# Belmont CRA: Scenarios of biodiversity and ecosystem services

## Biodiversity futures: projecting changes in biodiversity and ecosystem services for decision-making

### 1. Background and Rationale

Biodiversity scenarios, which are the outputs of the combination of socio-economic scenarios and models of impacts of global change on biodiversity, are essential tools for i) better understanding and synthesizing a broad range of observations, ii) providing information about future impacts of global changes such as land use change, invasive alien species, overexploitation, climate change or pollution, iii) providing decision support by developing adaptive management strategies and iv) evaluating the implications of alternative social-economic development pathways and policy options. One of the key objectives in using scenarios is to move away from the current reactive mode of decision making in which society responds to the degradation of biodiversity and ecosystem services in an uncoordinated, piecemeal approach, to a proactive mode in which society anticipates change and thereby minimizes adverse impacts and capitalizes on important opportunities through thoughtful adaptation and mitigation strategies.[1]

Rapid scientific progress is now being made in developing socio-economic scenarios and models of global change impacts on biodiversity and ecosystem services. Currently a major challenge in this field of research, is improving the relevance and value of these advances for decision makers at multiple scales. For example, post hoc analyses of global assessments of biodiversity and ecosystem services (e.g., Millennium Assessment, Global Biodiversity Outlook 3) indicate that the scientific impact of biodiversity scenario analyses in these reports has been high, but the degree of influence on policy, management and behavior has been low. Biodiversity scenarios have been a key component of forward-looking decision making in some instances at local and national levels (e.g., climate change impacts on forests and protected areas, management of fisheries) but these cover only a small range of sectors and cases. Several new advances in the science of biodiversity scenario development are needed to strengthen their relevance.

Efforts have recently been launched with the support of global environmenal change programs to help reinforce the coordination including the EU-COST Harmbio Action ("Harmonizing Biodiversity Models"), SESYNC themes (US Socio-Environmental Synthesis Center) and activities undertaken for the scenarios assessment of the Global Biodiversity Outlook 4 of the Convention on Biological Diversity. However, all of these actions involve only a small portion of the global scientific community working on biodiversity scenarios.

This Belmont Forum call encourages the development of new international networks of scientists and their institutions able to implement innovative research to underpin needed improvements in biodiversity scenario development. It is closely tied to the

[1] "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" (IPBES.MI/1/INF/12).

objectives of global research programs, assessment bodies, and multi-lateral environmental agreements (e.g. CBD, UNFCCC, IPBES). The relevance for the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) is particularly high due to timing of the IPBES work program[2], which focuses on assessing past, present and futures of biodiversity and ecosystem services.

Moreover this call addresses two key areas of the Belmont Challenge: i) assessments of risks, impacts and vulnerabilities, through regional and decadal analysis and prediction; and ii) inter- and transdisciplinary research[3] that takes account of coupled natural, social and economic systems. It also addresses the three integrated research themes of Future Earth (www.futureearth.info), with a particular focus on Dynamic Planet ("Observing, explaining, understanding, and projecting earth, environmental and societal system trends, drivers and processes and their interactions; anticipating global thresholds and risks").

The Belmont Forum plans opening a second call in 2017, on the same topic, for international collaborative research projects possibly in partnership with other funding bodies such as the European network BiodivERsA (www.biodiversa.org).

## 2. Objectives and Fundamental Questions

Work carried out in response to the present call should focus on networking activities and on the capacity building that supports research, but not on research activities themselves. The objective of the present call is to stimulate networking and capacity building for innovative research across social and natural science disciplines. Proposed activities must advance the formation of international networks of scientists, the co-design of research with relevant stakeholders, and the inter- and trans-disciplinary methodologies of scenario-building needed to address two key issues that have been identified as obstacles to greater use of biodiversity scenarios in decision-making:

- *Harmonizing and integrating development and application of biodiversity scenarios* ***across spatial scales of relevance to multiple types of decisions*** - Previous biodiversity scenarios have typically been highly scale specific. On the one hand, scenarios at global scales are difficult to translate into actions at sub-global scales, where many biodiversity relevant decisions are made. On the other hand, scenarios at regional scales often do not include global scale constraints and feedbacks (e.g., international trade, teleconnections, etc.) making them difficult to translate into international policy. Discussions with policy and management stakeholders indicate that this is one of the key barriers to greater integration of biodiversity scenarios into decision making at global and national scales.
- *Harmonizing and integrating consideration of* ***multiple dimensions of biodiversity and ecosystem services*** *in biodiversity scenarios* – Previous biodiversity scenarios have typically focused on a very limited number of dimensions of biodiversity and ecosystem services (e.g., global extinctions, loss of species compared to natural systems). However, decision-making

[2] http://www.ipbes.net/images/Overview%20IPBES%20work%20programme%20def.pdf

[3] Transdisciplinary research bring scientists together with stakeholders from outside academia (they can be decision makers, practitioners, actors from civil society and the private sector) in the co-design, co-production and co-delivery of knowledge, policy and practice.

processes often require information on a much broader range of dimensions – both because different decision-making processes may focus on different dimensions, and because some processes are purposely designed to address multiple dimensions (e.g. through multi-criteria trade-off analysis).

Projects should also pay particular attention to at least some of the following issues:

- *Coupling of socio-economic and biodiversity dynamics*. Fully integrated models of biodiversity and socio-economics (e.g., bio-economic models) can provide novel insights into the dynamics and long-term sustainability of socio-ecological systems.
- *Improvement of models of impacts on biodiversity*. Innovative work on genetic adaptation, rapid evolution, eco-evolutionary dynamics, and species interactions is encouraged because these are key shortcomings in the current generation of models.
- *Coupling models across gradients of human transformation in terrestrial, freshwater and marine systems*. Biodiversity scenarios often focus on one type of system (e.g., terrestrial vs. marine) or on one part of the gradient of human transformation (e.g., "natural" vs. agricultural vs. urban systems). Interdisciplinary research on the interactions between systems is essential for making scenarios more representative of systems that decision-makers deal with.
- *Estimation and communication of uncertainty*. Estimation of uncertainty can be based on a variety of methods including model validation using empirical observations, model validation using experimental simulations, and model-model comparison. Uncertainty also needs to be communicated in innovative, transparent ways to decision makers. Model validation will require close collaboration with observation systems.

Proposals may consider a wide range of approaches to socio-economic scenarios including extrapolations from current trends, probabilistic approaches, prospective approaches using stakeholder input to define contrasting scenarios, desirable or on the contrary feared endpoints, plausible socio-economic development pathways (e.g., IPCC SRES, MA scenarios), tests of specific policy or management actions, and "back-casting approaches" (i.e., working backwards from defined future endpoints).

## 3. Call process

This call for proposals encourages the formation of new international networks (one round selection, one to two-year projects, 2015-2016). Several networks already exist focusing on some elements of biodiversity scenarios (see introduction), but they primarily support North-North networking and only partially address the main objective of this call. As such, proposals for these networking projects will be evaluated against their pertinence to the objective of the call, the added value of the proposed networks compared to existing networks, and their ability to build scientific capacity in a broad range of countries.

The Belmont Forum will consider opening a second call for international research projects on the same topic in 2017 possibly in partnership with other funding bodies such as the European network BiodivERsA (note that the submission of a proposal to the first call will not be a requirement for submission to the second call).

Proposals to the present call may include activities dedicated to the preparation of research proposals to the second call. However all proposals to the present call must demonstrate that their project will deliver a significant contribution to advancing the formation of international networks of scientists, co-design of research questions with relevant stakeholders, co-building of inter and trans-disciplinary methodologies of scenario development needed to address the two key issues identified as obstacles to greater use of biodiversity scenarios in decision-making as mentioned above.

Funding should support researchers to cooperate in consortia consisting of partners from at least three of the participating countries.

Researchers from countries not represented by any of the Partner Organizations can participate in the research project at their own expense. Where appropriate, some Partner Organizations could also support capacity building in some developing countries.

All projects must include travel funding for participating in an end-term meeting held back-to-back with a scientifically relevant international conferences or events (potentially jointly coordinated by the CBD, Future Earth and IPBES) in 2016.

**4. Timeline**

Opening Date of the Call: 2nd May 2014

Closing Date for Submission of Proposals: 2nd July 2014, 11:59 PM Central European Summer Time (CEST)

**5. How to Apply**

All call documents and submission portal can be found on the Belmont Forum Grant Operations site (https://bfgo.org/).