Monitoring biodiversity change

GEO Data Technology Workshop
4. Data and Information Needs and Challenges for GEO Work Programme Activities

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23.04.19 / Vienna, Austria
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The biodiversity crisis

Has the Earth’s sixth mass extinction already arrived?

World on track to lose two-thirds of wild animals by 2020, major report warns

Living Planet Index shows vertebrate populations are set to decline by 67% on 1970 levels unless urgent action is taken to reduce humanity’s impact
Commitment for Biodiversity: Increasing Demand for **Relevant** and **Accessible** Biodiversity Data
One challenge of biodiversity change: Knowledge gaps

Spatial gaps

Living Planet Index Populations

Temporal gaps

Temporal trends in biodiversity indicators

Taxonomic gaps

Distribution of sampling sites for soil bacteria, macrofauna and fungi


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The Group on Earth Observations Biodiversity Observation Network

**Mission:** Improve the **acquisition**, **coordination** and **delivery** of biodiversity observations and related services to users including decision makers and the scientific community.

**Vision:** A **global biodiversity observation network** that contributes to effective **management policies** for the world’s biodiversity and ecosystem services.
GEO BON in numbers

8 Working Groups, 8 Observation Networks and 4 Task Forces
672 registered members from 81 countries and 461 institutions

- Volunteer-based
- Small secretariat
- Biodiversity monitoring
GEO BON Core Activities

1. Developing the Essential Biodiversity Variables
2. Developing the Biodiversity Observation Networks
3. Producing policy relevant outputs

Data, Information Needs and Challenges
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Data, Information Needs and Challenges
Developing the Essential Biodiversity Variables

**EBVs: Minimum** set of measurements, *complementary* to one another, that can capture major dimensions of biodiversity *change*.

**EBVs are:**

- Biological and policy relevant
- Sensitive to change
- Biological state variables
- Generalizable across realms
- Scalable
- Feasible

**Examples:**

- **Genetic Composition**
  - e.g. Allelic diversity
- **Species Populations**
  - e.g. Species distribution
- **Species Traits**
  - e.g. Body size, phenology
- **Community Composition**
  - e.g. Species interactions
- **Ecosystem Structure**
  - e.g. Ecosystem extent
- **Ecosystem Functions**
  - e.g. Disturbance
Developing the Essential Biodiversity Variables

**EBVs**: Minimum set of measurements, complementary to one another, that can capture major dimensions of biodiversity change.
Developing the Essential Biodiversity Variables – EBV Data portal

EBV catalogue and visualizer

Changes in local terrestrial diversity (PREDICTS)
Desc: Changes in average local terrestrial diversity for each grid cell caused by land-use, land-use intensity, and human population density, estimated by the PREDICTS model (Prusil et al., 2018). It reports number of species in each cell relative to a pristine baseline (percentage) and changes in species number (percentage) relative to 1900. Uses the LLIT 2.0 projections for land-use and the PREDICTS database with 767 studies from over 22,000 sites on over 51,000 species from all taxa.

Plot Options

Country  2001  2012  sum

Calculate
GEO BON Core Activities

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Data, Information Needs and Challenges
Developing the Biodiversity Observation Networks

BONs: Contribute to the collection and analysis of harmonised biodiversity observations, the development of integrated and interoperable biodiversity monitoring programs, the development of data standards.

Thematic BONs
- Marine BON (MBON)
- Freshwater BON (FWBON)
- Soil BON

BON Endorsement process

National and Regional BONs
Developing the Biodiversity Observation Networks

**ENGAGEMENT**
1. Create an Authorizing Environment
2. Establish design and implementation team

**ASSESSMENT**
3. User needs assessment and choice of regional assessment units
4. Inventory of data, tools and platforms

**DESIGN**
5. Focal Ecosystems, Conceptual Models, EBVs and Primary Observations
6. Data collection Methods
7. Sampling Framework
8. Data management, Analysis and Reporting

**IMPLEMENTATION**

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Navarro et al., (2017) Current Opinion in Environmental Sustainability
Developing the Biodiversity Observation Networks

BON IN A BOX

Improving Capacity for Biodiversity Conservation

BON In a Box (Biodiversity Observation Network in a Box) is a customizable and continually updated toolkit. It provides access to the latest biodiversity observation design, data collection protocols, and data management, analysis and reporting tools. It serves as a technology transfer and capacity building mechanism to ensure you have access to the best and most up-to-date tools and technologies for building a biodiversity observation system.

BON in a Box connects tools users and developers to promote ongoing tool improvements and the development of new tools. The goal is to lower the threshold for the start-up or enhancement of biodiversity observation networks and support more effective conservation actions through the improved supply of quality biodiversity data. BON In a Box is a Group on Earth Observations - Biodiversity Observation Network Initiative and the development of this Latin American regional version was led by Colombia’s Alexander von Humboldt Institute.
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Data, Information Needs and Challenges
Producing policy relevant outputs

EBV based indicators: Integrating in situ and remote sensing observations for open access & real-time indicators

- **Species Habitat Indices (SHI)**
- **Biodiversity Habitat Index (BHI)**
- **Species Protection Index (SPI)**
- **Protected Area Representativeness & Connectedness (PARC) Indices**
- **Global Ecosystem Restoration Index (GERI)**
- **Species Status Information Index (SSI)**

**Essential Biodiversity Variables (EBVs):**
- Species distributions
- Ecosystem extent and fragmentation
- Taxonomic diversity

**Global Biodiversity Change Indicators**

- [#GEOdatatech](#GEOdatatech)
Producing policy relevant outputs

Candidate EBV classes for the SUSTAINABLE DEVELOPMENT GOALS

- Genetic Composition
- Ecosystem Structure
- Ecosystem Functions

Species Populations

Target 14.2
Prototype product to integrate EO, OBIS data, local surveys

MBON Marine Biodiversity Observation Network

OBIS OCEAN BIOGEOGRAPHIC INFORMATION SYSTEM

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Species Traits
Ecosystem Structure
Ecosystem Functions

Species Populations
Ecosystem Structure
Ecosystem Functions

Species Populations
Ecosystem Structure
Ecosystem Functions

Species Populations
Ecosystem Structure
Ecosystem Functions

14 LIFE BELOW WATER
Producing policy relevant outputs: integrating human health and biodiversity monitoring

The example of the Nipah virus

Forecasting vector distribution

Species Traits
- e.g. Phenology, Reproduction

Community Composition
- e.g. Species interactions

Ecosystem Structure
- e.g. Ecosystem extent, Fragmentation

Source: Daszak et al. 2013, PNAS
Thank you!

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THE BEIJING 2018 CALL
ON BIODIVERSITY OBSERVATIONS
FOR POST-2020 DECISION-MAKING

We, the Group on Earth Observation Biodiversity Observation Network (GEO BON), have gathered scientists and practitioners from over two dozen countries, on the occasion of our 10th anniversary, in Beijing, to discuss the future of biodiversity monitoring globally. We call on the Parties to the CBD to step up efforts on the collection, analysis and delivery of biodiversity observations.

Despite significant progress over the last decade in gathering biodiversity observations and on the development of indicators, significant gaps and barriers remain. At the time of the mid-term assessment of progress towards the Aichi biodiversity targets for 2020, uncertainties remained in the evaluation of most of the targets. Repeated, long-term biodiversity observations are crucial to detect changes in biodiversity and ecosystem services and for assessing current and future policy options through scenarios and models. Without a significant increase in global investment in biodiversity monitoring it is likely that existing observation gaps will continue to impair not only the assessment of policy goals but also their effective implementation.

To achieve a step change in action, we propose that the post-2020 targets explicitly include development of operational and sustainable national biodiversity observation networks. These networks would collect observations on multiple Essential Biodiversity Variables to inform the development, implementation and evaluation of national biodiversity policies. Such nationally encompassing monitoring systems would collect in situ and remote sensing data; aggregate and publish the data into public repositories using existing data standards; estimate or model Essential Biodiversity Variables; report on indicators relevant to national biodiversity strategy goals; and greatly facilitate policy implementation at a critical time for the world’s biodiversity.

Beijing, 13 July 2018