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Outcome of an informal expert workshop on main issues relating to the development of a conceptual framework for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

Note by the secretariat

The annex to the present note has been prepared by the secretariat of the United Nations Educational, Scientific and Cultural Organization on behalf of the interim secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. It presents the outcome of an informal expert workshop on main issues relating to the development of a conceptual framework for the Platform, held from 27 to 29 October 2012 in Paris. In addition, the outcome is available for further online review until 28 February 2013. It has been reproduced as received, without formal editing.

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Annex

Outcome of an informal expert workshop on main issues relating to the development of a conceptual framework for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

Contents

1. Executive Summary

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) was established to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term wellbeing and sustainable development.

Drawing from the Busan outcome (UNEP/IPBES/3/3), representatives of 94 governments at the second session of the Plenary meeting to determine the modalities and institutional arrangements for IPBES, held in Panama City in April 2012 agreed to establish IPBES to perform the following four interrelated functions:

(i) Identify and prioritize key scientific information needed for policymakers at appropriate scales and catalyse efforts to generate new knowledge by engaging in dialogue with key scientific organizations, policymakers and funding organizations, but not directly undertake new research;

(ii) Perform regular and timely assessments of knowledge on biodiversity and ecosystem services and their inter-linkages, which should include comprehensive global, regional, and as necessary sub-regional assessments and thematic issues at appropriate scales and new topics identified by science and as decided by the plenary;

(iii) Support policy formulation and implementation by identifying policy relevant tools and methodologies such as those arising from assessments, to enable decision makers to gain access to these tools and methodologies and, where necessary, promote their further development; and,

(iv) Identify and prioritize capacity building needs to improve the science-policy interface at appropriate levels and then provide and call for financial and other support for the highest-priority needs related directly to its activities, as decided by the Plenary, and catalyse financing for such capacity-building activities by providing a forum with conventional and potential sources of funding.

Acknowledging the complex nature of biodiversity, ecosystem services and human wellbeing and the need to ensure coordination and collaboration among the four functions to be implemented by IPBES, representatives of governments at the Panama meeting requested the interim secretariat to prepare a draft conceptual framework document for IPBES, which would be made available for review through an open and transparent process. That document is available online for review until 28th February 2013 at www.ipbes.net/plenary/intersessional, and presents the substantive elements of the current document for review and discussion.

The current information document is the final outcome of an informal multidisciplinary expert process that made use of online facilities and a workshop to bring together twenty eight experts from all regions in support of the secretariat's work in responding to the request from the Panama meeting. The informal group of experts were drawn from a broad range of scientific disciplines and

other knowledge systems participating in their own capacity (see Annex 1). The development of the document was done through an online collaboration process, using a web-based platform to keep a complete record of all contributions towards the final production of the document. The online process was followed by a workshop convened in Paris by UNESCO from 27-29 October, with significant financial support of the Ministry of the Environment of Japan and the International Union for Conservation of Nature, a further financial contribution from the DIVERSITAS Programme, and under the oversight of the United Nations University-International Human Dimensions Programme, United Nations University-Institute for Sustainability and Peace and DIVERSITAS. Finalisation of the post-workshop document was made using the web platform.

The overall aims of this document are to:
(i) first provide a brief overview of what are conceptual frameworks and how they have been used in related initiatives;
(ii) second, to highlight some of the key building blocks an IPBES conceptual framework might include in order to address issues of biodiversity, ecosystem services and their impacts on human wellbeing;
(iv) third, to reflect on how to adequately capture spatial and temporal scales when developing an IPBES conceptual framework; and finally
(v) to consider how a conceptual framework could be used to guide the development and implementation of the functions of IPBES.

Participants at the workshop identified the following twelve key messages and six considerations for the attention of delegates at the first plenary meeting of IPBES and discussion of the next steps toward the development of a conceptual framework for IPBES.

Key Messages

Key Message 1: Conceptual frameworks can be essential tools to guide the development of the work program of IPBES.
Conceptual frameworks lay out the key components and interactions in complex systems, develop a joint understanding of their key elements and support agreement on common definitions and approaches to guide assessment activities and associated IPBES functions. They have been shown to bring clarity to complex processes and to focus attention on the most important issues to be considered.

Key Message 2: Conceptual Frameworks can be critical for facilitating and strengthening multidisciplinary collaboration and enabling communication across disciplines.
Conceptual frameworks can provide common terminology and concepts that facilitate communication and collaboration across disciplines. Previous applications of conceptual frameworks in broad, multidisciplinary processes illustrate the importance of giving due attention to developing them in a fully interactive and adaptive manner, involving all relevant disciplines.

Key Message 3: Conceptual frameworks can be used to facilitate the inclusion indigenous and local knowledge systems, which are essential for understanding the complex interrelationships among biodiversity, ecosystem services and human well-being.

Indigenous peoples and local communities have their own representations of relationships between social and ecological spheres. These worldviews, which are conceptual frameworks in themselves, are complementary to science-based frameworks and can reinforce the delivery of IPBES functions.

Key Message 4: Conceptual frameworks, if developed in an open and transparent process allowing the involvement of a broad set of stakeholders and knowledge holders can significantly increase policy relevance by addressing user needs as well as improving adaptation and learning.

A deliberative, open and transparent process to develop a conceptual framework for IPBES could be a very significant step in establishing a successful user-driven process to support the platform. Moreover, the shared understanding developed from building a conceptual framework by such an open process will also help to assess the need for new knowledge and understanding about the relationships, variables and structures that are required for the analysis of complex systems and subsequent policy support.

Key Message 5: The key building blocks of an IPBES conceptual framework could include: 1) biodiversity and ecosystem functioning; 2) ecosystem goods and services; and 3) human well-being; with 4) institutions and decisions as key indirect and direct drivers of all inter-linkages. (See possible representation in Figure 1)

An IPBES conceptual framework might include biodiversity, ecosystem services and human well-being inter-linkages as a SocioEconomic-Ecological System (SEES). The ecological system underpins the complex interactions between changes in biodiversity, ecosystem functioning and the supply of ecosystem services at various scales while the socioeconomic system is key to highlighting changes in preferences and demands for constituents of well-being and how these might both depend on and impact the state of ecological systems.

Key Message 6: Biodiversity and ecosystem functioning might be explicitly included in the Conceptual Framework because they play multiple roles in underpinning the quality, quantity and resilience of ecosystem services, in providing the raw material for adapting to change, as well as in providing direct benefits and having particular meanings to people.

Biodiversity is the variety of life at all levels from genes, through populations, communities and species to ecosystems and biomes. It includes not just the diversity of the biological components, but also their structures, functions and the interactions between them.

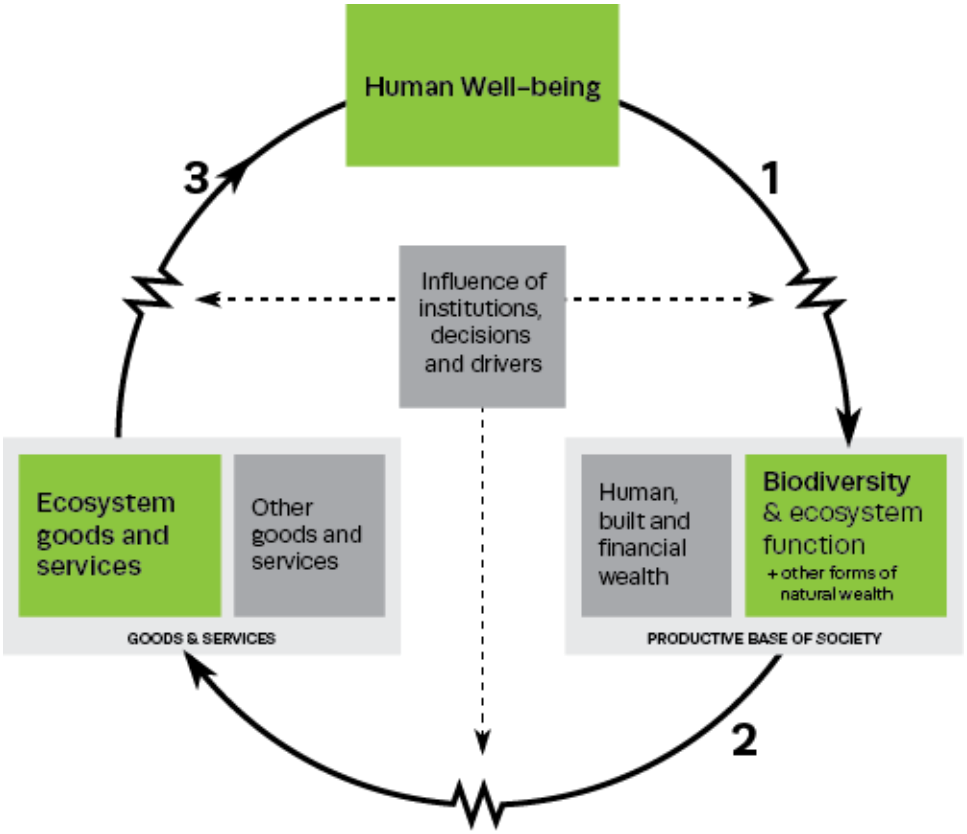

Figure 1. A possible representation of key building blocks and inter-linkages that might be considered for an IPBES conceptual framework. Building blocks are shown in square boxes. Inter-linkages are indicated by the black arrows. Institutions, decisions and drivers influence and are influenced by the inter-linkages among the key building blocks as indicated by the dashed arrows and zigzags. Numbers are used for reference to discussion of inter-linkages in the text.

Key Message 7: Human well-being is multi-dimensional and dependent on access to and changes in bundles of goods and services and is context specific with preferences for constituents of human wellbeing varying across individuals and societies (Figure 1, Link 3). *Human wellbeing should be seen as multi-faceted and affected by preferences for and access to biodiversity, ecosystem services and other goods and services that are mediated by institutions and decisions.*

Key Message 8: Changes in biodiversity, ecosystem functioning and other forms of wealth[1] (see Box 1) are caused by decisions mediated through institutions which are influenced by the state of and changes in human well-being (Figure 1, Link 1).

[1] Wealth is defined here to be the social worth of society's assets which include built capital, human capital, knowledge, natural capital, population, institutions and time. This therefore goes beyond just seeing wealth as a financial or economic value of assets but wealth as the productive base of a society required for human well-being. This productive base or the total social wealth of all assets can be considered as the inclusive wealth of society (IWR 2012-UNU-IHDP and UNEP).

The state of and changes in human wellbeing both drive and are driven by decisions and institutions that affect the productive base of society which includes biodiversity, ecosystem functioning, other forms of natural wealth, human, built, and financial wealth.

Key Message 9: The production of most goods and services is dependent on biodiversity, ecosystem functioning and other forms of wealth a society possesses (Figure 1, Link 2).

The productive base of societies comprises of: (i) the natural wealth that includes biodiversity and ecosystem functioning; (ii) human labour and ingenuity that comprises human wealth; (iii) infrastructure and other forms of produced capital as built wealth; and (iv) equity and monetary assets as financial wealth. The production and flow of ecosystem services are dependent to varying degrees upon the different levels of biological complexity, their degree of interaction, and the abiotic components of ecosystems, generally requiring the other kinds of wealth to turn them into benefits for people. The ability of the productive base to produce ecosystem goods and services efficiently and effectively is mediated by decisions and institutions.

Key Message 10: Decisions both influence and are influenced by institutions, and can become key indirect and direct drivers of change and thereby affect interactions among biodiversity, ecosystem functioning, ecosystem services and human wellbeing.

Formal and informal institutions encompass the formal and informal rules and norms, respectively, among stakeholders and structures, along a continuum of scales, and determine and are determined by decision-making. Institutions and decisions drive change, indirectly or directly, either positive or negative, in all components of and interactions within the socioeconomic-ecological system (SEES). Therefore formal and informal institutions can strongly affect the ability of the SEES to move on pathways towards conservation and sustainable use of biodiversity and ecosystem services for long-term human wellbeing and sustainable development.

Key Message 11: The IPBES conceptual framework might consider the properties and processes that occur at different scales of space, time and governance, as well as the interactions across these scales

Decisions, institutions and drivers acting at different scales and levels affect biodiversity, ecosystem services, and human wellbeing at various scales and across different stakeholders. A sufficiently flexible and robust conceptual framework, which allows the up scaling and down scaling of key variables and processes would facilitate comparability and integration of findings across space and time, and support decision-making at different levels.

Key message 12: The IPBES Conceptual Framework could be common to and support all four functions of IPBES .

A conceptual framework can help ensure coherence and coordination among the four functions of IPBES. For each of the four IPBES functions, further consideration might be given to how the conceptual framework can be used in order to support delivery of the work programme, including its use in the proposed IPBES scoping process.

Key Considerations for further developing the IPBES conceptual framework

Consideration 1: A conceptual framework for IPBES would benefit from being developed through an open, deliberative and transparent process including scientific experts, indigenous and local knowledge experts, policymakers and other relevant stakeholders.

Consideration 2: The IPBES conceptual framework for IPBES might include the key components of biodiversity, ecological functioning, ecosystem services and human well-being as a SocioEconomic-Ecological System (SEES).

Consideration 3: The inclusion of institutions and decisions and their role as key indirect and direct drivers of changes in the state of biodiversity, ecosystem functioning, ecosystem services and human well-being within the IPBES conceptual framework might be considered in order to provide clear strategies for response interventions.

Consideration 4: The conceptual framework developed for IPBES could include the explicit recognition of spatial and temporal scales to allow a deeper understanding of multi-scale and cross-scale impacts of changes to and changes of the various components within the SEES.

Consideration 5: The IPBES conceptual framework could be developed as an important tool for ensuring the coherence and coordination in the delivery of the four functions of IPBES.

Consideration 6: The conceptual framework for IPBES could clarify information on synergies and trade-offs across the various components of the SEES and provide guidance for responding to detrimental changes in biodiversity and ecosystem functioning both in the short run through adaptation and in the long run through transformational changes.

2. Introduction and Context

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) was established at the second session of the IPBES Plenary in Panama on April 21, 2012. The primary mandate of the platform is to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long term wellbeing and sustainable development (UNEP/IPBES.MI/2/9 App I).

Drawing from the Busan outcome (UNEP/IPBES/3/3), representatives of 94 governments at the second session of the Plenary meeting to determine the modalities and institutional arrangements for IPBES, held in Panama city in April 2012 agreed to establish IPBES to perform the following four interrelated functions:

(i) The Platform identifies and prioritizes key scientific information needed for policymakers at appropriate scales and catalyzes efforts to generate new knowledge by engaging in dialogue with key scientific organizations, policymakers and funding organizations, but should not directly undertake new research;

(ii) The Platform performs regular and timely assessments of knowledge on biodiversity and ecosystem services and their interlinkages, which should include comprehensive global, regional and, as necessary, sub regional assessments and thematic issues at appropriate scales and new topics identified by science and as decided upon by the Plenary. These assessments must be scientifically credible, independent and peer-reviewed, and must identify uncertainties. There should be a clear and transparent process for sharing and incorporating relevant data. The Platform maintains a catalogue of relevant assessments, identifies the need for regional and sub regional assessments and helps to catalyze support for sub regional and national assessments, as appropriate;

(iii) The Platform supports policy formulation and implementation by identifying policy-relevant tools and methodologies, such as those arising from assessments, to enable decision makers to gain access to those tools and methodologies and, where necessary, to promote and catalyze their further development;

(iv) The Platform prioritizes key capacity-building needs to improve the science-policy interface at appropriate levels and then provides and calls for financial and other support for the highest- priority needs related directly to its activities, as decided by the Plenary, and catalyzes financing for such capacity-building activities by providing a forum with conventional and potential sources of funding.

In light of the highly inter-dependent and inter-connected nature of these functions and the necessity to ensure coherence and coordination in the implementation of the work program,

representatives of governments at the Panama meeting (UNEP/IPBES.MI/2/9) requested the interim secretariat:

"*To prepare a draft conceptual framework document informed by the review of assessments and drawing on existing conceptual frameworks. The draft will be made available to all Governments and stakeholders for online review through an open and transparent process, and all comments received will be compiled for consideration by a multidisciplinary and regionally balanced expert workshop that will be mandated to make a proposal for a conceptual framework for consideration by the Plenary at its first session.*"

In support of the response to this request, and on behalf of and in collaboration with the IPBES interim secretariat, UNESCO convened an informal group of experts to develop the present information document as a basis for the online review process. The experts worked both online and through a workshop, which was made possible thanks to the significant financial support of the Ministry of the Environment of Japan and the International Union for Conservation of Nature (the latter funded in part by the Gordon and Betty Moore Foundation), and a further financial contribution from the DIVERSITAS Programme, and the oversight of the United Nations University-International Human Dimensions Programme, United Nations University-Institute for Sustainability and Peace and DIVERSITAS.

The overall intention of this document is to provide an overview of the key issues, components, building blocks and elements that might be considered when a conceptual framework is developed for IPBES. A common conceptual framework would, ideally, provide a common analytical basis and schematic representation of key issues related to biodiversity, ecosystem services and their relationship with human wellbeing for all IPBES stakeholders.

Furthermore, a common conceptual framework might help structure the future work of IPBES across the four functions of IPBES in a coherent and consistent manner in addressing the problem of changing biodiversity, ecosystem functioning and ecosystem services and their impacts on human wellbeing.

The specific aims of this document are two fold:

First, to provide a brief overview of what conceptual frameworks are and how they might be useful for undertaking activities related to: (i) policy relevant assessments; (ii) identification of research gaps; (iii) supporting policy: and (iv) identifying capacity building priorities.

Second, to identify a set of possible key building blocks for an IPBES conceptual framework that reflect the complex interactions between biodiversity, ecosystem functioning, ecosystem services and their relationship with human wellbeing.

3. What are Conceptual Frameworks and how can they be useful to IPBES?

Conceptual frameworks, in the context of IPBES, might be described as "a concise summary in words or pictures of relationships between people and nature". In other words, conceptual frameworks depict key social and ecological components, and the relationships between these components. They provide common terminology and structure for the variables that are of interest in the system of interest, and propose assumptions about key relationships in the system.

Conceptual frameworks have the ability to provide a shared language and a common set of relationships and definitions, which have proved to be effective in supporting the kinds of collaborative and comparative work anticipated in IPBES. In this way conceptual frameworks are useful tools to make complex systems as simple as they need to be for their intended purpose. They help clarify and focus thinking about complex relationships, supporting communication across disciplines, knowledge systems and between science and policy. They may provide support to structure and prioritize work. They may also allow buy-in from a variety of stakeholders, by involving them in the development of the framework, and thus increase policy relevance.

Key Message 1: Conceptual frameworks can be essential tools to guide the development of the work program of IPBES.
Conceptual frameworks lay out the key components and interactions in complex systems, develop a joint understanding of their key elements and support agreement on common definitions and approaches to guide assessment activities and associated IPBES functions. They have been shown to bring clarity to complex processes and to focus attention on the most important issues to be considered.

There are several examples of interdisciplinary and large-scale projects where conceptual frameworks have been influential in supporting a programme of work, allowing it to meet its objectives, but also in communicating a set of ideas and priorities that have more lasting impacts. A well-known example is the Millennium Ecosystem Assessment (MA) (Annex 2-Figure A). The MA conceptual framework was the product of a long planning phase, involving all stakeholders in the MA. It provided a structure and focus for the extensive work done by over 1300 experts during the 5 years of the MA, with the structures, terms and concepts now being widely used and understood.

In addition to guiding the implementation of the work program of IPBES at the global level, if properly designed, a conceptual framework could provide the basis for undertaking the different functions of IPBES at various appropriate spatial scales. For example, the MA conceptual framework was also intended to serve as a link between the global assessment and several sub-global assessments that took place under the MA initiative.

Although the attempt to provide a common framework to allow a more fluid scaling up and down between assessments conducted at different scales had limited success in the MA, it provided important lessons for the future development of conceptual frameworks. For example, the regional southern African assessment, using the MA conceptual framework investigated the interactions across scales ranging from a local scale to a river basin and up to the regional level (Annex 2-Figure B), and identified different stakeholders across political, geographical, biophysical scales and the governances and institutional structures that operate from local communities to national governments–a feature which was not explicit in the MA framework but could very well be incorporated in the development of the conceptual framework for IPBES.

Key Message 2: Conceptual Frameworks can be critical for facilitating and strengthening multidisciplinary collaboration and enabling communication across disciplines.
Conceptual frameworks can provide common terminology and concepts that facilitate communication and collaboration across disciplines. Previous applications of conceptual frameworks in broad, multidisciplinary processes illustrate the importance of giving due attention to developing them in a fully interactive and adaptive manner, involving all relevant disciplines.

The complexity of the issues relating to biodiversity, ecosystem services and human well-being to be addressed by IPBES makes multidisciplinarity a necessary approach (see Box 1 for definition of multidisciplinarity adopted by delegates at the Panama meeting).

Box 1. Definition adopted by IPBES for Multidisciplinarity

"Multidisciplinarity" connotes an approach that crosses many disciplinary boundaries, knowledge systems and approaches to create a holistic approach, focusing on complex problems that require expertise across two or more disciplines. Multidisciplinarity arises when scientists (including natural and social scientists), policy and technical experts, natural resource managers, other relevant knowledge holders and users, interact in an open discussion and dialogue giving consideration to each perspective (**UNEP/IPBES.MI/2/9)**.

However, bringing together such a wide range of disciplines with their own methodologies, terminology and tools to produce a coherent output requires careful design and collaboration in an open and transparent manner. A conceptual framework developed by such a diverse group of experts might provide a platform for such collaboration and the integration of knowledge from a wide variety of disciplines.

Key Message 3: Conceptual frameworks can be used to facilitate the inclusion indigenous and local knowledge systems, which are essential for understanding the complex interrelationships among biodiversity, ecosystem services and human well-being.

Indigenous peoples and local communities have their own representations of relationships between social and ecological spheres. These worldviews, which are conceptual frameworks in themselves, are complementary to science-based frameworks and can reinforce the delivery of IPBES functions.

Indigenous peoples and local communities are interlinked with and close observers of their natural environments. Their indigenous and local knowledge has been long recognized as a key source of observations, information and interpretations with respect to biodiversity, which complements scientific understandings.

Conceptual frameworks drawing from indigenous and local knowledge may thus complement scientific conceptual frameworks and reinforce the achievement of IPBES objectives. Significant aspects may include amongst others:

- greater emphasis on the interdependence of societal and ecological spheres;
- central role of social relations and reciprocity amongst humans, as well as between humans and nature;
- continuity of relations between past, present and future generations, and intergenerational transmission of values, knowledge and responsibilities;
- emphasis on cyclical processes in natural and social domains;
- collective identification with place/land/ancestral territory;
- recognition of the role of communities in managing and maintaining landscape mosaics and biodiversity that enhance the provisioning of ecosystem services for human wellbeing;
- recognition that knowledge is also embodied in practice, action, morality, spirituality (as opposed to abstracted and objectified).

One example of an indigenous conceptual framework, in this case an Andean worldview, is presented in Annex 2-Figure C which was used in the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD).

A conceptual framework developed with active participation by indigenous and local knowledge holders might also be used to guide the assessment, documentation, and protection of different forms of indigenous and local knowledge which might lay the foundations for the reinforcement of the use of indigenous and local knowledge in the four functions of the IPBES.

Key Message 4: Conceptual frameworks, if developed in an open and transparent process allowing the involvement of a broad set of stakeholders and knowledge holders can significantly increase policy relevance by addressing user needs as well as improving adaptation and learning.

A deliberative, open and transparent process to develop a conceptual framework for IPBES could be a very significant step in establishing a successful user-driven process to support the platform.

Moreover, the shared understanding developed from building a conceptual framework by such an open process will also help to assess the need for new knowledge and understanding about the relationships, variables and structures that are required for the analysis of complex systems and subsequent policy support.

The likelihood of results and outputs from IPBES to be used by potential users will likely be correlated with the level of participation in and the sense of ownership of IPBES by these users. In this regard, a conceptual framework can increase the uptake of the platform's results and outputs if it is co-designed from the very onset through an open and transparent process with the involvement and participation of these stakeholders in their various capacities.

For example, in the case of the Japan Satoyama –Satoumi Assessment (JSSA), a conceptual framework was developed by a group of stakeholders which included experts, policymakers from national to prefecture governments and grass roots organizations. The objective was to obtain a better understanding of the key indirect and direct drivers of biodiversity and ecosystem services change across urban-rural landscapes. Although the JSSA used the MA conceptual framework as a basis, it included a landscape model, which captured the mosaic structure of landscapes and the mismatch of institutions that were considered important by the users of the assessment (Annex 2-Figure D).

The United Kingdom National Ecosystem Assessment (UKNEA) developed a conceptual framework for an assessment of the state and value of the UK's natural environment and ecosystem services, and to foster better interdisciplinary cooperation between natural and social scientists to assist in strengthening policy making, to ensure effective management of the environment and ecosystem services in the future. The UK NEA included different value systems, and the economic valuation of multiple services was attempted. The conceptual framework also accounted for the spatially explicit nature of economic values. This also allowed understanding of the distributional trade-offs among ecosystem services impacts of land use change across space (Annex 2-Figure E).

These examples illustrate the contextual importance for each conceptual framework and the involvement of not only scientific experts but all relevant knowledge holders and user representatives. A conceptual framework is developed with a purpose in mind, and has proved be most successful when all stakeholders are active participants in its design, revision and use, which also change over time and with use. A typical case in point is the use of a conceptual framework to guide the development of the Aichi Biodiversity Targets of the Strategic Plan for Biodiversity 2011-2020, implemented by Parties to the Convention on Biological Diversity (Annex 2-Figure F).

Definitions and understandings of key terms and concepts are developed as part of the design of a conceptual framework, and the on-going adaptive process means that new information gathered through using the framework can be integrated for future applications. Once a conceptual framework is put in use, such as for an assessment or in the development of policy, it will also help to develop new knowledge, thus it should allow further improvements to be included in future

conceptual frameworks. IPBES can benefit from such past frameworks, learning from approaches and components that worked, and also from those that were less successful.

4. What might be the key building blocks for an IPBES conceptual framework?

Key Message 5: The key building blocks of an IPBES conceptual framework could include: 1) biodiversity and ecosystem functioning; 2) ecosystem goods and services; and 3) human well-being; with 4) institutions and decisions as key indirect and direct drivers of all inter-linkages. (See possible representation in Figure 1)

An IPBES conceptual framework might include biodiversity, ecosystem services and human well-being inter-linkages as a SocioEconomic-Ecological System (SEES). The ecological system underpins the complex interactions between changes in biodiversity, ecosystem functioning and the supply of ecosystem services at various scales while the socioeconomic system is key to highlighting changes in preferences and demands for constituents of well-being and how these might depend on and impact the state of ecological systems.

Figure 1 illustrates a possible representation of the key building blocks and their interactions. Figure 1 represents biodiversity and ecosystem functioning not only for their contribution to the supply of ecosystem goods and services, but also for their own intrinsic value. Some ecosystem goods and services are provided directly by biodiversity and ecosystem functioning, such as aesthetics, recreation, regulation of quantity and quality of water resources, or fodder for animals.

Other goods and services are produced jointly with "other forms of wealth" including produced, human and financial wealth. For example, agricultural goods (i.e. food and fiber) depend on a set of ecosystem functions (including soil formation, nutrient cycling, pollination, primary production) – which can be considered as the natural wealth of society- as well as on human wealth (such as farm labor and knowledge of farming- human ingenuity, and machinery-produced wealth). The ensemble composed of natural wealth on one hand (biodiversity and ecosystem functioning plus other forms of natural wealth), and of social wealth on the other hand (human, built, and financial wealth), could be considered to form the "productive base of society".

The inclusion of these other social forms of wealth in the IPBES conceptual framework will ensure that the full suite of ecosystem services and their contributing components can be reflected, providing a significant addition to many of the existing frameworks on biodiversity, ecosystem services and human wellbeing. However, this framework allows the range of stakeholders to have an understanding of how these forms of wealth together contribute to the overall wealth of society and the role natural wealth contributes to human wellbeing.

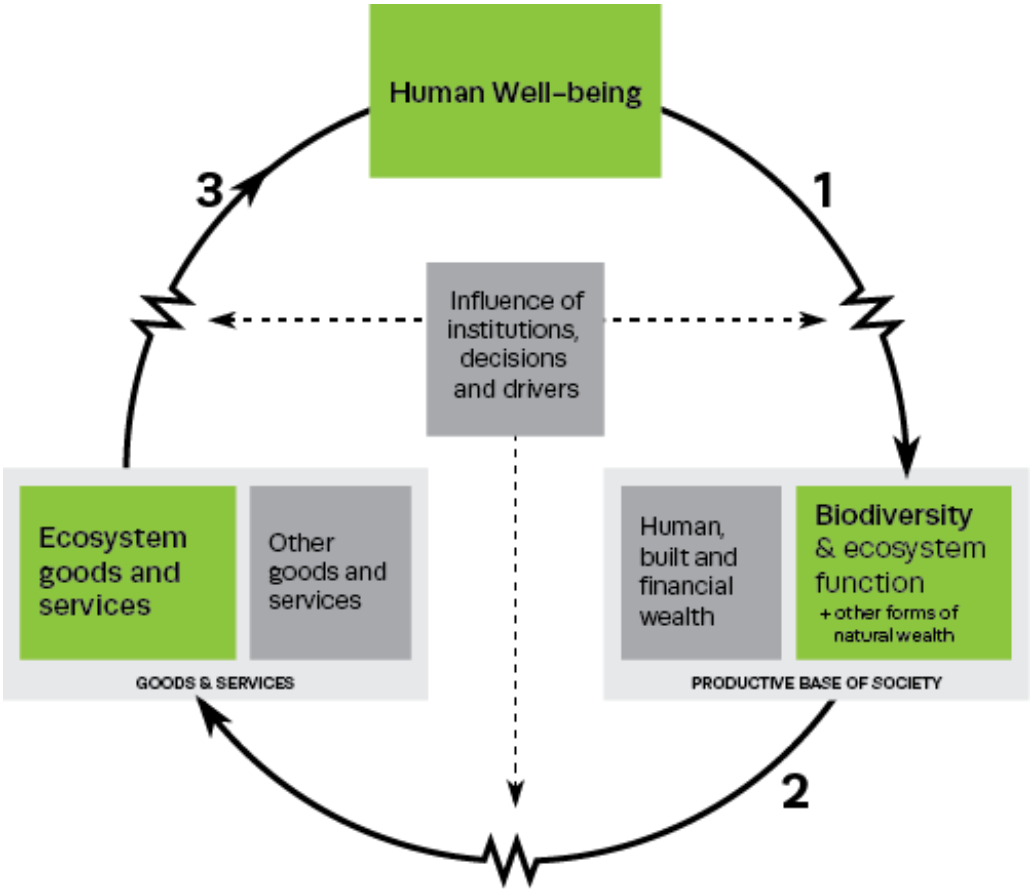

Figure 1. A possible representation of key building blocks and inter-linkages that might be considered for an IPBES conceptual framework. Building blocks are shown in square boxes. Inter-linkages are indicated by the black arrows. Institutions, decisions and drivers influence and are influenced by the inter-linkages among the key building blocks as indicated by the dashed arrows and zigzags. Numbers are used for reference to discussion of inter-linkages in the text.

Finally, the contribution of ecosystem goods and services to human wellbeing can be jointly considered alongside contributions of "other goods and services" such as education, built-up infrastructure, health facilities, and housing among others. For example, the level of water filtration by watersheds, an ecosystem service, contributes to human wellbeing (in the form of improved health or reduced treatment costs) is in part based on the availability of water filtration by other means (e.g. buying bottled water from another location, or treating water in a built facility). If there are no alternatives to watershed filtration, then that ecosystem service will contribute strongly to human wellbeing. If there are alternatives that are cost effective, that ecosystem service may contribute less to the associated components of human wellbeing. The key point here is that, at any given time, there are many ecosystem goods and services contributing to many components of human wellbeing and an IPBES conceptual framework might allow differentiation of these diverse contributions.

Figure 1 also keeps the economic systems integrated in the social (human, built and financial) component. Although the economic system is indeed in principle a sub-component of the broader social system, the IPBES conceptual framework might consider separating the economic system from the social system, purely because of the central role it plays in our present social systems and because of the impacts it has on ecological systems across spatial and temporal scales.

Finally, institutions, either formal or informal, affect the interactions and balance among the key building blocks that might be considered for the conceptual framework for IPBES. Institutions and their decisions are influenced by the state of and changes in human wellbeing, and this in turn yields the indirect and direct drivers of change in biodiversity and ecosystem services and subsequent changes in goods and services, circling back to human well-being.

Therefore, the economic system in principle oversees the way the different forms of wealth are accessed and used for human well-being while the social system provides the overarching umbrella that captures the way society makes decisions and channels these decisions through the institutions society have developed formally and informally for improving human well-being.

Key Message 6: Biodiversity and ecosystem functioning might be explicitly included in the Conceptual Framework because they play multiple roles in underpinning the quality, quantity and resilience of ecosystem services, in providing the raw material for adapting to change, as well as in providing direct benefits and having particular meanings to people.
Biodiversity is the variety of life at all levels from genes, through populations, communities and species to ecosystems and biomes. It includes not just the diversity of the biological components, but also their structures, functions and the interactions between them.

The term biodiversity has been defined and used in a variety of ways by the scientific community and by a multitude of decision makers. The Convention on Biological Diversity (CBD) states that (CBD, Article 2 Convention Text): "Biological diversity means the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems." This definition is broad and inclusive compared to some common understandings of the term.

It is now commonly acknowledged that biodiversity encompasses all the forms of life, and organizes itself at various levels of complexity, ranging from genetic to species to ecosystem variability. Functional interaction among those levels produces flows of ecosystem services, which are captured by societies and translated into benefits for humanity (see Annex 3).

Biodiversity has multiple roles in underpinning the quality, quantity and reliability of ecosystem services, and is also the raw material for adaptation to the ever changing natural environment as well as the source of direct benefits to people. The type of biodiversity involved varies across this

range of roles, and depends on the ecological context and the ecosystem services of interest, together with the meanings and values brought by the social and cultural context.

Ecosystem services are to a greater or lesser degree almost always dependent in some way on biodiversity, but certain biodiversity components also hold value to people independently and outside of these roles in ecosystem services. The diversity of life on Earth, and the processes that maintain that diversity in the face of continuing pressures and drivers of change, are recognized by many people to be important in their own right. Thus, based on the cultural context, people differentially conceive and attribute meaning, understand, and act on the appraisal and acquisition of biodiversity. The IPBES conceptual framework can therefore benefit from incorporating differences in conceptions and ways of knowing, that are inherent to indigenous and local knowledge, as well as to science.

Key Message 7: Human well-being is multi-dimensional and dependent on access to and changes in bundles of goods and services and is context specific with preferences for constituents of human wellbeing varying across individuals and societies (Figure 1, Link 3).
Human wellbeing should be seen as multi-faceted and affected by preferences for and access to biodiversity, ecosystem services and other goods and services that are mediated by institutions and decisions.
Human wellbeing is complex, multi-faceted and context specific depending on the geography, history, institutional context, scale and socio-economic and cultural aspects of households and communities. The constituents of well-being range from relatively objective constituents such as material wealth, health and personal security to more subjective elements such as identity of place, happiness, and/or freedom of choice.

An individual's well-being is therefore determined by the ability to secure a combination of these constituents or bundles of constituents of well-being that they have reason to value. The ability of an individual to achieve or improve their well-being depends in turn on many factors that alter accessibility to goods and services as illustrated by Link 3 in Figure 1. For example, deforesting for timber might increase the material wealth of an individual in the logging industry while the local community dependent on some of the non-timber forest products such as medicinal plants might see a drop in their health conditions because of a loss in access to these traditional medicines.

Representation and possible resolution of the mismatch in values among different stakeholders of a specific ecosystem good and service will be facilitated by a conceptual framework that highlights understanding of these linkages and the underlying institutions overseeing the access to and use of these ecosystem goods and services as well as other goods and services.

Changes in human wellbeing are therefore a consequence of an individual or group ability to secure a range of goods and services which contribute towards satisfying the bundle of constituents of well-being valued. Accessibility is determined by what the socioeconomic-ecological system (SEES)

can produce (the Goods and Services box in Figure 1) and by formal (laws, markets, etc.) and informal (culture, norms, etc.) institutions that affect in principle the equitable access and use of these goods and services (the transformer in Link 3 in Figure 1).

An IPBES framework could reflect the multiple bundles (i.e. combinations) of constituents of human well being in a way that allows an understanding of trade-offs and synergies among these different bundles and among different individuals, groups or sectors of society. This consideration of trade-offs and synergies would also reveal how important ecosystem goods and services are to well-being relative to other goods and services and also highlight which individuals, groups or parts of society are most dependent on and/or vulnerable to ecosystem goods and services changes versus changes in other goods and services.

Key Message 8: Changes in biodiversity, ecosystem functioning and other forms of wealth (see Box 2) are caused by decisions mediated through institutions which are influenced by the state of and changes in human well-being (Figure 1, Link 1).
The state of and changes in human wellbeing both drive and are driven by decisions and institutions that affect the productive base of society which includes biodiversity, ecosystem functioning, human, built, and financial wealth.

State of and changes in human (individual and/or societal) well-being drive decisions that alter the amount and quality of biodiversity, ecosystem functioning and other forms of wealth, referred to in Figure 1 as "the productive base of society". There is broad recognition that institutions provide the foundation for societal and individual interactions and in this case, institutions can alter decisions made in response to the human condition (human wellbeing). All forms of human-made wealth (built, human, financial) are created when individuals spend time and effort in transaction and transformation activities to build the productive base today that will increase individual and societal well-being in the future.

Box 2. Definition of Wealth
Wealth is defined here to be the social worth of society's assets which include built capital, human capital, knowledge, natural capital, population, institutions and time. This therefore goes beyond just seeing wealth as a financial or economic value of assets but wealth as the productive base of a society required for human wellbeing. This productive base or the total social wealth of all assets is called the inclusive wealth of society (IWR 2012-UNU-IHDP and UNEP).

The decisions people, groups, corporations, or governments make in response to state of and changes in human wellbeing influence the amount and quality of biodiversity, ecosystem functioning and each kind of wealth as clearly illustrated in link 1 in Figure 1. For example, a community prioritizing health services may choose to invest in medical facilities or the construction of a road to allow easier access to medical practitioners. Such a decision would change

the balance of the different forms of wealth and will also likely change the condition of biodiversity and ecosystem functioning.

Communal management groups or government agencies reacting to a broader social well-being may take decisions to conserve biodiversity or ecosystem functioning for current and future generations. Institutions that mediate these decisions can influence the balance among human, built, financial wealth, and natural wealth, which comprises biodiversity and ecosystem functioning. A conceptual framework for IPBES might recognize that individual or group decisions made in response to human wellbeing drive changes in biodiversity, ecosystem functioning and other forms of wealth.

Key Message 9: The production of most goods and services is dependent on biodiversity, ecosystem functioning and other forms of wealth a society possesses (Figure 1, Link 2).
The productive base of societies comprises of: (i) the natural wealth that includes biodiversity and ecosystem functioning; (ii) human labor and ingenuity that comprises human wealth; (iii) infrastructure and other forms of produced capital as built wealth; and (iv) equity and monetary assets as financial wealth. The production and flow of ecosystem services are dependent to varying degrees upon the different levels of biological complexity, their degree of interaction, and the abiotic components of ecosystems, generally requiring the other kinds of wealth to turn them into benefits for people. The ability of the productive base to produce ecosystem goods and services efficiently and effectively is mediated by decisions and institutions.

The IPBES conceptual framework might benefit from a clear distinction of how the different components of socioeconomic-ecological systems (SEES) underpin the supply of ecosystem services. Ecosystem services are produced by biodiversity, ecosystem functioning and in many cases, other forms of wealth such as human, built and financial wealth. This is reflected in link 2 between the productive base and goods and services in Figure 1. For example, in agricultural food production, non-timber forest product provision and others, ecosystem services rely on biodiversity and ecosystem functioning, but also require inputs from components of human, financial and built (e.g., roads) wealth. This link also reflects the important role of institutions and decisions in determining the ability of people to access these forms of wealth.

The existence of various forms of wealth does not ensure that all groups have access to them, and it is institutions and decisions that determine which groups have access (physical or institutional) to which forms of wealth. For example, the presence of recreational fish stocks in a river does not guarantee the provision of recreational fishing opportunity to everyone. Access may be restricted for certain social groups or at certain entry points or during certain times of year by laws or cultural practices.

Many existing conceptual frameworks do not account for the multifaceted contribution of biodiversity, ecosystem function and other forms of wealth to the supply of ecosystem goods and services. For example, pollinators may not only be providing pollination of plants valued by people

but they may also be providing other ecosystem goods or services such as honey, pest regulation services, and additionally have existence and option values. Representing the ability of the socioeconomic-ecological system to produce the full suite of ecosystem and other goods and services will allow the IPBES conceptual framework to provide a basis for understanding trade-offs or synergies among goods and services.

Key Message 10: Decisions both influence and are influenced by institutions, and can become key indirect and direct drivers of change and thereby affect interactions among biodiversity, ecosystem functioning, ecosystem services and human wellbeing.

Formal and informal institutions encompass the formal and informal rules and norms, respectively, among stakeholders and structures, along a continuum of scales, and determine and are determined by decision-making. Institutions and decisions drive change, indirectly or directly, either positive or negative, in all components of and interactions within the socioeconomic-ecological system (SEES). Therefore formal and informal institutions can strongly affect the ability of the SEES to move on pathways towards conservation and sustainable use of biodiversity and ecosystem services for long-term human wellbeing and sustainable development.

The elaboration of the key linkages among human wellbeing, the productive base and goods and services in the preceding sections highlights the central role decisions and institutions (symbolized by the dashed arrows and zigzag symbols in Figure 1) play in mediating who, when, where and how:

(i) changes in the state of human wellbeing affect the production of the different forms of wealth in the productive base (link 1);

(ii) different forms of wealth are transformed to goods and services (link 2); and

(iii) goods and services contribute to human wellbeing (link 3).

Decisions are the product of choices from individuals and/or communities, which are organized through institutions across temporal and spatial scales and from the global to the individual level. Decisions reflect a number of factors, including the degree to which the impacts of such decisions are taken into account by harnessing synergies and resolving trade-offs among natural and other forms of wealth. Due consideration of such impacts may lead to better informed decisions.

Decisions implemented through institutions can become indirect and direct drivers of change. The distinction between direct and indirect drivers arises, in the case of IPBES, from the way the decision affects biodiversity, ecosystem functioning and the supply of ecosystem services. Decisions such as macroeconomic fiscal or monetary policies implemented normally through the formal institutions do not directly cause a change in the ecological system but work their way through the direct drivers of change such as land use change, pollution, exploitation of resources, and climate change among others. The direct drivers of change are mediated by a combination of formal and informal institutions. Addressing the indirect drivers of change might require a systemic change in the institutions while tackling the direct drivers of change can be done in a relatively more focused and direct manner at targeted institutions.

Institutions encompass all formal and informal interactions among stakeholders and structures that determine how decisions are taken and implemented, how power is exercised, and how responsibilities are distributed. Institutions also determine to various degrees the access to, allocation and distribution of the various forms of wealth and the benefits they provide through goods and services. They can be organized along a continuum of temporal and geographical scales spanning from global institutions, international treaties, law, and policy, through to small groups and individuals, influencing and influenced by socio-economic-cultural contexts, including values, traditions, customs, norms and fads.

Comprehensive consideration of formal and informal institutions might include understanding their capacity, legitimacy, inclusion, direction, performance, accountability, fairness, culture, and appropriate scale of operation, as well as convenient evaluative criteria (qualities) broadly to consider both process and outcome legitimacy. The latter can be considered as consisting of three parts: effectiveness (the effect on biodiversity and ecosystem services); efficiency (are we reaching the goal in a cost-effective manner); and equity (effect on distribution across individuals).

The IPBES framework could broadly reflect the full realm of institutions ranging from more formal institutions, such as laws and markets, to more informal institutions, such as culture, norms and fads. Formal institutions are more commonly reflected in conceptual frameworks as they encompass the components of the formal economy.

The economy is usually seen as playing a disproportionately large role in influencing people's decisions and behaviour. However, many drivers of human behaviour and preferences work outside the market system and reflect world view, sense of place, cultural norms and other significant informal institutions. Including all forms of institutions and decisions, and their role in altering connections within the socioeconomic-ecological system, will help decision makers identify and test the extent to which policy options will be able to affect both the indirect and direct drivers of the components of the system.

The IPBES conceptual framework might reflect this important role of institutions and decisions in influencing the balance and quantity of ecosystem and other goods and services generated by a system. By so doing, it will also clarify the ways in which policy decisions can affect the production of ecosystem and other goods and services from biodiversity, ecosystem functioning and other forms of wealth.

Key Message 11: The IPBES conceptual framework might consider the properties and processes that occur at different scales of space, time and governance, as well as the interactions across these scales

Decisions, institutions and drivers acting at different scales and levels affect biodiversity, ecosystem services, and human wellbeing at various scales and across different stakeholders. A sufficiently flexible and robust conceptual framework, which allows the up scaling and down scaling of key

variables and processes would facilitate comparability and integration of findings across space and time, and support decision-making at different levels.

A sufficiently flexible and robust conceptual framework will allow the scaling up and down of key variables and processes in order to allow comparability and integration of findings across spatial and time scales and support decision-making at different levels.

The consideration of different stakeholder needs, scale of management and policy implementation activities, scale of ecological processes and the scale of potential drivers of changes suggest careful consideration of the various types of scales in a conceptual framework for IPBES.

Such a multi- and cross-scale perspective will also support the identification of trade-offs within scales (e.g., between different policy sectors) and across scales (e.g., limiting local use of forests for carbon sequestration goals on the global scale). Taking into consideration the key building blocks presented in the earlier sections, the conceptual framework for IPBES might consider and represent the spatial, temporal and governance scales that have been shown to play an important role in biodiversity, ecosystem functioning, ecosystem services and human well-being interactions.

Spatial scales – In terms of assessment, it has been agreed that IPBES will focus on global and regional (and sub-regional) geographic scales (UNEP/IPBES.MI/2/9: Annex I). However, the properties and processes that occur at these relatively large spatial scales will be, in part, linked to properties and processes acting at smaller scales. Explicit consideration of multiple spatial scales will support understanding of the diversity of and generalities in mechanisms driving change in the socio-ecological systems, as well as helping to render analyses more pertinent for management and policy at all levels. A coherence of representation of properties and processes across scales in the conceptual framework will facilitate cross-scale analyses and synthesis.

Temporal scales – The IPBES framework could also reflect the interactions among components of the socioeconomic-ecological system over various temporal (time) scales. Some interactions progress very rapidly. For example, a decision to cut down a forest to create agricultural production very quickly changes the balance of biodiversity, ecosystem functioning and the productive base. Alternatively, some interactions progress more slowly, often on timeframes beyond those regularly accounted for in decision-making. For example, changes in water quality caused by an upstream dam may alter an indigenous community's beliefs about the spiritual entities that exist in the realm of the river system. This type of cultural change may be quick, on the order of months, or it may happen more slowly, on the order of decades.

All recent major assessments covering biodiversity and ecosystem services (e.g., MA, GBO, GEO, IPCC) have included analyses of trends, current status and possible future trajectories. The analysis of trends – i.e., looking back into the past – provides insight into the mechanisms underlying change and perspective on whether key indicators are showing improvement or degradation over time.

How far back in time the analysis of trends might go needs to be carefully considered. Assessments have often focused heavily on trends over the last several decades, even though historical and paleontological records can provide considerable additional perspective and insight into many components of the socio-ecological system.

The analysis of status – i.e., looking at the condition of biodiversity, ecosystem services or human wellbeing at the time of the assessment – has typically been the focus of most assessments. When carried out in a consistent manner over time, the assessment of status provides the basis for calculating trends. The analysis of projected trajectories or possible future trends using models and scenarios – i.e., looking into the future – allows the anticipation of future changes, exploration of the dynamics under a wide range of plausible socio-economic development pathways and studying of the potential impacts of management or policy decisions. Considerable progress has been made over the last decade in the development of socioeconomic scenarios and models of impacts on biodiversity and ecosystem services, which can facilitate a more proactive approach to managing biodiversity and ecosystem services for human wellbeing.

Institutional or governance scales – Another important consideration for the IPBES conceptual framework is how it might capture the degree of overlap between different institutional arrangements and ecosystem boundaries at different scales. Understanding the mismatch between ecosystems and institutional arrangements is particularly critical at larger scales where political and administrative boundaries cut across environmental systems, such as a watershed. The IPBES conceptual framework can support the ability to understand the degree of mismatch between ecosystem units and institutions in order to make policy recommendations above and below the country level. For instance, in being responsive to policy and decision making at all levels, IPBES might address institutions at global (e.g., MEAs, multilateral Banks), regional (e.g., NEPAD, EU, ASEAN), national (e.g., national environmental protection agencies, ministries of finance) and local (e.g., city or village government) scales, as well as individuals.

5. How might the conceptual framework be used to guide the development of the IPBES work program?

Key message 12: The IPBES Conceptual Framework could be common to and support all four functions of IPBES.

A conceptual framework can help ensure coherence and coordination among the four functions of IPBES. For each of the four IPBES functions, further consideration might be given to how the conceptual framework can be used in order to support delivery of the IPBES work programme, including its use in the proposed IPBES scoping process.

The implementation of all four functions of IPBES – assessments, policy support tools and methodologies, knowledge generation, and capacity building – could benefit from a common

conceptual framework for IPBES. A common conceptual framework could also help in developing the scoping process required in IPBES on topics selected for the work programme as illustrated in Figure 2.

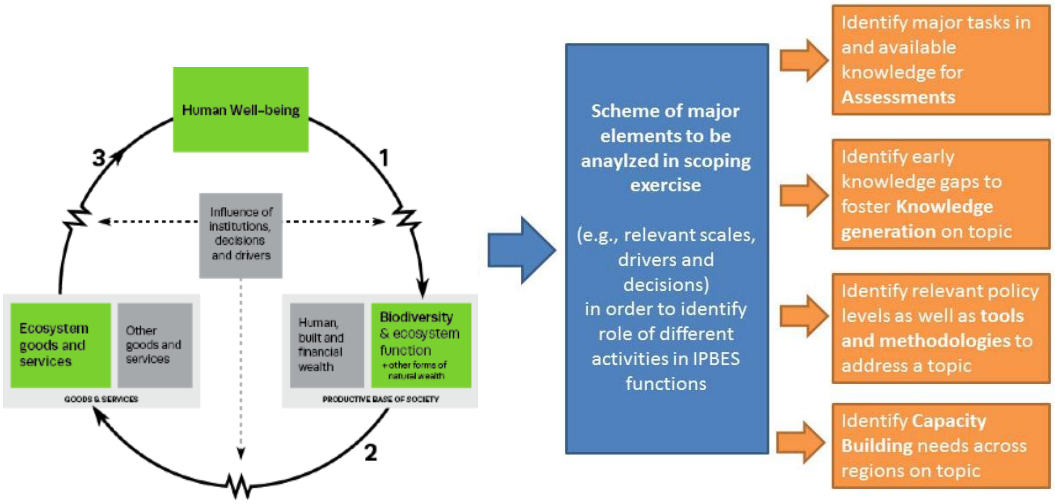

Figure 2: Illustration on how a Conceptual Framework could support with its major building blocks a scoping process in IPBES that includes the four IPBES functions.

In addition to this overall support for an integration of the work of IPBES across the four functions, the conceptual framework may also support the implementation of the four functions individually, depending on the nature of each function and specific activities on them in a future programme of work. A brief description of how the conceptual framework can be used in each of the four functions is presented below.

Assessment function

Most major assessments in the past have used a conceptual framework to guide their work and to ensure a shared understanding among the stakeholders involved. A common, but adaptable conceptual framework for all the assessments to be carried out in IPBES, whether global, regional, or thematic, will support coherence in approach between the different assessments, and the opportunities for synthesis between the assessments. This will allow, in particular, the scaling up and down of assessments done at different scales as well as the comparison among assessments performed at specific scales or on different themes (see information paper from Tokyo workshops on assessments for further information: UNEP/IPBES.MI/1/INF/12, and UNEP/IPBES.MI/2/INF/10).

Depending on the work programme, assessments may then address the whole list of building blocks outlined in section 3, or may focus on a few of them, for example addressing the status and trends of specific components of biodiversity or specific ecosystem services. Whilst recognizing the value of consistent application, for each assessment activity, the conceptual framework could be

adapted and further specified as necessary, either thematically or depending on the scales that are to be addressed in the activity.

Policy tools and methodologies function

Identifying policy tools and methodologies as options for responses and intervention strategies to address detrimental changes in biodiversity, ecosystem functioning and ecosystem services, is key to the policy support function of IPBES. It is a key challenge for IPBES to develop a conceptual framework in a manner that these responses are synergistic with the key drivers of those changes, paying attention in particular to the cross-scale relationships between the drivers of and responses to changes, and to the diversity of social groups and cultures, including political and institutional diversity.

The main building blocks presented in this document may reflect the main elements for such a framework specifically for the policy support function in IPBES, but may also need to be specified further via an operationalizing scheme. This scheme may enable the identification and involvement of relevant stakeholders in IPBES activities on policy support tools and methodologies. In addition, knowledge about institutions, decisions and drivers can help identify the relevant context for various available policy tools, which may address issues like policy strategy development, management and implementation issues, policy design as well as other decision making processes at different scales (see also further information in the report of the Bonn workshop on the IPBES policy support function, UNEP/IPBES/MI/2/INF/7).

Knowledge generation catalysis function

Although IPBES will not carry out new research to fill knowledge gaps, it will play a vital role in organizing new research by identifying knowledge gaps and working with partners to prioritize and fill these gaps. A conceptual framework could help engage all relevant stakeholders for this function, including the scientific community, research funding agencies and the observation and monitoring community. It would, in particular, help to structure discussions to identify and prioritise gaps, and help to ensure that all components of the conceptual framework and their inter-linkages are addressed, for example through considering monitoring and observations activities in the context of human well-being, and linking observations to some measure of human well-being. Another example of the importance of a conceptual framework would be in the design of models and scenarios for IPBES, which would need to be integrated throughout the entire framework, and be scalable from regional to global and in-between regions (for further information, see results of Paris and Annapolis workshops on this function: UNEP/IPBES.MI/1/INF/11 and UNEP/IPBES.MI/2/INF/11).

A conceptual framework can thus build on the outcomes of the other work of the platform, expert and policymakers to identify where gaps in knowledge are, but also to highlight where modifications and revisions of the conceptual framework might be needed as new knowledge becomes available.

Capacity Building function

The conceptual framework could support capacity building in many ways, including by supporting the involvement of a broad range of stakeholders in the design of the conceptual framework itself (e.g., via stakeholder meetings and other consultative processes- learning by doing process to capacity building) as well as in the implementation of other work programme elements, and in support of national and subnational assessment activities beyond the direct scope of IPBES.

6. Key Considerations for the further development of the conceptual framework for IPBES

In light of the key messages highlighted in this document, six considerations of an operational nature are presented for consideration by the plenary of IPBES in its deliberations on the development of a conceptual framework for IPBES.

Consideration 1: A conceptual framework for IPBES would benefit from being developed through an open, deliberative and transparent process including scientific experts, indigenous and local knowledge experts, policymakers and other relevant stakeholders.

Consideration 2: The IPBES conceptual framework for IPBES might include the key components of biodiversity, ecological functioning, ecosystem services and human well-being as a SocioEconomic-Ecological System (SEES).

Consideration 3: The inclusion of institutions and decisions and their role as key indirect and direct drivers of changes in the state of biodiversity, ecosystem functioning, ecosystem services and human well-being within the IPBES conceptual framework might be considered in order to provide clear strategies for response interventions.

Consideration 4: The conceptual framework developed for IPBES could include the explicit recognition of spatial and temporal scales to allow a deeper understanding of multi-scale and cross-scale impacts of changes to and changes of the various components within the SEES.

Consideration 5: The IPBES conceptual framework could be developed as an important tool for ensuring the coherence and coordination in the delivery of the four functions of IPBES.

Consideration 6: The conceptual framework for IPBES could clarify information on synergies and trade-offs across the various components of the SEES and provide guidance for responding to detrimental changes in biodiversity and ecosystem functioning both in the short run through adaptation and in the long run through transformational changes.

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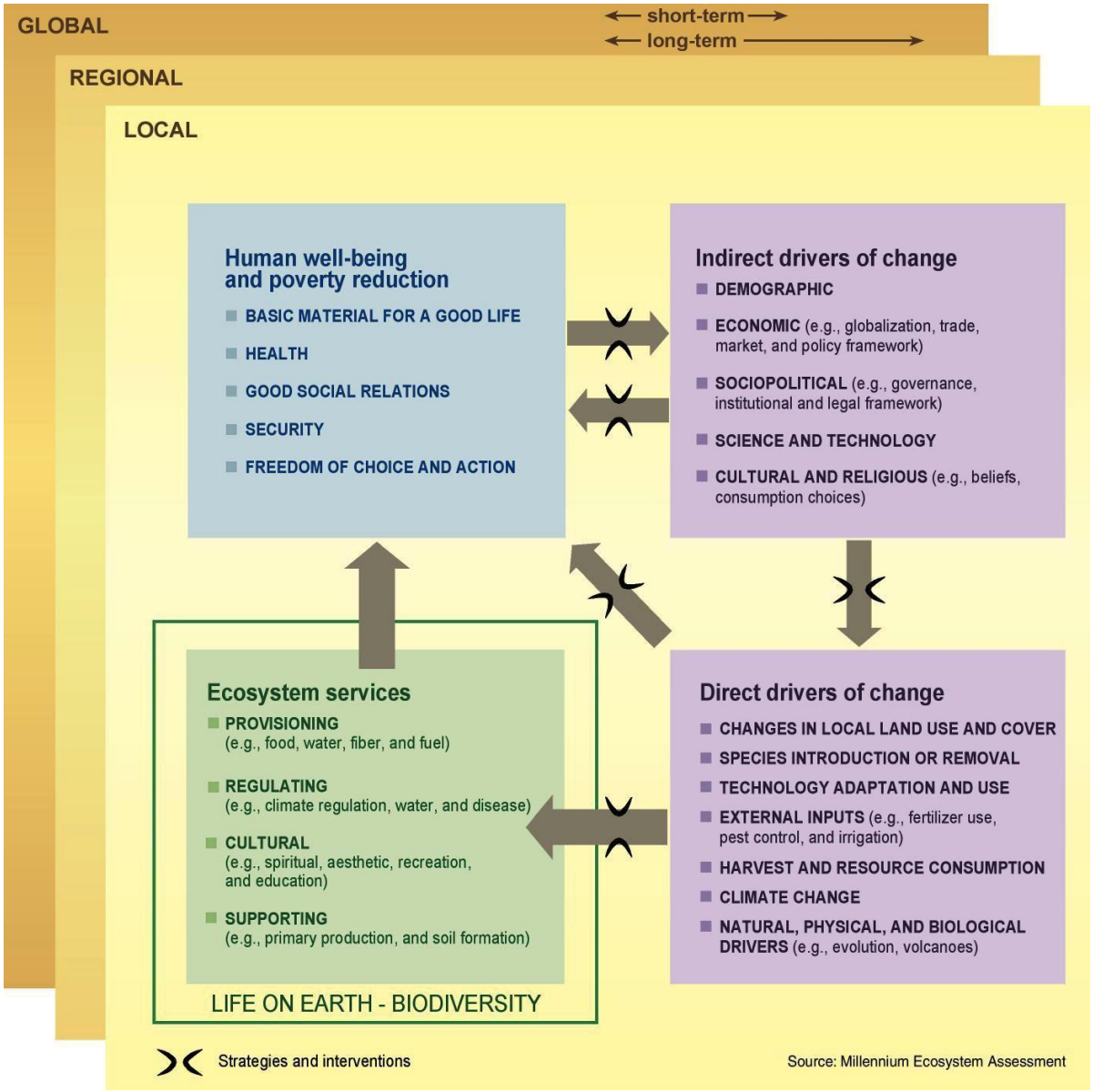
Annex 2 Examples of Conceptual Frameworks

Figure A – The conceptual framework of the Millennium Ecosystem Assessment



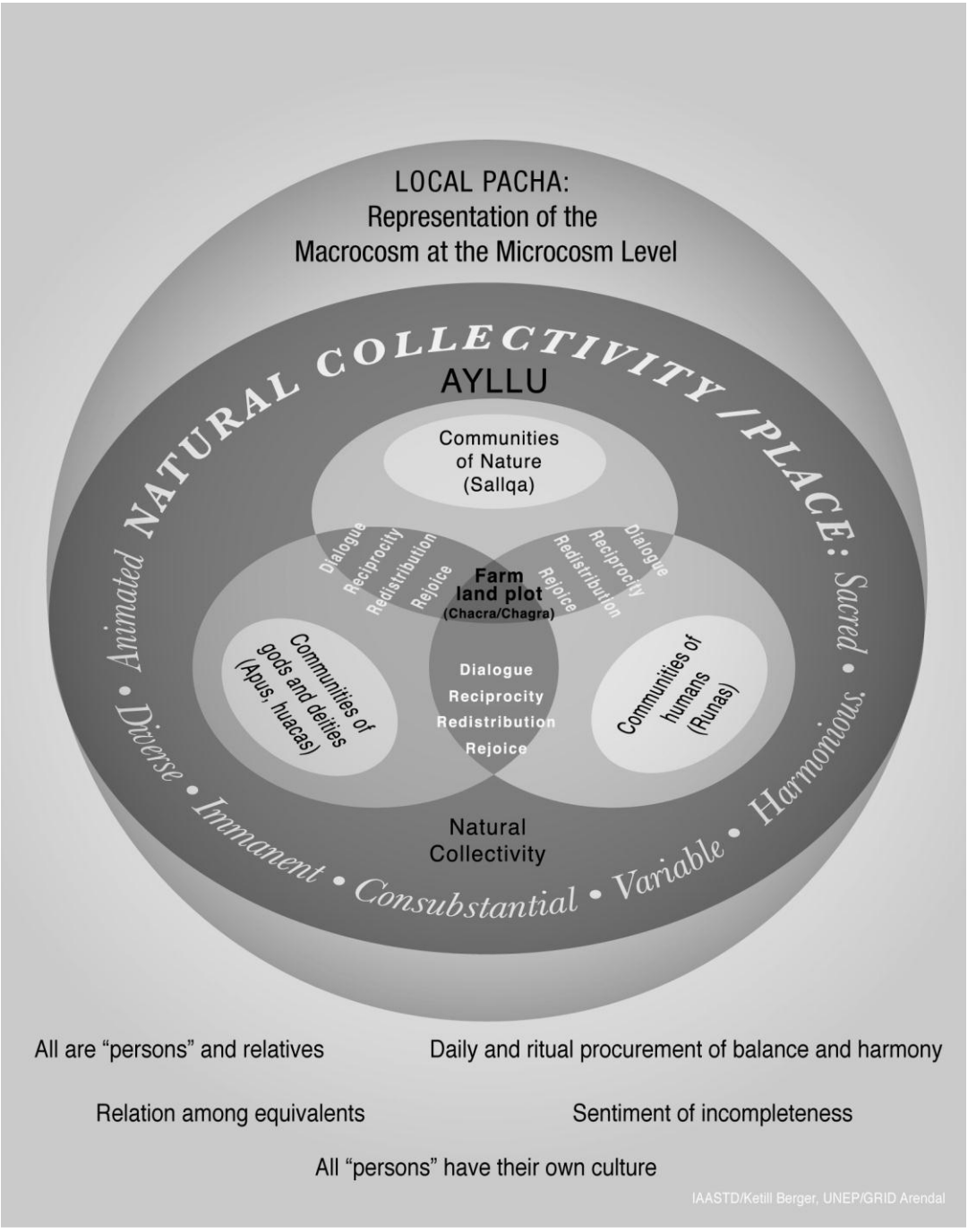
Source: Millennium Ecosystem Assessment (MA 2005)

Figure B – The Southern African Sub Global Assessment (SafMA)

The SafMA used the MA conceptual framework, and took into consideration three specific scales ranging from the local scale to the basin scale and finally to a region wide scale. Within these scales, governance and institutions were analysed at these scales as well as the different stakeholders involved in the access and use of the bundle of ecosystem services provided at each scale.

Source: SafMA

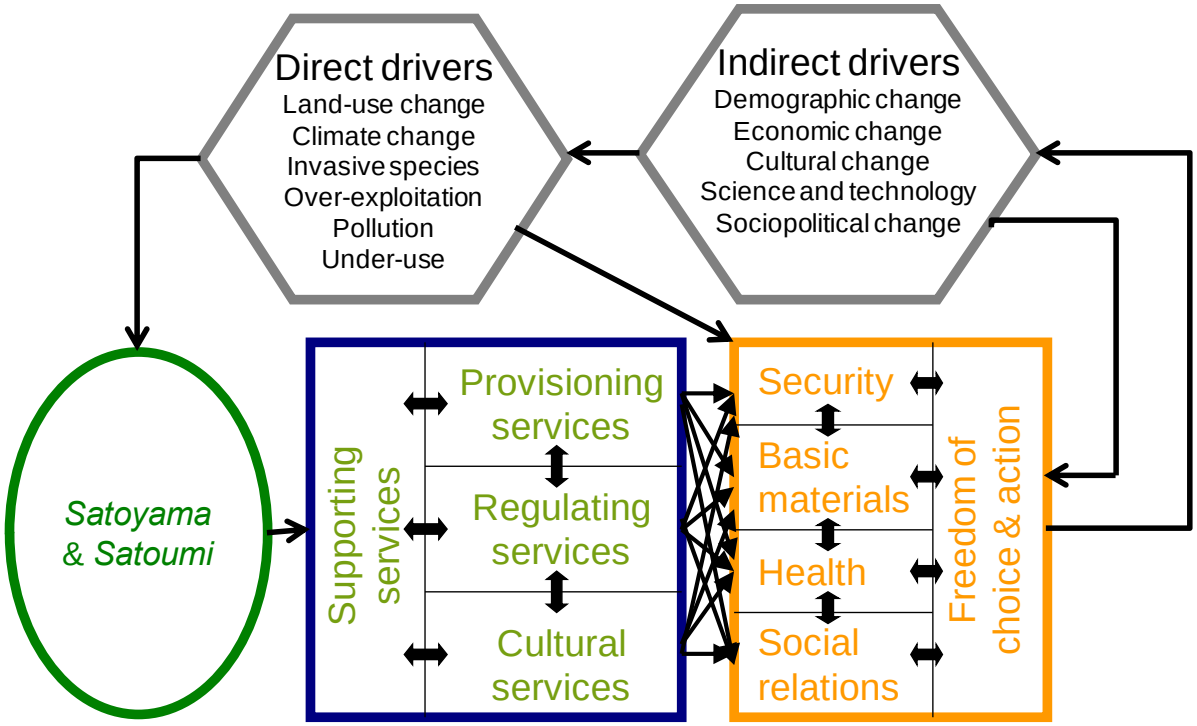
Figure C – An Andean Indigenous worldview conceptual framework



Source: Figure provided by Tirso Gonzales – IAASTD. (2009b) *Agriculture at a Crossroads. International Assessment of Agricultural Science and Technology for Development (IAASTD). Volume III. Latin America and the Caribbean*, Island Press, Washington, DC.

Figure D – The Japan ecosystem assessment (JSSA)

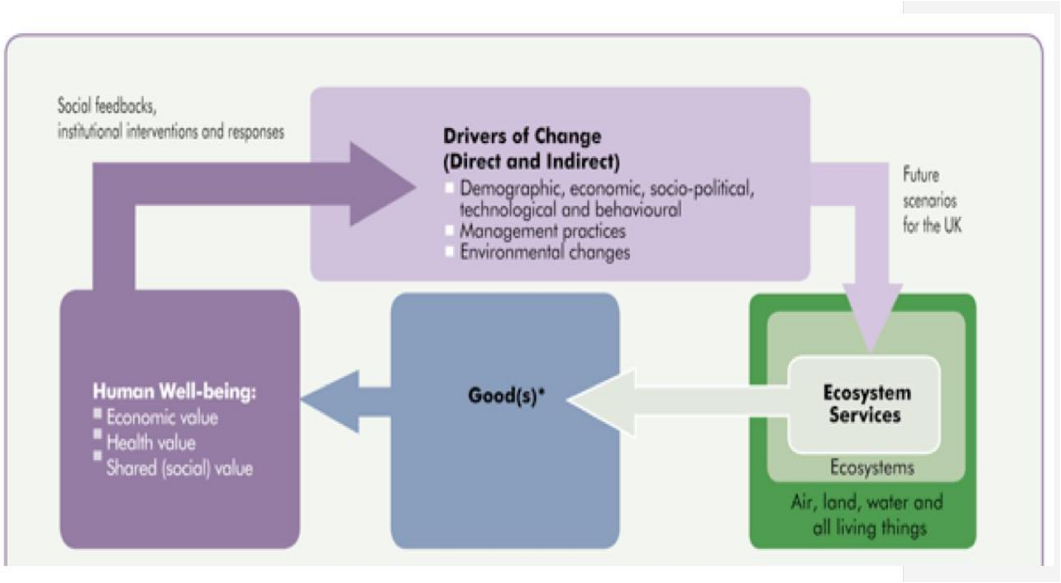
The Japan Satoyama –Satoumi Assessment (JSSA), developed a conceptual framework to obtain a better understanding of the key indirect and direct drivers of biodiversity and ecosystem services change across urban-rural landscapes called Satoyama in Japan. JSSA used the Millennium Ecosystem Assessment (MA) conceptual framework as a basis. As the focus of the assessment was on understanding landscape ecology and the mosaic of ecosystem types required to produce a bundle of ecosystem services for human wellbeing, the landscape module was explicitly introduced into the MA framework. The key variables of the overall conceptual framework were replicated at the prefecture level to allow easy scaling up and down of these variables to get an overall perspective at the national level (Duraiappah et.al 2012, JSSA 2011).



Source: Duraiappah et.al 2012

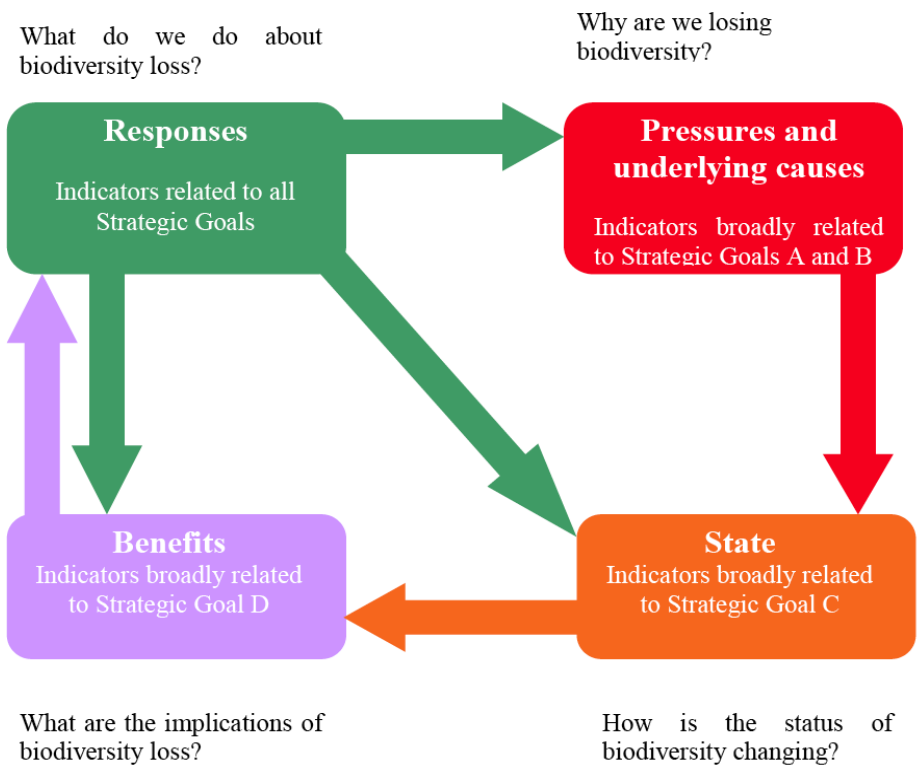
Figure E – The United Kingdom national ecosystem assessment (UKNEA)

The UK NEA developed a conceptual framework for an assessment of the state and value of the UK's natural environment and ecosystem services, and to foster better interdisciplinary cooperation between natural and social scientists to assist in strengthening policy making, to ensure effective management of the environment and ecosystem services in the future. The UK NEA included different value systems and the economic valuation of multiple services was attempted. The conceptual framework also accounted for the spatially explicit nature of economic values. This also allows understanding of the distributional trade-offs among ecosystem services impacts of land use change across space.



Source: (UKNEA 2012).

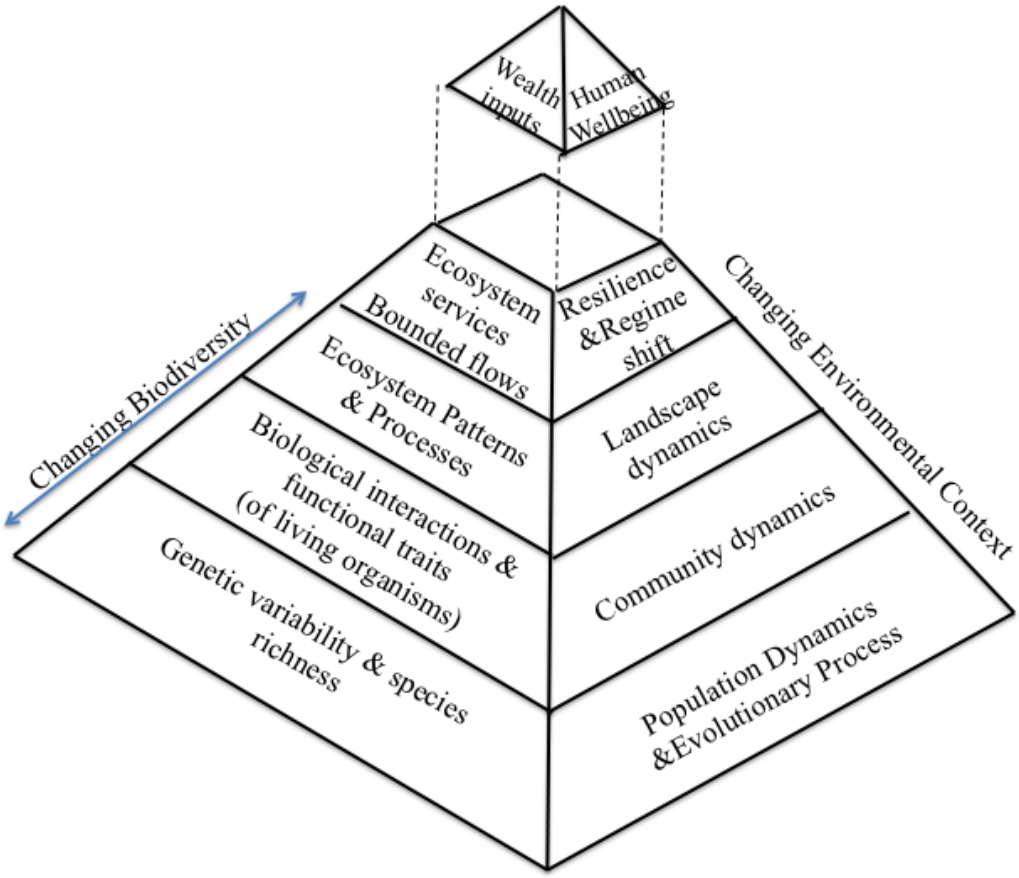
Figure F – Conceptual framework for the Aichi Targets of the Strategic Plan for Biodiversity 2011-2020 (UNEP/CBD/AHTEG-SP-Ind/1/3)



Annex 3 The pyramid of biodiversity as a source of social benefits

Genetic variability and species diversity form the basis of all biological interactions upon which functional traits of organisms are combined to define ecosystem patterns and processes. All ecosystem flows depend on the changing configuration of these, which in turn, and with the addition of other forms of capital, may benefit societies. Ecological change, however, occurs at all scales and is also driven by the environmental context that influences population dynamics, the behaviour of biological communities, the dynamics of landscapes and even evolutionary processes. Changes in any level of biodiversity ultimately demonstrates that ecosystem services are produced within certain functional thresholds and are subject to regime shifts which will affect social and economic well-being.

Different representations of the connections between biodiversity, ecosystem functioning and human wellbeing can be considered in the IPBES conceptual framework. Some conceptual frameworks suggest that the benefits of biodiversity and ecosystem functioning flow to humans through the provision of ecosystem goods and services. Other conceptual frameworks suggest there is an additional direct pathway from biodiversity and ecosystem functioning to human well being. This direct pathway is usually used to reflect intrinsic value, and in some cases cultural values associated with biodiversity and ecosystem functioning.



Annex 4 Background references

Asah, S.T., Blahna, D.J. and Ryan, C.M. 2012. Involving forest communities in identifying and constructing ecosystem services: Millennium assessment and place specificity. *Journal of Forestry*, 110, 149-156.

Ash, N et al. 2010. Ecosystems and Human Well-Being: A Manual for assessment practitioners (Island Press).

Brondizio, E. S., Ostrom, E. and Young, O. 2009. Connectivity and the Governance of Multilevel Socio-ecological Systems: The Role of Social Capital. *Annual Review of Environment and Resources* 34:253–78.

Carpenter, S.R., Mooney, H.A., Agard, J., Capistrano, D., DeFries, R.S., Diaz, S., Dietz, T., Duraiappah, A.K., Oteng-Yeboah, A., Pereira, H.M., Perrings, C., Reid, W.V., Sarukhan, J., Scholes, R.J. and Whyte, A. 2009. Science for managing ecosystem services: Beyond the Millennium Ecosystem Assessment. *Proceedings of the National Academy of Sciences of the United States of America*, 106, 1305-1312.

Cowling, R.M., Egoh, B., Knight, A.T., O'Farrell, P.J., Reyers, B., Rouget'll, M., Roux, D.J., Welz, A. and Wilhelm-Rechman, A. 2008. An operational model for mainstreaming ecosystem services for implementation. *Proceedings of the National Academy of Sciences of the United States of America*, 105, 9483-9488.

Daniel, T.C., Muhar, A., Arnberger, A., Aznar, O., Boyd, J.W., Chan, K.M.A., Costanza, R., Elmqvist, T., Flint, C.G., Gobster, P.H., Gret-Regamey, A., Lave, R., Muhar, S., Penker, M., Ribe, R.G., Schauppenlehner, T., Sikor, T., Soloviy, I., Spierenburg, M., Taczanowska, K., Tam, J. and von der Dunk, A. 2012. Contributions of cultural services to the ecosystem services agenda. *Proceedings of the National Academy of Sciences of the United States of America*, 109, 8812-8819.

Dasgupta P. and Duraiappah A. 2012. Well-being and Wealth, in UNU-IHDP and UNEP. *Inclusive Wealth Report 2012. Measuring progress toward sustainability.* Cambridge: Cambridge University Press.

Diaz, S., Quétier, F., Caceres, D.M., Trainor, S.F., Perez-Harguindeguy, N., Bret-Harte, M.S., Finegan, B., Pena-Claros, M. and Poorter, L. Linking functional diversity and social actor strategies in a framework for interdisciplinary analysis of nature's benefits to society. 2011. *Proceedings of the National Academy of Sciences of the United States of America*, 108, 895-902.

Duraiappah, A.K. 2011. Ecosystem services and human well-being: Do global findings make any sense? *Bioscience*, 61, 7-8.

Duraiappah, A.K, Nakamura, K., Takeuchi, K., Watanabe, M. and Nishi, M. 2012. *Satoyama and Satoumi: Socio ecological production landscapes of Japan.* Tokyo: United Nations University Press.

Duraiappah, A., and Roger, D. 2011. The Intergovernmental Plaform on Biodiversity and Ecosystem Services: opportunities for the social sciences. *Innovation: The European Journal of Social Science Research*.

Larigauderie, A., Prieur-Richard, A.-H., Mace, G.M., Lonsdale, M., Mooney, H.A., Brussaard, L., Cooper, D., Cramer, W., Daszak, P., Diaz, S., Duraiappah, A., Elmqvist, T., Faith, D.P., Jackson, L.E., Krug, C., Leadley, P.W., Le Prestre, P., Matsuda, H., Palmer, M., Perrings, C., Pulleman, M., Reyers, B., Rosa,

E.A., Scholes, R.J., Spehn, E., Turner, B.L., II and Yahara, T. 2012. Biodiversity and ecosystem services science for a sustainable planet: the DIVERSITAS vision for 2012-20. *Current Opinion in Environmental Sustainability*, 4, 101-105.

Luck, G.W., Harrington, R., Harrison, P.A., Kremen, C., Berry, P.M., Bugter, R., Dawson, T.P., de Bello, F., Diaz, S., Feld, C.K., Haslett, J.R., Hering, D., Kontogianni, A., Lavorel, S., Rounsevell, M., Samways, M.J., Sandin, L., Settele, J., Sykes, M.T., van den Hove, S., Vandewalle, M. and Zobel, M. 2009. Quantifying the Contribution of Organisms to the Provision of Ecosystem Services. *Bioscience*, 59, 223-235.

Mace, G.M., Norris, K. and Fitter, A.H. 2012. Biodiversity and ecosystem services: a multilayered relationship. *Trends in Ecology & Evolution*, 27, 19-26.

Millennium Ecosystem Assessment. 2005. Ecosystems and Human Well-being: Biodiversity Synthesis. World Resources Institute, Washington, DC.

Perrings, C., Duraiappah, A., Larigauderie, A. and Mooney, H.A. 2011. The biodiversity and ecosystem services science-policy interface. *Science*, 331, 1139-1140.

Reyers, B., O'Farrell, P.J., Cowling, R.M., Egoh, B.N., Le Maitre, D.C. and Vlok, J.H.J. 2009. Ecosystem services, land-cover change, and stakeholders: Finding a sustainable foothold for a semiarid biodiversity hotspot. *Ecology and Society*, 14.

Reyers B., Polasky, S., Tallis, H., Mooney, H.A. and Larigauderie, A. 2012. Finding common ground for biodiversity and ecosystem services. *BioScience*, 62:503-7.

UNEP/IPBES.MI/1/INF/12 (Nairobi 2011): Report of an international science workshop on assessments for an intergovernmental science-policy platform on biodiversity and ecosystem services, held in Tokyo from 25 to 29 July 2011.

UNEP/IPBES.MI/2/INF/10 (Panama 2012): Report of the scientific workshop on assessments for an intergovernmental science-policy platform on biodiversity and ecosystem services.

UNEP/IPBES.MI/1/INF/11 (Nairobi 2011): Considering the generation of knowledge function of IPBES: Recommendations from a meeting of scientific organizations interested in IPBES convened by ICSU, and hosted by UNESCO (Paris, France, 10 June 2011).

UNEP/IPBES.MI/2/INF/11 (Panama 2012): Report of the workshop on the theme "Considering further the intergovernmental science-policy platform on biodiversity and ecosystem services knowledge-generation function.

UKNEA 2012: The UK National Ecosystem Assessment. 2011. Synthesis of the Key Findings. UNEP-WCMC, Cambridge.

UNEP/CBD/AHTEG-SP-Ind/1/3. Report of the Ad Hoc Technical Expert Group on Indicators for the Strategic Plan for Biodiversity 2011-2020.

UNU-IHDP and UNEP 2012. The Inclusive Wealth report 2012, Cambridge University Press, Cambridge, United Kingdom.