# GBIC Scoping document

## *Global Biodiversity Informatics Conference, Copenhagen 2-4 July 2012*

## Introduction

The Global Biodiversity Informatics Conference (GBIC[1], Copenhagen, 2-4 July 2012) will bring together leading researchers, policy-makers, and representatives of major research institutions and initiatives in the domain of biodiversity and informatics.  For the purposes of this three-day sequence of workshops, GBIC's organizers have used an inclusive definition of 'biodiversity', which encompasses data on the levels of genetics, species, populations, communities and landscapes.

The goal of GBIC is to develop a long-term vision for how data on these different levels can be mobilized and made interoperable and computable for diverse uses, including research, policy support, education, and re-use by all stakeholders.

This document provides background for GBIC's participants to prepare for the workshops and to be active contributors to its outputs and the community consultation that will follow. The following timeline summarizes this process.

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| June 2012 | Pre-conference consultation with workshop participants |
| 2-4 July 2012 | GBIC, Copenhagen |
| July-August 2012 | Drafting of Global Biodiversity Informatics Outlook (GBIO) |
| September 2012 | Consultation on GBIO draft |
| October 2012 | Publication of GBIO |
| 2013 | Follow up meetings to promote take-up of GBIO recommendations among key stakeholders |

## Background

The Convention on Biological Diversity (CBD) defines 'biological diversity' (biodiversity) as "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."

The *Third Global Biodiversity Outlook* (GBO3) was published by the CBD in 2010 and concluded that the target agreed by the world's governments in 2002, "to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth", was not met. The loss of biodiversity is an issue of profound concern for its own sake, but biodiversity also underpins the functioning of

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[1] GBIC is jointly funded by the Global Biodiversity Information Facility (GBIF) and the Coordination of Research e-Infrastructure Activities Towards an International Virtual Environment for Biodiversity (CReATIVE-B), with additional support from the Aage V. Jensen Charity Foundation and the JRS Biodiversity Foundation. The organizing committee also includes representatives from the Encyclopedia of Life (EOL), Consortium for the Barcode of Life (CBOL) and Natural History Museum, London (NHM).

ecosystems, which provide a wide range of services to human societies. Its continued loss, therefore, has major implications for current and future human well-being.

Most future scenarios analysed for GBO3 projected continuing high levels of extinctions and loss of habitats throughout this century, with associated decline of some ecosystem services important to human well-being. Changes in the abundance and distribution of species may have serious consequences for human societies. The geographical distribution of species and vegetation types is projected to shift radically due to climate change, with many species' ranges being displaced by hundreds or thousands of kilometers towards the poles by the end of the 21st century.

GBO3 also concluded that there was a high risk of dramatic biodiversity loss and accompanying degradation of a broad range of ecosystem services if ecosystems were pushed beyond certain thresholds or tipping points. The poor would face the earliest and most severe impacts of such changes, but ultimately all societies and communities would suffer.
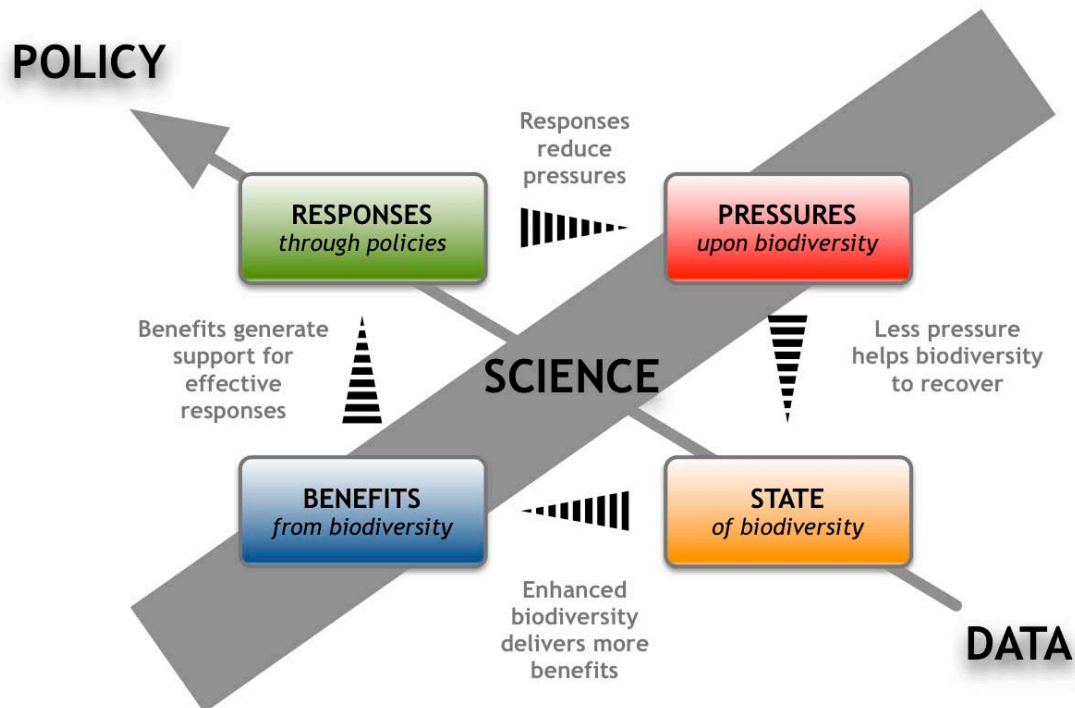
The conclusions of GBO3 prompted the adoption of a new set of targets under the Strategic Plan for Biodiversity 2011-2020.  These are known as the Aichi Biodiversity Targets and cover a wide range of direct and indirect threats to biodiversity and impacts on the functioning and prosperity of human society.  The world's governments and research community are faced with the challenge of developing appropriate and effective strategies to meet these targets.

The Executive Secretary of the CBD, Braulio Dias, has acknowledged that the lack of consistent baseline data and ongoing monitoring of biodiversity has been a "major obstacle towards improving the scientific evidence of the consequences of biodiversity loss" and that the Aichi Targets will only be achieved with great improvements in this evidence base[2].

An overall approach to meeting these challenges is set out in the following graphic, which indicates how data underpin science and how science in turn can underpin policy.  These connections reflect concerns identified by the CBD and other Multilateral Environmental Agreements (MEAs) around:

- State of biodiversity;
- Pressures upon biodiversity;
- Benefits from biodiversity;
- Responses through policy.

[2] http://www.cbd.int/doc/speech/2012/sp-2012-04-30-sbstta16-en.pdf

POLICY

Responses
reduce
pressures

RESPONSES
*through policies*

PRESSURES
*upon biodiversity*

Benefits generate
support for
effective
responses

SCIENCE

Less pressure
helps biodiversity
to recover

BENEFITS
*from biodiversity*

STATE
*of biodiversity*

Enhanced
biodiversity
delivers more
benefits

DATA

## The role of biodiversity informatics

Over the last quarter of a century, a large and diverse global community has addressed itself to the use of information technologies to model, share and analyse biodiversity data. This biodiversity informatics community has established networks that bring together data on the naming and classification of the world's species, the wealth of specimens held in the world's natural history collections, the observations and measurements of professional ecologists and citizen scientists, and knowledge of the biology and interactions of different organisms. At the same time, these networks have developed and promoted the necessary principles for data sharing, citation and re-use. Given these foundations, biodiversity informatics is well-positioned to help the global community respond effectively and appropriately to the great challenges it faces in understanding and protecting the diversity of life on earth.

Biodiversity informatics includes the application of computing technologies at all stages from capture of primary data to the use of these data in research and policy, including: development of suitable data models; tools and processes to support data capture; data storage and archival; data discovery and integration; modelling and visualization. In this context, 'data' can include: data entered by collections managers, field researchers and others; machine-generated measurements and data, particularly from remote sensing and molecular sequencing; multimedia and digitized versions of existing literature, notebooks and other historical materials. Biodiversity informatics aims to use these resources to establish a foundation of taxonomic, ecological and genomic information stored in digital form, and on these foundations, to develop new visualizations and analyses of existing information.

The purpose of these activities is to address biodiversity questions at scales ranging from local to global and from genes to ecosystems. Examples of such questions are:

- How many species exist in the world?
- What species occur at a given location, and how abundant is each?
- Can we map the communities, habitats and ecosystems found across a given region?
- Which threats do species and ecosystems face, and how are these threats affecting biodiversity and the services offered by these ecosystems to human society?
- Can we predict the effects of a global temperature rise of X degrees C on the geographic range of a given species?

Such questions involve not only biodiversity in the basic sense but related domains such as ecology, geographic distributions of environmental parameters, global climate models, and socio-economic data. GBIC needs to consider how all of these linkages may be achieved.

## Developing a vision

Many workshops and symposia have considered various aspects of these requirements, and have sought to encourage relevant data sharing and exchange.

In June 2009, the e-Biosphere 09 Conference in London brought together leading initiatives and members of the biodiversity informatics communities to review strategies and goals and to pursue greater data integration and interoperability. It reflected the breadth of existing biodiversity informatics activity and its discussions addressed key themes, such as:

- Biodiversity research, including:
    - systematic and evolutionary biology
    - taxonomy
    - identification
- Status of and benefits from biodiversity, including:
    - conservation
    - agriculture
    - fisheries
    - forestry
    - industry
- Threats to biodiversity, including:
    - habitat loss, degradation and fragmentation
    - pollution
    - over-exploitation
    - invasive alien species
    - climate change

However, the biodiversity informatics community still lacks a coherent shared vision to focus its activity. GBIC will pave the way to producing such a vision. Its principal deliverable, the **Global Biodiversity Informatics Outlook (GBIO)**, will set out the most critical high-level goals, and provide a roadmap for achieving them.

In developing such a vision and establishing priorities, GBIC and its outcomes should both assist strategies for research funding agencies in coming years, and provide a valuable contribution to future editions of the Global Biodiversity Outlook (GBO) produced by the CBD.

The GBIO document resulting from the GBIC workshop deliberations will include a practical roadmap to guide and prioritize implementation over the next 5-10 years, by focussing on how informatics can respond to key questions and opportunities, such as:

- What is the status of biodiversity on earth?
- How is biodiversity changing through time and space, and how do genetic and ecosystem diversity impact each other?
- What are the dynamics of and the main threats to biodiversity?
- How can scientific evidence around biodiversity best be delivered and presented to support the needs of policymakers?
- What are the crucial foreseen research breakthroughs (from genomics, taxonomy, ecology etc.) which may help to address key questions?
- What are the new infrastructure challenges arising from expected data growth and new categories of data?
- How can we increase access to and use of data?
- What are the social/societal/cultural changes required to meet these goals?

## GBIC

The participants invited to attend the GBIC in Copenhagen have been selected for their roles as thought-leaders and representatives of biodiversity science, computer science and related policy initiatives.  To take maximum advantage of their diverse perspectives, the participants will be divided into three parallel workshop groups, each led by a cross-disciplinary team of co-chairs who will also act as co-authors of GBIO.  This smaller-group format will increase opportunities for individual input and to improve development of a shared perspective.

GBIC will involve these participants at three critical stages in the process of developing the GBIO:

1. **Pre-conference questionnaire**: a short online questionnaire is circulated with this document.
2. **Conference workshop discussions**: three days of parallel facilitated workshops aimed at developing a preliminary draft of the GBIO and following a well-defined agenda covering the following broad themes:
   - **Biodiversity Science** - How can informatics and data management support better understanding of biodiversity and support basic and applied biodiversity research?
   - **Strategic Plan on Biodiversity** – How could informatics and data management support the information needs and global response to the

Aichi Targets established under the Strategic Plan on Biodiversity 2011-2020?[3]

- **Establishing the Vision – Towards a Biodiversity Informatics Roadmap** – For each of the areas identified in the *Biodiversity Science* and *Strategic Plan on Biodiversity* discussions, what are the recommended actions in relation to data, informatics and practices within science and society?

3. **Post-conference consultation on GBIO drafts**: opportunities via email to respond to drafts of the GBIO as it is further developed.
    - The 12 workshop co-chairs and representatives of GBIC's sponsor organizations will integrate the ideas generated at the Copenhagen meeting into a draft GBIO document by late summer 2012. GBIC participants will be given an opportunity to comment on the draft.
    - The document will then be revised, made available for public comment, and revised before final release in early October 2012.
    - An Executive Summary will be prepared and distributed to government agencies, NGOs, and other stakeholders in policy arenas.
    - A short version of GBIO will also be prepared for publication in a peer-reviewed journal.
    - Follow up meetings will be scheduled during 2013 to promote take-up of GBIO's recommendations among key stakeholders.

See timeline at beginning of this document.

**Core background reading**
GBIC participants are encouraged to familiarize themselves with the following key documents. These and other documents that may be useful in support of the workshop discussions are provided on the conference website at http://www.gbic2012.org/documents.html/.

1. *Global Biodiversity Outlook 3,* published by the CBD in 2010 http://www.cbd.int/gbo3/

2. The technical rationale for each of the 20 Aichi Targets, extracted from CBD document *UNEP/CBD/SBSTTA/15/3* http://www.cbd.int/sbstta15/review

3. Report from the Group on Earth Observations - Biodiversity Observation Network (GEO-BON) entitled *Adequacy of Biodiversity Observation Systems to support the CBD 2020 Targets* (accessible at http://www.earthobservations.org/geobon.shtml)

4. Report of the 13th meeting of the Genomics Standards Consortium, Shenzhen, China, 4-7 March 2012

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[3] http://www.cbd.int/sp/

http://standardsingenomics.org/index.php/sigen/article/view/sigs.2876184/741

5. Statement by CBD Executive Secretary Braulio Dias at the opening of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), 30 April 2012 http://www.cbd.int/doc/speech/2012/sp-2012-04-30-sbstta16-en.pdf