Creating a Network of Knowledge for biodiversity and ecosystem services

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A recommended design for "BiodiversityKnowledge", a Network of Knowledge to support decision making on biodiversity and ecosystem services in Europe

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Preamble – some guiding words of explanation on this "living document"

This paper is the draft version of a "*recommended design for a Network of Knowledge to support decision making on biodiversity and ecosystem services in Europe*" – a potential instrument for improving the science-policy interface on biodiversity in Europe in the near future.

The final version of this paper, as a white paper, will be the main deliverable of the EU funded Coordination Action KNEU (Grant No. 265299), whose main aim is to develop a European Scientific biodiversity Network of Knowledge to inform policy-making and economic sectors (ENV.2010.2.1.4.3-3).

An executive summary can be downloaded under this link: http://biodiversityknowledge.eu/images/PDF/2013-08-01-WhitePaper-Summary.pdf

Definitions of main terms and concepts can be found under this link: http://biodiversityknowledge.eu/faq

Short explanation of context:

For the sake of clarity, we briefly introduce the three levels of activities representing the context of this document: 1) The FP7 funded project to develop a possible design of a Network of Knowledge (NoK) on biodiversity in Europe, i.e. the KNEU project, 2) the product of the KNEU project; the recommended design of a Network of Knowledge named BiodiversityKnowledge and finally 3) the wider context justifying the design of BiodiversityKnowledge; i.e. a potential EU mechanism on biodiversity expertise[1]. **The main focus of the paper is to discuss, the NoK BiodiversityKnowledge** but the other levels will often be mentioned in this paper – KNEU as it delivered many additional inputs for this paper by its case studies and workshops, and the EU mechanism as it frames the role of the NoK on the policy side:

Project: KNEU

The FP7 funded KNEU project (2010-2014) is our working environment to develop the recommended design for a Network of Knowledge on Biodiversity and Ecosystem Services. Eventhough comprising 18 European institutions, the project is designed to interact more broadly with the whole community of knowledge holders on biodiversity and ecosystem services. To facilitate this discussion, the KNEU project set up the website www.biodiversityknowledge.eu

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Product: *BiodiversityKnowledge*

The Network of Knowledge (NoK) we name *BiodiversityKnowledge* and its recommended design and operationalisation for the future is the main product of the KNEU project, embedded in the specific European context of biodiversity science and policy. The BiodiversityKnowledge recommended design and operationalisation, documented in this paper, is based on a prototype that was developed, broadly discussed and applied in test cases within the KNEU project in 2011/2012.

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Context: an EU mechanism on biodiversity expertise

The wider policy context of the NoK approach is linked to the ongoing process towards an **"EU mechanism on Biodiversity Expertise[2]",** as officially refered to in the Biodiversity 2006 Communication and Action Plan[3] and in the EU Biodiversity Strategy to 2020. In addition, current initiative related to the target 2 Action 5 of the Biodiversity strategy, namely the MAES process[4] on Mapping and Assessing Ecosystem Services, also provided insights throughout the project work. As demonstrated by the high level of interest and current

[1] http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm

[2] This process is currently supported by a DG Environment tender contract (2012-2013) on exploring options for such a mechanism.

[3] http://ec.europa.eu/environment/nature/biodiversity/comm2006/bap_2006.htm

[4] The EU Commission jointly with the Member States started a major process towards Mapping and Assessing Ecosystems and their Services (MAES), see http://biodiversity.europa.eu/ecosystem-assessments

45 related activities, the organization of European expertise is meant to be valuable in the context of the IPBES[5] development.

[5] Intergovernmental Platform on Biodiversity and Ecosystem Services, see http://www.ipbes.net

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Prepared by the consortium of the KNEU project, based on a broad European consultation[6].

In order to develop and discuss the concept for BiodiversityKnowledge as open and transparent as possible, this paper is issued from a series of consultations at a larger scale than the KNEU consortium itself:

- September 2012: first document draft prepared by the team of WP5 & 2 of the KNEU project, based on the work done in WP1, WP2 (Deliverable D.2.1), including the discussions at the first project conference in May 2012 and numerous workshops with experts and their specific feedback via the evaluation work package (WP4)
- October 2012: First draft discussed within KNEU consortium
- November 2012: revised first draft discussed with stakeholders in Dialogue Group,
- April 2013: Development of second draft, completely revised and more focused to key functions of the NoK
- April 2013: Consultation on second draft with Dialogue Group and with WP2, 3 and 5 of the KNEU team
- July 2013: revision second draft and consultation within the whole KNEU consortium
- August 2013: Development of third draft and launch for open consultation, including direct feedback from institutions and use of workshops to discuss specific elements of the Biodiversity Knowledge structure
- September 2013: revised version
- September 24-26, 2013 Berlin : 2nd BiodiversityKnowledge conference for final discussions
- December 2013: Final concept and endorsement by knowledge holders, communication of results

6 The KNEU project consulted more than 300 individuals and organisations through the organisation of workshops, focus groups and conference side events as well as through interviews with stakeholders.

Content

1 Aim and approach of the concept paper

1.1 Aim of the concept paper

The aim of this paper is to present a recommended design, of a Network of Knowledge (NoK) for European expertise on biodiversity and ecosystem services (*BiodiversityKnowledge*) to inform decision making, including policy making and economic sectors.

In this paper we successively tackle the following aspects:

- → outline the **background and context** for the NoK (chapter 2)
- → discuss **potential functions for a NoK** (chapter 3)
- → outline the **challenges, lessons learned and added values of a NoK** (chapter 4)
- → derive main options for the design of the NoK and its **potential governance structure, rules and procedures** for operating it (chapter 5)

The contents of this paper are based on the work and analysis undertaken in the KNEU project, complemented with a literature review, the findings from the SPIRAL project[7] and a tender contract for DG Environment on the EU Mechanism on Biodiversity Expertise. It also benefits from suggestions collected via interviews and workshops with scientists and policy makers during the KNEU project, with a special emphasis on those issued from the demonstration cases of KNEU carried out during May 2012 to May 2013.

The ideas presented are thus the result of the broad engagement of more than 300 individuals and organisations into earlier discussions on the prototype NoK concept, interviews with stakeholders and the demonstration cases participants. In order to make those contributions visible, summaries of them are included in boxes throughout the document.

1.2 Approach to serve different needs

In compiling this paper, we faced a major challenge in serving the various points of view of stakeholders involved in the science-policy interface on biodiversity and ecosystem services in Europe. What science policy interfaces are, how they function, what are the cost-benefits of different models are still subjects of research. The KNEU project took into account the latest research findings on the issue (e.g. SPIRAL project results[6]) but also acknowledges the fact that its approach is based on these evolving and non exhaustive understanding. In this context and as the Network of Knowledge is per essence building on a large variety of organisations, the project acknowledged the needs to:

- identify the *facts* on the science-policy landscape and the way science-policy interfaces are organised
- take into account the *interests* of all addressees and their institutions as far as possible in order to acknowledge their "role in the biodiversity landscape" and to be as inclusive as possible.

[7] SPIRAL: Science-Policy Interface on biodiversity – Research, Action and Learning (contract No. 244035), see www.spiral-project.eu (2010-2013)

Finally, being at the cross-road of policy, science and other stakeholders implies that many various values are at stake and require compromises. The project then also aimed to:

- take into account the *values* of addressees regarding the science-policy interface (e.g., a policy maker may focus on relevance and the "added-value" to the current situation, a scientist may focus on credibility), but also when addressing the topic of biodiversity and ecosystem services and the different values put upon them by different actors in the field

The proposal for BiodiversityKnowledge is an attempt to address this complex set of expectations, needs and values but of course represents a compromise with potential strengths and challenges.

We nonetheless hope that we will successfullfy demonstrate that BiodiversityKnowledge has clear added-values to improve the way knowledge and decision-making interact in the management of biodiversity and ecosystem services in Europe.

2 Background

2.1 The European biodiversity knowledge landscape - Needs assessment

The need for better informed decision making, especially in the environmental sector has gained increased recognition over the last decade, and has recently been outlined again in the proposal for the 7th Environmental Action Programme[8]. With increasing complexities in the sector, the risks of making inadequate and/or contested decisions increases as do the risks of not properly implementing policies and thus not achieving its targets. This calls for a more reflexive involvement of the evidence-base into the design and the implementation of decisions, and consequently for more credible, relevant and easily accessible knowledge. The field of biodiversity and ecosystem services and its development over the last decades is especially challenging in this respect (See Box 01).

Discussions with policy makers and other stakeholders suggest, that three concrete needs exist where decision making could profit directly from an improved scientific input[9]:

- The joint formulation of questions building on an integral more holistic understanding of all relevant factors should identify distinct policy-relevant questions that science is able to address and provide concrete answers to;
- A better understanding of concrete policy impacts on the ground, to allow for the development of implementation-oriented concrete proposals for tools and options to bring about desired change in practice;
- Coherent and independent analysis able to inform, raise awareness and trigger action beyond the environmental sector, in all relevant policy domains.

Parts of these needs are addressed by EU institutions from a policy as well as research policy perspective. On the policy side, for example, the role of the European Environment Agency was

8 See http://ec.europa.eu/environment/newprg/proposal.htm

9 See results of the service contract with DG Environment, entitled "Towards an EU mechanism interfacing science and policy on biodiversity and ecosystem services"

strengthened, including its leading role in setting up and further developing the Biodiversity Information System Europe (BISE).

Box 01: Challenges in tackling the field of conservation, biodiversity, ecosystem services and natural capital at the interface between policy and science

The area of nature conservation has undergone major changes in its conceptual basis, in science as well as society over the last 20 years. With the success of "biodiversity" as major concept and its political implementation in the Convention on Biological Diversity (CBD), classical conservation concepts (and their underlying values) have been opening up and now include sustainable use of natural resources, which are tightly linked with the concept of ecosystem services and, more recently the concept of natural capital (for a reflection, see Sharman & Mlambo 2012).

The CBD itself shows this development with including use-perspectives and the terms of ecosystem services and natural capital very strongly into its recent Strategic Plan for 2020. So does the European Biodiversity Strategy for 2020.

As this shift changes the underlying rationale for environmental policy (see for example Spierenburg 2012, Jax et al. 2013, Turnhout et al. 2013) it holds some dangers for classical approaches, while at the same time allowing for a stronger mainstreaming of environmental policies in other sectors.

When further developing the science-policy interface in this field, as proposed in this paper this holds the challenge of supporting both strains of rationale for policies – the classical ones focussing on nature conservation and biodiversity, which is more based on intrinsic values and the new services-centred one, using a utlitarian point of view. This means that questions to be tackled at the interface always need to reflect on both these perspectives. Thus the approach of the interface must really be multidisciplinary, reaching out to scientific (and other) knowledge which normally serves other policies (e.g., economics, agricultural research and many more).

The following questions illustrate some of the questions a NoK could address:

- How do changes in the diversity and abundance of pollinators in Europe relate to different factors like use of pesticides, landscape attributes, parasites and other factors?
- What is the relationship between animal health and aspects of global change (including changes in biodiversity) in Europe?
- What are the potential consequences of climate change in Europe on the current legislation in nature conservation (Birds and Habitats Directive)?
- Ecosystem restoration: How to balance the goals of service provision and nature conservation in restoration efforts across European ecosystems?

Further reading:

Sharman, M. & Mlambo, M.C.(2012): Wicked: The problem of biodiversity. Gaia 21: 274-277.

Spierenburg, M. (2012): Getting the Message Across Biodiversity Science and Policy Interfaces A Review. GAIA 21: 125-134.

Jax, K.; Barton, D.N.; Chan, K.M.A.; de Groot, R.; Doyle, U.; Eser, U.; Görg, C.; Gómez-Baggethun, E.; Griewald, Y.; Haber, W.; Haines-Young, R.; Heink, U.; Jahn, T.; Joosten, H.; Kerschbaumer, L.; Korn, H.; Luck, G.W.; Matzdorf, B.; Muraca, B.; Neßhöver, C.; Norton, B.; Ott, K.; Potschin, M.; Rauschmayer, F.; von Haaren, C. & Wichmann, S. (2013): Ecosystem services and ethics.- Ecological Economics 93: 260-268.

Turnhout, E., Waterton, C., Neves, K. and Buizer, M. (2013): Rethinking biodiversity: from goods and services to "living with". Conservation Letters, 6: 154–161.

On the research policy side, several initiatives were launched to stimulate research and research infrastructures. Much scientific biodiversity research funded through the EU's Framework Programmes, which include more than 80 projects in the last 10-15 years, has become increasingly more linked to policy needs, *for example*[10]

- The Networks of Excellence ALTER-Net (terrestrial biodiversity) MARBEF (marine biodiversity, now EuroMarine) and EDIT (taxonomy)
- LifeWATCH as a joint Infrastructure supported by these networks
- The ERA-Net BiodivERsA as programme for integration of funding activities among member states
- the European Biodiversity Observation Network (EBONE) and the following project Building the European Biodiversity Observation Network (EUBON) that inter alia are aiming to contribute to the GEO BON initiative,
- large scale EU projects like ALARM, BIOFRESH, SCALES or TESS

to name just the few large initiatives and projects over the last years.

Besides, many other stakeholders are increasingly engaging into an active exchange with policy on issues of biodiversity and ecosystem services: e.g. learned societies (e.g. Ecological Federation (EEF), the Society for Conservation Biology (SCB)), NGOs (e.g. BirdLife, WWF), private sector, etc. On the international level, the Future Earth programme set up by ICSU might support and link up with all these activities and institutions.

All these players need to be enabled to bring their knowledge into the decision making process in a concise manner, and thus adding value to the current situation, where knowledge for their potential users is often difficult to access.

Access points to knowledge are still scattered and poorly organised across disciplines and institutions – as are different forms of knowledge. There is no consistent overview of the knowledge holders and expertise in various fields of biodiversity in Europe (but see Box 02). For many biodiversity topics, scientific knowledge alone is not always sufficient to provide answers to specific policy and management questions. Practical and local knowledge may need to also be integrated, especially when it comes to implementation and management decisions from the regional to the local scale. How to access and integrate practical and local knowledge remains a challenge. But in Europe, with its broad networks of practitioners, NGOs and expertise in administrations, the task might be easier to address compared to the global scale, as one of the demonstration cases during the KNEU project has shown (see below).

[10] For a complete list of relevant projects, see
http://ec.europa.eu/research/environment/index_en.cfm?pg=projects&area=bio&fptab=fp7&fp7page=all
http://www.edinburgh.ceh.ac.uk/biota/

BOX 02: Where is the knowledge on Biodiversity in Europe? How does this knowledge flow?

Within KNEU, the complex task of mapping the knowledge landscape on biodiversity in Europe was undertaken to create an overview of expertise and stakeholders on biodiversity and ecosystem services knowledge in Europe. The original aim was to identify candidates for permanent knowledge hubs for a NoK that can provide timely evidence-based answers to topical questions. However, the exercise inevitably demonstrated that in order to build a network of knowledge in Europe, we need to first understand the flows of knowledge within Europe, i.e. where is knowledge coming from, where does it go, where it might be hidden and who is playing a key role in this knowledge landscape. In order to establish the flows while highlighting biodiversity knowledge hubs we have interviewed persons working with biodiversity issues, using the interview-based mapping tool called Net-Map (Schiffer and Hauck, 2010) as a directive. In total 44 people were interviewed, working in a very broad range of disciplines all related to biodiversity; e.g. practitioners, researchers, environmental lawyers, policy makers, etc. The map under-construction shows actors which are key providers of knowledge, actors which are key requesters as well as actors which are playing a key role in the knowledge flow paths, i.e. they are relaying knowledge. Those latter connecting actors for example include IUCN, the European Commission, the EEA or the recently released and quite influential TEEB initiative. This fastidious and dynamic task will highly contribute to the building of a responsive community as developed later in this document in section 3.2 as it highlights not only the key players in the knowledge landscape but also connection gaps hindering the knowledge flow.

2.2 The global context - IPBES

At the global level, efforts by the international community to operationalize the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) have led to its official launch in April 2012[11]. The first meeting of the plenary in January 2013 took first steps in developing the work programme and set up its subsidiary bodies. With the secretariat of IPBES being located in Bonn, Germany, Europe will be expected to bring its broad expertise on biodiversity and ecosystem services into this process (see Box 03).

There is a common agreement that many topics related to biodiversity and ecosystem services need to be tackled on the regional[12], national and even local level and that these scales need to be taken into account in global efforts. Accordingly, a support of IPBES work from the regional level (namely the EU or from a pan-European perspective) could ensure higher regional relevance and implementation of the outcomes. Currently, no specific structure is available to serve such a support function and how this challenge of a regional support to IPBES can be tackled in Europe is currently an open issue. Section 5.4 describes the potential role of the NoK as a regional support body for IPBES.

[11] For more details on IPBES, please visit www.ipbes.net

[12] Please note, that in the context of global UN-related activities, "regional" addresses the scale of continents or biomes, thus "national" being below this level. In the EU context, "regions" refer to the sub-national level.

BOX 03: The functions of IPBES and the potential objectives of its work programme 2014-2018

The multistakeholder-conference in Busan 2011, preparing the launch of IPBES, decided that IPBES should serve four different functions*:

1. perform regular and timely assessments of knowledge on biodiversity and ecosystem services and their inter-linkages, at appropriate scales and including thematic issues;
2. Promote access to, and development of policy-relevant tools and methodologies;
3. Prioritize and enable key capacity-building needs to improve the science-policy interface at appropriate levels;
4. identify and prioritize key scientific information needed for policymakers, and catalyse efforts to generate new knowledge

These functions align in parts with the functions 1-3 introduced for BiodiversityKnowledge in section 2.3, with the regular assessments and the promoting of access to relevant tools and methodologies being integrated in the "Answering-decision-making-needs" function of BiodiversityKnowledge.

To translate these functions into concrete activities, the current draft of the IPBES work programme derives five main objectives from these functions:

1. enhance the enabling environment for the knowledge-policy interface for biodiversity and ecosystem services;
2. strengthen the knowledge-policy interface on biodiversity and ecosystem services on regional and sub-regional levels;
3. strengthen the knowledge-policy interface with regards to thematic and methodological issues;
4. strengthen the knowledge-policy interface on the global dimensions of changes in biodiversity and ecosystem services; and
5. communicate and evaluate IPBES activities, deliverables and findings.

These objectives are further translated into concrete activities and deliverables and show the different kinds of needs on the global level in terms of knowledge assessments (objectives 2-4) and the enabling environment to achieve them (objectives 1 and 5).

** These functions are defined in paragraph 1 in Appendix I to Annex I in UNEP/IPBES.MI/2/9, specifically in sub-paragraphs (b) to (e)*

*** see draft work programme of IPBES for online review, July 2013, available at http://www.ipbes.net/intersessional-process/current-review-documents-ipbes2.html*

2.3 The potential functions of a science-policy interface on Biodiversity for Europe - The "EU mechanism" discussion

260 There are a lot of organisations, institutions and working groups already that support the exchange of knowledge between science and policy, and with IPBES developing on the global scale, it is important to identify potential gaps and avoid overlap when establishing further institutions for the science-policy interface in Europe. In the 2006 EU Biodiversity Action Plan, under the heading "*To substantially strengthen the knowledge base for conservation and sustainable use of biodiversity, in the EU and*

globally", the need was stressed for an "*EU mechanism for independent, authoritative research-based advice to inform implementation and further policy development*"[13] which should be able to deliver a consolidated view from science (and other knowledge) to inform policy making.

Since then, analyses have been carried out at an international scale for IPBES[14], and at a European scale on what the concrete functions of such a mechanism could be, and how science and all knowledge holders could best contribute to it.

Potential functions at the science-policy interface in Europe: Four main functions have been identified[15] by the work of KNEU that would serve different purposes and also would need to complement each other as well as complement the existing institutions, thus adding "oil in the system" for an improved functionality in the science-policy landscape:

(1) **a Network function (NET),** to better network existing knowledge holders and their knowledge as basis to improve access to this knowledge. Networking here is understood in its larger sense and this function can include capacity building activities to strenghten the community of knowledge holders.

(2) **an Answering-Decision-making-Needs function (ADN),** to improve the support of decision making through the provision of relevant knowledge on a request driven basis with tested methods and protocols. The objective is to provide consolidated views on specific topics and to make use of relevant types of knowledge including practical and local knowledge.

(3) **a Research Strategy function (RS),** to identify policy-relevant research gaps and ways how to fill them (see Box 04)

(4) **an International Collaboration function (IC),** to use and feed in the European knowledge into international science-policy processes like IPBES or SBSTTA-CBD, as well as foster European links to global research efforts (see section 2.2 for a short introduction)

Several institutions in Europe are already contributing to each of these functions to some extent or at least working in such a direction, like the European Platform for Biodiversity Research Strategy (EPBRS) and BiodivERsA for the research strategy function (see Box 04). This implies that any concrete operational model for the EU Mechanim will need to be based on linking with these existing initiatives to avoid duplication and streamline efforts.

What is currently lacking nonetheless is an enabling environment of better structured interactions acknowledging the roles of existing knowledge holders and organizing the knowledge flow between actors by a targeted, integrative approach, bringing today's possibilities of networking and up-to-date methodologies on knowledge assessments together and aligning them with the needs from the different actors.

13 See COM (2006) 216 final, p.13: available at eur-lex.europa.eu/LexUriServ/site/en/com/2006/com2006_0216en01.pdf

14 See "Gap analysis Gap analysis for the purpose of facilitating the discussions on how to improve and strengthen the science-policy interface on biodiversity and ecosystem services" (UNEP/IPBES/2/INF/1)

15 See for example the discussions and presentations of the first BiodiversityKnowledge conference: http://biodiversityknowledge.eu/index.php?option=com_content&view=article&id=32

BOX 04: Developing the research strategy in Europe: The EPBRS and BiodivERsA

The research strategy function has mainly been facilitated since 1999 by the EPBRS (European Platform for Biodiversity Research Strategy) , with support from the EU projects BIOPLATFORM and BIOSTRAT. The effectiveness of EPBRS to bring together scientists as well as policy makers and other stakeholders from many Member States at focused meetings and via electronic conferences has helped considerably to derive the research agenda. This included a significant number of specific recommendations on different issues, with some of them resulting in concrete project calls over the last ten years. Also, EPBRS developed a framework document for a European Biodiversity Research Strategy for 2020 and laid the foundation for the concept of a network of knowledge on biodiversity, which is explored in the KNEU project.

Such an integrative function for identifying knowledge needs from a broader policy perspective will still be needed in the future, for example in serving the forthcoming Horizon 2020 programme and other funding schemes for implementing the research strategy. The proper identification of knowledge gaps and needs could also be accounted for by BiodivERsA when updating its strategic agenda to further integrate national research programmes on biodiversity and ecosystem services across countries in Europe.

In the scope of this document, we focus on these first two functions, the networking and the answering-decision-making-needs function, that were identified as the main functions needed to strengthen the knowledge flow and address the basic needs identified in section 2.1.

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3 "BiodiversityKnowledge": A proposal to address networking and policy support

3.1 Introduction

Processes at the interface of science and policy can have very different structures and approaches. Very generally speaking, processes can be driven more by policy (e.g. expert panels set up on a specific topic) or by science (e.g. policy support work via applied research projects or via learned societies), accordingly, the diversity of approaches is high[16]. All science-policy interfaces (SPIs) face a joint problem: the challenge of finding the right balance between ensuring credibility, legitimacy and relevance at the same time. Box 05 summarizes this challenge and chapter 4 further elaborates on them.

BiodiversityKnowledge is an attempt from the scientific community to self-organize and better integrate with other forms of knowledge in order to improve the capacity to respond to knowledge demands from policy. It is driven by science and other knowledge holder institutions in the first place and ensures the credibility and legitimacy of the knowledge used and its holders. In order to make it relevant for policy and other decision-making processes, it nevertheless needs to include elements that link up directly with policy – both thematically as well as within its governance structure (see chapter 5 for details).

[16] For more details on the different forms of SPIs, see SPIRAL (2012): a study on the landscape of science-policy interfaces: http://www.spiral-project.eu/sites/default/files/SPIRAL_1-2.pdf

BOX 05: The balance between credibility, relevance and legitimacy in SPIs – insights from the SPIRAL project

Credibility, relevance and legitimacy (CRELE) are attributes which can explain the influence and impact of SPIs.

- Credibility is the perceived quality, validity and scientific adequacy of the people, processes and knowledge exchanged at the interface;
- Relevance is the salience and responsiveness of the SPI to policy and societal needs;
- Legitimacy includes the perceived transparency and the balance of perspectives within SPI processes.

These CRELE attributes are widely accepted and used, and can explain an SPI's influence. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, http://www.ipbes.net/) considers the CRELE attributes as important. The Intergovernmental Panel on Climate Change (IPCC) uses CRELE to evaluate scenarios, draw lessons from past experiences and explain assessments' influence.

Building credibility, relevance and legitimacy into SPI design is key to ensuring impact. But SPIs have to work with numerous constraints (resources, time, policy cycle and so on), and it is not always possible to enhance all aspects of CRELE. Though it may be tempting to focus on the immediate policy challenges, it is important to consider not just short-term improvements in CRELE, but also the long-term prognosis. CRELE takes time to build, but can be lost very quickly. SPIs need to make strategic choices regarding what dimension of CRELE to emphasize and what specific features to prioritise to ensure high impact over the long term. There is no 'one size fits all' recipe: the right balance of features will vary according to the context.

Sources: SPIRAL briefs: Keep in CRELE: credibility, relevance and legitimacy for SPIs: http://www.spiral-project.eu/sites/default/files/07_Keep-it-CRELE.pdf and CRELE Choices: trade-offs in SPI Design: http://www.spiral-project.eu/sites/default/files/13_Brief_CRELE-choices.pdf

The Network of Knowledge approach, as proposed here, takes advantage and acknowledges the situation described above in offering an open and transparent process for better interlinking knowledge provision and knowledge needs. Today, consolidated views from science (and other forms as knowledge) are often lacking in discussions, and it is not clear, where knowledge comes from, what its uncertainties are, and whether the processes compiling it has been credible and inclusive. Knowledge holders, expecially from science, often feel uneasy about this situation and want to get active, but want to ensure that the credibility of science (and of the persons and institutions involved) is ensured when getting engaged and that their efforts are relevant.

These main challenges and concerns call for a participatory, transparent approach which not only identifies a credible way to conduct assessments of knowledge, but also acknowledges the challenge of transparency in its processes and an engagement strategy not restricted to specific institutions, disciplines or forms of knowledge.

Accordingly, BiodiversityKnowledge puts emphasis on the NET-function for the benefit of the knowledge community as well as the ADN-function to concretely address the needs from decision-making, using the community brought together by the NET-function as foundation.

The following sections outline what these two functions need, which building blocks exist already, and how BiodiversityKnowledge could complement them.

3.2 Network function (-NET): Building a responsive community

Reliable and rapid access to existing information, knowledge and expertise is not always available and/or sufficient for some of the needs expressed by decision or policy-makers. Interviews on knowledge needs conducted within KNEU showed, that an **internet-based "one-stop-shop" or portal as entry point** to this always evolving knowledge is considered very helpful but to date is not available (see Box 06).

The Biodiversity Information System Europe (BISE), established in 2010 is an important starting point for such a portal, but it currently lacks an explicit link to the knowledge holder community (in science and practice) and a concept on how to engage such a community into a continuous exchange. A workshop of the SPIRAL project last September, bringing together researchers from 20 EU projects and experts from EEA, DG Environment and DG Research and Innovation developed a set of ideas and recommendations on how to improve this link (see Box 07). They show the enormous potential that was discovered in better linking BISE and knowledge holders. Some of the recommendations could be implemented via the NET-function of a NoK.

BOX 06: Differents knowledge needs for different requesters but a similar solution to their problems.

In the KNEU project, a number of interviews with potential knowledge requesters for a NoK on biodiversity and ecosystem services were conducted*. As first results it needs to be outlined that there are different needs from different groups of requesters, across policy and society, depending on the way they are working with knowledge in their daily work.

Although the knowledge needs differ, the general barriers of accessing the right knowledge and the potential solutions were similar across these groups. The main barriers therefore include an information overload in general, but on the other hand a lack of specific knowledge tailored to needs. This includes as problem the fragmentation of relevant and poorly signposted knowledge and a lack of time to access it. Also the restricted access to some knowledge (e.g. in scientific journals) was an obstacle as well as the lack and availability of relevant data. All in all, a lack of coordination and collaboration in the field was recognized.

As solution, knowledge requesters asked for a centralisation/streamlining of information and knowledge for exchange with knowledge holders (acknowledging the role that BISE, the Biodiversity Information System Europe, might play in this, a thematic presentation of information and knowledge, more digests and briefings with filtered information and in general tools or mechanisms (e.g. via IT/ social media approaches). Nonetheless, information and knowledge accesses should be easy to validate.

Clearly the solutions to the barriers provided an important reference for the expressed preferences for, and expectations of the NoK. Thus the system should be Internet-based and it should be open access (and pertinent to civil society) in order that everybody has the same level of information.

**Source: KNEU Deliverable 1.1: Overview of experts and requesters of a potential NoK: Mapping knowledge holders, identifying requesters and barriers on how to link them. It can be found at www.biodiversityknowledge.eu*

Independently of BISE, the networking within the knowledge community is still poorly developed in terms of its capacity to actively engage in policy processes. But, based on the networks existing between research institutions, e.g. the PEER Network and the networks on the basis of EU funded projects (especially the Networks of Excellence, and also the network of BiodivERsA projects), a "community of interest" has been developed over the last decade that is one base element for an interface on Biodiversity and Ecosystem Services. What is lacking is a common platform that serves their diverse interest and makes it easier to provide knowledge while getting recognised for this service.

BOX 07: Recommendations of the SPIRAL workshop to better link scientific results and knowledge with BISE (shortened with respect to NoK relevant tasks):

The Biodiversity Information System for Europe (BISE) is a single entry point for data and information on biodiversity in Europe. It is a partnership between the European Commission (DG Environment, Joint Research Centre and Eurostat) and the European Environment Agency. Bringing together facts and figures on biodiversity and ecosystem services, it links to related policies, environmental data centres, assessments and research findings from various sources. Research is one of the 5 foci of BISE portal. That part of BISE is still in its infancy, though.

The following recommendations to further develop BISE were discussed at the SPIRAL workshop organized in September 2012:

- **BISE as a standard entry point:** With its general approach, BISE has the best potential to become the starting place for all biodiversity-related information and knowledge
- **Networking beyond BISE:** Although BISE should be an entry point for research information and knowledge, further networking in research will be needed outside BISE to strengthen science-policy activities.
- **Sharing data from projects:** Beyond the formal data flows managed by the EEA and available via BISE, BISE could also make use of data and knowledge from research projects as an additional resource for long-term availability.
- **Further develop the database of research projects in BISE.** The recently established database in BISE on research projects related to biodiversity, hosted by the EEA Biodiversity Data centre, is a good starting point to promote further projects results.
- **Managing and opening the project section of BISE**. The project section of the BISE website could furthermore be opened by a guided content management system for projects to post their material.
- **Long-term archiving of project knowledge.** After the lifetime of projects, their knowledge often gets lost. It should be explored whether BISE could become a long-term archive of the results, products and website contents after completion of projects.
- **Promote BISE in the research community.** The research community should be made more aware of BISE.
- **BISE as provider of research-relevant information on policy**. A function in BISE that could be developed is the provision of an entry point for researchers to better understand the policy context of their research.

Source: text copied and shortened from SPIRAL brief "Tools for Science-Policy Interfaces: Recommendations on BISE and Eye on Earth", which was developed in a joint workshop of researchers and policy makers from DG RTD, DG ENV and the EEA in October 2012, available at: http://www.spiral-project.eu/sites/default/files/18_WS%20recs_BISE%20EoE_3.pdf

As such (social) network approaches are time and labour intensive in setting them up and keeping them active, as the examples of the Networks of Excellence show, incentives have to be given to encourage participation. However, numerous examples illustrate how such communities were successfully established, for example the Cochrane or Campbell Collaborations and the Centre for Evidence-based Conservation.

Such a network of networks and existing institutions and networks would form the basis for a broad engagement strategy of the knowledge community for the biodiversity science-policy dialogue in general, and would form the basis for the more formally organised answering decision-making needs function.

Major elements of such a network (as online platform) would include:

- An **overview of finalised and on-going research activities on the European level**, including direct links, sorted by themes to existing information and knowledge and expert networks (See also Box 07)
- A **"knowledge holder" area** where knowledge hubs are registered and able to present themselves and the area they work in
- A "**thematic knowledge area**" that allows for a thematic access to knowledge from different policy relevant areas. It could include digest of knowledge as entry points and then link to both the "project" and the "knowledge holder" area for further information and detail. Using thematic areas as main building blocks would also allow to build up the platform step by step[17]
- A "**forum**" which allows knowledge requesters to pose questions to the community of knowledge holder and projects. It could be either completely open, or it could be restricted (or anonymized) to allow requesters to even pose conflicting or "simple" questions.

For all of these elements, an analysis should be conducted if they can become a formal part of BISE, can be taken over (in parts) by existing networks[18] or if they should be complementary to it with clear links for easy access.

The added value of developing actively a community of interest via the Network function:

- ***Knowing who is who:*** *by helping the knowledge holders to organize themselves, the possibility to identify right addressees for requests will be strongly increased. Similar approaches on national scale have shown that this is an essential ingredient for success at the SPI.*
- ***Enhance collaboration:*** *bringing together different disciplines and expertise across countries on a specific topic, will strengthen collaborative work. It will contribute to consolidating and better using existing databases. Knowledge holders will be able to have access to the work of others and build on it, thus contributing to tangible progress in biodiversity knowledge and policy.*
- ***Making the link between science and other knowledge forms more explicit*** *will help to build the Community of Interest and enhance the exchange between science and other knowledge holders, e.g. from practical biodiversity management via the thematic knowledge areas. Further developing this link is crucial for a better integration of knowledge.*
- ***Enhanced responsiveness****: in complement to existing platforms, a more diverse and mutual exchange of knowledge requesters and its holders and thus an increased awareness on both sides on "what is out there" is created and enables a rapid response mechanism to informal questions.*

[17] As a specific example, see the databases of evidence-base conservation: www.conservationevidence.com

[18] On the European, the first major networks are the former Networks of Excellence (www.alter-net.info; http://www.euromarineconsortium.eu/fp6networks/marbef; www.e-taxonomy.eu) and their common infrastructure LIFEwatch (www.lifewatch.eu). On the global level, linkages will need to be explored to the potential BES-NET web portal aiming to support the work of IPBES, which is currently under discussion.

- ***Enhance cost-effectiveness*** *of money invested in European research: The Network-function will enhance the ability to use and reuse knowledge gathered in European projects and beyond.*

3.3 Answering-decision-making-needs function (ADN-function)

The second and main function of the BiodiversityKnowledge NoK is to explicitly support European policy in different areas of the policy cycle – in the development, design, implementation, monitoring, evaluation and reporting of policy and management strategies. This part of the function is similar to the "policy support" function of IPBES, yet focussed on the concrete needs in a European context.

Whenever a topic requires an in-depth analysis and a consolidated view from science, specific activities to synthesize and analyse existing knowledge will be needed. To serve this second function, BiodiversityKnowledge would provide an interface where knowledge holders are identified and invited to jointly synthesize available knowledge on a given topic. The prototype of this interface (Livoreil et al. 2012) is a request-driven knowledge-policy interface process. Such a process has three phases. The steps for handling a request would include a preparation, a conducting and a finalising phase (see Figure 1)[19].

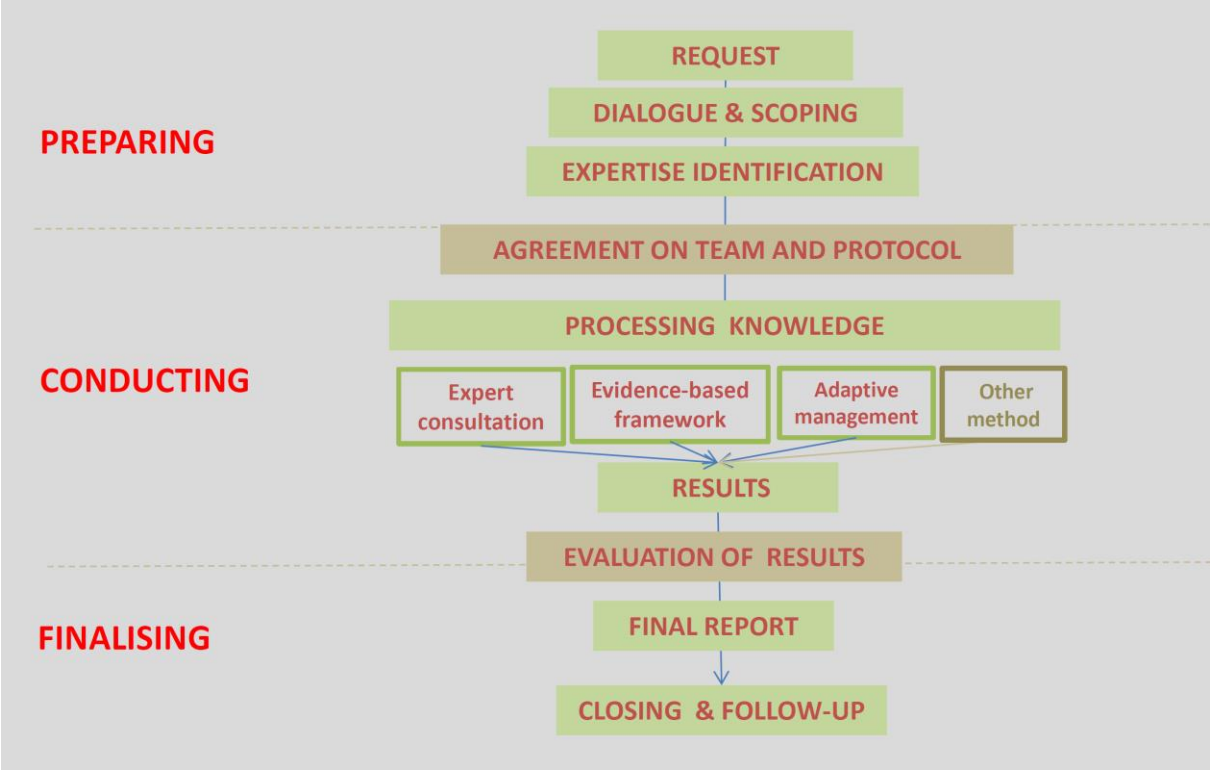


Figure 1: *Phases to conduct a detailed knowledge analysis for a policy request via the Policy Support function of an EU mechanism (Source: Livoreil et al 2012, KNEU Deliverable 2.1, for details see the narrative of the NoK prototype at www.biodiversityknowledge.eu)*

[19] The general process presented here is similar to the one currently under discussion for conducting the work of the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES). With our approach on transparency and the options for different methodological approaches, we aim at further strengthening the credibility and legitimacy of the process.

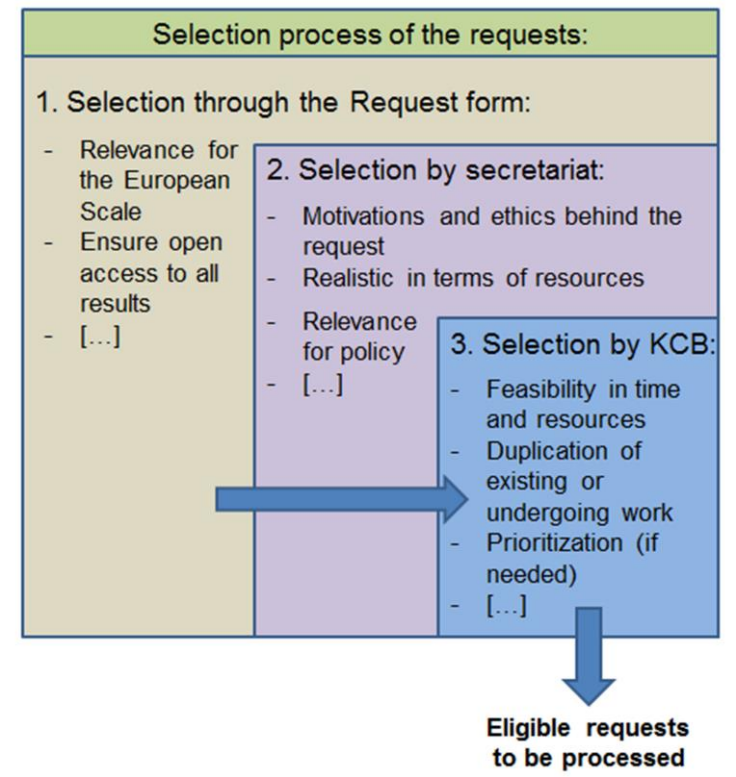
Different types of actors will be involved in this interface: the knowledge requesters, the knowledge holders, organised in ad-hoc working groups or acting as evaluators and a knowledge coordination body (KCB) finally to coordinate the whole process. Different stakeholders, especially the requesters, will be continuously involved in all phases of the process.

A small secretariat for technical support would be helpful as well, especially for ensuring that the process is following its agreed protocol and that openness and transparency are ensured and time and resource constraints are handled effectively (see chapter 5 and the narrative of the NoK prototype at www.biodiversityknowledge.eu).

For the **preparation phase**, a dialogue and scoping process between requesters and knowledge holders will be the central element in order to properly identify the requester's needs and how these can be framed in order to be answered. At the same time, the scoping will gain a first overview of the knowledge available on the topic.

The preparation phase initiates with a request posed on the web portal interface via a request form. This request form will help outlining the major elements of the requests and will help to check for the basic criteria of selection a request to the NoK should contain (see Box 08). This request form will be a first automatic selection process and avoid accumulation of irrelevant and inappropriate requests. To further the selection process, the request form will then be analysed by the secretariat and the selected requests will then be proposed to and discussed with the KCB.

***Box 08:* Examples of selection criteria for accepting to process a request.** *The decision whether a request should be checked further would be subject to three filters; 1) the request form including basic selection criteria, 2) the secretariat will further check the forms and 3) the Knowledge Coordination Body (KCB) will mainly check the feasibility of the request.*



This selection in three steps will help increase the quality and relevance of the request, as it will be in the interest of the requester to prepare their request as thoroughly and precisely as possible to benefit from an efficient process in the preparation phase. A set of guidelines for submitting requests will be made available[20]. Any interested person or institution will be able to check the whole process of selection of requests on the Web Portal.

Even if a request cannot be conducted, for example because of resource limitations, the preliminary stage should always be a win-win situation as its outcomes can be used as benchmarks and guidelines for future requests, or could be used again when the resources are made available.

Once a request is accepted a scoping group will be formed, acting independently from single institutions and covering a suitable range of stakeholders and knowledge holders for the given topic. The group will retrieve an overview of the knowledge available to assess its quantity and quality according to a list of criteria. This will include the disciplines needed to provide input, the potential role of other forms of knowledge, the type and quantity of data and information needed (e.g. from experimental studies, models…), and the potential methods to be used for compiling the knowledge.

The scoping group may also launch a call to the NoK and its knowledge hubs to identify experts on the topic and consult them about (1) the importance of the request for biodiversity & ecosystem services, (2) their perception of current challenges and state of knowledge on the topic, (3) if they would like to get involved in processing the topic (Figure 2).

Then they provide feedback with the KCB to the requester. Often, the scoping process might lead to a refinement of questions, breaking them down into sub questions, and even prioritizing these from a requester perspective, depending on the means available to conduct the work.

This might lead to an agreement between the NoK and the requester on the future process regarding procedure, timeline and also financial issues.

Following the final acceptance and refinement of the request, detailed guidelines (via a general protocol) will be developed to synthesize the knowledge, using appropriate methods in the **Conduction phase**. For the actual process of conducting the review, the first step is to set up an ad-hoc working group which includes experts from the scoping group, but most probably additional ones based on the methods chosen and the expertise needs identifed. The first task of this working group is to detail the general protocol regarding the methodological details. This methodological protocol should give a maximum of details about how the knowledge will be gathered, examined, compiled, and about the methods that will be used for assessing the knowledge. Within the prototype, expert consultation, evidence-based approaches and adaptive management have been considered as relevant methods, but these could be complemented by other methods as appropriate. The different methods are not mutually exclusive but are interlinked, which has proven helpful in the demonstration cases of KNEU[21]. They will all involve for example expert consultation at some point. The main constraint will be the availability of

[20] Similar to this process, the IPBES plenary recently decided on the request-process within IPBES: in IPBES, governments and international agreements are invited to submit requests to a given date, with a detailed list of issues to be tackled in a form, to the MEP for consideration in the IPBES work programme.

[21] See KNEU Deliverable 3.1. For another example, see Dicks, L.V., Hodge, I.; Randall, N.P.; Scharlemann, J.P.W.; Siriwardena, G.M.; Smith, H.;G.; Smith, R.K. & Sutherland, W.J. (2013): A transparent process for "evidence-informed" policy making.- Conservation Letters. DOI: 10.1111/conl.12046

resources from the NoK side and the time and funds from the requester perspective (or the resources available via other means see chapter 5 on finances).

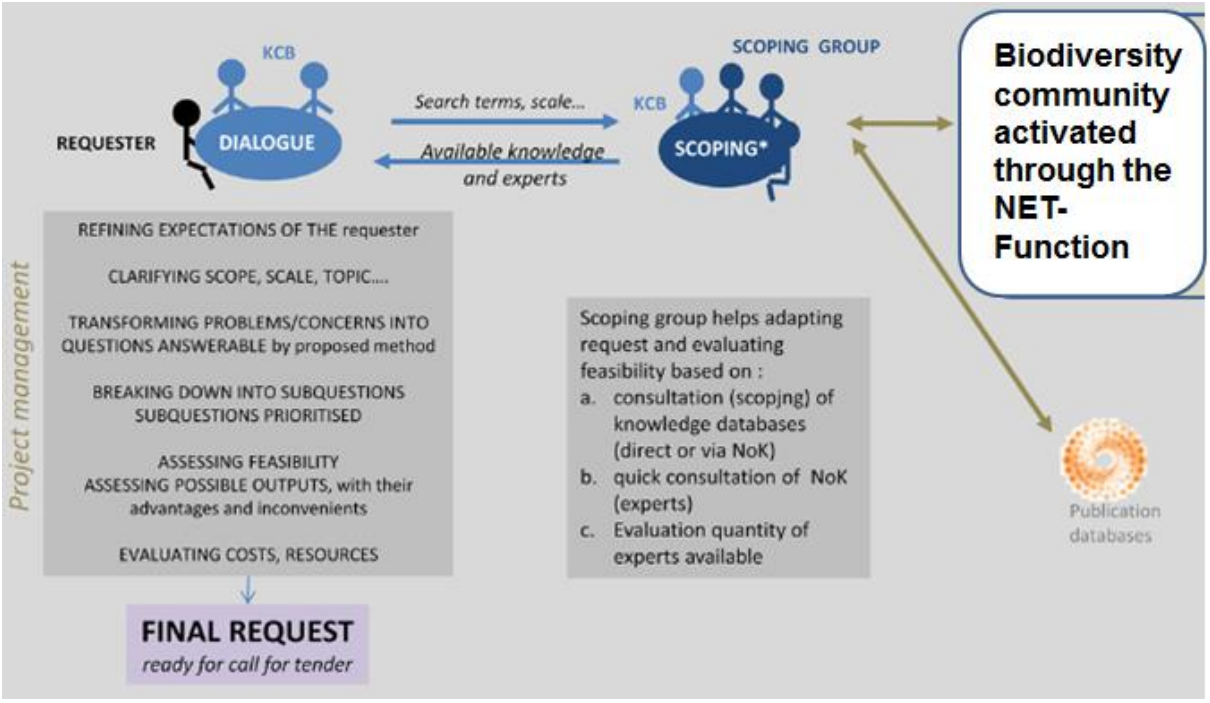


Figure 2: *Dialogue and scoping process to finalize the request*

In all approaches, the common point is to use the NoK to gather, evaluate and use the largest quantity and best quality of knowledge available (for details, see the narrative of the NoK prototype at http://biodiversityknowledge.eu).

The (draft) complete protocol, once refined with all methodological details by the working group, should be made available to any interested party (i.e. open-access) and peer-reviewed, as it has been successfully conducted in all KNEU demonstration cases. This ensures that all stakeholders had a chance to highlight flaws or possible biases, lack of clarity or inappropriate semantics, gaps in relevance or scope before the work is conducted.

The main and core step of the NoK will then be to conduct the review on the request, based on the finalised protocol agreed with the requester. The working group built for the specific request will be responsible for overseing and leading the process, based on the protocol. The final products will be highly variable (e.g. reports, briefs, scenarios…) and depending on the request and the requester's needs and resources.

For the **Finalisation phase**, the involvement of experts in a broad review process (including scientific and other knowledge providers as well as stakeholder review elements as appropriate) is essential. This will help to ensure the results are of adequate quality, relevance and well understood by all concerned. The evaluators should also check the quality of the process and work in progress at various stages during the conducting phase, to ensure that the protocol is adequately followed.

This whole request-driven process requires a set of rules and procedures, including identification of a number of different groups (scoping group, working group, review group) where experts need to get involved. Further details on this process can be found in Livoreil et al. (2012) and in chapter 5 of this paper, where the procedural aspects are outlined.

The added values of establishing a clear process for answering decision-making needs are the following:

- ***One entry point for requests:*** *The need for an entry point for requests from decision-making to science (and beyond) has been articulated clearly across the KNEU project. The questions to be addressed may be limited in number and only be addressed if they go beyond the scope of existing mechanisms like consultancy contracts and the work of responsible agencies and other bodies.*
- ***Ensuring a broad and updated coverage of the available knowledge:*** *The process is based on broad participation and thus enables independent internal and external feedback loops and other means for controlling and increasing quality in all its processes.*
- ***Ability to access knowledge at appropriate scales and forms:*** *The direct link to the open network of networks enables to target expertise at the appropriate scales from local to global.It will also enable to include knowledge from other sources than science in its strict sense.*
- ***Using tested methodological approaches:*** *Although flexibility will be needed, a high level of credibility can only be achieved by sound methodological approaches. The methodological "toolbox" proposed and tested in the NoK will be crucial to achieve this credibility and explicitly adds a new dimension of quality and transparency.*
- ***Transparency of processes:*** *In addition to using tested methods, the NoK process will allow for clearly documenting every step in addressing a given request. It thus allows a broad participation and opens up to different perspectives in science and beyond.*

Thus, BiodiversityKnowledge will be able to provide a consolidated view from science, and include other forms of knowledge as necessary.

3.4 Showcasing the pathways for decision support through the NoK

How could a NoK, with the two functions outlined above, work to support policy making? Figure 3 outlines the potential "workflow" in four steps: A request arises in decision making and if the requester is not able to answer it via his/her usual ways (e.g., by addressing colleagues, experts or knowledge sources he knows, by using consultation contracts), he may use BISE as single entry point to look for the according knowledge (step 1). If this is not sufficient, a next step (2) could lead him into the operation space of NoK which first provides him with additional sources as outlined in section 3.2 via the NET-function. For many requests, this may yield sufficient knowledge, e.g. if relevant studies for the question can be identified or quick responses from a limited number of experts seems sufficient.

Whenever a topic requires specific activities to synthesize and analyse existing knowledge to ensure a consolidated view from science, it will be transferred to the ADN-function (step 3), where the process outlined in section 3.3 would apply.

This process could be directly addressed whenever a request has a strategic or long-term perspective where the need for a detailed analysis with direct involvement of science and other forms of knowledge

is evident from the outset (*direct request route). It has to be emphasized, that such requests should not replace existing ways of directly addressing policy-related issues (*e.g.* regular reporting on policies, as done by governments, the Commission and responsible agencies) or the role of consultancy contracts.

If step 3 identifies gaps, which can only be tackled by additional research, these gaps would be communicated to research funding mechanisms and research institutions explicitly (step 4), thus linking up with research strategy function identified in section 2.3.

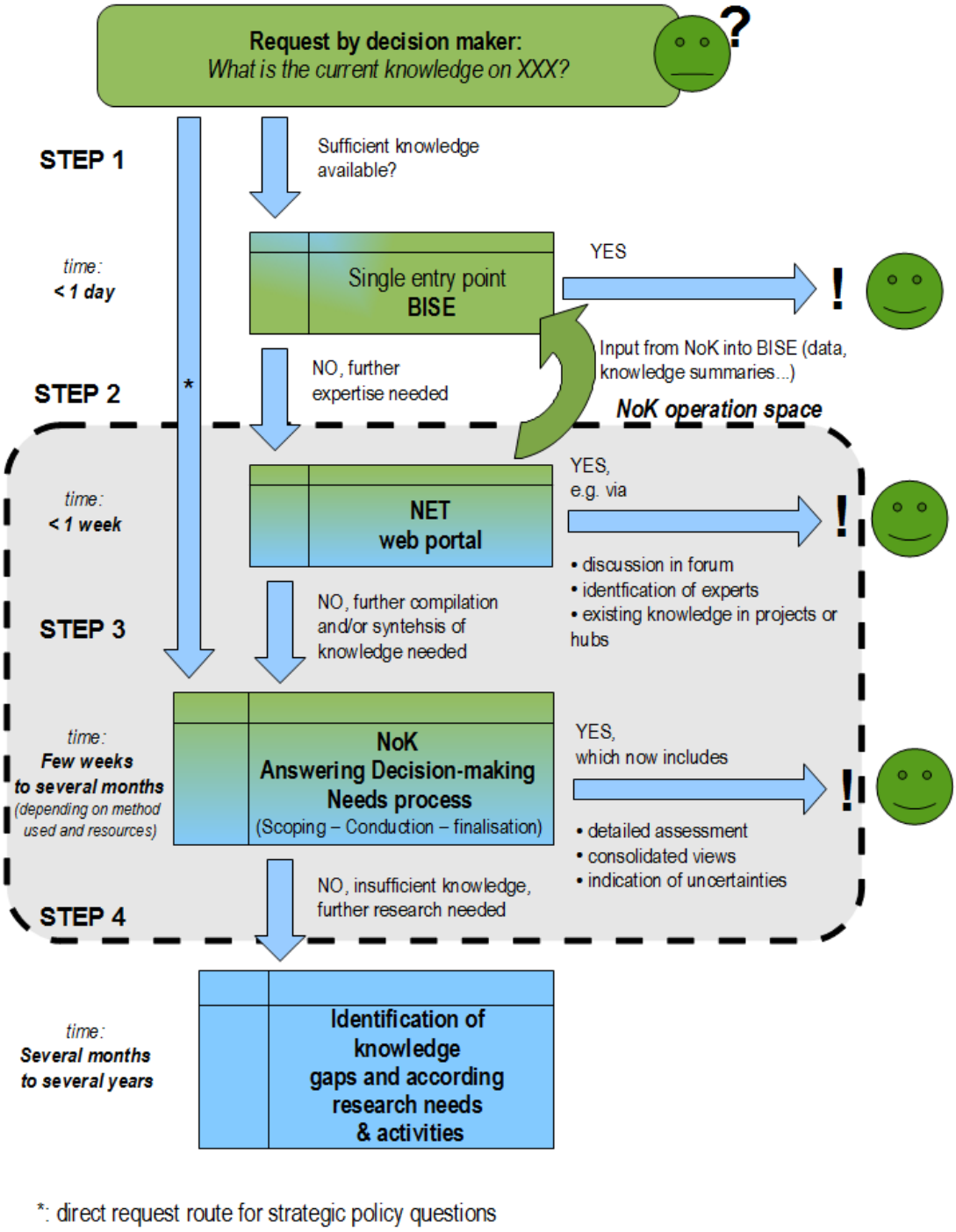


Figure 3: *Flowchart of the entry points where the NoK is supposed to support decision making in identifying and collating relevant knowledge.*

Although this flowchart is rather mechanistic and leaves out the challenging activities within the steps, it highlights the demand of time and resources which each step may take, especially each request

processed in step 3 (and 4). The more demanding the method used in step 3 is (see also section 3.3), the more time and resources-consuming it will be and thus may conflict with the timelines of the policy process to be informed. These time constraints need to be carefully considered and stress the importance for ensuring a well-organised and resourced second stepThe demonstration cases have shown, that especially relying strongly on voluntary contributions from experts limits the possibility for short term reaction, an according funding to support major working steps (*e.g.* in conducting systematic reviews) may help shortening the timelines considerably.

Nonetheless, such a process would help to make transparent and thus decide consciously about the level of validation that the answer to a request can achieve. Step1 and Step 2, which may often be sufficient for certain requests are limited in this respect, but using Step 3 will enable to develop concerted and validated views from science (either inner- or multidisciplinary) on a given topic, a deficit often cited by decision makers in consultations. Uncertainties and gaps in knowledge, which are identified during the process, can even lead to additional reseach efforts in Step 4.

3.5 Conclusions: BiodiversityKnowledge as science-driven part of the wider science-policy interfaces

As highlighted with the grey-shaded "operation space" in Figure 3, BiodiversityKnowledge as a Network of Knowledge would operate in between the current workspace of science (lower part of figure) and the workspace of policy, supporting the high number of existing interface processes in enhancing knowledge flow to better channel the support of decision making from science. Within this context, the importance and also ambition of the network function cannot be underestimated, as its success will make a difference in how the policy support function is perceived in terms of legitimacy, but also in term of credibility (see Box 05). Activating a broad range of knowledge holders from science and beyond by building a Community of Interest will be crucial to overcome current restriction in participation in Science Policy Interface processes.

The operationalization in a crowded space of acting institutions, avoiding duplication of efforts, raises a number of challenges. These will be discussed in the following chapter 4, as basis for the potential design options that are then discussed in chapter 5.

4 Ability of a Network of Knowledge to deliver relevant products while ensuring credibility and legitimacy

A broad consultation was undertaken to identify recommendations on the design of the draft NoK and what it would take to significantly improve the capacity of the scientific community to respond to knowledge requests from policy.

Three regional workshops, a conference by the KNEU project as well as four sessions organized at external conferences (ESP 2011, ECCB 2012, IPBES-1 2013 and ALTER-Net 2013) were carried out to collect feedback and discuss the NoK structure (See detailed list of events which KNEU organized or attended on www.biodiversityknowledge.eu). Together with further meetings (e.g. with the project's client dialogue group), interviews and spontaneous feedback, approx. 300 individuals have commented on the draft NoK, with about 10% policy makers, 15% practitioners and about 75% scientists. Through this process, key challenges were identified, which BiodiversityKnowledge has either since tackled in an updated NoK prototype or still needs to address in the setup of the NoK.

The broad consultation led to the identification of four essential ingredients for developing a NoK (each one is further detailed below, list doesn't indicate a ranking):

- *Quality assurance;*
- *Data sharing, standards and data exchange*
- *Connecting, motivating and acknowledging the knowledge holders and requesters ;*
- *Communication*

In addition to those ingredients, further challenges lie in the more process-oriented elements of the NoK – its governance and its financial support. These issues will be addressed in chapter 5 directly with the options presented for the NoK design.

To integrate the four ingredients mentioned, while keeping the work of the NoK open, accessible and transparent, the following analysis uses the CRELE attributes, already introduced in section 3 and Box 05 in order to serve as baseline and guide the procedures[22]:

- **Credibility** of the NoK which is the perceived quality, validity and expertise of the people, processes and knowledge exchanged at the interface. Credibility may be ensured by e.g. the rigour of the process and the quality of the participants and by transparency of all processes and decisions
- **Relevance** or saliency, which represent the responsiveness of the NoK to policy and societal needs, i.e to the users of the NoK
- **Legitimacy** is the perceived fairness and balance of perspectives within the SPI processes, including inclusiveness of all relevant stakeholders, transparency, fairness in treatment of diverging values, beliefs, and interests.

These attributes are widely accepted and used, and can explain an SPI's set-up and outcomes, and have been explicitly considered for example in the creation of IPBES. The Intergovernmental Panel on Climate Change (IPCC) uses them to evaluate scenarios, draw lessons from past experiences and explain assessments' influence.

[22] See also according briefs of the SPIRAL project: http://www.spiral-project.eu/content/documents#jump2briefs

Particularly to achieve credibility and legitimacy, **independence**, i.e avoiding influence of specific groups, will be important. As many contributors in the discussions stressed the importance of this attribute, we added it as a fourth interlinked attribute.

Both practical application and scientific analysis using the CRELE attributes have shown, that major trade-offs can arise when designing and conducting SPIs[23]. For example, a strong legitimacy, e.g. via a mandate by governments, might reduce credibility on the science-side, as political control of results might be a part of the SPI process (e.g., the negotiations by governments on the "summary for policy-makers" of IPCC reports). On the other hand, a strong focus on scientific credibility might reduce the relevance of the work, as issues tackled might get reduced to those where scientific knowledge is available and consolidated in terms of clear results[24].

For each of the four ingredients mentioned above, the following sections outline the challenges faced in terms of credibility, relevance, legitimacy and independence, then draw lessons learned so far from a general perspective on science-policy interactions as well as from the KNEU project and how the NoK approach can in fact *add value* to science-policy interactions.

4.1 Quality assurance

Quality assurance in SPIs covers a broad range of issues, some of them directly tied to scientific work (see also next section on data), and some of them related to the SPI processes itself, where quality stands for effective procedures. Thus, "quality assurance" is an overall challenge affecting all four attributes from credibility to independence.

4.1.1 Challenges

Over the past decades trust in the ability of the scientific community to speak with "one voice" and in the quality of scientific knowledge has decreased in both public opinion and among policy makers. For almost any position you can find scientific arguments and evidence[25]. Besides some work that does not comply with scientific standards in many cases seemingly contradictory results or conclusions are due to the fact that different often very narrowly defined questions are analyzed or different methodologies are applied.

Hence, in a science-policy context at least two challenges arise with regard to quality assurance: the quality of the knowledge used must be assessed and an adequate framing is essential. This means that policy questions need to be translated and often broken down in such a way that they can be addressed with the available knowledge (whether scientific and/ or beyond) and results need to be integrated in adequate ways to provide answers to the policy question, taking the available knowledge and the ways they were achieved into account.

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23 See for example the work of SPIRAL, www.spiral-project.eu, or the paper of Cash, D. W. et al. (2003): Knowledge systems for sustainable development.- Proceedings of the National Academy of Sciences of the United States of America 100: 8086-8094.

24 For details, see mentioned SPIRAL briefs on the CRELE concept, see www.spiral-project.eu/documents

25 For a brief discussion, see Pielke Jr., R. (2007). The Honest Broker: Making sense of science in Policy and Politics.- Cambridge University Press

But it is not sufficient to ensure quality internally it also has to be communicated so that results are considered of high quality by requesters and relevant stakeholders (see section 4.4).

Quality of knowledge input into a decision-making process has several dimensions: An assessment will be considered of high quality if the criticism against it has been lowered to a minimum, i.e. the outcomes cannot be easily (and honestly) disputed/debated. Or it can be said as of high quality because it is useful, understandable and relevant to the current context. "Quality" will always be perceived with a variety of meanings by different stakeholders. Nevertheless, high quality science relies on principles that are valid for all disciplines and make the scientific endeavour as rigorous and objective as possible. Explaining and using these principles can provide an explicit basis to give a indication of the level of confidence or risk associated to each result.

Keeping this complexity in mind, a few - more general - challenges can be highlighted and will need to be tackled to enhance quality insurance in any science-policy process:

- **Accuracy of information**: identifying biases and confounding variables, and differences in methods in original work, confidence, level of transparency and replicability for provision of data
- **Limitations:** comprehensiveness of knowledge taken into account, its validity, applicability of the evidence and uncertainties of findings; adequacy of the information and relevance to real-world conditions; measurable indicators of performance
- **Alternative options**: Identifying multiple perspectives on a topic and presenting different options for action and the potential trade-offs associated with the options identified
- **Expected barriers to the use of results**, including time pressure, perceived threats to autonomy, preference for tacit knowledge, resources required
- **Lifespan of the answer**: Anticipated needs for future updating of findings due to expected new results, especially in the context of existing uncertainties. Ability to update knowledge when new knowledge is produced.

Although many of these issues may appear complex, suitable ways of accounting for them are available from assessments and other evaluation processes[26]. As one major cornerstone, this would include, besides review processes, an approach to assign certainty terms to key findings, as it has been developed for the MA and IPCC. This includes an indication of the level of expert agreement on a given statement and type, amount, quality and consistency of evidence[27].

[26] For a recent example on issues related to the CAP reform, see for example Dicks, L.V., Hodge, I.; Randall, N.P.; Scharlemann, J.P.W.; Siriwardena, G.M.; Smith, H.;G.; Smith, R.K. & Sutherland, W.J. (2013): A transparent process for "evidence-informed" policy making.- Conservation Letters. DOI: 10.1111/conl.12046

[27] See for example the according document of IPCC: Mastrandrea, M.D., C.B. Field, T.F. Stocker, O. Edenhofer, K.L. Ebi, D.J. Frame, H. Held, E. Kriegler, K.J. Mach, P.R. Matschoss, G.-K. Plattner, G.W. Yohe, and F.W. Zwiers, 2010: Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties. Intergovernmental Panel on Climate Change (IPCC). Available at www.ipcc.ch

4.1.2 Lessons learned

General lessons:

Learning from experiences like the IPCC and the MA, quality assurance of the process and the output are of crucial importance. For the NoK and through its limited experience so far, many lessons learned could be used to improve the quality of *both,* process and products, while ensuring a balance in addressing the four attributes.

The credibility of the process and products of the NoK are highly dependent on a broad and balanced participation of experts, bringing in a diversity of backgrounds (disciplines, geographic, etc..), experiences and approaches, thus enhancing relevance and building legitimacy (see also section 4.3).

The quality of the process and product, as well as the quality of the methodologies used can only be judged if they are understood by all those concerned. To achieve this, it is important to ensure transparency of processes and to use understandable language within and outside the working groups (see also section 4.4.).

Lessons from the work of KNEU:

In order to ensure quality throughout the entire NoK process, quality control on the expertise involved in the process should be built-in as early as possible. A combination of structured search for adequate experts through the existing hubs that can help identify relevant experts and an open call for expertise should be used to ensure broad participation of relevant experts, in order to avoid bias by using only one of these approaches[28]. In addition, a transparent open recruiting/nomination process to select the participating knowledge holders for working groups and evaluation should be established using a priori defined criteria.

Other important lessons (from KNEU and other processes) are that for all products clear review procedures will have to be established and that the final products should not only be reviewed by different scientists but also by different stakeholders to increase relevance (engineers, economists, lawyers, policy makers etc…), thus using an extended peer-review approach.

Finally, a system for quality evaluation and improvement of both process and outcomes will need to be developed, including for example integration of feedback, screening for more advanced methodologies for knowledge assessment, or a build-in, but independent regular evaluation procedure.

[*More insights in this respect will be gained from the ongoing work of KNEU WP4 evaluating the outcomes of the demonstration cases*.]

[28] As outlined by Dicks et al. (2013), the influence of group composition on outcomes in science-policy processes in environmental issues has rarely been analysed in studies, so that a broad approach trying to involve multiple disciplines and key stakeholders should be used from a "precautionary" perspective

4.1.3 Added values of a NoK

The broad consultation and the demonstration cases have clearly indicated some added values of the NoK prototype in enhancing quality.

The NoK approach aims at a broad participation and thus enables independent internal and external feedback loops and other means for controlling and increasing quality. Particularly for conflictive issues bringing the different perspectives into a common process can help to bring more evidence into the decision-making process, but also make the underlying conflicts and interest visible.

The NoK approach includes an explicit choice of the best available methodologies to compile and assess the available evidence. This ranges from evidence-based methodologies such as systematic reviews to different forms of moderated expert consultations to transdisciplinary approaches such as collaborative adaptive management, with the possibility to combine these approaches depending on the needs identified. This choice process will be made transparent explaining what each method means for accuracy of information used, its limitations etc.to ensure credibility.

When using evidence-based methodologies to assess knowledge, the extensive and comprehensive literature search, the critical appraisal approach and the goal of transparency and objectivity in reporting aim at minimizing bias and selectivity to particular sources unlike any other review process[29].

If there is not sufficient evidence published in peer-reviewed papers and where more applied forms of experience-based knowledge are relevant, other forms of knowledge can be included (this may include "grey" literature"). Here again, the transparency of the process used to acquire information sources and their basis will be important to be documented, so the transparency and traceability regarding the origins of knowledge and outputs contribute to enhancing credibility.

Where there is not sufficient evidence available different forms of expert consultation will be used. Here the process of selecting relevant experts is particularly important and again making the selection criteria explicit can help to increase credibility. Different forms of triangulation can be applied to ensure acceptable levels of validity. Possible approaches include stakeholder dialogues preceded by stakeholder mapping and analysis, different forms of Delphi processes and Bayesian models for situations characterized by high levels of uncertainties and low levels of knowledge available[30].

To sum up, the NoK will use an explicit and transparent procedure to ensure quality throughout the entire process: from selection of experts, scoping of available knowledge, choice of methodologies, conduction of the assessments, and extended peer review.This will increase credibility and legitimacy. Similarly, accounting for and communicating uncertainty will increase credibility.

4.2 Data standards, data sharing & exchange and methods to analyse them

[29] See for example the approaches used by the Collaboration of Environmental Evidence, www.environmentalevidence.org

[30] For decription and discussion of these methods, see Bergmann, M.; Jahn, T.; Knobloch, T.; Krohn, W.; Pohl, C.; & Schramm, E. (2012): Methods for Transdisciplinary Research. A Primer for Practice. Campus Verlag

4.2.1 Challenges

Answering questions and producing knowledge that require interpretation of biodiversity data is still hampered by lack of harmonization of protocols, taxonomy and accessible, common databases. The lack of agreement and use of standardized protocols and species' names can result in multiple experts seemingly disagreeing with each other already on the data integration level. This does not contribute to transparent and easy-to-understand communication with requesters at a later stage of knowledge compilation, nor does it contribute to the credibility of the scientific community. Standards and data harmonization have to be developed to allow research institutes and agencies to communicate and exchange findings.[31] As one underlying reason data sharing is often problematic due to issues like confidentiality and ownership which hinder a timely and constant integration of new data into shared databases[32].

This underlying challenge for a Network of Knowledge cannot be tackled directly. It is, however, seen as a major obstacle for better informed policy-making in both science as well as in policy, as it may hinder the use of certain methods in analyzing existing knowledge. It therefore needs to be taken into account when designing a NoK, making sure that organisations dealing with data harmonization and data sharing are involved and informed on identified needs.

4.2.2 Lessons learned

General lessons:

On the policy level, harmonization is being pursued and stimulated by the reporting obligations for International Conventions such as the Convention on Biological Diversity (CBD) but also by the European reporting on the Birds Directive and the Habitats Directive. These require integrated assessments on status and trends of species, habitats and ecosystems, to name just a few[33].

The three domains of biodiversity, marine, freshwater and terrestrial, have achieved standardization and common database development in decreasing degree: In the marine domain, data sharing is common practice as cooperation is of utmost importance when collecting data for monitoring fish stocks. Hence, standards and data harmonization had to be developed to allow research institutes and agencies to communicate and exchange findings. In freshwater ecology the standardization of protocols and existence of common databases is much less developed[34]. In terrestrial ecology, only species like birds and butterflies have standard procedures for collecting data, for other species and for ecosystems, such standards are only developing[35].

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[31] It should be noted that in first place, the interest in better data harmonisation and sharing lies in science itself, as it is needed to better answer scientific questions across scales, taxa, and for complex interactions, to name just a few.

[32] For an according analysis, see for example Enke, N.; Thessen, A.; Bach, K.; Bendix, J.; Seeger, B. & Gemeinhölzer, B. (2012): The user's view on biodiversity data sharing — Investigating facts of acceptance and requirements to realize a sustainable use of research data.- Ecological Informatics 11: 25-33

[33] See for example the GEO Biodiversity Observation Network – Concept document (2008), online at http://www.earthobservations.org/documents/cop/bi_geobon/200811_geobon_concept_document.pdf

[34] but see the EU-funded project BioFresh www.freshwaterbiodiversity.eu, which takes major steps forward in this respect

[35] but see ongoing approaches like the European Long Term Ecosystem Research Network (LTER-Europe) www.lter-europe.net, the work of the LIFEWATCH infrastructure (www.lifewatch.eu) and the work of GBIF (www.gbif.org) on the global scale

The work of earlier EU-projects like EUMON and EBONE, and the work carried out currently in the EUBON project[36], and the continuation of LifeWatch will bring this integration of data and standards further and this work would need to be used and further linked to the aspects of knowledge generation from such data.

Lessons from the work of KNEU:

Depending on the methods used in processing requests in the NoK, there is a strong need for data in a processed and readily accessible format. In any case, a broader accessibility of available data and information based on broad datasets on a sound scientific basis increase credibility of knowledge derived from such data and information. Often the availability of information is a major criterion for decisions in the NoK process on whether certain methods can be used and may often restrict the work to expert consultation approaches.

The NoK thus highlights the need for data and information integration and availability and supports their further development in initiatives like LIFEWATCH, EUBON and GBIF.

4.2.3 Added value of a NoK

As outlined, the integration of data and information towards accessible and relevant knowledge is important for scientific work, but also for the broader evidence base, that a NoK would need to build upon to gain credibility.

Accordingly, the added value of a NoK is to facilitate, speed up and demonstrate the usefulness of data integration and sharing, and its potential links to the general needs of policy, *e.g.* when it comes to regular reporting, developing monitoring approaches, but also for science, as many high level studies from integrated datatsets, for example in the U.K. show.

The NoK will need to establish a close collaboration with existing data sharing initiatives, but it can also significantly contribute to their promotion and use. The NoK can thus support the dissemination and use of many databases which until now have been less well known or poorly used.Such a work could be developed in close collaboration or directly with the Biodiversity Information System Europe (BISE).

On the operational level, when trying to collate existing knowledge to answer a request, finding the scientific literature is relatively easy thanks to tools and databases. Yet, a part of science is hidden from these sources if the data is not accessible via these sources or when a programme or study is currently conducted, it is not referenced yet and could be easily omitted. By locating relevant ongoing activities in knowledge generation, NoK contributes to their integration into the current request and thus supports its (further) use, as shown by the integration of the work of NERC Cambridge on issues of the agricultural case study.

In bringing together different disciplines and expertise across countries on a specific topic, the NoK also strengthens the collaborative work across disciplines and knowledge domains, to answer a request which can play an important role in evaluating existing databases and highlighting potential quality gaps. The central added value of collaborative work consists in enabling contributors to have access to and work on the work of other scientists and enables others to build on their own efforts, all in all contributing

[36] For further information, see websites of the projects: EUMON: http://eumon.ckff.si/, EBONE: http://www.wageningenur.nl/en/Expertise-Services/Research-Institutes/alterra/Projects/EBONE-2/About-EBONE.htm; EUBON: http://eubon.eu/

Box 09: Some lessons learned from the Agriculture Demonstration Case:

The demonstration case presented here analysed the question "Which types of landscape management are effective at maintaining or increasing natural pest regulation in a context of decreased use of pesticides?" A combination of methods was used to address this questions and subsets of it (for details, see KNEU Deliverable 3.1). The following lessons learned can be drawn from it:

- Systematic reviews can be a powerful and useful tool not only to get a clear picture of a knowledge field for policymaker information, but also to get a comprehensive overview of a subject for designing research or monitoring, answer open questions, identify key knowledge gaps, spot traditional approach flaws (e. g. recurring design setups doing the same kind of research over and over again and expecting different outcomes) and summarize the state of a particular art for whatever purpose.
- Working with professional librarians and information managers to conduct the search for systematic review approaches in the case was very interesting because they know the search engines, tools, and have experience in designing searches.
- Even if information on indigenous and practical knowledge was exchanged and methods to access such knowledge were presented and discussed during the conduction of the case, a balanced representation of such knowledge in decision-making processes might be difficult to achieve due to the different nature of knowledge forms.
- Workshops are important ways of networking and they are more effective in bringing together people of various backgrounds and exchanging knowledge at various levels than other ways of networking, such as e-mailed information. However, they also require much more resources and they are facilitated if financial support for travel and subsistence is provided.
- The workshop created a positive atmosphere but was not enough to maintain a traceable level of exchanges afterwards.

(Extracted from the deliverable KNEU WP3 (3.1) in the Agriculture demonstration case)

to tangible progress in biodiversity knowledge and policy. Many European projects, including the collaboration of funding agencies via BiodiERsA show that this approach is successful and could be further facilitated by a NoK.

With a NoK operating as a network of networks showcases the relevance of integrating data and speeds up ongoing processes and dissemination across countries, it will also contribute strongly to a higher legitimacy of SPI processes, as country specific results and views can be incorporated especially in expert consultations, thus being able to add value not only at the European, but also at the country level (see for example the Conservation demonstration case in deliverable 3.1 of the KNEU project (downloadable from www.biodiversityknowledge.eu).

Box 09 summarizes some lessons learned from the agriculture demonstration case.

4.3 Connecting, motivating and acknowledging the actors

4.3.1 Challenges

There are a large number of formally and informally ongoing interactions which can provide the majority of knowledge needed. Thus a first important step when setting up a NoK consists in identifying,

connecting, committing and acknowledging the knowledge holders on the one hand and the potential requesters on the other. Since a NoK should be able to connect with as many relevant networks, organizations and individuals as possible in different regions and member states, within Europe and worldwide it will need a basic coordinating structure to do so, but has to be flexible in order to address the right stakeholders for each potential topic, often reaching out beyond the "classical" disciplines and stakeholders of the biodiversity and environmental sector. This is maybe the most crucial challenge in setting up a NoK.

Most stakeholders today, in policy, in science, or from any other area, face a high workload in their specific context, limiting the investment of time (and potentially the motivation) to engage in interface processes. Even if the general interest in the work of a NoK is high, as it has been stated by many participants in the various events of the KNEU project, the challenge is to keep them informed as for many thematic requests, they (as individuals and/or institutions) might not be the right experts to involve, but might be for later requests. So the design of the NoK (as network, and as answering-decision-making-needs process) needs to provide incentives not only for getting actively involved, but also for "staying tuned" into the overall process.

Another challenge in this context is, that different entry points are required for different stakeholders, as they will have different interests and the benefits of staying tuned will differ as well (see for example Box 10 on the motivations of experts to get engaged).

The community of knowledge holders which needs to be addressed is a dynamic entity: knowledge from some sources (e.g. from research projects) quickly loses accessibility, people change affiliations and/or belong to various hubs, for example to a university, a European research project and a learned society. Some of these knowledge hubs have encountered ways of dealing with the dynamic community of interest by establishing their own ways of interacting internally and with the area of policy, for example some learned societies have established "policy committees".

Nonetheless, major challenges remain in better connecting all these hubs and pathways into policy and bring them together for a common input into policy discussions, whenever this is needed and desired.

Box 10: Motivations of experts for getting involved in policy support activities

The motivations of individual experts to get involved in policy support activities vary from individual to individual, between the individual and institutional level, as well as between disciplines. They include

- Demand-driven process by policy
- Technical learning and new ideas from other countries
- Networking and future collaborations
- Working together in focused technical groups
- Personal contacts with coordinators (trust)
- Personal contacts with other participants (spread the word and trust)
- Interdisciplinary process
- Contributing knowledge and data
- Career development (scientific publishing for early career)
- Institutional agreement (scientific publishing)
- Knowledge exchange ideas/ techniques
- Prestige of being involvement in European projects
- Sharing information and feedback/ dialogue with peers
- Learning about methodologies
- Information on the project progress and wider context
- Meeting location
- Non scientists increasing scientific knowledge
- Expenses paid

Taken together, these all help to justify time away from other workload. Accordingly, it is important to communicate this range of potential benefits to support involvement.

(Based on KNEU WP4 interviews and focus groups with participants from demonstration cases)

The main challenge here is then to connect and commit this dynamic and diverse community and to connect enough knowledge holders for a comprehensive representation of the existing and interdisciplinary knowledge on a topic. To enhance credibility and legitimacy, the NoK will have to work in a complementary process of networking excellent people, skills and the latest knowledge as well as integrating different types of knowledge. Involving well-known and respected contributors for example will improve visibility and credibility. In addition, continuity in the commitment from the biodiversity community should ensure long-term functioning of the mechanism.

4.3.2 Lessons learned

Lessons from the work of KNEU: The NoK would need to maintain and improve the mapping of knowledge holders of directly-linked biodiversity actors at different scales but also including legal, social and technical actors beyond core areas, which is a specific challenge. In addition, it would be important to leave enough flexibility in the mapping to cope with the dynamics of the knowledge landscape and to include new actors.

Through the broad consultation and the mapping exercise of KNEU (see Box 02), obstacles to commitment to the NoK were highlighted, such as (1) the resource limitation of the knowledge holders and (2) motivations from the knowledge holders to get involved in any policy support activities (see concrete examples in Box 10). Reasons to increase the willingness to participate include:

- Confidence in usefulness: if participants feel confident that their engagement will help to make a difference in comparison to the current situation of decision support. This requires ensuring that the NoK is useful for policy development and practical management (although this is a "chicken and egg" situation especially at the very early stages of NoK, when this confidence has no explicit proofs yet). This confidence can be enhanced by ensuring a well functioning, supported and well communicated process, that tries to keep the focus and interest on the decision-making high and to be transparent internally as well as externally.
- Mandate: A clear general mandate to the NoK from the policy side would support interest and dedication, as it ensures an interest in the results from the requester's side. Also an acceptance (or even official mandate) of the process from institutional knowledger holders would increase its legitimacy.
- Easy-to-use: The NoK should limit the time the participants spend with understanding the engagement process and the technology involved in the process. NoK should then provide some clear guidelines for the different actors on how to get engaged. For this the NoK should have explicit instructions, documentation, user support or even video demonstrations as if involvement is too complicated few people will bother to try it out. Additionally, the way to get involved should be tailored to the users, (e.g. through a topical approach where participants can contribute their expertise) and the outputs should be adapted to the different categories of users. The work performed within the project also highlighted the additional importance to create and support a "Community of interest", via a web portal, which would require further exploring the possible technological approaches to achieve an active use of such a tool. A suggestion was to provide a friendly and free-access web-interface to facilitate exchange of information, enable communication with the community and allow for commenting on the different products.
- Credits and outputs: Participation to the NoK and contributions to its outputs need to be acknowledged through status, financial or scientific rewards (including scientific papers). Also a certain prestige in taking part should be built up.[37]
- Learning environment: The NoK creates a learning environment where participants feel that their time investment is rewarded with learning new methods, new knowledge and increasing their network.
- Collaboration: The NoK can create an open and pro-collaborative working environment (i.e. avoid feeling of competition between knowledge holders but promote collaboration). Knowledge holders with similar or related research interests who want to help answering a request should find that they have more to gain from collaboration than from competing for decision-maker's

[37] The issue of prestige shouldn't be underestimated, as it can be seen from the high prestige in science today that experts gain when becoming lead authors in the IPCC Assessment reports

attention. Being transparent during the whole process will help contributors/followers to build on the work of others.

- Independence: The NoK should ensure that the whole process is independent from external control and from vested interests, contributing to its credibility. The NoK should be both cautious and transparent regarding links to other organizations and interests, in particular where significant funding is involved. According procedures for dealing with conflicts of interest need to be set up.
- Link to international activities: Although the NoK would focus on the European level, it will get additional acceptance and support by linking up with international activities. Here, the link to IPBES is of specific importance. For example, the NoK could provide European synthesis work on topics tackled by IPBES, and thus create a "win-win" situation where the work in the NoK is used on the European as well as on the global level and thus the input of experts is acknowledged twice.

Box 11 gives some examples on how challenges, lessons learned and added values are linked, derived from the case studies.

4.3.3 Added value of a NoK

Within KNEU, the current biodiversity landscape of experts, networks and knowledge holders in Europe has been mapped (see Box 02 and KNEU deliverable 1.1). The mapping shows that the broad community of individual knowledge holders is diverse and includes among others research organizations, cross-institutional projects and networks, learned societies, and NGOs. The most efficient way to access and connect the knowledge on biodiversity is to use existing hubs and organizations, reaching multiple individuals simultaneously, as the NoK approach proposes. It will never be possible to address a complete community, but hubs act as multipliers and also as a first implicit level of quality control on the expertise involved in the process.

Box 11: Some examples from the case studies on challenges and lessons learned regarding connecting and committing actors

- The NoK worked fine to reach knowledge hubs and experts and informed them about the development of the case study, but it was not enough to get them involved or to get feedback. Personal contacting worked much better, and face-to-face meetings (e.g. workshops) are one important way to get people more involved and to really exchange knowledge of various kind.
- The heterogeneity of the knowledge holders and users is a challenge in terms of achieving an efficient knowledge exchange and synthesis. In each community, there are people who have skills and the mind-set which favours bridging the gap between knowledge-oriented community (e.g. scientists) and the task-oriented stakeholders (managers, decision-makers including policy makers). They should be identified as they are very effective members of working groups. The challenge is to make sure they are acknowledged by their own community as representatives with integrity and authorisation to speak on behalf of their groups (no conflict of interest, not only promoting their own vision).
- Scientific tools (search engines, libraries, databases, analysis...) are in place to implement scientific synthesis and assessment. However, nothing comparable is available for traditional, practical and technical knowledge, here the involvement of knowledge holders is even more important but also more time consuming.

Extracted from the deliverable KNEU WP3 (3.1) on demonstration cases

When taking this aspect, and the lessons learned into account, a NoK approach - through explicitly reaching out to the whole community - has a clear added value with regard to credibility, relevance and legitimacy as it enables a broad participation. This is rarely the case in science-policy approaches that restrict the input to certain groups, institutions or individuals, like (many but not all) consultancy contracts, work by single research projects or institutions.

This is especially important in the area of biodiversity and ecosystem services, with its diverse community of knowledge holders' that need to be activated differently for each topic to be addressed, depending on the knowledge needs. The demonstration cases have shown, that this can be achieved for different communities (see Box 11), although this will always need dedication and continuity in the processes of the NoK.

4.4 Communication

4.4.1 Challenges

As outlined in the three sections before, the challenges on quality control, data harmonization and involvement are high but can be tackled by a NoK approach. But for achieving each of them, a high level of professional communication – on policy needs, processes of the NoK, data and methodologies, to name just a few– is required. This is especially true as the NoK approach is, at least in parts, new to many actors in the field and requires a high level of understanding why the processes of the NoK are designed in a certain way and do not always follow "classical" approaches of science-policy interactions.

Thus, communications in the NoK – with involved actors as well as to the outside – will need to balance the need of communicating results and engaging people, but also achieve a level of capacity building to raise understanding of the processes and thus the ability and willingness of actors to get involved.

This holds especially true, as many biodiversity and ecosystem services related issues are mainstreaming issues, so a continuous broad outreach is needed to engage and make aware the relevant knowledger holders and requesters from all areas, including other policy sectors (e.g., agriculture, forestry and fisheries, climate and transport) and their according stakeholders as well as different scientific disciplines. Here a major challenge lies in the translation of problems to be tackled and the results achieved into the corresponding language of those sectors and disciplines.

Connecting and motivating the different actors to be involved in the NoK, requires broad and clear communication on (1) the added values of involvement for both knowledge holders and requesters, and (2) current and future projects tackled by NoK.

4.4.2 Lessons learned

General lessons:

Many experiences over the last years have shown that internal and external communication in science-policy interfaces are of major importance to ensure credibility, legitimacy and relevance of a process. The problems of the "Climategate" discussions of IPCC for example showed that a professional communication about the processes of getting to specific results, and the way potential mistakes are tackled are important for the perceived credibility of a process[38]. The lessons from the TEEB process, on the other hand, show how helpful a joint framing from policy and science in combination with a suitable outreach campaign can be to promote findings from science-policy processes effectively and engage more than 500 experts in different sets of reports and other activities within a relatively short timeframe[39].

Lessons learned in the KNEU project:

Within the first phase of the project, which organized general discussions on the NoK approach and specifically the prototype for answering-decision-making-needs, it became obvious that the implementation of such an approach requires a very reflexive process, that sometimes seems to be contradicting approaches used in the more linear model of policy advice that many experts are familiar with. Accordingly, explanation and joint framing of the process is very important to gain internal acceptance and motivation to participate in a NoK process.

Wherever the processes had been discussed and understood, many experts (and decision makers involved) where supportive. Accordingly this internal communication has to be taken very serious and cannot just be a sideline in the work of the NoK in order to achieve legitimacy and general acceptance of the process. Only then a broad engagement (see section 4.3) can be achieved.

Putting communications into the centre of the work will also be relevant as the conduction of assessments during the NoK process will necessarily need to focus on its protocols in order to ensure credibility, but also needs to ensure that it stays relevant as the work develops. Accordingly, the NoK's

[38] See for example: Hajer, M.A. (2012): A media storm in the world risk society: enacting scientific authority in the IPCC controversy (2009–10).- Critical Policy Studies 6: 452-464, and Beck, S. (2012): Between Tribalsim and Trust: The IPCC under the "Public Microscopse".- Nature and Culture 7(2): 151-173

[39] Ring, I., Hansjürgens, B., Elmqvist, T., Wittmer, H. & Sukhdev, P. (2010): Challenges in Framing the Economics of Ecosystems and Biodiversity: The TEEB Initiative.- Current Opinion in Environmental Sustainability 2: 15-26

strategy should plan to transcribe results not only from a scientific point of view, but adapt the language for the requesters and provide help with the interpretation of the results in the context of their work. This problem can very often be found in research projects[40], but also the demonstration cases of KNEU faced this challenge of bringing back the scientific findings of the conduction phase into the relevant context of decision-making.

In addition, and linked to the quality control challenge (see section 4.1), communication needs to be clear about the quality of results and their uncertainties.

The NoK will also have to maximize on innovative, creative and dynamic tools to improve interaction with knowledge holders and within its working groups, i.e. to propose tools and technology solution to facilitate the communication between knowledge holders (for example social media, interactive website platform, e-conference). Finally, in order to keep attracting actors, the NoK needs to develop and maintain a strong position in the international context.

A communication strategy will also need to address how to reach out to new actors beyond the "usual suspects", which proved difficult in the KNEU project so far. As EU coordination action, KNEU maybe did not have enough traction to attract new groups (e.g. the private sector, different DGs of the European Commission) as those actors already working at the interfaces between sectors might currently be overloaded by similar processes and KNEU as project appeared as lower prioirity.

Finally, a communication strategy will also need to include the usual PR elements including press releases, website, conference presentations etc. to communicate the results and approach of the NoK.

4.4.3 Added values of a NoK

The main added value of a NoK in terms of communications would be that the complexities arising from the broad topics to be discussed, and the needs to do this in a sound process described here, would be streamlined into one pro-active strategy of communications, this can hardly be done by individual processes like projects or institutions. In terms of credibility, this is a major issue, but will also need dedicated resources, e.g. via a person in the secretariat working full-time on this subject.

Today, communications about processes and methodologies to come to recommendations for policy and the uncertainties behind these recommendations is rarely done explicitly, and this again would serve the credibility of the process if the NoK does so.

Finally, a coherent communication strategy including both functions of the NoK also enables stakeholders from all sides to find different entry points into the knowledge landscape and thus contribute to building the "Community of Interest" that is the backbone of the work the NoK could conduct.

[40] See for example Neßhöver, C.; Timaeus, J.; Wittmer,H.; Krieg, A.; Geamana, N.; van den Hove, S.; Young, J.; Watt, A. (2013): Improving the Science-Policy Interface of Biodiversity Research Projects.- Gaia 22: 99-103

5 "BiodiversityKnowledge" in more detail: guiding principles, governance rules & procedures, and finances needed

In general, a design proposal for a NoK on biodiversity and ecosystem services should

- significantly improve quality and scope of results when providing knowledge input into policy
- be based on the existing knowledge landscape,
- avoid duplication of existing efforts,
- follow a realistic, stepwise approach for its implementation, and
- allow for iterative improvement and learning.

Similar to the discussions that were taking place in the design stage of IPBES, the general questions to be answered is whether existing institutions can cover the identified functions properly. As Europe counts with a multitude of networks and institutions, "networking the network" is of specific importance and thus plays a crucial role when outlining potential design options.

On the other hand, existing approaches on improving the input of knowledge into decision-making have yielded mixed impacts and the pathways of these impacts into European policy context often remain unclear[41].[42] Accordingly, the effectiveness of such processes is often low and misses a clear common platform and framework, including methodological approaches, to address the needs and ensure a high credibility[43]. Thus, building on existing networks, as well as shaping a visible and credible platform (which not necessarily means creating a new institution) for the science-policy interaction need to be brought together.

Based on these considerations, and inspired by the principles of the Cochrane Collaboration, the following eight guiding principles have been developed for BiodiversityKnowledge:

1) **Promoting access and enabling wide participation**, through open invitations for participation, as well as communication of procedures and outputs of BiodiversityKnowledge, taking advantage of existing networks and strategic alliances.
2) **Ensuring broad collaboration**, by striving for involvement of the whole scope of relevant expertise in working groups.
3) **Building on the enthusiasm of individuals**, involving and supporting people of different nationalities, expertise and backgrounds.
4) **Avoiding duplication**, by providing overview of existing knowledge, and by good management and co-ordination to maximize efficiency and minimize costs in science-policy interactions.

41 For an overview analysis, see Lilieu Ltd. & Collingwood Environmental Planning Ltd. (2012): Assessing and strengthening the Science and EU Environment Policy Interface.- European Commission Technical Report 2012-059

42 A recent concrete example where a concrete approach was clearly missing is the heavy debate about the influence of specific pesticides on pollinators.

43 See also key findings of the gap analysis of IPBES (IPBES/2/INF/1)

5) **Striving for relevant and up-to-date information**, by linking the best available recent knowledge with ongoing policy discussions on biodiversity and ecosystem services.

6) **Ensuring quality**, by responding to feedback, applying advanced methodologies, and developing systems for quality assurance.

7) **Minimizing bias**, through a variety of approaches ensuring scientific rigour, broad participation, transparency and by avoiding conflicts of interest.

8) **Ensuring fair and transparent processes,** through clear rules and procedures for conducting assessments of knowledge.

9) **Include reflexivity and learning,** by ensuring that processes and results are continuously evaluated.

To put these principles into practice the NoK needs a clearly structured and transparent, but flexible process, which defines roles of different actors and ensures acknowledgement of involvement. The governance structure and the rules and procedures should be clearly defined internally (following processes, protocols and defined roles) as well as externally (transparent selection of experts, including the whole spectrum of expertise available).

5.1 Governance, rules and procedures

In designing the prototype for the ADN-function (see the detailed narrative of the NoK prototype at www.biodiversityknowledge.eu) based on the analyses of challenges in chapter 4, a general set of governance bodies, rules and procedures can be identified to go beyond the current situation and enhance especially the credibility and relevance of the activities of the NoK. The prototype of the ADN-function and the methods used in the demonstration cases have set the baseline for this. The following sections shortly introduce these bodies as basis for discussion the design options later on.

5.1.1 (Governance) bodies

5.1.1.1 General considerations

For the NoK, the general opinion was that it should be science-driven to ensure a high level of credibility, but that a link to policy via a mandate would be desirable to ensure relevance and ownership from the policy side. Accordingly, the NoK can learn on existing experiences like the MA[44] or the IAASTD[45] which basically acted by one or two governing bodies and working groups for the conduction work. IPBES, as most recent new body to compare with, has its foundation more on the policy side with a strong governmental plenary setting the work progamme, supported by a Multidispciplinary Expert Panel to oversee the scientific implementation of it.

[44] Millenium ecosystem Assessment (MA), see http://www.millenniumassessment.org

[45] International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), see http://www.unep.org/dewa/Assessments/Ecosystems/IAASTD/tabid/105853/Default.aspx

The bodies needed for a NoK are comparable to some of the bodies developed for IPBES. Those potential bodies, aiming to increase specifically credibility and relevance and to follow the basic principles, are further described in the next section.

5.1.1.2 Potential bodies

Knowledge Coordination Body (KCB): The KCB is the central decision body of the NoK (comparable to a steering committee in many institutions), it decides which requests to take up in the ADN-function and decides on steps to be taken to develop the NET-function. For requests, it identifies relevant knowledge providers by launching according calls to knowledge hubs and communicates the question asked by the requester, convenes scoping and working groups or other meetings, maintains dialogue across actors and organises (peer) review of documents.

Depending on the level of political mandating, the KCB could be composed of knowledge holders solely (networking option) or by a combination of them and ex-officio decision-makers delegated by the mandating policy bodies.

It is anticipated that the KCB should have more then 15-20 members to ensure effective collaboration. The KCB shall meet once or twice per year to identify the work plan for the next 12-18 months and check and direct all on-going processes. The KCB could nominate a chair and two vice-chairs for a given period to serve as representatives of the NoK.

The way the KCB is composed and its members are selected will be subject to detailed discussion in its set-up phase. In any case, as central body of the NoK it will need a set of dedicated experts to serve in it, with expertise not only on biodiversity and ecosystem services, but also on interface processes, interdisciplinary work and methods for assessment processes.

Working groups: In order to organise the work of the NoK on specific request (ADN-function), the KCB will need to set up *scoping* as well as *thematic ad-hoc working groups*. The scoping groups will be responsible for a detailed scoping of a topic and will include experts, the requester and additional stakeholders on the given topic. From this group, the working group will be set up, most likely including additional experts following the identified needs during the scoping and the methods to be used. The requesters will be able to follow the work directly, but will not be member of the working groups themselves.

While in general it was agreed that working groups should be *ad-hoc* and only be installed for specific requests, it might also be relevant to install *open-ended working groups*, especially in overseeing the coherent implementation of the rules and procedures of the methodological approaches in the ADN-function and on the work to develop the NET-function, which is the basis for identifying experts for the thematic *ad-hoc* working groups.

Tasks and responsibilities of working groups would need to be further defined. As baseline to develop this, the guidelines for authors and reviewers as used in IPCC, MA and other similar processes such as Cochrane Collaboration could be used[46]. Also it should be attempted that the composition should reflect

[46] e.g., see IPCC principles and procedures Appendix A, Annex 1

a range of views from several disciplines, forms of expertise, and geographical representation[47] (see Box 12 for first experiences on this process in KNEU).

BOX 12: Experience in identifying and involving experts for working groups from the KNEU demonstration cases

The KNEU test cases identified and involved designated expert into request-driven thematic working groups. All three test cases were able to involve a significant number of experts but also experienced some general challenges, which includes:

- General calls for involvement (via email) most often don't yield much feedback. Idenitify and addressing experts personally was more successful. [An established, renowned structure like a NoK may improve this situation]
- Willingness and ability to participate is generally higher in member states from northern and central Europe. Colleagues from eastern and southern European countries face strong constraints in terms of resources, which hamper their contributions
- Open calls in general will most often attract experts that are already active in science-policy activities. Colleagues not familiar with such processes but with an important expertise might not get involved
- The limitations in time resources of most experts willing to get involved are a strong barrier. Accordingly the most appropriate way of involvement and method to be applied might not be used because of these constraints.

As a consequence working groups will need (a) a dedicated person responsible for the management and communications within the group and (b) additional financial resources to support travel and in some case also working time of working group members.

Secretariat: A secretariat is required to ensure responsiveness. The secretariat will schedule and handle the day-to-day work and budget, support the work of the KCB and the NoK in general by linking with knowledge hubs and managing the daily administration of the NET-function. The secretariat will also be responsible for implementing the communication strategy.

It will oversee and guide the processes to answer requests from policy. Experiences from the KNEU test cases and from other processes have shown that going through the procedures, particularly of the ADN-function requires a good overview of the process and constant follow-up. This can not be ensured by a KCB that meets only occasionally and where members take this job on as an extra to their usual workload. A strong expertise in the methodological approaches applied in the ADN-function is also required: the secretariat should have good general knowledge and approach the working group on methodologies and relevant other knowledge hubs for specific needs.

(Virtual) Plenary of knowledge holders: Although a NoK will be open for contributions from all knowledge holders, developing at least a "virtual" plenary of engaged knowledge hubs/ institutions might support transparency and broad engagement as well as a visible acknowledgement of contributions. Based on some key criteria (see below), institutions would register in this virtual plenary and be informed and asked for their feedback regularly on all decisions and actions taken by the KCB. With

[47] Compare IPCC principles and procedures, Appendix A, 4.2.2.

this, also a major foundation for the NET-function would be built, as main knowledge hubs are identified and actively engaged in all processes.

Regular national and international conferences in Europe could be used to call for (short) real plenary meetings back-to-back, to strengthen the exchange of the community.

For this plenary, it would be important to keep it as open as possible, especially in terms of disciplines and regional involvement.

Mandating policy body: In order to have a strong mandate from the policy side, especially for the policy support function, a policy body should be identified that serves as mandate-giving body and thus interacts regularly with the NoK and its KCB. This could either be done by nominating policy delegates for the KCB, and/or regularly inviting the chair/ the secretariat to report on the activities of the NoK in the meetings of the policy body.

If the mandate of the NoK is restricted to the area of biodiversity and ecosystem services in the strict sense, the Coordination Group on Biodiversity organised by DG Environment could be the mandating body, to give one example.

Another option is that the "mandate" is given on a case by case basis, so that the requester of a case, accepting the operation principles of the NoK would give the mandate to do a specific case.

5.1.1.3 Rules of engagement for knowledge holders

As outlined in the challenges section, a proper acknowledgment of contributions of institutions as well as individuals is at the core of a NoK. At the same time, a high quality of contributions and outcomes needs to be ensured.

Institutions as core members and knowledge hubs

Although the main knowledge inputs into NoK activities will come from individuals (see below), the involvement of institutions plays a decisive role in accessing and activating these experts. Research institutions, projects, research networks and learned societies, to name just a few, are increasingly linked and communicate via electronic means so that information and requests can be easily distributed among them, thus they can easily serve as knowledge hubs to provide knowledge but also to ask for it in their respective communities. Most often, individual experts will even be linked to different hubs, e.g. via their own institute, a collaborative project, and a learned society.

As many institutions have the support of policy or societal processes in their overall mission, there is often an intrinsic interest in them to get involved into a broader process, but nonetheless, as many discussions in KNEU have shown, their visibility in the process needs to be ensured and other incentives need to be set. For a number of partners, especially in Eastern/central and southern Europe, financial support might be needed for them to be able to get engaged[48].

[48] see recommendations from the according regional workshops: http://biodiversityknowledge.eu/index.php?option=com_content&view=article&id=42&Itemid=142

The challenge is to attract such institutions as core partners in the NoK, to ensure visibility of such leading partners, but at the same time keeping the NoK and its bodies open for other actors.

How this in fact can be achieved – ensuring commitment from key partners, but at the same time keeping an open network structure, needs to be discussed in detail.

One model could be to enable organisations to act as free members and core members. Core members would commit themselves to put own resources into the NoK, either financially, or in-kind and thus gain specific acknowledgments in the process, but would not be in a position to dominated the NoK processes[49].

Individuals

In general any individuals with expertise on biodiversity and ecosystem services topics with regard to different scientific disciplines as well as practical knowledge might be a contributor to the work of the NoK. This expertise would normally be verified by a record of scientific work (papers, projects etc.) or by experiences in management and policy. In addition, scientific, technical or policy expertise and knowledge on relevant topics will also be of importance to ensure that the knowledge brought in can also be aligned with according processes.

Individuals will be able to get active in the NoK on two levels:

1. via the NET function in registering as knowledge provider (and/or reviewer) for the network and thus being able to provide input to ad-hoc requests, discussions and other fora on the e-platform.
2. by becoming active member (for a given time) in the bodies of the NoK, namely the KCB or a scoping or working group

While the first activity will follow a social network approach, where activity will heavily rely on self-initiative, the second one will include an active identification of potential contributors by the KCB and via engagement of knowledge hubs in identifying them.

In terms of acknowledgement, it will be important to highlight contributions of individuals on both levels, but especially when they become active member of activities in the ADN-function (see section 4.3).

One major challenge here is to keep potential experts on “continuous standby”: the pitfall is that - as for most experts (and even most knowledge hubs), topics under discussion in the NET-function activities and especially the cases addressed in the ADN-function will be outside of their scope of interest - there are few incentives to check regularly if their knowledge might be needed. To keep attention high will need a dedicated communication strategy from the secretariat and the knowledge hubs to enable knowledge holders to notice easily when their knowledge is needed.

5.1.1.4 Rules and procedures of the policy support process

As outlined earlier, a successful NoK would profit from a mandate from a or several policy bodies in order to ensure that its work and results are in fact needed and acknowledged as important input into

[49] See for example the model of the Ecosystem Services Partnership: http://www.fsd.nl/esp/79192/5/0/50

decision making processes. Also, according to interviews with knowledge holders, a mandate would increase the motivation to participate in working groups and similar activities.

At the EU level, different policy institutions already exist, which could play a role in mandating a NoK on biodiversity. In general, this could be

- The European parliament or a sub-body of it
- The European Commission via one or more of its DGs (in the case of biodiversity, for example DG Environment and DG Research)
- Experts groups of the member states in the EU contexts (e.g., the Working Party on International Environmental Issues (WPIEI) for international activities or the Coordination Group on Biodiversity and Nature (CBGN) on EU related issues) – these groups would reach out to the member states and thus ensure their involvement
- The Nature Directors meeting or something similar as explicit body of the member states

Which of these bodies (or another or a combination of them) could serve as mandating body for a NoK, is subject to discussions with the EU Commission and the member states and is currently explored in the context of the discussion of setting up a European mechanism on biodiversity expertise in general, where the NoK could become a part as bottom-up process from science.

5.2 Finances: Possible models

As in every science-policy interface, a cross-institutional and cross-thematic process like a NoK is a major challenge in terms of finances. Looking at existing SPIs in general, three models of operation and financing have been identified:

a) **Complete funding of activities by one major donor** (e.g. a governmental body): In such cases, the SPI is most often linked, also in terms of legitimacy, to the funding institution (e.g. as advisory boards/bodies). For example, DG Environment supports several boards on different policies (e.g., on Biodiversity and Nature), or DG RTD support the Standing Committee on Agricultural Research (SCAR)[50]. There is currently no clear model on the european level that such a funding model could follow.

b) **A core funding via a fund/new institution** which is supported by one or several parties (governmental or others), and additional financing by requesters to conduct work on their request: This option is common at the global level, but it hasn't been in practice in Europe very often. It would assume that some countries or ministries (and/ or DGs) would agree on a memorandum of understanding with according rules and guidelines on setting up such a fund, as it has just been set for IPBES. Alternatively, or as add-on, a new institution could be founded that is supported by the fund or directly by the different donors.

c) **A bottom-up approach mainly driven by knowledge holder institutions**: Over the last decade, many research institutions have gathered in networks and similar constructs not only to improve scientific coordination, but also to better link up for the exchange with policy and

[50] See http://ec.europa.eu/research/agriculture/scar/index_en.html

society. For example, the FP funded Networks of Excellence such as ALTER-Net, MARBEF (now integrated in EuroMarine) and EDIT have developed means also to engage with society. A similar approach is followed by the ESFRI project LifeWatch. Until now, these networking activities, although gaining impact in improving communication to policy, have not been able to ensure a critical mass of joint funding to support the development of high-profile science-policy interface work. EU project funding is restricted in time and the project means are sharply reduced, even if some networks continue their work afterwards[51]. A similar lesson can be drawn from the European Platform for Biodiversity Research Strategy (EPBRS). With funding via two EU project (BIOPLATFORM 2002-2004 and BIOSTRAT 2006-2009), a broad involvement of participants across Europe could be ensured. Without such support, participation in the EPBRS processes is more and more restricted to institutions and partners able to fund participation by their own means.A bottom-up funding would thus need a number of dedicated national institutions or regional networks to provide a core funding for NoK activities. Additional support could basically come via in-kind-contributions of person-months and logistical support, but over the last years, even such support has not increased, but rather decreased in many networks so that such a purely bottom-up approach holds some risks in terms of continuity and resources.

Given that at the European scale the purpose of such an SPI (with the NoK becoming a part or core of it), is clearly defined in its roles and includes purely European tasks (e.g. in the context of implementation of the EU Biodiversity Strategy and research policy focusing on biodiversity and ecosystem services), an option between a), b) and c) is a possibility and needs to be developed jointly between science and policy. Section 5.3 gives a rough indicative budget and shortly discusses the possibility of in-kind contributions of scientific institutions which could support a link between option a/b with c.

[51] results of the SPIRAL project, ongoing analysis

5.3 Options for the NoK design

5.3.1 Option A – Basic, based on improved networking approach

The networking option would basically rely on existing institutions, networks and initiatives to be strengthened and willing to bring together their expertise and resources in order to fulfil the above mentioned functions. A (light) coordination structure could then be set up which ensures regular exchange between these institutions and an open participation in the processes. Potential institutions and initiatives which could take a leading role in the two functions would need to be identified and get involved, e.g. the networking function would need to be further developed jointly with BISE-partners and existing networks on the science side (e.g. the former Networks of Excellence like ALTER-Net, EuroMarine and EDIT and existing large scale projects like EUBON and SCALES).

The policy support function would need a linking and better interaction between existing official approaches via, for example, the EEA and the ETC/BD, as well as better involvement of existing work on the more science-oriented side (e.g., the JRC and the PEER initiative in general).

All on-going EU projects with relevance to biodiversity and ecosystem services should become involved in a cluster as part of their science-policy work.

The positive side of such an approach would be to rely on existing structures in the first place and thus reduce the need for additional resources. It would also support a strong commitment of involved organisations. Accordingly, it would be basically driven bottom-up from knowledge-providing institutions, but would also need a clear endorsement or mandate from policy, e.g. via the European Commission.

The funding for such a networked approach would come from different sources and commitments of participating institutions, but would also need additional support to ensure that both functions can be covered properly and to ensure a broad participation beyond the supporting organisations.

Two sub-options seem feasible:

OptionA1 – "Basic": a minimal approach just having one person/secretary funded by a participating institution which would act as relay between core partners as well as the policy side, identifying options for activities (in networking as well as in policy support). Specific activities would then be initiated on an *ad-hoc* basis by partners, basically facilitated by the secretary with communicating needs and identifying potential experts and expertise for a request by decision making. This model would not be based on specific rules and procedures, but would strongly rely on bottom-up willingness to stand ready for input into policy, similar to the way many organisations and networks are acting today in this respect. The added value compared to the current situation would only develop slowly, as participating organisations improve their own ability in contributing. Accordingly, a "brand" would develop and thus the interest in broader participation. Relevance would be slightly increased, credibility the same (although a sound methodological approach would be limited as well), but legitimacy would be limited.

Indicative budgetary needs: For this basic option, at least one full time person would be needed to coordinate activities, supported by additional funds for carrying out at least some basic studies, support a basic website and arrange group meetings for expert consultations. A yearly budget of 150 to 200 k€ would be needed.

Option A2 – "Basic plus":

In addition to A1 with a single secretary, the NoK would set a minimal Knowledge Coordination Body of volunteers from participating institutions which would install a core set of principles to be followed and which would screen more actively the requester-side on knowledge needs and address them via core activities in form of expert consultations (e.g., also using e-conferences). Requests needing a more detailed methodology would need specific funding from requesters, but the weak structure may lead into rather slow processes in such cases, if many experts have to get involved. The relevance of activities, e.g. compared to those of EU projects could be improved, being more reactive to concrete needs from decision-making. The legitimacy compared to the current situation would not improve considerably as the involvement would mainly be restricted to those knowledge holders willing and having the resources to participate in the activities and as requests, similar to consultancy contracts, would be directly funded by the requester.

Indicative budgetary needs: The basic plus options would need 2 scientific persons working full time (one coordinator and one scientific knowledge broker) plus administrative support (half position). This secretariat would be supported by further funds for travel and external support for communications, and would also have substantial support to arrange for meetings of the KCB and support at least 2-3 working groups to carry out work in the ADN-function. A budget would accordingly sum up to about 450-500 k€ per year, where the funding for the ADN-work could come from the according requesters.

The added values of both sub-options are summarized in Table 01.

5.3.2 Option B - Full platform approach

A more ambitious solution is to set up a new body, similar to IPBES, at the European level with its own governance structure, ensuring a stronger link between science and policy and having a permanent secretariat to oversee the work, and ideally an explicit mandate from policy to ensure a high level of relevance and legitimacy. The Knowledge Coordination Body may explicitly include knowledge holders as well as decision makers, to ensure a direct link between its mandate and the work conducted.

In general, the two functions could be covered by two open-ended working groups (one for the networking function, and one for the policy support), again involving the above mentioned institutions and the broad range of other relevant players, linking to existing insitutions like BISE. This would build on the fact that different institutions in the landscape might be more interested to support either the networking or the request-answering function. The request-answering group would need to further detail the work based on thematic requests.

Addressing the actors broadly might be easier in this platform solution, as more resources for engagement would be available and thus strongly strengthen the legitimacy also on the knowledge holder side.

Besides establishing thus a clearer perspective for the networking as well as the request-answering function, an explicit mandate could also include the support to international processes like IPBES, where both the networking and the request-answering function can be used as baseline for this support.

Such an approach would be more costly and resource intensive, but would also have the advantage of overcoming more clearly the shortcomings that have been identified in the analyses of the KNEU project

in terms of restricted resources and the need for continuity to ensure transparency, which would jointly increase strongly aspects of credibility and relevance of the NoK.

As in Option A, the full platform-approach can also be implemented in two sup-options with different levels of ambition.

Option B1 "Standard": In order to set up a "standard" full platform approach, a secretariat including a coordinator and a secretariat with 2-3 additional experts will be needed. In addition, the KCB needs to be supported for travel expenses to give experts from all fields, regions and institutions the ability to get engaged in this major body. This would increase the legitimacy and especially the independence of the body.

The approach would also ensure that all involved develop and follow strict rules and procedures in identifying topics to be tackled (*e.g.,* in form of setting up a yearly work programme), installing explicit scoping processes and review processes. The type of requests which could be tackled would be broad and methods applied would go beyond the expert consultation approach, including explicit face-to-face meetings (workshops) and the use of methods like evidence-based approaches and adaptive management using a common protocol. In addition, foresight activities could be carried out with relevant partners.

The funding would need to come (beside potential in-kind contributions of research institutions) from a core funding not directly linked to requests, in order to ensure independence on the policy side (see funding model a or b). Applying the full platform approach even in this standard format may strongly increase the credibility as well as the relevance of the work and could lead to an establishment of a "brand" in 3-5 years.

Indicative budgetary needs: The standard approach would need to add to substantially more resources into the setting up and maintenance of the NET-function, the communications and also the support for carrying out studies in the ADN-function. Accordingly, up to 4 full time scientific positions can be anticipated, supported by 1.5 administrative support persons (including website maintenance). In addition a part-time science translator might be needed for communications and substantial funding would need to go into developing and setting up the NET-function web portal (partly one-time investment). Up to five major ADN-studies could be conducted, which might lead to budgetary needs of around 900 to 1.000 k€ per year (with probable reduction after first years of setting up the webplatform).

Option B2 "Standard plus": The strength of the platform model would be even more strengthened, if it is set up with a long-term plan and vision to allow a built in, iterative self-improvement mechanism as it has been done already in the KNEU project by continuously reflecting with the actors involved on the strengths and weaknesses of the processes and the requests processed. This would also lay a broader foundation for the networking component.

In order to step up the standards compared to option B1, this option would more explicitly provide funding to involve professionals needed to address requests on a more ad-hoc basis (e.g., librarians for systematic reviews, IT experts, meta-analysts and modellers). This would further increase the credibility of products and accelerate the possibility of the NoK to react to different kinds of requests. Also, in order to ensure equitable possibilities to participate in the processes, this option would ensure the

engagement of experts from all regions in Europe by having the possibility to pay their engagement as needed. According rules would need to be set up and might even be needed in the other options (at least A2 and B1).

On the networking function side, the ambition would also increase in terms of not just looking at the networking of experts and organisations, but also develop and use the network's e-platform for integration and exchange on methods used, linking up to existing platforms like ConservationEvidence and the tools under development in LifeWATCH.

In addition, option B2 would provide the resources the explicitly strengthen the link to the other functions, including the link to IPBES on the international scale (see discussion below, section 5.4)

Indicative budgetary needs: In addition to the Standard platform approach (B1), the Standard plus option would be even more ambitious and thus would need a further enhanced budget in terms on communication, website support and also for the link to other functions (e.g., international collaboration). Accordingly, the budget could be expected at around 1.200 to 1.400 k€ per year (again, with a decrease after initial years' investments).

One type of institutional knowledge hubs that could play an additional role in the set-up could be the national biodiversity platforms that exist in some European countries and act as hubs towards policy in their countries and towards the European biodiversity landcapes[52]. They could help in implementing specific cases of the ADN-function or support other activities of the NoK according to their profiles.

5.4 Possible links to support other functions

Although the NoK would focus on the NET-function and the ADN-function to build the network and support environmental decision-making in Europe, there will be the possibility to directly link it to the other two functions.

For the Research strategy function, the work on the NoK will directly feed into it, similar to the knowledge generation function in IPBES, where assessments and other results from the work will also highlight potential research needs. This discussion will need to be linked to the discussion on the further development/ refinement of the future role of the EPBRS.

For the international support function, the role of the NoK for international processes, especially for IPBES, will need to be reflected in more detail as well. In the IPBES process, it may be that regional hubs or at least regional activities might be needed to support the work on the global scale (as currently proposed in the draft work programme for IPBES 2014-2018). This could include, for example, conducting regional assessments on certain topics or at least collecting knowledge on a specific topic on the regional scale and communicate it to IPBES processes.

Although most EU countries (and possibly the EU itself) will be members of IPBES, it will be very helpful to have an organisational structure – e.g. as function or working group of an EU mechanism, to serve

[52] In some countries, such hubs are directly embedded into national institutions, e.g. the Joint Nature Conservation Centre in the U.K., or the platforms are self-standing institutions and projects, like the Swiss Biodiversity Forum (www.biodiversity.ch), the Belgian Biodiversity Platform (www.biodiversity.be), the Network-Forum for Biodiversity Research Germany (www.biodiversity.de) or the French Foundation for Biodiversity Research (www.fondationbiodiversite.fr)

this need and help to integrate knowledge from different European countries to be fed into the IPBES process.

Whether such a function is needed will depend on the regional needs identified in the structure and the work programme of IPBES, which will be decided in 2013. European members of IPBES will have to decide on whether they want to organise their input into IPBES nationally, or integrate (parts of) it at the European scale. In many cases and topics, it can be foreseen that an integrated European input will be more effective and better able to address multi- and cross-scale issues, e.g. when European policies and management activities are relevant. Processes in this function should be aligned as far as possible with the development of a conceptual framework within IPBES and potential first plans for regional assessments.

Depending on the knowledge needs identified by IPBES and sent back as requests for input to the regional level and the members of the platform, the other functions identified in this apper – networking, answering-decision-making-needs, and research strategy – can be used to either

- Collect existing knowledge in Europe on a topic and communicate it to an IPBES activity (via the network function)
- Plan and conduct European studies to feed into IPBES activities (via answering-decision-making-needs and the research strategy function) or to respond to EU requests
- Communicate or further identify research needs derived from IPBES activities for the European context (via the research strategy function)

In turn, a joint mechanism by EU (or European) countries could also facilitate the identification of suggestions for the IPBES work programme and help clarify regional differences in IPBES results.

5.5 Added values of options presented

The table below summarizes the added values which can be expected by establishing a NoK following the presented options, with the goal to improve credibility, relevance legitimacy and independence of a NoK, compared to the current situation of feeding in biodiversity knowledge in decision-making processes (see chapter 4). As current situation, we take here the situation described in chapters 1-3 and its challenges described in chapter 4 regarding the issues of credibility, relevance and legitimacy: a high number of different activities on different levels (national to global, science- to policy-driven) carried out to support the science-policy interface on biodiversity, with an according diversity of approaches but lacking integration and mutual exchange, as well as outreach beyond the biodiversity sector.

This view reduces the complexities behind the options for the NoK and does not explicitly address the trade-offs between aiming for credibility, relevance and legitimacy.

Generally speaking, a more ambitious and resource intensive approach (Options B) will enable a clearer added value in terms of all attributes. While Options A may already be helpful to especially increase the relevance of the science-policy interface, a comprehensive approach to enhance credibility (esp. by a broad set of methods to be used in a consistent manner and opening up to other areas of expertise) and legitimacy (both on the sides of knowledge holders and requesters) is likely to be only achieved by a full platform approach (Option B).

Jointly with the added-value of the functions of the NoK outlined in chapter 3, all options outlined could improve significantly the SPI on biodiversity and ecosystem services in Europe, including the support of international processes like IPBES.

Table 01: Added value of different options for setting up a NoK, compared to current situation:

Legend: (-) no significant improvement; (+) small improvement. Limited in scope and visibility, (++) significant improvement, (+++) high improvement

Option	Credibility	Relevance	Legitimacy	Resource needs	Need for agreed principles and rules	Ability to strengthen involvement of different forms of knowledge
A1 Basic	-	+	-	+	+	-
A2 Basic +	-	+	+	++	++	-
B1 Standard	++	++	++	+++	+++	+
B2 Standard +	+++	+++	++	++++	+++	++

The preference of one of the options (or a mixture/ sequence of them) over another, will depend on the willingness of the knowledge holder community to set it up and support it, and the willingness of policy-making as the potentially main recipient to support it and formulate a mandate for an overall structure like the “EU mechanism”, or at least for a bottom-up organised NoK as outlined in this paper. Bringing both perspectives and underlying interests and values together remains the main challenge in shaping the science-policy interface in Europe and thus help ensuring a sustainable relationship to the natural environment.