GROUP ON EARTH OBSERVATIONS

POLICY BRIEF 2

A global monitoring scheme

The Convention on Biological Diversity's (CBD's) Strategic Plan for Biodiversity 2011–2020 envisages that "by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people". Although 193 parties have adopted these goals, there is little organised or coherent infrastructure in place to collect the biodiversity information necessary to monitor progress towards the objectives of the CBD Strategic Plan (http://www.cbd.int/sp/targets/). International conservation policy requires biodiversity data to be up-to-date, reliable, comparable among sites, relevant, and understandable, as is becoming obvious from the work plan adopted by the Intergovernmental Panel for Biodiversity and Ecosystem Services (IPBES: www.ipbes.net/; http://tinyurl.com/ohdnknq) and from recent assessments of the international biodiversity targets. Coordinated large-scale biodiversity monitoring, linked to environmental data, is needed for a comprehensive Global Observation Network that can meet the five strategic goals of the Strategic Plan for Biodiversity and its 20 accompanying Aichi Targets for 2020. This is the main motivation for the development of the Global Earth Observation System of Systems (GEOSS). Considering this, the Biodiversity Observation Network of the Group of Earth Observation (GEO BON) is focused on serving both IPBES and the CBD to ensure improved and enhanced biodiversity observations are available to support assessments and targets.

In close cooperation, colleagues from GEO BON and the EU project EU BON have identified nine requirements that are important for the successful implementation of a global terrestrial species monitoring scheme.

EU BON

1. Designing and implementing an integrated information chain from monitoring to policy reporting

A global species monitoring program will coordinate and integrate global data collection and metadata provision, survey design (both sampling strategies and field protocols), data storage and access, computation and modelling of biodiversity indicators, and dissemination of policy-relevant reports in a comprehensive framework (Fig. 1).

2. Building capacity to create a comprehensive spatial monitoring program

Current monitoring efforts are very unevenly distributed geographically and are biased towards particular taxa, habitats and biomes. This mismatch between where biodiversity is most abundant and diverse (the tropical regions) and where expertise and capacity is concentrated (the temperate zones) leaves research and policy largely uninformed about the status of and trends in a large proportion of biodiversity. A truly global monitoring scheme will rely on statistically sound sampling frameworks, with contributions from both professionals and citizen scientists.

3. Implementing minimum data standards to capture Essential Biodiversity Variables (EBVs)

Primary (raw) occurrence records, such as those stored in the Global Biodiversity Information Facility (GBIF) and similar national Biodiversity Information Facilities, are currently insufficient for the development of EBVs, as EBVs from only two classes (Species Populations and Community Composition) can be informed by GBIF data.

4. Implementing common monitoring protocols

The adoption of common observation and monitoring protocols for new programs, together with assimilating existing ones, would foster data integration, data interoperability and indicator extraction. A short list of protocols needs to be developed by examining the feasibility and complementarity of what is currently implemented.

5. Developing and optimizing semantics and ontologies for data interoperability

While adoption of common protocols would greatly increase the usability of biodiversity data, it is not always practical for existing long-term monitoring programs to change established methodologies, as long time-series using common methodologies are invaluable for detecting accurate trends in biodiversity status. Techniques for harmonizing data collected with disparate methodologies exist, but sufficiently structured, machine-readable metadata are critical to this integration, as well as to support quality evaluation routines.

6. Integrating emerging technologies (monitoring, data management and analysis)

Technologies such as remote sensing, camera trap networks, soundscaping, drones, copter-based transects, phenocams, radio tracking, and automated environmental DNA (eDNA) can help automate the colleaction of observation data, decrease long-term monitoring costs, increase the frequency of assessments, and extend coverage to remote places. Although each comes at a cost and has its own strengths and weaknesses, adoption of such tools is imperative to fill the huge gaps in monitor coverage.

7. Coordinating diverse but complementary local nodes

A global species monitoring network needs to offer a platform for dialogue between existing monitoring programs through fostering the coordination of efforts by regional and national biodiversity observa tion networks (e.g. Arctic BON, Asia–Pacific BON, and ECOSCOPE, the national French biodiversity observation network). It is important that these networks explore interoperability and identify opportunities for integration that will allow a global analysis of the state of and trends in biodiversity to detect globally relevant patterns.

8. Providing a common modelling framework

To develop global-scale models with greater predictive power, GEO BON advocates a common modelling framework. Traditional modelling approaches are insufficient for modelling changes in ecological systems reliably. Non-linear dynamics, 'tipping point' scenarios and complex feedback loops are currently the biggest limitations for most modelling approaches seeking to identify critical changes in biodiversity composition and extrapolating conditions in time and space beyond the boundaries of current knowledge.

9. Facilitating and securing funding

A solid and long-term financial base is critical for maintaining the structures and institutions that generate, curate and interpret biodiversity data so that they are functional and effective over time. Policymakers and stakeholders must recognize that biodiversity data collection, storage and processing requires adequate funding.

GEO GROUP ON EARTH OBSERVATIONS

Contacts

Working group leads
Dirk S. Schmeller

Department of Conservation Biology, Helmholtz Centre for Environmental Research – UFZ, Leipzig, Germany

dirk.schmeller@ufz.de

+49 162 67 69 238

Richard Gregory

RSPB: Department of Conservation Science, UK

richard.gregory@rspb.org.uk

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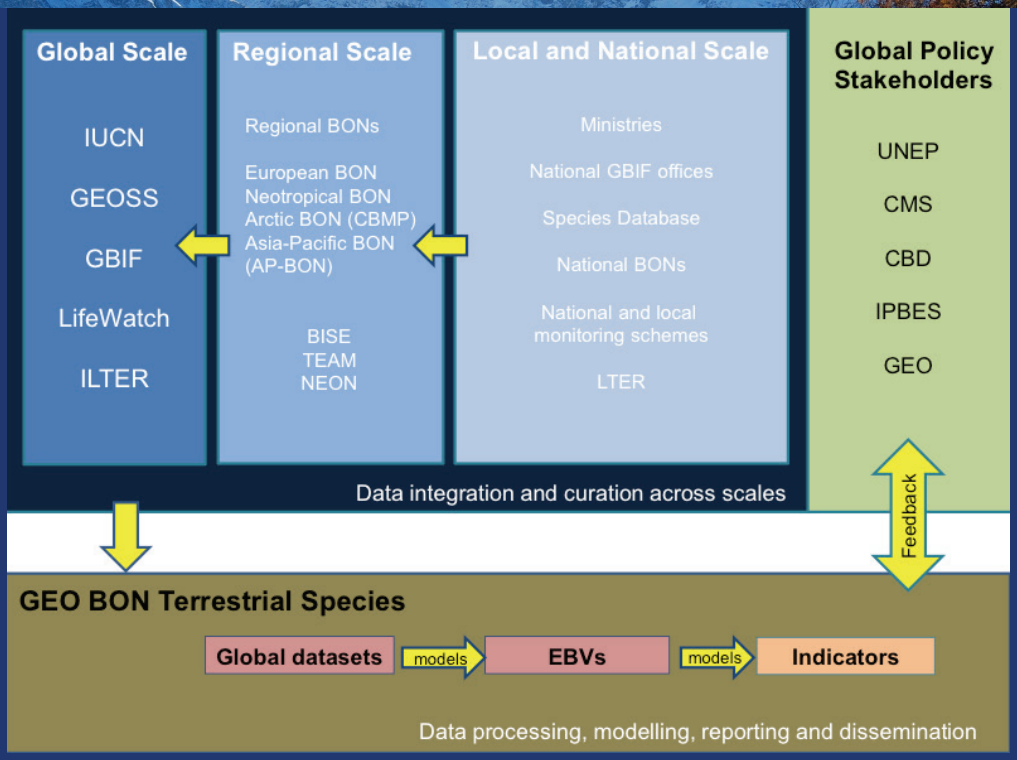

Figure 1. The steps from 'local and national' to 'regional' to 'global' scale biodiversity monitoring. Data from the different scales need to be integrated and curated across scales. These global datasets will be processed by GEO BON, modelled, and used to inform Essential Biodiversity Variables (EBVs) and key indicators. The resulting reports will then be disseminated to important stakeholders ona global scale.

Outlook

The nine requirements identified here represent a pathway for achieving effective species monitoring on a global scale: our past experience has identified the main pitfalls targeted by each of these requirements. All in all, we believe that some organization and political willingness should allow the best use to be made of the already large but un-coordinated biodiversity monitoring effort, and the GEO BON Working group Terrestrial Species calls for improved coordination and policy support at all scales. Considering these nine requirements, GEO BON is initiating the development of the BON in a Box (Biodiversity Observing Network in a Box) program. BON in a Box is a capacity building toolkit for lowering the threshold for nations and regions to establish or enhance existing biodiversity observing networks. It will serve as a technology transfer mechanism and interoperable platform by which nations and regions can adopt similar platforms, monitoring protocols, the Essential Biodiversity Variables, and related data standards, data management and analysis tools. This program is being initiated in Latin America in 2015.