Concept note:

Network of knowledge for biodiversity governance

Biodiversity is not just "the natural world" or "things in nature reserves." It is the intricate, complex, interacting and dynamic world of life on Earth, including humans and the ecosystems that we and other living things depend upon. It underpins every human culture and every economy.

This discussion paper was prepared at the initiative of EPBRS.

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Version 1.2 of February 17, 2009.

This document can be downloaded at http://www. epbrs.org

Executive summary

Policy and decisions that affect the conservation and sustainable use of biodiversity should be based on the best available evidence. Global and regional discussions have shown that much of the available science and experience is not being effectively used, and that interfaces between science and policy must be significantly improved.

A network of knowledge, bringing together existing organizations and processes in a flexible, responsive and broad-based way, would improve the science-policy interface by helping to focus the support of science and scientists on the needs of those setting policy and taking decisions. The network of knowledge would allow temporary, *ad hoc* associations of diverse organisations to assemble and communicate knowledge adapted to the needs of clients. The use of existing organisations minimises administrative costs and overheads.

A library is a simple, if limited, analogy. A researcher uses a catalogue or index to pick out just those books that are relevant to their research to create a temporary, designed-for-purpose assemblage of information. Just as different sets of books are needed for each new research question, so for each different request from its clients, the network of knowledge accesses appropriate organisations and expertise in a dynamic way.

The main tasks of the network of knowledge would be to respond to the needs of decision-makers by: answering requests for information with policy-relevant information, policy options and scenarios; providing early warnings; co-ordinating multiple-scale assessments; helping to build capacity; and communicating with stakeholders, and where appropriate, the public.

The concept of a network of knowledge is scalable and relevant to improvement of science-policy interfaces at all levels from global to local.

At the hub of the network is a body that reviews the knowledge provided by the "knowledge holders" and produces reports that are: authoritative and supported by evidence, useful and timely, and relevant to the user's needs; reviewed by qualified experts to ensure that the report is thorough and widely accepted by knowledgeable persons; independent of any vested interests or political, commercial or financial influence; and informative about uncertainties and the limits of applicability of the knowledge. The reports preserve the intellectual property rights of knowledge holders.

The governance structures related to the network of knowledge need the capacity to: co-ordinate questions and scientific knowledge; keep the system in good administrative order; orient the work and manage the finances; manage drafting panels, outcomes and reviews; and communicate the findings.

The cost of an international network of knowledge and the associated governance structures for a biodiversity interface is likely to be similar to the cost of the IPCC.

Background and purpose of document

Two science-policy interfaces on biodiversity and ecosystem services are currently under discussion: an Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and a "European mechanism". They are both intended to encourage communication, consultation and cooperation between scientists and policy makers, and thereby contribute to efforts to manage equitably the relation between humans and the ecosystems on which we, and life on Earth, depend. Although these are separate developments, with their own histories, stakeholders, characteristics, requirements and architecture, each interface would necessarily link scientific and policy elements.

The Chair´s report of the meeting on an IPBES (Putrajaya, November 2008)[1] makes it clear that the participants saw a need to strengthen the science-policy interface[2] and to provide more effective means to support multiple-scale assessments, compile, assess and synthesise existing scientific knowledge to provide early warning and policy-relevant information on biodiversity and ecosystem services and to contribute to building capacity[3]. This document provides a view of a possible mechanism to provide those services.

It focuses on how to gather relevant information and to ensure that it is made accessible and useful to the policy makers and other stakeholders who need it. The functions it describes do not comprise a complete IPBES[4], since it only touches lightly on the client, or policy, side of the interface, which is in the hands of the clients of the information-delivery service.

The Chair's report makes reference to a “network of networks” to access and supply information. In line with the draft EU position for the UNEP Governing Council meeting, this document uses instead the term “network of knowledge”[5] to describe a system that improves access to reliable and timely information.

This concept note provides a general description of the characteristics and advantages of a network of knowledge for biodiversity. It discusses a cost-effective way to build on existing structures and networks, to gather existing knowledge, derive policy-relevant information, and to deliver the peer-reviewed result to the science-policy interface. It is intended to

[1] In annex to UNEP/IPBES/1/6 available at http://ipbes.net/Documents/Advance_IPBES_Meeting_Report.pdf

[2] for a more complete discussion of what is meant by "science-policy interface" see Annex 1: Considerations for a science-policy interface.

[3] This note interprets “Assessments” as formal, demand-driven processes to develop comprehensive statements of status, trends and drivers of change in biodiversity and ecosystem services.
“Early warning” relates to developments, trends or discoveries that the network considers should be brought to the attention of policy makers before any client has asked for information on that issue.
“Policy-relevant information” is taken to include information delivered in appropriate formats for policy-makers and practitioners on any issue related to biodiversity or ecosystem services.
Some typical questions that might be put to the network are listed in Annex 2: Examples of questions for a network of knowledge.
“Capacity building” consists of activities intended to improve the scientific, analytic and networking capabilities of institutions and individuals.

[4] Characteristics of a complete science-policy interface are described in Annex 1: Considerations for a science-policy interface.

[5] The term "network of knowledge" is preferred to the alternative "network of networks" because it focuses on what the network is intended to deliver and exchange (knowledge) rather than what the network might consist of (other networks). Furthermore, the term "network of networks" seems to imply that organisations that are not networks cannot be part of the system. By saying nothing about the architecture of the knowledge providers, "network of knowledge," is both more inclusive and more accurate.

provide a consistent way to interrogate a complex landscape of knowledge, and to do so in a way that permits correct attribution of knowledge to those who provide it.

The concepts and principles of the network of knowledge are largely the same for the provision of knowledge to clients at a global, regional, or in some circumstances, national scale. A global network might well include, nested within it, regional networks designed specifically for the governance structures and knowledge holders of that part of the globe. A global or regional network would not, however, be competent to provide answers at very local levels of governance.

What is a Network of knowledge?

A "network of knowledge" on biodiversity and ecosystem services is a coordinated, flexible, dynamic and purpose-specific grouping of organisations that collaborates to provide and communicate knowledge[6] about biodiversity and ecosystem services. It is an *ad hoc* grouping of specialised sources of knowledge, and not a permanent association of networks or institutions. Its coordinating body brings together each temporary group specifically to answer a particular question. The network normally grounds its work on existing knowledge about biodiversity and ecosystems. It provides a way to find and assemble the requested information from the "knowledge holders" (institutions whose members are expert on fields related to biodiversity and ecosystem services), while offering opportunities to build capacity and to compare information from various sources.

A simple analogy is a researcher preparing a paper on a particular subject, using the information in a university library. The books in the library are the "knowledge holders", and their content is the knowledge. To gather the necessary information, the researcher – the "knowledge coordinating body" – picks out just those books, from the entire holding of the library, that are relevant. The resulting pile of books in front of the researcher is a temporary, designed-for-purpose assemblage of information. Just as the researcher puts the books back on the shelves when the work is complete, and assembles new piles for new research questions, so the network of knowledge is designed to access expertise in an appropriate, dynamic, designed-for-purpose way.

Like all analogies, this one is imperfect, not least because books are passive repositories of knowledge and cannot write, whereas the knowledge providers are responsible, working through an *ad hoc* group of experts that they nominate, for undertaking much of the work of synthesis and reporting.

The analogy serves, however, to point out that (a) in most cases the knowledge used in the reports of the network pre-exists the moment when the network starts to answer the clients' question, (b) only part of the network is activated for any given question from the client, (c) a library needs a catalogue, and the network of knowledge needs mechanisms to identify sources of knowledge, and (d) just as the researcher distils and transforms the information in the books into a paper for a particular audience, so the network of knowledge must deliver information from multiple sources in ways that are relevant and meaningful to its clients.

To create a balanced, unbiased paper, the researcher in the library reads widely from all the available literature. Similarly, a network of knowledge should not filter at source the knowledge it accesses. Policy-relevant information may require contributions from a wide

[6] "Knowledge" is defined in this note as perceptions, discoveries, or lessons learned through experience or study giving familiarity, awareness, and understanding of biodiversity and ecosystems. In some parts of the English-speaking world the plural "knowledges" might be used instead, to indicate the plurality of sources and means involved in gaining that understanding.

range of knowledge holders, including natural scientists, economists, sociologists, anthropologists, lawyers, historians, experts in environmental law or environmental policy, philosophers, civil society organisations working in the field of biodiversity or ecosystems, and specialised science-policy interfaces and advisory boards.

The researcher in the library does not treat all sources of information as equally weighty and reliable. Instead, the bibliography notes the sources of information that contribute to the paper. In an analogous way, the network of knowledge should generate comprehensive analyses using evidence from all relevant sources, and then ensure that the reader of the final report can easily trace the source, and hence the weight to be given, to each of its elements.

Tasks of a network of knowledge

The main tasks of a network of knowledge would be to:

- respond to requests for information from its clients, including, if required by its clients, policy-relevant information, policy options and scenarios;
- provide reports on issues that its members wish to draw to the attention of its clients, including both early warnings and in some cases the need for further research on key policy-relevant issues;
- design and co-ordinate multiple-scale assessments that respond to the needs of decision-makers;
- help to build capacity to provide reliable, evidence-based and policy-relevant information and to undertake assessments;
- interpret its findings for the clients of the network, and communicate with them, with other scientists, and where appropriate, with the public, concerning the implications of their findings, and what policy options might be available.

Thus the network can respond to requests for information from policy makers (it can be demand-driven). It also allows knowledge providers to identify issues that may trigger its coordinating body to initiate investigations and to bring the findings of such investigations to the attention of policy makers (it can be proactive).

Examples of the kinds of questions that might be asked of a network of knowledge, or generated spontaneously from within, are given in Annex 2.

The network of knowledge may also be tasked to collaborate with existing initiatives and mechanisms to maintain web-based and dynamic platforms where practitioners can contribute to structured discussions of tools, techniques, good and bad practices, and lessons learnt.

Clients and knowledge providers of the Network of Knowledge

The main potential clients of the network of knowledge are public or private decision-makers. Their decisions affect international and in some cases, regional or national biodiversity governance. They may include the global and regional conventions and agreements related to biological diversity, governments and administrations, Civil Society Organisations and businesses. They may also include other organisations with a responsibility for biodiversity governance, management, research and capacity building.

The "knowledge providers" called upon to provide information on any particular issue are bodies or networks that gather, assemble and analyse evidence and data using well-defined, usually scientific, methods and processes. These bodies include learned societies, civil society organisations, research institutes and networks, major scientific programmes, key global initiatives, and, at a European scale, networks of excellence, integrated projects and

infrastructure initiatives. Providers may view themselves as belonging to the scientific or to the policy domain or to the science-policy interface, or to be stakeholders or civil society organisations, or to combine these characteristics in various proportions.

Products of the Network of Knowledge

Biodiversity and the knowledge needed to underpin policy

Biodiversity, ecosystem services, and human systems are intricately linked and co-evolving[7]. The biodiversity-related knowledge that can underpin policy or management includes but goes well beyond the biological and other natural sciences.

Biodiversity research necessarily touches on a wide range of issues and disciplines, and is intrinsically interdisciplinary. Furthermore, policy may benefit from access to the knowledge, expertise, and know-how that emerge not from the scientific process but from practice (for example, farming, watching birds, gardening or keeping bees), from the private sector, from tradition or from familiarity with a place[8]. The knowledge exchanged in a science-policy interface must integrate information from that range, and should give appropriate consideration to competing schools of thought, to be as inclusive and balanced as possible.

The range of expertise that is needed to generate plausible and useful policy-relevant knowledge on questions related to biodiversity and ecosystems is eclectic and ever-changing. This differentiates a network of knowledge on biodiversity from an analogous scientific panel of expertise on, for example, climate change. It is also what makes necessary a mechanism that assembles experts and institutions in *ad hoc*, variable geometries that depend on the question under examination. Indeed this may be the only feasible means to access and assemble the required information.

The knowledge provided to policy makers should, as far as possible, be:

- in formats relevant to their need;
- delivered to appropriate fora on appropriate dates ;
- authoritative and supported by evidence, useful and timely, and relevant to the user's needs;
- in almost all cases, a product of peer-reviewed inquiry;
- independent of any vested interests or political, commercial or financial influence;
- when appropriate, include information about uncertainties and the limits of applicability of knowledge.

In some cases, the knowledge provided may include the information that inaction cannot be justified while additional knowledge is accumulated to improve understanding of elements needed for adaptive governance and management.

The network would ensure proper attribution and preserve the property rights of knowledge holders.

[7] This complex set of interactions creates planet-wide feedback affecting the whole system. Continued research is needed to understand the links well enough to discover effective ways to slow or stop the further loss of biodiversity and the biological capacity to support human needs.
[8] Such knowledge is often referred to as lay, indigenous or local knowledge.

Quality assurance and peer review

The aim is to provide reliable knowledge that is fit for purpose. This frequently means that it should be of high scientific quality. Not all organisations and networks will provide equally reliable information. Thus the assessment of the quality of knowledge is a key issue, and the key to the long-term utility of the network of knowledge depends on an adequate quality assurance.

Peer review, the conventional and reliable method to evaluate the quality of academic knowledge, can be used for those organisations and networks that generate academic knowledge. The purpose of the peer review is mainly to ensure that impartial experts believe that the synthesis is thorough, and that its conclusions are supported by the available evidence and widely accepted by the communities with knowledge in the various fields. The network must therefore ensure that its products are properly and publically validated by appropriate authorities. In the case of interdisciplinary research on complex systems, review based on an extended community of peers will normally be appropriate.

Not all relevant knowledge is necessarily peer reviewed. Reports and other products of the network would therefore clearly identify the sources of information and in particular any sections in which information emanates from sources that do not employ rigorous scientific validation. For example, reports may include sections based on information from legislators, lawyers or doctors, or citizen-based science including CSOs, people responsible for managing biodiversity, associations concerned with the countryside, including hunters and fishermen, the private sector, or from local and traditional knowledge.

Functional parts of a network of knowledge

Delivery and exchange of information between knowledge providers and clients requires a series of activities, including:

- co-ordinating questions and answers on the policy side of the interface;
- co-ordinating, collating, organising, synthesising and reporting scientific and other knowledge on the scientific side;
- keeping the system in good administrative order to ensure effective links with both sides of the interface;
- orienting and financing the work;
- managing political outcomes and options;
- communication and outreach.

The tasks of the stakeholder coordination, knowledge coordinating, secretariat, advisory, and inter-governmental validation bodies are set out in some detail in a later section. First, though, it is useful to consider how the network of knowledge might work in practice, and to sketch out how the information it assembles might be dealt with on the client side of the interface.

In practice: an example

Before deciding what form it might take, it is necessary first to decide what functions a network of knowledge might have. Thus in an ideal world it would be preferable to outline its activities without describing its structure. It is, however, difficult and confusing to describe actions without naming the actors. For this reason, this concept note provides a "straw man" architecture, whose aim is primarily to allow the reader to understand the processes

envisaged. There may be alternatives to the structure described here: bodies might be combined or split, or the roles might be shared differently between various bodies.

Let us imagine that a client wishes to know to what extent biodiversity change is likely to promote new and emergent diseases (question 5 in Annex 2).

The stakeholder coordination body[9] discusses this question and decides that it is of sufficient general interest to put it to the network of knowledge. It also decides whether a governmental approval process will be needed, given the subject of the question. It begins a discussion with the knowledge coordinating body to ensure that the question is formulated in a way that will lead to a response that is likely to be useful to the clients. The discussion also includes an assessment of the scope of the question. Should the work focus on a small subset of diseases with different aetiologies that will be useful for illustration, or on diseases in particular environments? What, exactly, are the parameters of the study? Is a brief analysis of the literature enough, or should it be a more exhaustive and comprehensive study? What kinds of knowledge should be accessed to provide the depth and breadth of understanding required by the clients?

If the work is likely to be particularly expensive, the two bodies might feel it necessary to consult the advisory group to ensure that the finance is available and can be released.

Once the scope of the work is agreed, the knowledge coordinating body, which maintains a dynamic list of co-operating knowledge providers, determines what organisations and networks from that list would be appropriate for the question. In this case, it would have to locate knowledge holders working in fields of relevance to new and emergent disease. This might include organisations and networks with expertise on demography, pathogens in wildlife and with zoonoses, vector-borne diseases, pathogen transmission, entomology, drug-resistant microbes, tropical hygiene, socioeconomic drivers including anthropogenic changes to land cover, antibiotic drug use and agricultural practices; conservation medicine, parasitology, ecology, viruses, prions, bacteria, rickettsia, and so on.

Sometimes, elements of the knowledge thought necessary to help answer the question might be held by none of the organisations on the list. The coordinating body would then need to find an appropriate knowledge holder, seeking the help of other members of the network to do so. Sometimes, however, many bodies on the list may hold similar knowledge. In this case they would collectively be asked to propose a point of contact whose responsibility would be to ensure that the various bodies provide the knowledge, working in whatever way suits them best.

The knowledge coordinating body would thus create an *ad hoc* network of knowledge from the relevant organisations and ask them to select and nominate appropriate experts to participate in a workshop on the question. Many of these organisations might not have participated in the work of the network before, so the knowledge coordinating body would have to explain the context and the question, and discuss how the knowledge holder might contribute.

The secretariat convenes a scoping workshop at which the nominated experts examine the question and discuss the structure of the work needed to answer it.

The experts then work within their organisations and networks to assemble, analyse, synthesise and frame the knowledge needed to answer the question from the perspective of their discipline or experience. This process may lead to the realization that further research is

[9] See Annex 4: Functions and responsibilities in detail for a detailed discussion of the governance tasks and the possible roles of various bodies in the governance structure.

needed to generate adequate policy-relevant knowledge on the issue. The product of this stage is a set of chapters, some of which may be discipline-specific.

The nominated experts then integrate the chapters into a single draft report.

The secretariat then convenes a workshop at which the experts discuss and finalise the full, integrated report, which at this stage may still be in rather technical language, aimed at specialists in the subject.

The knowledge coordinating body then formulates the report in language that makes it easy for the clients to access and understand the message. It discusses this draft with the experts, and once they have approved it, organises and carries out a peer review. Once that process is complete, it passes the report to the secretariat for translation and publication. If a governmental approval process is needed the knowledge coordinating body also collaborates with the experts to provide a summary of the report.

The secretariat provides the report (and summary if appropriate) to the stakeholder coordination body. If the summary is to be discussed by governments, the stakeholder coordination body then submits the summary to the governmental validation body.

Network of knowledge at various scales

An earlier section in this note stated that the concepts related to the delivery of knowledge are broadly the same at international, regional, and by implication national, scales. As an example, an EU-scale network of knowledge might be called on to answer questions related to the Nature directives[10]. It might equally be asked to say what policy choices it sees with respect to zebra mussel invasions of various Member States. Neither issue is necessarily of high priority internationally, but the mechanism, the nature of the network, and the knowledge holders will be the same if a question involving the same kinds of expertise is asked at an international scale. The appropriate knowledge holders will probably change as one changes scale – for example, it will often be crucial to involve a wider range of organisations holding a particular kind of knowledge as the geographic span of the question increases – but the principles of operation remain largely the same.

While the concept does not change with scale, the remit and clients of the network are clearly sensitive to scale. A national-scale network of knowledge has a national remit and national clients, while a regional or an international one have remits and clients appropriate to the scale at which they operate. In each case, in addition to the main clients, the network may also have more local clients, depending on its remit. Thus for some topics and under some circumstances an international network might also serve national clients.

The concept also has the advantage that at any given scale a network of knowledge can be constructed out of networks that operate at more local scales. Nested within the global scale network of knowledge may be regional networks, and nested in them, national and local ones.

Benefit to organisations and networks

Interaction between members in different organisations and networks should benefit the participants by broadening their perspectives, creating synergies, cross-learning and cross-fertilisation of work, and encouraging further collaborative investigation. It can help existing

[10] Council Directive 79/409/EEC on the conservation of wild birds, commonly referred to as the Birds Directive and Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, commonly referred to as the Habitats Directive.

organisations and networks to collaborate better with one another, bringing benefit to all the participants, including visibility for highly specialised participants.

Participation would encourage the actors to see their knowledge applied at scales from the global to the local, and help participants to see the relevance to policy of their knowledge of the results of their research.

Reports would give due credit to the contributors. Their authors would benefit from citations and media coverage.

Cost and financing

Unless funds are available to support scientists and organizations in making input, then the input depends not on the best science but on those scientists who are able to contribute using someone else's money or at their own expense. This would inevitably preclude many scientists and organisations from contributing, and bias at source the knowledge contained in the reports. Funding must therefore be found not only for the network functional bodies (secretariat etc.) but also for the workshops, and for work done in gathering the information and preparing the contributing chapters.

For the sake of comparison, the IPCC's Trust Fund budgeted around €3.8m (5.6m Swiss francs) for 2008, with IPCC governing bodies allocated about a third of the budget, and scoping meetings, expert meetings and workshops absorbing one fifth. Roughly one half of the budget was dedicated to other expenditures. 2008 was a year of relatively low activity for the IPCC. When the main IPCC reports are prepared, negotiated and published, the budget is of the order of twice this amount.

Many IPCC activities are financed not by the Trust Fund, but through voluntary contributions from governments (in particular Japan, the Netherlands, the United Kingdom and the United States of America). India provides support for the website, while WMO and UNEP provide staff and financial support. Thus the true cost of the IPCC is considerably larger than the numbers quoted here.

The cost of the network of knowledge and the associated governance structures for a biodiversity interface can be expected to be similar, and given the complexity and range of issues covered by biodiversity, probably rather more than the cost of the IPCC.

Some components of the network may be able to use existing sources to finance their participation. This might involve adapting existing funding frameworks within the community of participating organisations, which may already include multidisciplinary and international collaboration.

For an operational system some additional funding will certainly be necessary. In an international network of knowledge, the nested nature of the network suggests that national networks would receive national finance. Clients will presumably contribute to the governance structure, including the secretariat, advisory and other governance bodies.

Conclusions

By using and building on what exists, and assembling appropriate knowledge from temporary, *ad hoc* associations of organisations, adapted to the issue under review, the network of knowledge provides access to relevant knowledge without un-necessary administrative or cost overhead.

It can readily respond at scales from the global to the local depending on its remit and its membership.

Properly selected, a network of knowledge provides an ideal partnership for assessments, including a follow up of the Millennium Ecosystem Assessment.

By accessing a range of different kinds of knowledge, the network can deliver or help create options for policy or management that take into consideration all relevant social, economic and biological constraints and knowledge, providing a rounded, complete and inter-disciplinary understanding of the issue.

By reducing the potential for replication of work, focusing effort and attention on key issues, and fully exploiting the existing knowledge base, it would make efficient and effective use of resources and facilities, such as GBIF, while increasing the relevance, effectiveness and profile of those facilities.

On a European scale, it would complement and add value to the future LifeWatch infrastructure network.

By drawing on existing data sources and expertise, it would increase our capacity to answer questions rapidly and to identify and respond to emerging issues. In this it would contribute directly to, and benefit from, the Global Earth Observation System of Systems (GEOSS).

The network of knowledge provides a channel through which clients can pose questions and request assessments, and an environment in which knowledge providers can work with one another to derive integrated answers from existing knowledge, or construct analyses of emerging issues, synthesise the results of assessments, and formulate and disseminate reports for easy use by the clients.

Annex 1: Considerations for a science-policy interface

Science and policy-making each have their own language, goals, priorities, quality criteria, rules and perceptions. Scientists regard knowledge as "good" when it emerges from a process with controlled methodology and data quality. Conclusions are often complex, susceptible to contradiction by future research results, and only valid in constrained contexts in a framework of theory that is both incomplete and evolving as it is repeatedly challenged. Policy makers view knowledge as "good" if it is reliable, delivered quickly and at low cost, and gives clear, unambiguous and politically acceptable options for action related to management or the prioritisation, development, implementation and evaluation of policy. Science-policy interfaces attempt to create a communication channel that interprets and packages questions generated by policy makers and knowledge generated by science in terms that make them useful to both groups of actors.

A science-policy interface is defined as a social process that "encompasses relations between scientists and other actors in the policy process, and which allows for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making"[11]. The interface between the elements is necessarily participatory, dynamic and without clearly-defined limits. In particular, a significant role of science may be to identify and define some of the key questions, and to help to avoid "solutions" that have no convincing scientific evidence in their favour.

This is not to deny, however, that some processes within the interface may be closely circumscribed and limited to certain classes of participants. From the perspective of sovereign states, for example, an essential characteristic of a science-policy interface for biodiversity issues may be a line-by-line validation[12], by governments, of a summary of scientific conclusions[13]. This validation is particularly valuable for those involved in inter-governmental negotiations in other fora, since it allows them to argue from universally-accepted starting points. Such formal validation of the scientific output may not be necessary for all science-policy interfaces, nor for all topics dealt with by the interface[14].

The relationships between and within institutions and organisations dealing primarily with policy may be intricate, complex, and dynamic, developing and operating in accordance with national, regional and international policies that are themselves changing and may not be consistent with one another. The nature, function and architecture of the information flow in this world depend on the purpose and scale of the policies. If policies fail to prevent or to slow the loss of biodiversity and ecosystem services, the fault may not lie with the interface, but in the process of converting knowledge to policy, and policy to effective action. The collapse of the North Atlantic cod fisheries is a notorious example, but there are many others. The point

[11] van den Hove, S. (2007, A rationale for Science-Policy Interfaces, *Futures*, 39(7): 807-826.

[12] There are several gradations of governmental endorsement of text in the UN system, for example. Thus approved material has been negotiated line-by-line while adopted text has only been agreed section by section and material that is accepted represents an apparently comprehensive, objective and balanced view that has not been negotiated.

[13] An obvious example of such a process in another domain is found in the approval of Summaries for Policy makers of the assessment reports of the Intergovernmental Panel on Climate Change (IPCC). For an outline description of the processes involved in generating IPCC reports, and a sketch of this science-policy interface, see http://www.ipcc.ch/ipccreports/index.htm

[14] Although not all issues would require validation, the step improves the understanding of the individuals involved and generates ownership of the results. It also engenders moral compulsion that is shared by all relevant stakeholders. Validation normally relates only to a particular presentation of the results – for example, to a summary of a more detailed and complete report which is not subject to policy-side validation and which remains available to all stakeholders.

of failure will depend strongly on the details of that process, and those details will change from instance to instance and from administration to administration.

The functions and attributes of a purpose-built science-policy interface might include:

- managing incoming inquiries, data and knowledge coherently and consistently;
- generating and formulating scientific questions of potential interest to policy and management;
- correctly understanding incoming inquiries, or correctly formulating internally-generated topics for investigation, and clearly identifying what knowledge the system is looking for;
- assessing what is known, and what needs to be known;
- assessing risk linked to lack of knowledge, where possible;
- capturing, discovering, accessing, gathering and collating relevant data from relevant and diverse understandings, perspectives, and values regarding biodiversity and ecosystem change;
- storing the data accessibly and with sufficient context to allow them to be reused;
- analysing, modelling or otherwise using the data to generate the required knowledge;
- assessing the quality of the process used to generate or amass the knowledge;
- helping to build capacity to provide reliable, evidence-based and policy-relevant information and to undertake assessments;
- synthesizing, packaging and communicating the scientific expertise, knowledge and policy options in a way that is accessible and intelligible to the intended audience of decision makers, managers and the public.

The system should in addition:

- create a mechanism for dialogue and exchange among holders of diverse knowledge and knowledge systems (a clearing house for knowledge);
- trigger, facilitate and support scientific assessments in areas where scientific knowledge is needed to support policy.

Annex 2: Examples of questions for a network of knowledge

1. What are the distribution, status and trends of species and habitats of various important taxa (e.g. the world's mammals, algae, echinoderms, fungi, beetles, flowering plants etc) and in key functional groups (e.g. pollinators)?
2. As biodiversity changes, what elements of ecosystem services also change?
3. How can practitioners assess what constitutes minimum viable areas, favourable conservation status and effective ecological networks for various species?
4. What are the probable effects on biodiversity of large-scale geo-engineering proposals to mitigate climate change, such as ocean fertilisation with iron?
5. To what extent is biodiversity change likely to promote new and emergent diseases?
6. What aspects of our understanding of public beliefs, perceptions, attitudes and preferences regarding biodiversity should be improved in order to make policies aimed at stopping biodiversity loss more effective?
7. What incentives to conserve biodiversity are offered by existing markets and institutions, how effective are they, and how can they be improved or complemented?
8. To what extent are policies intended to make sustainable the use of biodiversity and ecosystem services implemented, to what extent are they effective, and if they are not, what options are there to generate effective policy?
9. Under what circumstances around the globe are the goods and services provided by ecosystems extracted or used sustainably, and how can we use biological resources, goods and services in a sustainable manner, incorporating where appropriate, lessons learned from traditional knowledge, innovations and practices?
10. What are plausible scenarios for future ecosystem functioning given various intensities of unsustainable use of components of biodiversity, and what would a "sustainable use" scenario look like?

Annex 3: comparison with IMOSEB recommendations

The IMoSEB International Steering Committee recommended that the mechanism should be:	Does the network of knowledge do this?		
	yes	partly	no
scientifically independent, credible, inclusive	☺		
policy legitimate through intergovernmental and multi-stakeholder involvement	Not applicable to network of knowledge[15]		
policy relevant but not policy prescriptive	☺		
responsive to decision makers	☺		
communicates in an appropriate form for consideration and possible action	☺		
based on a robust and relevant conceptual framework	☺		
supported by networking efforts of scientific and knowledge holders	☺		
and should:			
address decision makers from governments and others sectors of society of global, regional and national scales,	☺		
promote dialogue between international agencies and decision makers		😐	
From the regional consultation indicated that an IMoSEB should			
Help to establish national, regional or thematic networks of science and expertise;	☺		
Generate, and make accessible databases on research projects, expertise, private and public funding for biodiversity research, tools, techniques and know-how, good and bad practices, experiences and lessons learnt and policies in biodiversity management;	☺ in collaboration with other initiatives already mandated to do this work		
Identify gaps in knowledge of biodiversity and ecosystems likely to impede policy or management, and the research needed to fill those gaps.	☺		
Identify areas in which capacity or knowledge is insufficient, and recommend ways to build capacity to local/national decision-makers ;	☺		
Initiate and develop partnership between users and providers of knowledge (including traditional and private sector knowledge)	☺		
Assess areas where there is limited or no capacity to transform biodiversity knowledge into action;	Not applicable to network of knowledge		
Evaluate the ways in which science and policy are linked, through indicators, monitoring systems, incentives or other means;			☹
Develop, test and disseminate methods to translate biodiversity knowledge into forms useful for decision makers;	☺		

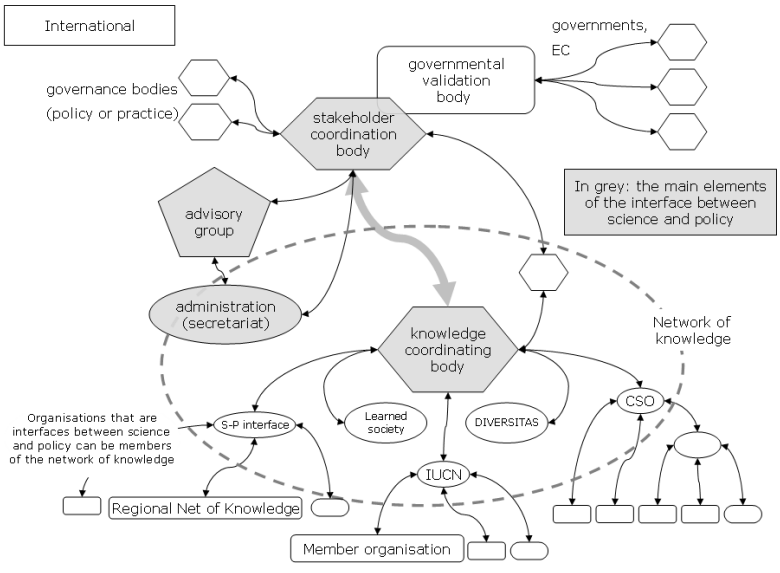
[15] The network of knowledge provides information to intergovernmental part of IPBES

Annex 4: Functions and responsibilities in detail

To set out the functions of the network of knowledge in more detail, this annex uses the same "straw man" components that are presented in the main text. This is intended to ensure coherence with the earlier architecture, but not to suggest that this is the only possible model.

The scientific tasks of the network of knowledge are co-ordinated by a knowledge coordinating body whose main role is to ensure the proper communication and two-way flow of information between the clients, or stakeholders, and the knowledge holders. The members of the knowledge coordinating body would include key representatives of the scientific community and of other knowledge-providing organisations. The body decides which questions, whether arising spontaneously from within the component organisations and networks, or from a client organisation (channelled through the stakeholder coordination body), are to be answered by the network. It is responsible for refining, constructing, and defining the question, in collaboration with key stakeholders and representatives of key knowledge providers. It then uses its internal expertise, the various Clearing House Mechanisms and equivalent information sources to identify appropriate knowledge providers, communicates the question to the providers, schedules and co-ordinates the work, and helps to animate and maintain a dialogue, across all appropriate levels and between all appropriate providers.

It helps the knowledge providers to generate reports submits the resulting reports to peer review or a specifically-assembled expert panel for final evaluation, and prepares the approved report for the client. It prepares summary reports when the client requests them. It is responsible for discussing and setting out recommendations, or policy options and strategies as appropriate with the experts, on the basis of the evidence presented by the knowledge networks, and for designing communication plans specific to the issue at hand. If the work of the knowledge holders has shown that scientific evidence is inadequate for policy needs, it may signal the need for research, assessment or capacity building to be undertaken by appropriate organisations. It collaborates with the advisory group and secretariat to develop strategies for communication, education, outreach and publication. This will probably involve the nomination of a spokesperson for the network.



The administration of the network of knowledge is the responsibility of an administrative body or secretariat. The secretariat staff would be well-qualified professionals with administrative skills and a good knowledge of both the science and the policy realm. The secretariat keeps track of relevant knowledge holders, identifies and brings in specialised knowledge holders when the question under review requires their expertise, and ensures that the knowledge holders are aware of open questions in their domain of expertise. It deals with practical issues such as the publication of reports and convening of working groups or other meetings.

An advisory group establishes the general policy and strategic orientation of the network of knowledge. Its members would include representatives of governments, scientific organisations, international organisations, appropriate conventions, the private sector, and civil society. It determines, modifies, and approves the objectives, scope and general work plan of the network, deals with the finance of the system, selects the director of the secretariat and acknowledges and approves the personnel making up the knowledge coordinating body. It would probably also decide on applications for membership from potential new client-side members of the system, consider partnership with other organizations and institutions and review the performance of the secretariat. The advisory group is also responsible for periodic reviews of the entire system, including its objectives, the results it obtained, and the extent to which the mechanism achieved its intended function by looking at the effect the results had on the problem. It examines whether the results were achieved by the methods originally planned, or whether the methods evolved as the system was implemented. It analyses any desirable or undesirable effects of the mechanism, and assesses whether it represents an effective use of resources.

The network of knowledge depends upon collaboration between existing holders and providers of knowledge of various kinds. The work could be greatly facilitated by individuals or organisations nominated to act as regional, national, local or thematic points of contact[16]. They would help in the communication between the stakeholders and the decision taking bodies of the network of knowledge, including passing on requests or information from the stakeholders, helping to co-ordinate relations between regional knowledge providers and users, and maintaining relations with national or regional biodiversity research programs.

Although it lies outside the network of knowledge as defined in this concept note, the client side may require a stakeholder coordination body to control the flow of questions to the network of knowledge and to ensure that relevant bodies are kept informed of the mechanism and its output. Its role may, however, be the responsibility of the advisory group, provided that the clients accept that the scientists in the advisory group have a role in client co-ordination.

To ensure the interface between the products and the clients, it is also likely to require a formal inter-governmental validation body of government representatives that meets to negotiate the wording of the summary reports. The tasks of this UN-like body are separate from the advisory group whose tasks are related to management and direction of the network of knowledge. This body would work on the summary of reports, in the manner of the IPCC assembly. Given the typically local nature of biodiversity, it is unlikely that all reports need pass through this process. For example, many thematic, horizon scanning and early warning reports would not need to go through a line-by-line negotiation process. They would be assembled and approved by the knowledge coordinating body and made directly available to the clients.

[16] Appropriate points of contact for the network of knowledge might include DIVERSITAS national committees and EPBRS national platforms.