first Action Plan (AP). The Slovak Government adopted the AP on 4th July 1998. This Plan for the period of years 1999-2010 represents the initial plan for implementation of concrete tasks aimed to achieve strategic goals set forth by the NBS. It provides a baseline on which substance and timing of current plans are elaborated to ensuring long-term systematic and comprehensive contribution for the implementation of the CBD and the NBS.

2.8.2 Ministries and Grant Agencies

The Ministry of Environment of the Slovak Republic (MoE SR) is the main authority of the state administration dealing with nature protection and its formation in all aspects. The MoE SR according to its Statute (Part 5 (2e)) uses scientific knowledge of institutes and research organisations, cooperates with them and with the Slovak Academy of Sciences (SAS), universities, civic associations and foundations to ensure that tasks of nature protection and its formation will be fulfilled.

Knowledge and suggestions derived from research projects are usually in forms of reports sent to County Authorities of the MoE SR and to particular regional State Protection Agencies. Also grant agencies like a scientific grant agency VEGA that is the common grant agency of the Ministry of Education of the Slovak Republic and the SAS or the Agency for Support Science and Technique (APVT grant agency) play an important role in biodiversity research.

2.8.3 Slovak Biodiversity Platform (SBP)

The determinative meeting of the Slovak Biodiversity Platform (SBP) was held in Smolenice (Slovakia) on the 14th April 2005 where 28 biodiversity experts from 16 organizations working sphere of biodiversity met. All participants agreed their membership in the SBP. Currently, the SBP has 6 member organizations from the Slovak Academy of Sciences (the ILE SAS as the main coordinator), 3 universities, 5 state authorities (including the MoE SR), 2 NGOs and 14 partners from abroad.

The SBP specified its main goals on its first meeting in Smolenice. The main goals are to analyse current state of biodiversity in Slovakia, identify priorities in biodiversity research and existing gaps, intensify cooperation among institutions working in biodiversity, share knowledge, make results from research projects accessible also for public, support increase of biodiversity knowledge and interest in public by recommendations on education syllabi, press on the VEGA grant agency to support preferably biodiversity projects, create a central database of biodiversity data administrated by the State Nature Protection Agency, etc.

On the second meeting of the SBP on 29th November 2004, that was held after a natural calamity in the Tatra Mts. and other affected areas on 19th November 2004, the members of the SBP discussed the current situation in the Tatra Mts. National Park (TANAP) also the UNESCO Biosphere reserve Tatras and the other affected areas. The windstorm totally devastated forest ecosystem on an area of 9000 ha and next 3000 ha was considerably damaged. The experts prepared a set of recommendations on how to deal with the current situation with respect to biodiversity protection on all levels on the affected areas. The standpoint of the SBP on the situation in the Tatra Mts. (http://www.ile.sav.sk/bioplatform/spb.htm, in Slovak) was sent to a newly constituted Governmental Committee for revitalization and development of Tatra Mts. that has in competence sustainable development and landscape ecological plans for the whole Tatra region. The standpoint was taken into account.

The Governmental Committee for Revitalisation and Development of the High Tatra Mts. of the Ministry of Agriculture of the Slovak Republic and the Management of the TANAP presented their standpoints on this document on the third meeting of the SBP on 26th April 2005. All reactions could be assessed as positive. On the ground of the EPBRS was highly appreciated interest of the SBP on the problem solving as well as its acceptance by the Slovak governmental bodies. The MoE SR offered the SBP cooperation with the newly restored Commission of the Convention of Biological Diversity to create an advisory body of the Minister of the Environment of the Slovak Republic.

2.8.4 Slovak Environmental Agency (SEA)

The Slovak Environmental Agency (SEA) is a scientific allowance organisation subordinated to the Ministry of Environment of the Slovak Republic. It has been established by the Decision of the Minister of the Environment of the Slovak Republic from 17 May 1993, No. 8/1993. The purpose of the establishment of the SEA was to execute the expert tasks to ensure the environmental protection and environmental policy development.

The main activities of the SEA include theoretical, strategic, methodological, coordination, documentation, information, education, promotion and other activities aimed mainly on spatial development, urban and rural landscape functional use, landscape-ecological issues, waste management, environmental informatics and monitoring, documentation and scientific-technical information, environmental impact assessment, environmental risks assessment and management, chemical safety, integrated prevention and pollution control, evaluation of state environment, environmental classification, cultural landscape and natural heritage protection, coordination of the international cooperation, environmental projects programming, environmental economy, environmental evaluation and labelling of products and environmental management and audit.

2.8.5 Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) (see box 1 below) procedure in Slovak legislation is adjusted by the Act No.127/1994 of the National Council of the Slovak Republic on the Environmental Impact Assessment, which came into effect on 1st September 1994.

On 1st December 2000 came into effect Act No. 391/2000, which changes and complements Act No.127/1994 on the EIA. By approval of this Act, the absolute agreement of legal regulations in the field of environmental impact assessment (Box 3.) in Slovakia with the legal regulations of EU has been achieved.

Box 3: Environmental Impact Assessment Process

The **purpose** of the EIA is complete expert and public assessment of planned constructions, facilities and activities before the decision on their permission from the point of view of their presumed impact on the environment.

The **subject** of the assessment are constructions, facilities and activities in the field of industry, energy, infrastructure, water management, agriculture, forestry, transport and communications, changes in land use, tourism, military facilities.

The whole assessment process in Slovakia is managed and regulated by the Ministry of the Environment of the Slovak Republic (MoE SR), by the EIA Section.

Further **participants** are: proponent, competent authority, permission authority, affected municipality and public.

According to the Act on the EIA a **permission authority** is defined as the authority of the state administration that is competent to issue the decision concerning the permission of the activity under special regulations.

A **competent authority** is defined as the central authority of the state administration within whose competence the assessed activity falls.

A **proponent** is defined as the juridical or physical entity intending to perform the activity that is to be assessed under this Act.

A **civic initiative** for the purpose of this Act means not less than 500 physical persons more than 18 years old, of which at least 250 persons have a permanent address in the affected municipality, who will sign a joint standpoint to a proposed activity. The list of signatures, with the expression of the opinion, will be delivered to the Ministry.

As the beginning the **preliminary environmental study (PES)** is delivered to the MoE SR. The PES must contain at least two alternatives, as well as a zero alternative that is an alternative for the state if the proposed activity would not be provided. The PES contains only the basic characteristics of the proposed activity, basic data about current state of the environment in the affected area, basic data on the presumed environmental impacts, basic evaluation of the advantages and disadvantages of proposed alternatives and proposals of measures to eliminate or reduce the adverse environmental impacts of the activity.

The proponent arranges the elaboration of the PES or/and the **environmental impact statement (EIS)**. The EIS is the complete investigation, description and evaluation of the presumed impacts of the proposed activity, including a comparison with the existing state of the environment in the affected area.

The MoE SR decides whether the activity will be or will not be assessed under the Act (whether a PES is enough or an EIS is required).

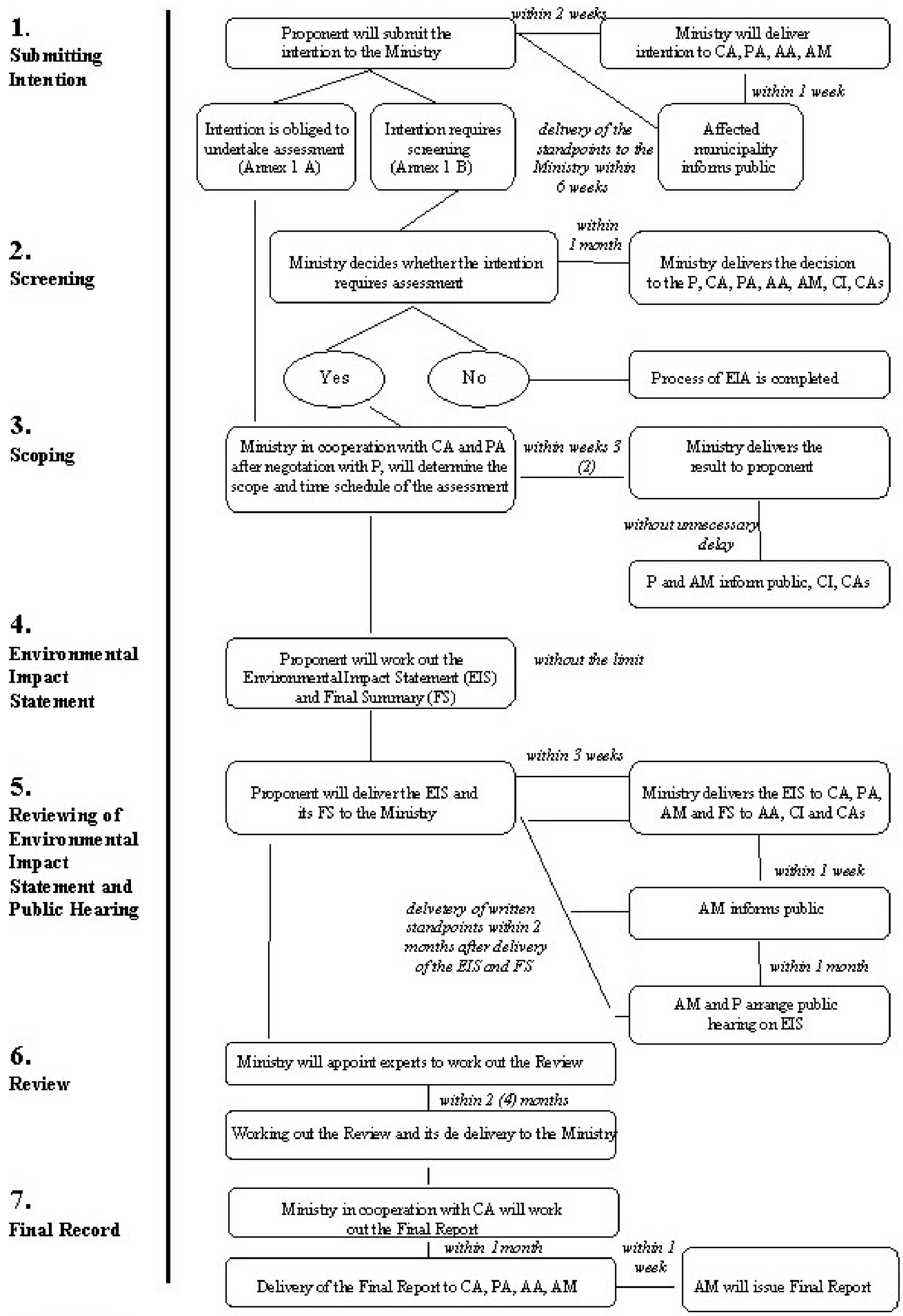
The MoE SR will ensure that an **expert review** is elaborated on the bases of the EIS, taking into account the submitted records and standpoints. The expert review can be elaborated only by the **authorized physical or juridical entities**. Persons who have taken part in the elaboration of the PES or the EIS cannot take part in the elaboration of the expert review. The proponent could be asked by the experts to provide complementary data necessary for the expert review. The experts review always includes the **draft of the final record**. Afterwards, the MoE SR will draw up in cooperation with the 'competent authority' **the final record**.

In a period of ten years, since 1st September 1994 to 1st September 2004, were assessed according to this Act 1550 constructions, equipments and activities. From the assessed activities the highest number represented sewage water treatment plants, sewerages and water ducts (257), waste treatment activities (110), motorway and road constructions (77), hypermarket and shopping park constructions (102), recreational accommodation constructions and ski lifts (55) and water works (37). Other activities represented introductions and reconstructions of different technologies and building of linear constructions such as gas lines and electric lines. The complete EIA process, that means assessment process was finished with a final record, was carried out in 304 cases. Screening process according to this Act was done in 1246 cases from which only a small percentage was further assessed and finished with final record.

According to the EIA Department of the MoE SR, proponents who underwent the EIA process at least once evaluate it mostly as positive. An important part in the EIA process is also public hearing on proposed activity. Unfortunately, presence of public is usually very low and majority of questions is concerning compensatory measures and property legal settlements. Only sporadically is proponent asked questions concerning impacts on environment and its protection. In cities and villages with active environmental organizations are public hearings with higher presence and also discussions are on more professional level.

The environmental impact assessment procedure, in spite of certain imperfections, has an apparent contribution to nature protections. It ensures from early stages of planned activities that impacts on nature and environment will be minimized. Time and financial demands related to assessing processes are counterbalanced with positive impacts in nature protection and with sustainable development.

Figure 11: Scheme of the steps in the EIA process in the Slovak Republic with time schedule (www.sazp.sk)



Abbreviations:
Ministry – the Ministry of Environment of the Slovak Republic, ***P*** – Proponent, ***CA*** – Competent Authority, ***PA*** – Permission Authority, ***AA*** – Affected Authority, ***AM*** – Affected Municipality, ***P*** – Public, ***CI*** – Civic Initiative, ***CA*** – Civic Association, ***EIS*** – Environmental Impact Statement, ***FS*** – Final Sumary

2.9 The European Union: The European Platform for Biodiversity Research Strategy: contributing to the interface between biodiversity science and policy

Extract from Sybille van den Hove & Martin Sharman (2006)[28]

2.9.1 Introduction

The European Platform for Biodiversity Research Strategy is an informal forum where scientists and policy-makers discuss science strategy for biodiversity policy. It recommends key scientific areas for biodiversity research in Europe - including issues relating to the Convention on Biological Diversity. The EPBRS mission statement reads as follows: 'The European Platform for Biodiversity Research Strategy is a forum for scientists and policy-makers to ensure that research contributes to halting the loss of biodiversity by 2010.'[29] The decision of including the 2010 target in the mission statement reflects the willingness of EPBRS to contribute to both the international and European political commitments. EPBRS is also an important element in the European Research Area (ERA) for biodiversity research[30].

The EPBRS strives to promote strategically important biodiversity research with concern for reduction of biodiversity loss, conservation, protection, restoration and sustainable use of the components of biodiversity. This is done through identification of policies for which biodiversity science knowledge is important, identification of significant gaps in knowledge that reduce the effectiveness of policy, establishment of priorities for biodiversity research in Europe and promotion of communication between scientists and end-users. The Platform has set itself a series of objectives, to be reached by the end of the 6th Framework Programme for Research and Technological Development of the European Union, whereby it aims at becoming the 'European voice in biodiversity science policy'. (See Box 4)

---

[28] van den Hove S. & Sharman, M. (2006, forthcoming) "Interfaces between Science and Policy for Environmental Governance: Lessons and open questions from the European Platform for Biodiversity Research Strategy", in: A. Guimaraes Pereira, S. Guedes Vaz, S. Tognetti (Eds.) *Interfaces between Science and Society*, Greenleaf: Sheffield.

[29] www.epbrs.org

[30] The ERA was established to encourage networking and cooperation, and to build a research equivalent of the common market by improving the coordination of research activities and the convergence of national and EU research policies.

Box 4: EPBRS objectives (Source: EPBRS, 2003)

- EPBRS should be the main European forum at which prominent natural and social scientists, influential policymakers and stakeholders exchange views and combine forces to plan, implement and exploit the research needed to underpin the conservation and sustainable use of components of biodiversity in Europe.
- EPBRS should be widely known and its activities widely appreciated by the science community and by the science policy-makers of the EU and Associated States.
- EPBRS should produce agreements that collectively have a significant impact in the Commission, Council and Parliament on the debate on the follow-up to the 6th framework programme.
- EPBRS should provide helpful science policy advice for the European delegations to the CBD and to the Council Environment working group (biodiversity).
- EPBRS should be the natural contact point for relevant organisations with a similar mandate outside Europe, and should provide support for a coordinated European contribution to international programmes such as ICSU[31] and initiatives such as the Millennium Ecosystem Assessment[32].
- EPBRS should have become the 'European voice in biodiversity science policy'.

2.9.2 Status and Process

The EPBRS depends on continued political support, resources and commitment from EU Member States and on the commitment of its participants. It considers that it will continue to develop as long as it can satisfy the following three types of interests:

(i) the interests of the research community in influencing the EC Framework Programmes for Research, improving research networks, understanding policy needs for research and contributing to the policy process;

(ii) the interests of the EC and Member States in helping to ensure the relevance to policy and public benefit of publicly-funded science in Europe; and

(iii) the interests of the successive EU Presidencies in promoting their own biodiversity research agenda in Europe and raising the profile of biodiversity research domestically.

The EPBRS is and aims at remaining an informal body that keeps close connections with the EU institutions, national governments, and relevant international bodies. It meets twice a year under the successive EU Presidencies. The maintenance of this systematic link to the EU Presidency and the continuity of the meetings are pivotal to the success of the Platform.

Since its inception in 1999, the agendas of the meetings of the EPBRS have tried carefully to balance science and policy. The scientific flavour of the meeting is important to ensure that all participants enjoy sufficient depth of understanding to discuss the substantive issues constructively. The themes addressed in the meetings have been chosen because they are of particular relevance to the organising country, while also having a European relevance. In some cases they were also chosen because they were important items on forthcoming CBD meetings or for the review of the European Biodiversity Strategy. Thus the group has dealt with Northern dimensions of biodiversity, islands and archipelagos, invasive organisms, water and forest, biodiversity conservation, Mediterranean biodiversity, scientific monitoring of biodiversity, sustainable use of biotic resources, and sustaining livelihoods and biodiversity. It has approached these topics with the aim of identifying scientific work of policy relevance that is needed to support the implementation of the CBD, the EU Directives on Birds and Habitats, EU and national Biodiversity Action plans, Natura 2000, and the EC Clearing-House Mechanism.

EPBRS also encourages and helps to establish national platforms for biodiversity research in Member States and other States participating in the EU programme of research. The forms and functions of these

[31] The International Council for Science (ICSU) is an international non-governmental association of natural scientists that works to identify and address major issues of importance to science and society.

[32] The MA (2001-2005) is designed to improve the management of the world's ecosystems by providing scientific information to meet the needs of decision makers.

platforms are adapted to the needs and administrative landscape of their country. In this activity, it is strongly supported by the thematic network 'BioPlatform'[33], funded by the European Community to provide scientific, logistic and financial support to the activities of the EPBRS.

To achieve its mission statement, EPBRS focuses on aspects of science policy and science issues relevant to wider policy. Crucial steps in the process are:

(i) identification of a set of topics that should be discussed by the EPBRS at its meetings;

(ii) identification of best practice in converting priority wish lists into science action plans;

(iii) identification and implementation of best practice in getting science action plans onto policy and funding agendas; and (iv) identification and implementation of best practices in building effective science-policy interfaces.

The EPBRS process consists of meetings, preparatory and dissemination activities between meetings, and activities of national platforms (Figure 12). Preparatory activities involve meeting design and logistics, electronic conferences, electronic preparation and discussion of draft recommendations, and ad hoc working group work on specific topics. Meeting activities involve keynote speeches, presentation of on-going European research activities, breakout group discussions and preparation of recommendations, and plenary discussions and adoption of recommendations. Dissemination activities relate to diffusion of outcomes (see below).

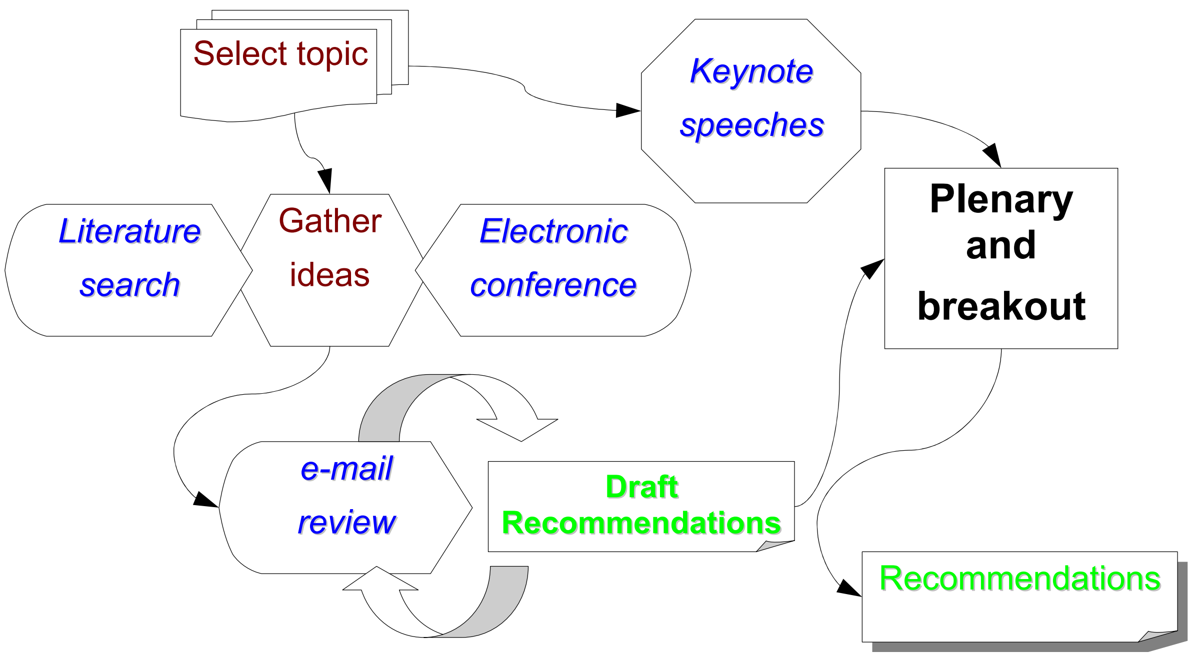


Figure 12: Process of EPBRS Meetings

2.9.3 Deliverables

The agreements of successive EPBRS meetings are the main tangible deliverable, they generally consist in recommendations for future research to address priority research gaps regarding the thematic issue under discussion. They also include methodological comments when needed. Other deliverables include proceedings of EPBRS meetings, reports on the status of biodiversity research in Europe and corresponding gaps, or more political statements on the importance of biodiversity research.

[33] BioPlatform members come from AT, BE, CH, DE, DK, ES, FI, FR, GR, IE, IT, NL, NO, PT, SE, SK, UK BG, CY, CZ, EE, HU, LT, LV, MT, PL, RO, and SI. It helps the EU presidency host country and the Commission to organise EPBRS meetings. It also runs electronic conferences in preparation of the EPBRS meetings, and organises the deliverables produced by the EPBRS. See http://www.bioplatform.info/ for more details.

The success of EPBRS depends on its visibility in the political landscape in Europe and on its ability to deliver relevant products at the right time, to the right people. The Platform has become a recognised and acknowledged participant in EU discussions of biodiversity science strategy and policy. This success is partly due to networking and linking activities, less tangible, but nevertheless highly important deliverables.

2.9.4 Membership, organisation and funding

Membership in the EPBRS is open to all states that participate in the 6th Framework Programme for Research and to the European Union Institutions. The EPBRS is also open by invitation to organisations whose mission involves them in biodiversity science policy at a European scale. Other stakeholders are invited to participate at appropriate meetings. The individuals who attend the meetings are selected by the participating state[34]. EPBRS participants must have the national contacts or influence to guarantee that the agreements of the meetings will be delivered and explained to the relevant authorities within their countries. The strength of the EPBRS lies in its members, among whom are several national delegates to SBSTTA[35]. At present the delegations from each participating state comprise one scientist and one policymaker, and the scientific representation is almost entirely drawn from the biological sciences. To contribute to the social science expertise of the body, the Commission invites some socio-economic experts to participate *ad personam* in the EPBRS.

The necessary work between meetings – to prepare the meetings themselves, but also to follow them up and to undertake the necessary work identified during the course of the meetings – is done by the participants on an ad hoc basis through the use of small working groups of volunteers and the extensive use of the network of national platforms as well as a very active internet discussion list – 'EU Biodiversity Science' – whose membership is open to anyone interested in biodiversity science.[36]

Funding remains a problem as in the present situation EPBRS is entirely funded by the successive Presidencies of the EU (as concerns meeting organisation) and by the BioPlatform thematic network which was funded under the 5th EU programme of research. External funding is sought to allow the EPBRS to function as an independent body. It could become part of a federation of National Biodiversity Platforms, driven by a common goal to encourage the convergence of biodiversity research on policy needs in the EU. Belgium is funding a permanent secretariat to build and maintain close links with relevant EU institutions including those that are responsible for sectors important for sustainable development, such as forestry, agriculture, fisheries and industry. The secretariat will also manages the EPBRS website.

The EPBRS Steering Committee (SC) is responsible for discussing the political and strategic orientation and activities of the EPBRS, and for making suggestions to the EPBRS to help to improve the relevance and impact of its work and on high level strategic and policy issues. In particular, the steering committee:

(i) reflects on actions to increase, the effectiveness and impact of the EPBRS;

(ii) reviews, updates and where necessary recommends changes to the EPBRS work plan, mandate, terms of reference, membership, or structure;

(iii) discusses and makes recommendations on issues on which there has been a strong division of opinion within the EPBRS;

(iv) reviews the need for specialised working groups on selected topics;

(v) acts as the point of contact for organisations that wish to establish dialogue with the EPBRS;

(vi) maintains links with external organisations, and in particular with the SBSTTA and the secretariat of the Convention on Biological Diversity; and

(vii) discusses and makes recommendations on the logistic requirements of the EPBRS, and sources and means of political and financial support. In each case the Steering Committee

---

[34] This is achieved by asking the relevant Research Programme Committee, as an emanation of the Council of Ministers, to nominate members.

[35] SBSTTA is the Subsidiary Body on Scientific, Technical and Technological Advice of the Convention on Biological Diversity.

[36] http://www.smartgroups.com/groups/BiodiversityScience

makes its recommendations to the full EPBRS membership, for discussion by email or in an EPBRS meeting.

2.9.5 Linking science and science policy

The EPBRS is clearly an interface between science and policy. Nevertheless, since it is a platform where scientists and policy-makers work together to define biodiversity research strategy, it is only one element of the wider interface between biodiversity science and biodiversity policy. The requirement for the research strategy is that it should allow for the development of research that will answer biodiversity policy needs. In other words, EPBRS aims at the definition of a biodiversity science policy that will lead to relevant science for biodiversity policy.

2.10 Science policy interface in global international conventions for the conservation of nature and biodiversity

Irene Bouwma, Alterra, the Netherlands

2.10.1 Introduction

The first group of international agreements for the protection of biodiversity were drafted at the global and European level in the 70's. The second group of international conventions and programmes was drafted in the 90's.

In global conventions nation states are the official participants in al these policies and therefore on the national level these policies need to be implemented in the national domestic, legal and political system in order to be effective.

At present there are 5 international global conventions focussing on biodiversity protection being:

- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention) (1971)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), (1979)
- Convention on Biological Diversity (1992)
- Convention on International Trade of Endangered Species (1973)
- Convention concerning the protection of the World and Cultural and Natural Heritage (World Heritage Convention (1972) (Delbaere, 1998)

In this case-study the first three of them are reviewed in respect to the policy-science interaction occurring.

2.10.2 Organizational structure

The three international global convention (Table 7) all have a scientific advisory body. Although the official descriptions of their roles and responsibilities vary overall the tasks of these bodies are comparable e.g. to provide the decision making body of the convention with scientific and technical advice.

Table 7: Organizational structure of the conventions

Convention	Name of decision making body	Name of Scientific body/ members	Role/ Task
Convention on Wetlands of International Importance Especially as	The Conference of the Contracting Parties (COP) meets every three years and promotes policies and	The Scientific and Technical Review Panel (STRP) Members: 15 individual STRP members, delegates from the four International Organization	The STRP provides scientific and technical advice to the Conference of the Contracting Parties. The STRP is composed of members with appropriate

Convention	Name of decision making body	Name of Scientific body/ members	Role/ Task
Waterfowl Habitat (Ramsar Convention)	technical guidelines to further the application of the Convention. The Standing Committee, made up of Parties representing the six Ramsar regions of the world, meets annually to guide the Convention between meetings of the COP	Partners -- BirdLife International, IUCN-The World Conservation Union, Wetlands International, and the World Wide Fund for Nature International -- 18 representatives of the subsidiary bodies of other Multilateral Environment Agreements and non-governmental organizations and associations.	scientific and technical knowledge, selected from the six Ramsar regions, and representatives of the four International Organization Partners (BirdLife International, IUCN–The World Conservation Union, Wetlands International, and the World Wide Fund for Nature). Other relevant organisations also contribute to the work of the STRP as observers.
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)	The Conference of the Parties (COP) meets at least once every three years. The Standing Committee provides policy and administrative guidance between the regular meetings of the COP.	Scientific Council Members: 69 country appointed members & 6 conference appointed members	A Scientific Council consisting of experts appointed by individual member states and by the COP, gives advice on technical and scientific matters (in 2003: approx. 70 members).
Convention on Biological Diversity	Conference of the Parties, since 2000 held every 2 years.	The SBSTTA (Subsidiary Body on Scientific, Technical and Technological Advice) Open to representatives of all member states.	SBSTTA is a subsidiary body of the Conference of the Parties (COP) and is to report regularly to the COP on all aspects of its work. Its functions include: providing assessments of the status of biological diversity; assessments of the types of measures taken in accordance with the provisions of the Convention; and respond to questions that the COP may put to the body.

Source: http://www.biodiv.org/default.shtml; http://ramsar.org/; http://www.cms.int/

2.10.3 How is the science-policy interface working?

The process through which the policy-science interface is working is two directional and is following:

- The decision making body of the convention request the scientific body to provide advice on a specific issue. However the mandates of the scientific body state that they can also suggest topics to the decision making body on which they feel scientific advice is required;
- Often an expert group is formed on the topic and drafts a paper;
- The entire scientific body reviews the paper in one of it's meeting and decides depending on the status whether it is forwarded to the decision making body of the convention and/or whether a recommendation is formulated for the decision making body ;
- The paper is reviewed in the decision making body and usually is accepted as an information document for the convention. If a decision needs to be made on the basis of the paper this will be drafted separately based on the recommendation of the scientific body and officially be approved as a decision.

(SBSTTA -Modus Operandi, Annex I of decision IV/16 and Section III, decision V/20; Ramsar Convention: Modus Operandi :Resolution VIII.28 Valencia, 2002)

In reality scientists and NGOs, whom often are playing an important role in providing scientific advice, play a more active role in identification of the topic on which scientific advice is requested. Often besides being active in the scientific body they (having an observer status) also participate in the meetings of the decision making body and by doing so try to influence the agenda setting of meetings of the decision making body in order to ensure that scientific advice is requested on a certain topic. Therefore the two bodies are less separated as the official procedure indicates.

The agenda setting by 'scientist' occurs generally in two ways:

- Often scientist, usually from research organization connected to the Ministry participate as representatives of their government in meetings itself. Figure 13 outlines how many of the representatives attending the two conventions are not working for the Ministry but for non-ministerial organizations. These are often research organization connected to the Ministry.
- NGOs as observers will either directly in the meeting or in the corridors of the meetings lobby hat a certain issue is put forward for advice to the scientific committee.

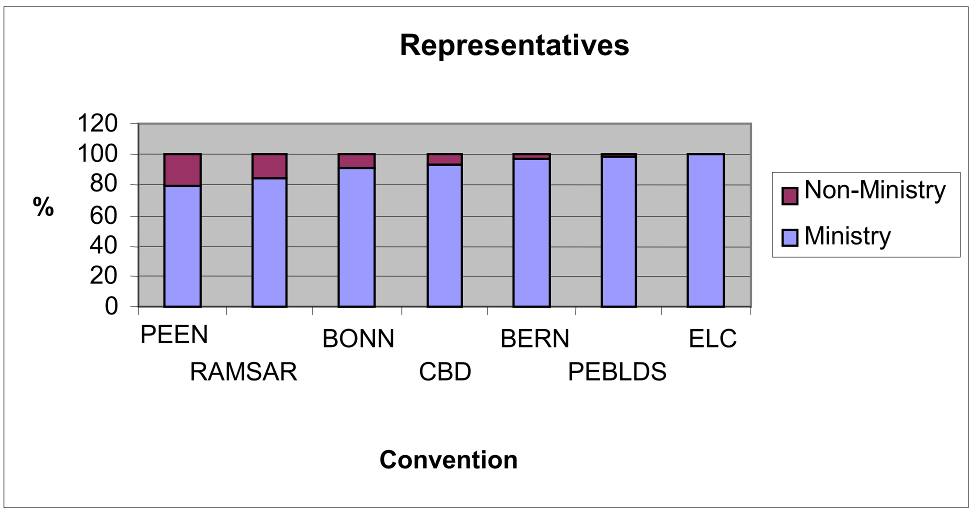


Figure 13: Average percentage of non-governmental employees in different international conventions and programs.

2.10.4 Kind of output and outcome

A quick scan of the documents of the 11 SBSTTA-meetings and of the websites of the scientific bodies of the Ramsar and Bonn Convention shows that the scientific advice requested and provided falls into in different categories:

- *Status, trends and threats to biodiversity* - often for specific habitats or species. Often specific indicators are developed to highlight the status and trends. On the basis of this information species are incorporated or removed from the official annexes of the Ramsar and Bonn Convention and special species conservation plans are drafted.
- *Status of an area* - whether it should be designated as a Ramsar Sites
- *Overview of best practices* in the field of sustainable use, management, legal instruments and financial incentives.
- *Guidelines* for the parties on sustainable use, management, legal instruments, financial incentives, monitoring etc. (often based on the review of best practices)
- *Definition and elaboration of scientific concepts* used in the convention's text or conventions discussions. For instance the ecosystem approaches in the CBD.
- *Advice on funding* (for instance Small Grant Programme of CMS)

A pivotal question is whether the scientific advice indeed does influence the decisions taken by the decision making body and whether it improves the subsequent execution of policies. In the framework of this paper this question will not be answered as it requires a detailed analysis of all meeting documents and decisions.

2.10.5 Bottlenecks

As it is difficult to provide a full overview of bottlenecks in the science-policy interface in all three conventions below are only some issues noted that might hamper the science-policy interface:

- Lack of money for research in the framework of the convention- often no of little money is available to undertake research specifically targeted to the questions posed. Therefore based on existing scientific research and available knowledge the scientific questions of the conventions needs to be answered
- Amount of information provided to the scientific bodies for review and discussion (especially for the SBSTTA on average 42 documents/ meeting)
- Members of the scientific bodies. The name scientific body indicates that scientist are the people who are forming the scientific bodies of the conventions. However a review of the participants of SBSTTA shows that less scientists are participating and more administrators. The question is whether the SBSTA is not more a preparatory body for the COP then a scientific body comparable to the ones of the Ramsar & Bonn Convention.
- The effectiveness of the science-policy interface is hampered by the overall rate of change of country representatives in the decision making bodies. Bouwma & Chardon (2005) showed that on average at every meeting only ¼ to 1/3 of the population has visited a former meeting, and that, at every meeting, 2/3 to ¾ of the attendees are new and not familiar with specific convention procedures.

2.10.6 Conclusions and recommendations

The review of the three conventions shows that all of them have established scientific bodies that have as a task to provide scientific advice on an number of issues ranging from status of biodiversity to management and financial and legal issues to the decision making bodies. Therefore a formal structure as well as procedure for the policy-science interaction is in place. In the paper some bottlenecks as information overload, lack of resources, lack of expertise and overall change in representatives were mentioned that might hamper the science-policy interface.

However for a precise assessment of impact of the scientific advice on the decisions of the scientific making body a detailed review of the recommendations put forward by the scientific making bodies and the decisions taken by the decision making bodies is required. It is expected that such an analysis is easier for the Ramsar and Bonn Convention then for the Convention on Biological Diversity given the number of the topics discussed.

Also as the implementation of these international conventions is very long (from international to national to regional and local policy) it will be difficult to assess whether the scientific advice provided to the conventions leads in the end to better policies on the ground.

References

Delbaere, B. (Ed.) (1998) *Facts & Figures on Europe's Biodiversity: State and Trends 1998-1999.* Tilburg: European Centre for Nature Conservation, Tilburg (Technical Report Series)

Bouwma, I.M. & J.P. Chardon (2005) *A quantitative network analysis of participants in international biodiversity related conventions and programs.* Alterra, Wageningen

3 Conclusions

The case studies in the previous section provide a good cross-section of science-policy interfaces at various levels or topics, all of which deal with biodiversity. Section 1 set the scene by describing the conceptual framework. The following conclusions can be drawn from what is presented in this report:

1. 'Science' and 'policy' are generic terms that in fact are very complex, dynamic and heterogeneous. The metaphor of the '**house with many rooms**, windows and passageways' nicely describes this heterogeneity. Even within this house rooms change, reconstruction is going on, people move from one room to another. These factors have consequences for designing a science-policy interface.
2. Interaction between science and policy is a **multi-actor and multi-level process**. It is not straightforward to identify the actors that need to be involved or to ensure continuation of involvement (due to the dynamic nature) as demonstrated for the international process of the Convention on Biological Diversity.
3. Even when actors have been identified, **time availability** is a limiting factor for a science-policy interface. The example from the Nature Report in Flanders showed that often participants to a steering committee or review panel do not attend meetings. This is because mostly the involvement is on a voluntary basis. No doubt, this holds for most examples presented here, not in the least for policymakers within the EU.
4. Also the **timing of interaction** is observed as a critical issue. Where policy processes are highly dynamic with speedy decision making and political interdependencies of deadlines, the research process requires more time for information collection and processing or for investigation and consultation. Clearly it makes no sense to feed research results into a policy process after a finite policy decision has been made. Some examples are presented where both processes are aligned (e.g. Netherlands Environmental Assessment Agency, Nature Report Flanders).
5. A **constant dialogue** between the various actors is recognized as a key requirement for an effective science-policy interface. This process needs to start at the design phase of research or information compilation (defining policy's information needs) and continue throughout the implementation, with specific attention to applicability or usefulness of research.
6. When facilitating dialogue, **effective communication** is a condition for success. Various examples have shown that this is not easy, due to differences in language or discourse between stakeholder groups or to lack of skills with scientific experts or policy workers. Facilitation of dialogue, stakeholder involvement and communication requires innovative thinking, as demonstrated in the Norwegian case (meeting at remote place with good catering), and professional targeted communication tools (e.g. Flanders, the Netherlands);
7. A shift is observed from mono-disciplinary approaches (e.g. nature report produced by natural scientists only) to more **interdisciplinarity** (also involving socio-economic disciplines) or even the inclusion of non-disciplinarity (civil science). The interdisciplinary approach is needed to create ownership and balanced views.
8. It is hard to assess effectiveness of science-policy interfaces at higher levels because of their relatively abstract nature. Some examples are presented of science-policy interfaces at more local scales that have **direct positive impacts on biodiversity** (e.g. large carnivores in Norway, Northern spotted owl in the US, the Lower Danube River System).
9. The issue of **scales** is recurrent in the discussion on science-policy interaction. Different mechanisms and constructs are needed at different levels or when translating high-level policies (e.g. CBD) to local level implementation. It is noted that a balance is needed between top-down (policy) and bottom-up (science). This topic is looked at more in-depth in the report that was produced as part of work package R4 'Means to measure success of implementing (inter)national conservation strategies: successes and constraints' (Furman *et al.*, 2005).
10. Many **tools and mechanisms** have been presented to form a science-policy interface: steering committee with range of stakeholders, project reports, symposia, press releases, indicators, nature reports, white papers, green papers, lobby groups, (inter)national biodiversity platforms, clearing-house mechanisms, decision-support systems, adaptive management, etc. (Annex 1).

For each situation, including for ALTER-Net, the most appropriate mix of tools needs to be selected and maintained.

11. **Funding** has been mentioned as a limiting factor to ensure a properly working and effective science-policy interface. Not only funding of biodiversity research, essential for proper decision making, but also funding of the establishment and running of a science-policy interface needs to increase. In this respect mention was made of who selects research projects to be funded, with a recommendation for a mixed group of scientists and funders.
12. In general terms most case studies advocate the establishment of a **permanent body** to act as a science-policy interface, rather than an ad hoc group.
13. Finally, it is recognized that – regardless of an effective science-policy interface – in many cases a factor of uncertainty remains in decision making. As said in the Norwegian case: ultimately **politics** decide and sometimes decisions will be made on non-scientific premises.

Reference

Furman, E., R. van Apeldoorn, B. Petriccione, T. Gottsberger, A. Gaaff & E. Primmer (2005) *Means to measure success of implementing (inter)national conservation strategies: successes and constraints.* ALTER-Net report WPR4-2005-02

4 Eight tips towards developing a durable ALTER-Net mechanism for science-policy interaction

Where the conclusions from section 3 are of a rather general nature, this section formulates eight tips that need to be taken into account when developing a durable science-policy interface for ALTER-Net. The aim is for such interface to last well beyond the current ALTER-Net period, which finishes in 2008. The tips listed here will also apply to other EU-funded projects, such as BioScore.

1. **Identify key actors:** in continuation of what has been done under work package I5 so far the main actors that need to be involved in the European biodiversity science-policy interface must be identified, preferably to the individual (or position) level).
2. **Develop time schedule:** the key policy processes of direct relevance to biodiversity conservation and research and their related timings need to be mapped out. Opportunities for most effective input from ALTER-Net into European policies must be addressed in consultation with the policymakers concerned. For instance, (i) laws or political processes that are sufficiently flexible to take into account evolution in knowledge or (ii) laws or political processes that are limited in time so that they are evaluated both on a political ground but also on a scientific ground. This might result in laws that require the taking into account of scientific results and methods in the political process.
3. **Strengthen advisory committee:** the functioning and structure of the current Network Advisory Committee needs to be reviewed in order for the NAC to become the permanent body for ALTER-Net science-policy interaction.
4. **Ensure national links:** develop a solid working relationship with the EPBRS and national biodiversity platforms to form the linkage between international policy and national implementation and research. National involvement and lobbying through national representatives supports the ALTER-Net integration goals.
5. **Facilitate dialogue:** identify a realistic and feasible way to ensure continuous dialogue between the various actors. Especially create ways to consult policymakers in identifying the policy community's research and information requirements and to ensure that these requirements are met throughout the implementation process.
6. **Develop targeted communication:** together with work package E2, and to a lesser extent I4, develop communication tools that are targeted at communicating the ALTER-Net messages to policymakers. Above all, formulate a common message or storyline to be communicated and help channelling ALTER-Net research outputs to policymakers. Stimulate the use of the International Biodiversity Press Centre as the gateway to biodiversity related research news (www.biodiversityresearch.net).
7. **Aim for interdisciplinarity:** prevent advocating a one-sided natural scientists' view on biodiversity research and conservation by involving scientists from other disciplines, including socio-economics, as well as non-disciplinary actors (NGOs, civil society, site managers, education, …). Line up with the FP6 project SoBio to achieve such integration.
8. **Towards continuity:** demonstrate that ALTER-Net is capable – and over time indispensable – to answer European research requirements that stem from policy and that ALTER-Net grows into the first entry point for biodiversity research questions.

Annex 1: Tools that are applied in the science-policy interfaces listed in this report

Advisory group: see 'Steering committee'

Biodiversity platform: national or international forum of scientists and policymakers to ensure that biodiversity research contributes to policy development, implementation and evaluation (e.g. EPBRS)

Booklet/leaflet/poster: attractively designed short summary of a project or a specific subject that aims at reaching a selected target group

Clearing-House Mechanism: 'A network of parties and partners working together to facilitate implementation of the United Nations Convention on Biological Diversity […]. The Convention created a mechanism to translate the goal of partnerships and cooperation into action […]. It also facilitates access to and exchange of information on biodiversity around the world. […]' (EEA web site, 2005[37]) Similar clearing-house mechanisms are created for the EC and for countries worldwide.

Conference proceedings/reports: reports/proceedings of a conference provide information about a conference and are also the published form of the papers that were presented at the conference. Mostly targeted at experts

Decision support system: generic term for many types of computer-based information systems that support decision making (database, model, GIS, …)

Environmental impact assessment: 'assessment of the likely human environmental health impact, risk to ecological health, and changes to nature's services that a project may have. The purpose of the assessment is to ensure that decision-makers consider environmental impacts before deciding whether to proceed with new projects' (Wikipedia, 2005[38])

Green paper: a government proposal, which is published to allow public debate on a specific topic (see also 'White paper')

Grey literature: All types of literature not available through the normal bookselling channels, including reports, trade literature, translations and ad hoc publications. (Auger, 1994[39])

Indicator: Indicators generally simplify in order to make complex phenomena quantifiable so that information can be communicated (DOE, 1996[40])

Lobby group: 'one person or an organization that acts on behalf of a section of the community. Lobby groups try to influence parliament and government both directly and through the media. They usually work through members of parliament. Lobby groups follow closely what a government is doing and present arguments for introducing and changing laws. They usually do a lot of research so that their arguments for change are factual and detailed' (Two Way Street web site, 2005[41])

Nature outlook: 'regularly published report that explores possible and probable futures for nature and the landscape in the context of economic, land use and environmental scenarios. Alternative future policies are evaluated with respect to their contribution to nature values, landscape quality and costs' (MNP web site, 2005[42])

---

[37] EEA web site (2005) EEA multilingual glossary of environmental terms - http://glossary.eea.eu.int/EEAGlossary (visited 13 Dec. 2005)

[38] Wikipedia (2005) www.wikipedia.org (visited 13 December 2005)

[39] Auger, C.P. (1994) *Information sources in grey literature*. 3rd ed. London: Bowker

[40] DOE (1996), Indicators of sustainable development for the United Kingdom, Department of the Environment, London

[41] Two Way Street web site (2005) www.peo.gov.au (last update April 1998)

[42] MNP web site (2005) www.mnp.nl/en/ (visited 13 Dec. 2005)

Presentation: live performance, often supported by multimedia facilities, to present the outcome of a project, content of a book or a certain issue. Format depends on target audience

Press release: digested and newsworthy story about your organization or research that you submit to various media (newspapers, radio, television, magazines, etc). If they are interested in your story, they may interview you or run your press release in their publication

Project meeting: regular meeting during a project lifespan in which the project team, sometimes with invited experts or stakeholders, meets to discuss project progress and results and how these relate to the needs of the funding body/stakeholders

Project report: report that describes the objectives, methodology, results and conclusions from a (research) project. (see also ‘Grey literature’)

Project symposium/conference/final workshop: meeting with open or selected invitation where the final results of a finished (research) project are presented to a selected target group

Scientific council: group of independent scientists that assesses scientific validity of project proposals and project findings

State of Nature report: a regularly published report that describes the state of nature and biodiversity for a given region or country, including policy measures and their effectiveness. Often such reports are accompanied by short summary brochures for policymakers. (also called State of Biodiversity report, Nature balance (the Netherlands), nature report, …)

Steering committee: group of independent representatives from policy and end-user stakeholders that assesses relevance of projects to their policy/activities and that may decide on financing (synonym: advisory group)

White paper: document as a next stage to a Green paper with statement on proposed government policy on a particular area of concern (see also ‘Green paper’)