Update on the GEO BON Activities
AP BON Meeting 23.10.18

Laetitia M. Navarro, PhD

GEO BON Executive Secretary

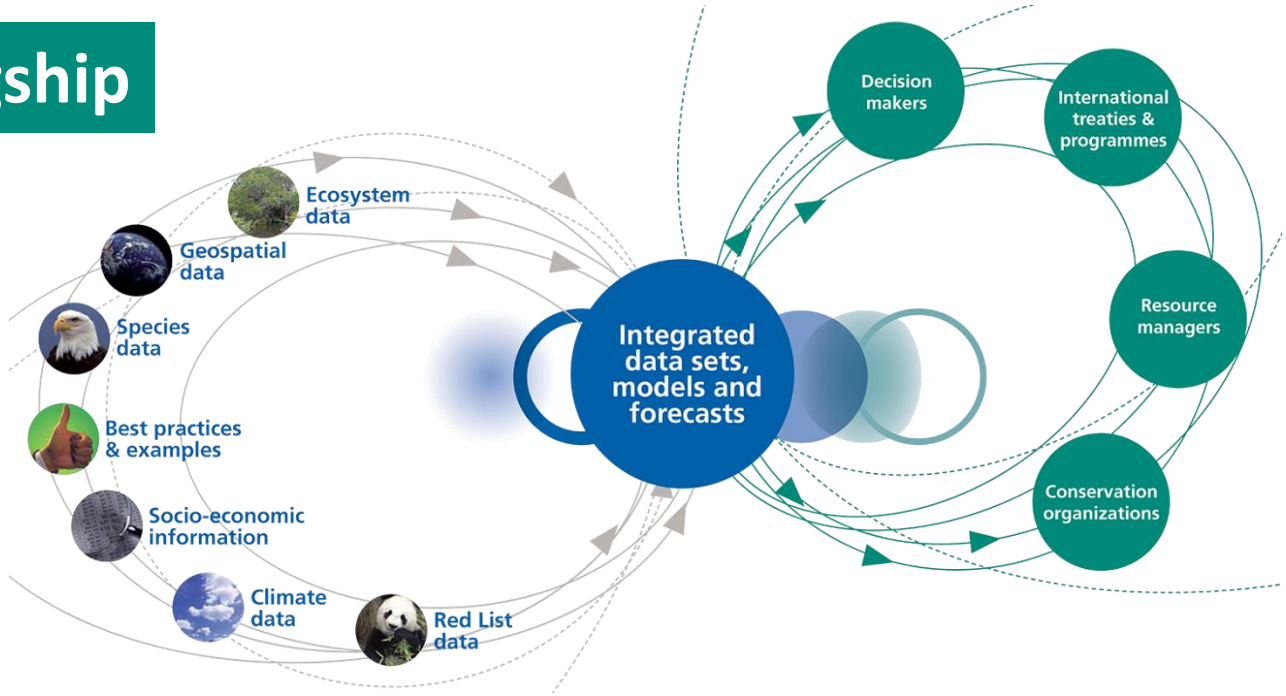
German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig

GEO BON in a nutshell

Mission

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

GEO Flagship



Vision

A **global biodiversity observation network** that contributes to effective **management policies** for the world's biodiversity and ecosystem services.

GEO BON

A Global Partnership

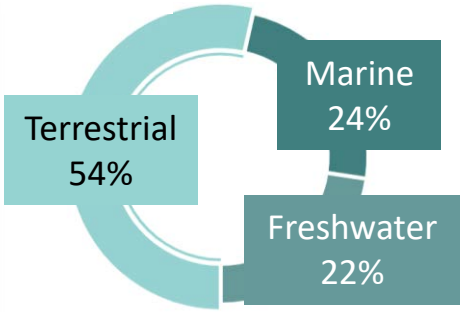
The network in numbers

± 500 members in 66 countries and 341 Institutes

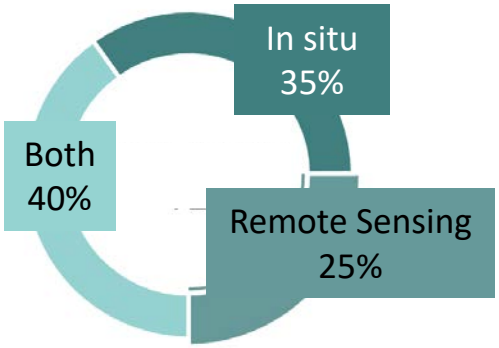
The network in numbers

± 500 members in 66 countries and 341 Institutes

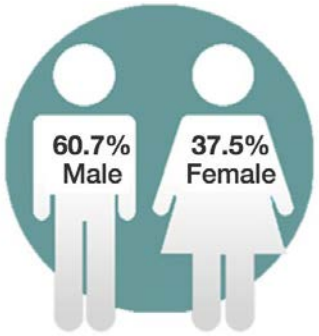
Realm

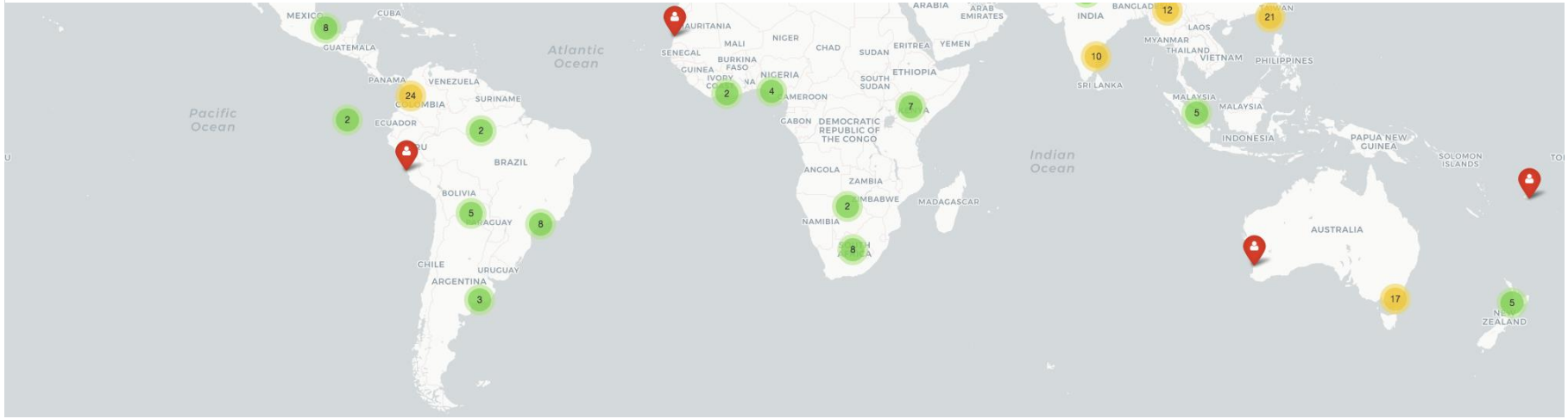


Earth Observations



Gender balance





GEO BON core focus

Developing the Essential Biodiversity Variables

Developing the Biodiversity Observation Networks

Producing Policy Relevant Outputs

Some Milestones for 2018

Some Milestones for 2018

Available online at www.sciencedirect.com
ScienceDirect
Current Opinion in Environmental Sustainability

Monitoring biodiversity change through effective global coordination

Laetitia M Navarro[1,2], Néstor Fernández[1,2], Carlos Guerra[1,2], Rob Guralnick[3], W Daniel Kissling[4], Maria Cecilia Londoño[5], Frank Muller-Karger[6], Eren Turak[7,8], Patricia Balvanera[9], Mark J Costello[10], Aurelie Delavaud[11], GY El Serafy[12,13], Simon Ferrier[14], Ilse Geijzendorffer[15], Gary N Geller[16,17], Walter Jetz[18,19], Eun-Shik Kim[20], HyeJin Kim[1,2], Corinne S Martin[21], Melodie A McGeoch[22], Tuyeni H Mwampamba[9], Jeanne L Nel[23,24], Emily Nicholson[25], Nathalie Pettorelli[26], Michael E Schaepman[27], Andrew Skidmore[28,29], Isabel Sousa Pinto[30], Sheila Vergara[31], Petteri Vihervaara[32], Haigen Xu[33], Tetsukazu Yahara[34], Mike Gill[35] and Henrique M Pereira[1,2,36]

frontiers in Marine Science
REVIEW

Advancing Marine Biological Observations and Data Requirem of the Complementary Essential Ocean Variables (EOVs) and Esse Biodiversity Variables (EBVs) Frameworks

OPEN ACCESS

Frank E. Muller-Karger[1*], Patricia Miloslavich[2,3], Nicholas J. Bax[2,4], Samantha Si, Mark J. Costello[5], Isabel Sousa Pinto[7], Gabrielle Canonico[8], Woody Turner[9], Michael Gill[10], Enrique Montes[1], Benjamin D. Best[11], Jay Pearlman[12], Patrick Ha, Daniel Dunn[13], Abigail Benson[14], Corinno S. Martin[15], Lauren V. Weatherdon[16], Ward Appeltans[17], Pieter Provoost[18], Eduardo Klein[1,19], Christopher R. Kelble[17], Robert J. Miller[18], Francisco P. Chavez[20], Katrin Iken[20], Sanae Chiba[16,21], David C, Laetitia M. Navarro[22,23], Henrique M. Pereira[23,24,25], Valerie Allain[26], Sonia Batten[2], Lisandro Benedetti-Cecchi[28], J. Emmett Duffy[29], Raphael M. Kudela[30], Lisa-Maria Rebelo[31], Yunne Shin[32] and Gary Geller[33]

Edited by: Johannes Karstensen, GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel, Germany
Reviewed by: Emmanuel David, Fisheries and Oceans Canada, Canada; Maciej Telszewski, Institute of Oceanology (PAN), Poland

SCIENTIFIC DATA
OPEN
Received: 6 October 2017

Data Descriptor: Introducing the Global Register of Introduced and Invasive Species

Shyama Pagad[1,2], Piero Genovesi[2,3], Lucilla Carnevali[2,3], Dmitry Schigel[4] & Melodie A. McGeoch[2,5]

nature ecology & evolution
PERSPECTIVE
https://doi.org/10.1038/s41559-018-0667-3
OPEN

Towards global data products of Essential Biodiversity Variables on species traits

W. Daniel Kissling[1*], Ramona Walls[2], Anne Bowser[3], Matthew O. Jones[4], Jens Ki, Donat Agosti[7], Josep Amengual[8], Alberto Basset[9], Peter M. van Bodegom[10], Johannes H. C. Cornelissen[11], Ellen G. Denny[12], Salud Deudero[13], Willi Egloff[7], Sarat, Enrique Alonso García[16], Katherine D. Jones[14], Owen R. Jones[17], Sandra Lavorel[18], [, Laetitia M. Navarro[6,20], Samraat Pawar[21], Rebecca Pirzl[22], Nadja Rüger[6,23], Sofia S, Roberto Salguero-Gómez[24,25,26,27], Dmitry Schigel[28], Katja-Sabine Schulz[29], An, and Robert P. Guralnick[32]

ECOLOGICAL APPLICATIONS
ECOLOGICAL SOCIETY OF AMERICA
Article | Open Access

Satellite sensor requirements for monitoring essential biodiversity variables of coastal ecosystems

Frank E. Muller-Karger, Erin Hestir, Christiana Ade, Kevin Turpie, Dar A. Roberts, David Siegel, Robert J. Miller, David Humm, Noam Izenberg, Mary Keller, Frank Morgan, Robert Frouin, Arnold G. Dekker, Royal Gardner, James Goodman, Blake Schaeffer, Bryan A. Franz, Nima Pahlevan, Antonio G. Mannino, Javier A. Concha, Steven G. Ackleson, Kyle C. Cavanaugh, Anastasia Romanou, Maria Tzortziou, Emmanuel S. Boss, Ryan Pavlick, Anthony Freeman, Cecile S. Rousseaux, John Dunne, Matthew C. Long, Eduardo Klein, Galen A. McKinley, Joachim Goes, Ricardo Letelier, Maria Kavanaugh, Mitchell Roffer, Astrid Bracher, Kevin R. Arrigo, Heidi Dierssen, Xiaodong Zhang, Frank W. Davis, Ben Best, Robert Guralnick, John Moisan, Heidi M. Sosik, Raphael Kudela, Colleen B. Mouw, Andrew H. Barnard, Sherry Palacios, Collin Roesler, Evangelia G. Drakou, Ward Appeltans, Walter Jetz

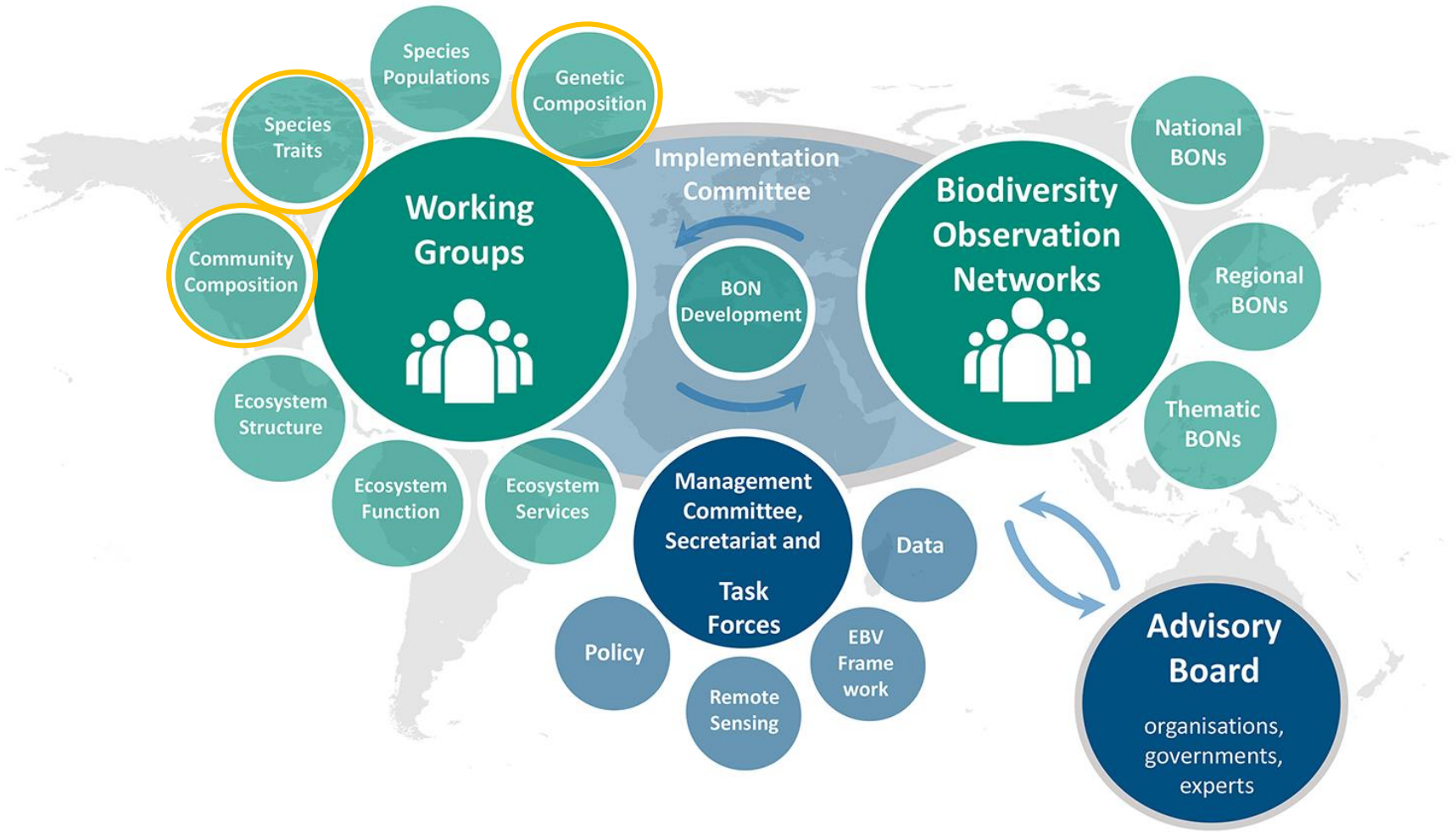
First published: 06 March 2018 | https://doi.org/10.1002/eap.1682 | Cited by: 1

PRIMARY RESEARCH ARTICLE
WILEY Global Change Biology

Essential ocean variables for global sustained observations of biodiversity and ecosystem changes

Patricia Miloslavich[1,2,3,4] | Nicholas J. Bax[1,5] | Samantha E. Simmons[6] | Eduardo Klein[2] | Ward Appeltans[7] | Octavio Aburto-Oropeza[8] | Melissa Andersen Garcia[9] | Sonia D. Batten[10] | Lisandro Benedetti-Cecchi[11] | David M. Checkley Jr.[12] | Sanae Chiba[13,14] | J. Emmett Duffy[15] | Daniel C. Dunn[16] | Albert Fischer[17] | John Gunn[3] | Raphael Kudela[18] | Francis Marsac[19,20] | Frank E. Muller-Karger[21] | David Obura[22] | Yunne-Jai Shin[19,23]

Some Milestones for 2018



Some Milestones for 2018

GEO BON core focus

Developing the Essential Biodiversity Variables

Supporting the development of Biodiversity Observation Networks

Producing Policy Relevant Outputs

GEO BON core focus

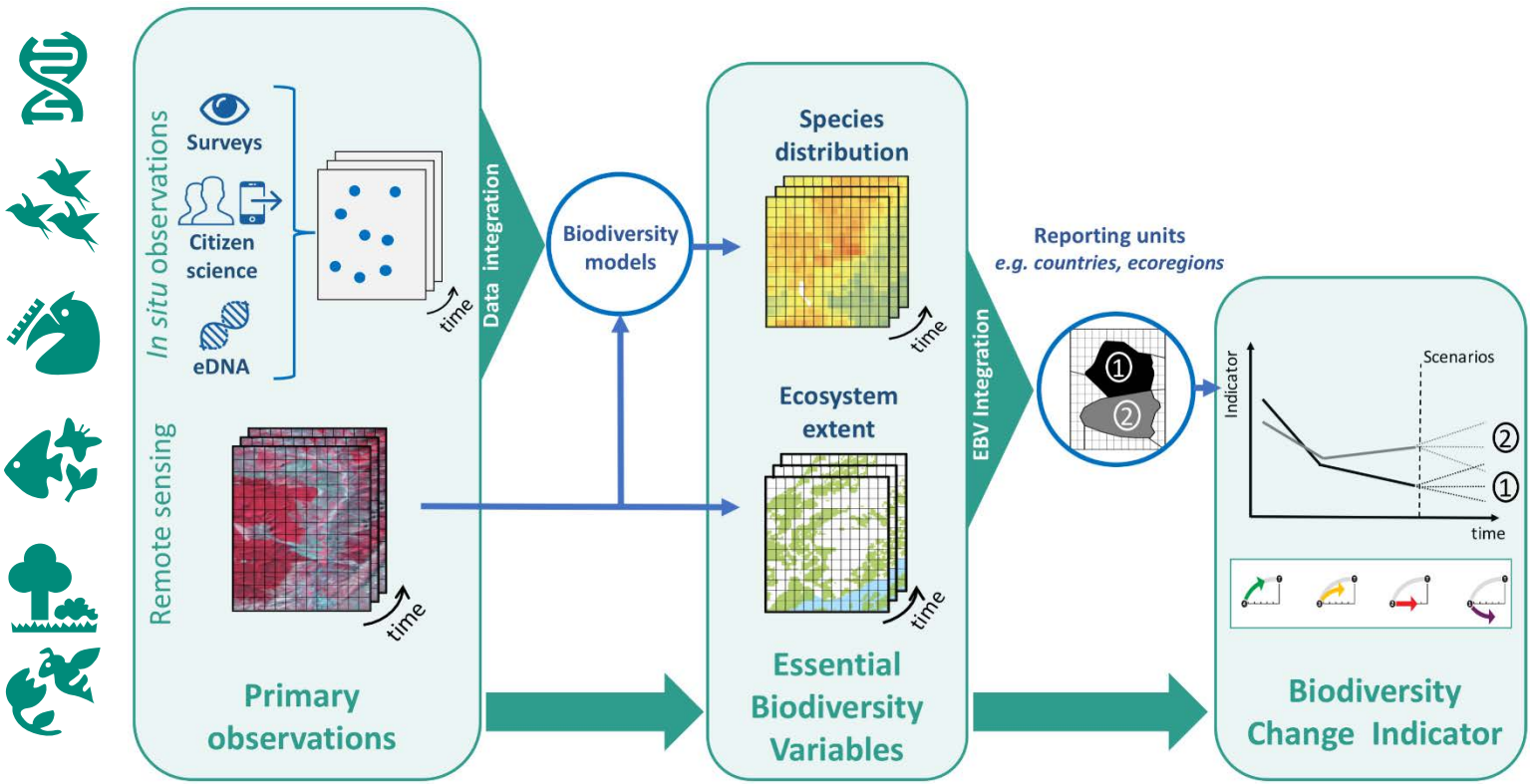
Developing the Essential Biodiversity Variables

Supporting the development of Biodiversity Observation Networks

Producing Policy Relevant Outputs

A standard and flexible framework for biodiversity observations: the Essential Biodiversity Variables

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



Users

National Governments

CBD

ipbes Science and Policy for People and Nature

SUSTAINABLE DEVELOPMENT GOALS

Navarro et al., (2017) COSUST

Acquisition, Mobilization and Integration of biodiversity observations

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

Challenges and opportunities for EBV development

Challenges

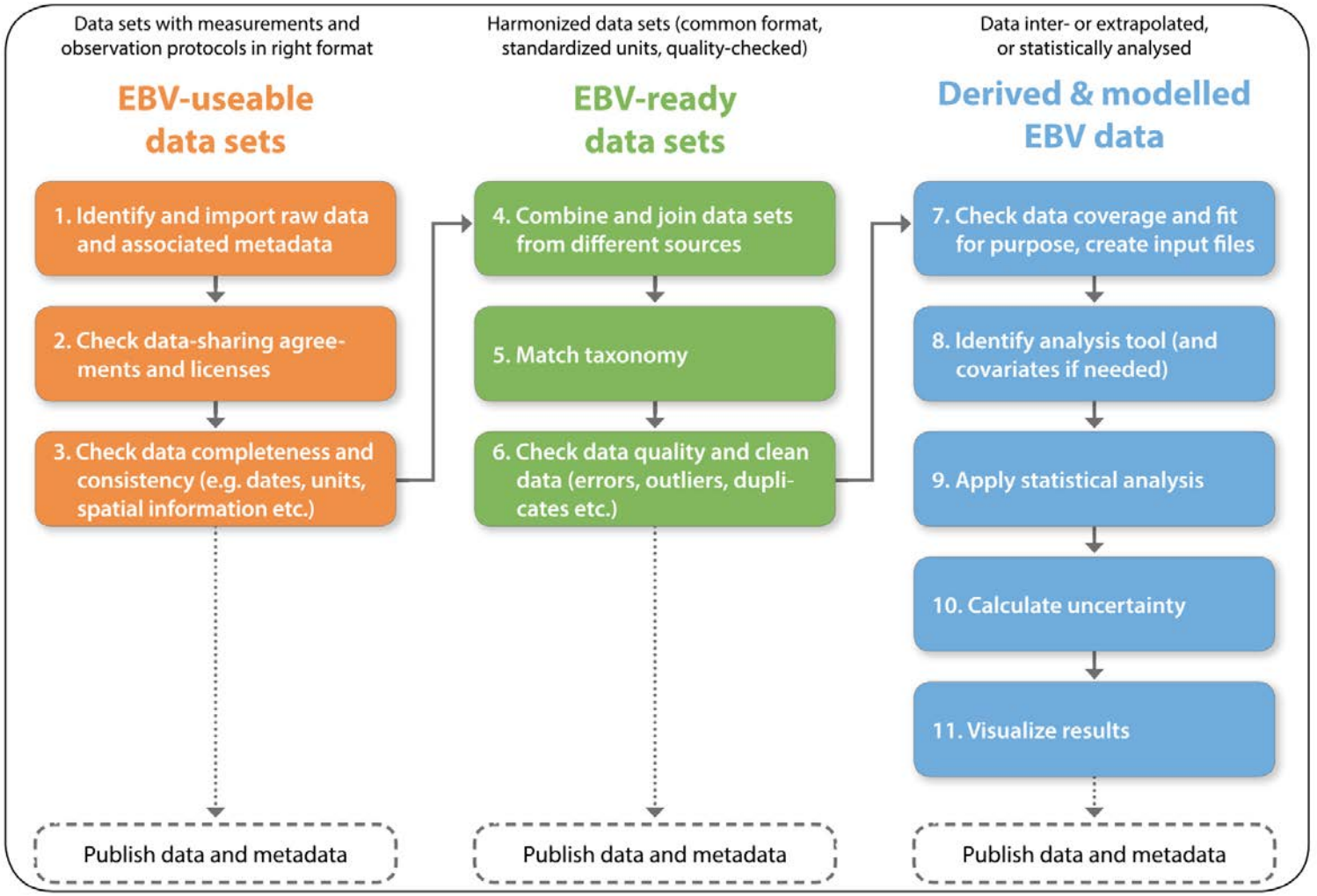
- Consultation processes on-going to agree on and prioritize lists of EBVs in the different classes
- Spatial and taxonomic bias in biodiversity observation → Gaps identification
- Lack of within species temporal variation observation (e.g. traits)

Challenges and opportunities for EBV development

Opportunities

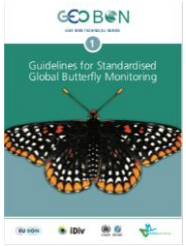
- Popularization of next generation sequencing, metagenomics (eDNA), and hyperspectral remote sensing
- increased data collection (e.g. citizen science), sharing, and integration
- Development of modelling approaches that combine species observations with remotely sensed environmental data

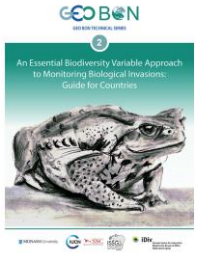
Developing and documenting workflows for the production of EBVs

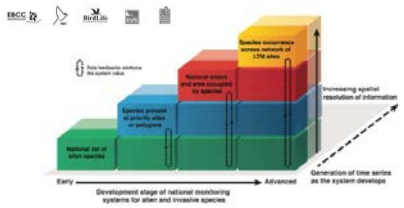


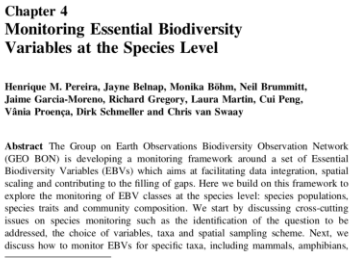
Kissling et al., (2017) Biological Reviews

Observation Design








Chapter 4
Monitoring Essential Biodiversity Variables at the Species Level

Henrique M. Pereira, Jayne Belnap, Monika Böhm, Neil Brummitt, Jaime Garcia-Moreno, Richard Gregory, Laura Martin, Cui Peng, Vânia Proença, Dirk Schmeller and Chris van Swaay

Abstract The Group on Earth Observations Biodiversity Observation Network (GEO BON) is developing a monitoring framework around a set of Essential Biodiversity Variables (EBVs) which aims at facilitating data integration, spatial scaling and contributing to the filling of gaps. Here we build on this framework to explore the monitoring of EBV classes at the species level: species populations, species traits and community composition. We start by discussing cross-cutting issues on species monitoring such as the identification of the question to be addressed, the choice of variables, taxa and spatial sampling scheme. Next, we discuss how to monitor EBVs for specific taxa, including mammals, amphibians,

Field Data Collection

Field guides

Data ingestion templates (e.g. ALA, GBIF)

Automatic image classification tools (e.g. iNat tool)

iNaturalist

eBird

Data Processing Management & Publishing

Standards:
Darwin Event Core
Humboldt Core

Tools:
GBIF IPT

Taxonomic backbone:
Catalog of Life/*best available authority*

Data Analysis & Modelling & Publishing

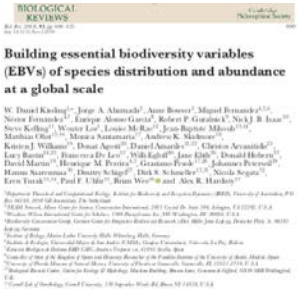
Map of Life

GDM

MaxEnt

Standards:
WMS
WFS

Data sharing agreements examples


BIOLOGICAL REVIEWS

Building essential biodiversity variables (EBVs) of species distribution and abundance at a global scale

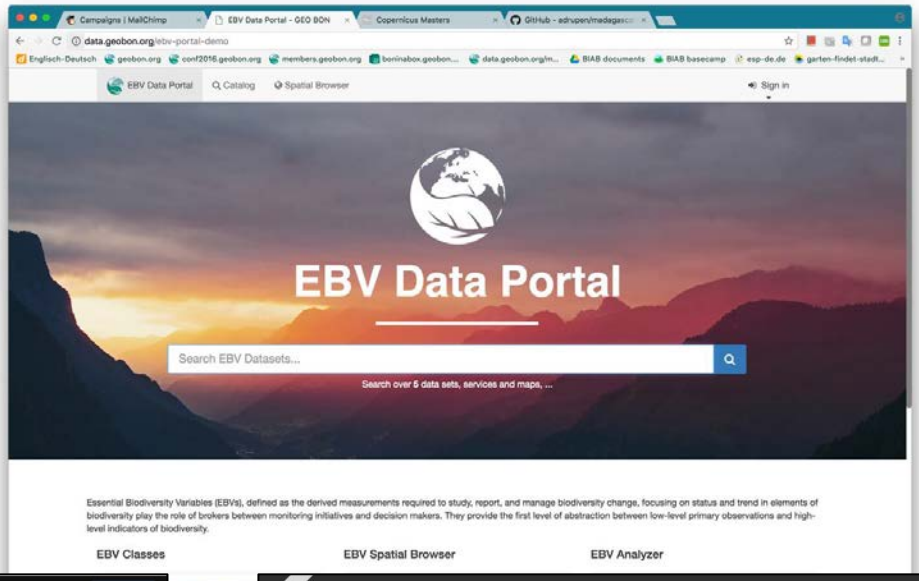
Reporting & Indicators

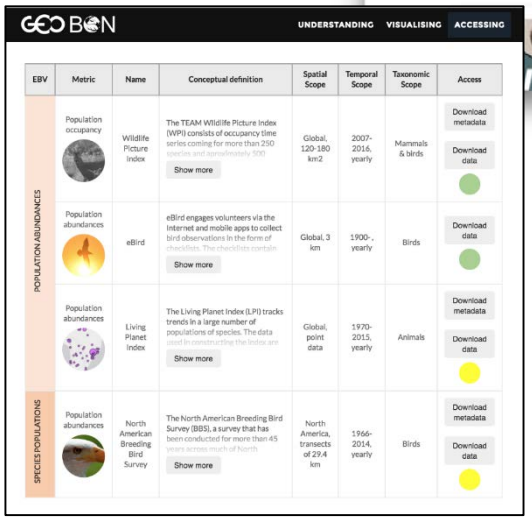
Species Habitat Indicator

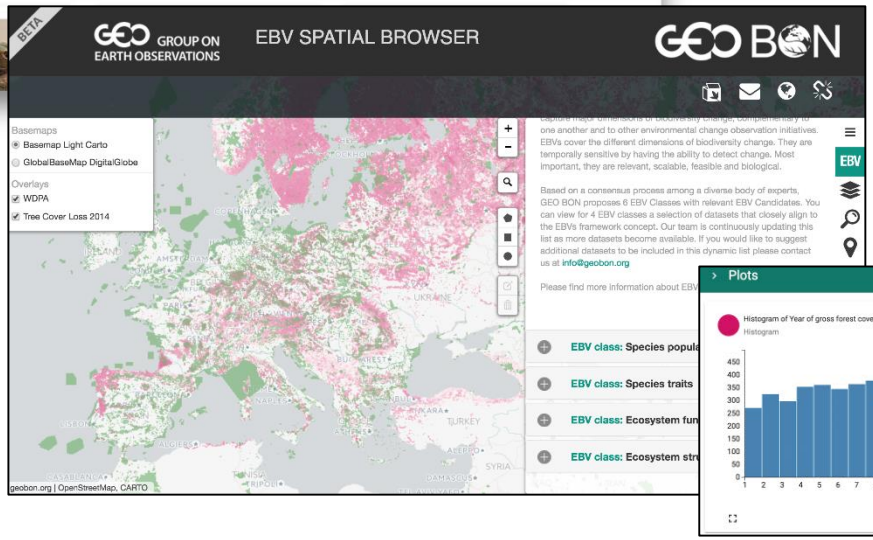
GEO BON Portal

Data Sources

Red List IUCN
GBIF
GRIIS







INDEXING • VISUALIZING • ANALYSING / SUMMARIZING

GEO BON core focus

Developing the Essential Biodiversity Variables

Developing the Biodiversity Observation Networks

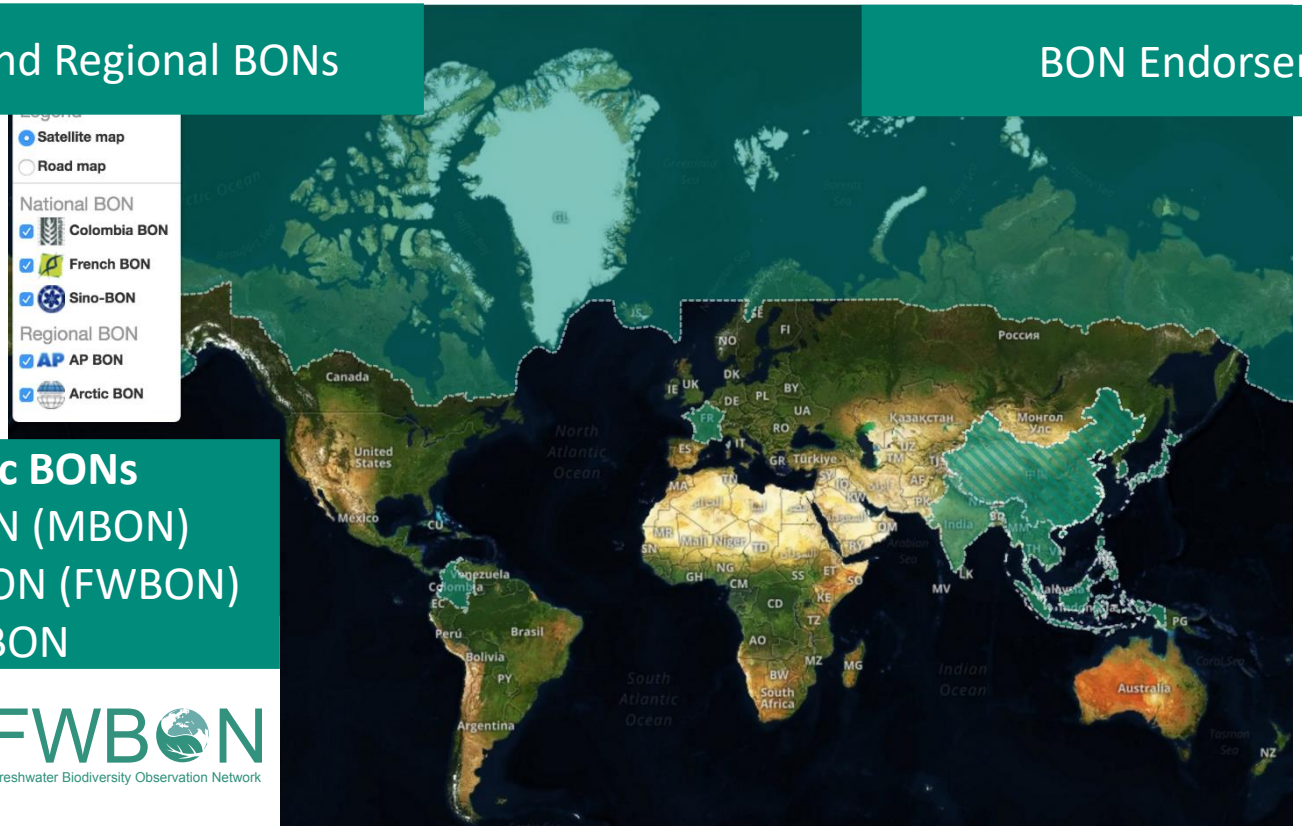
Producing Policy Relevant Outputs

Building a Network of National, Regional and Thematic BONs

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

National and Regional BONs

BON Endorsement



Thematic BONs

Marine BON (MBON)

Freshwater BON (FWBON)

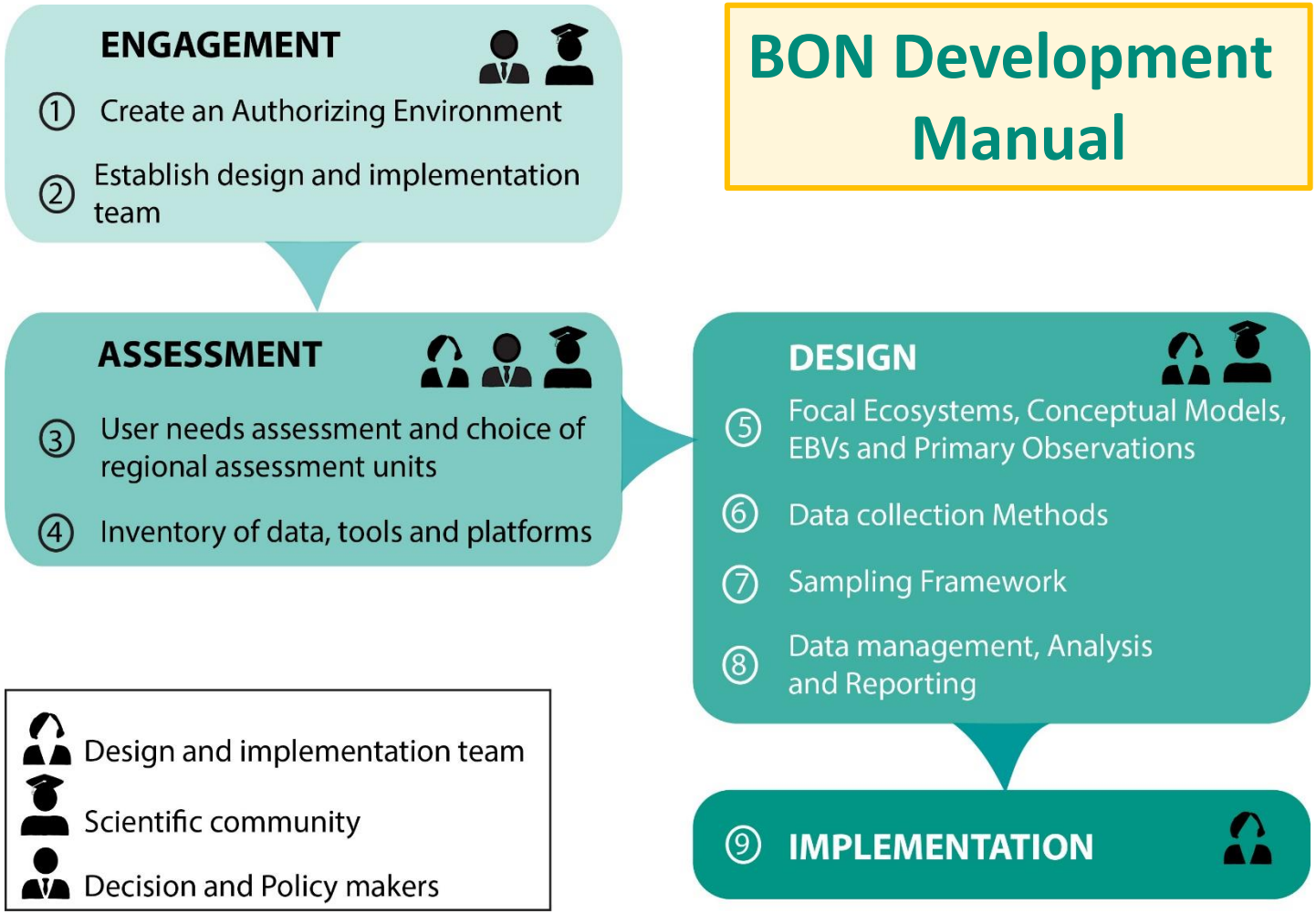
Soil BON

MBON Marine Biodiversity Observation Network

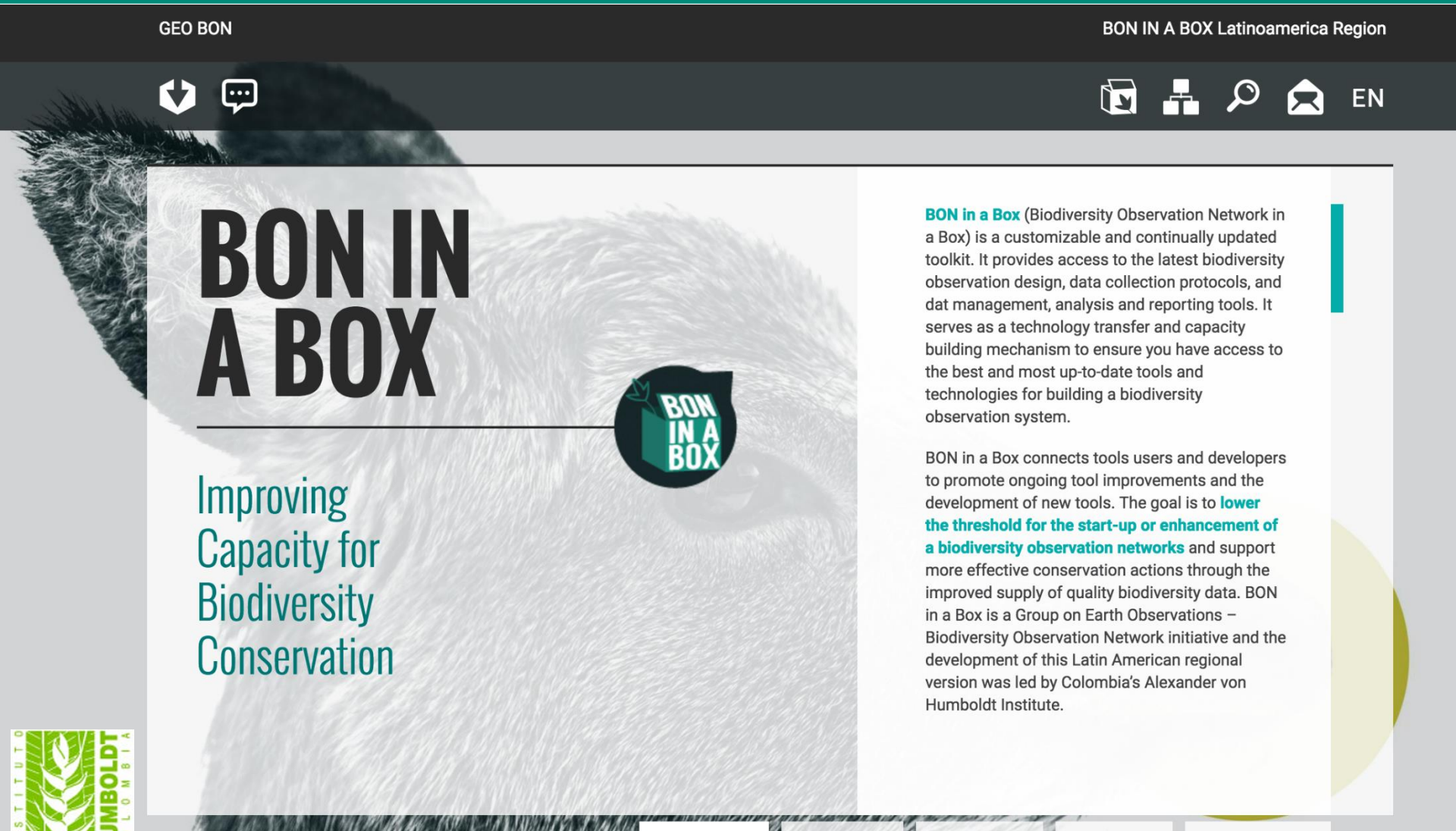
FWBON Freshwater Biodiversity Observation Network

Supporting the development of BONs – BON development process

BON Development Manual



Supporting the development of BONs – Capacity building and knowledge exchange



Documenting Biodiversity Observations

Biodivers Conserv (2017) 26:1959–1971
DOI 10.1007/s10531-017-1339-3

ORIGINAL PAPER

Optimized monitoring sites for detection of biodiversity trends in China

Haigen Xu[1] · Mingchang Cao[1] · Yi Wu[2] · Lei Cai[3] · Yun Cao[1] · Hui Ding[1] · Peng Cui[1] · Jun Wu[1] · Zhi Wang[1] · Zhifang Le[1] · Xiaoqiang Lu[1] · Li Liu[1] · Jiaqi Li[1]

China BON level metadata															
nested per Province and stratefied across biomes															
[2780 counties in China]															
	Species Populations EBV Class														
	Taxonomic group	**Number of species being monitored**	**No. spp**	**Spatial unit/regions**	**Method**	**Reps**	**Frequency**	**Metric**	**Start**	**End**	**Data management**	**Published**	**Spatial and temporal resolution of published data**	**DwC Standard**	**Data aggregation pe county**
CHINA BON	Birds	all	~1000	380 Counties	transect	10/county	annual	counts	2011	present	national database	not yet	n/a	national standard	population density/line transec
	Mammals	large-medium body size	100	70 counties	camera trap										
	Butterflies	all		380 Counties											
	Amphibians	all		380 Counties											

China BON level metadata						
nested per Province and strate						
[2780 counties in China]						
	Species Populatic					
	Taxonomic group	**EBV being produced (1)**	**EBV being produced (2)**	**EBV being published and in what form**	**Are the EBV's accessible via the GEOBON Portal**	**Indicators calculated**	**Policy relevance/link**
CHINA BON	Birds	maps of species richness across sites	distribution and abundance map for each species	Scientific publications in Chinese	No	LPI - GMA to be calculated	
	Mammals	across sites for each species - occupancy probability					
	Butterflies	maps of abundances across sites for each species	population density/sample region				
	Amphibians	maps of abundances across sites for each species	population density/sample region			LPI - GMA to be calculated	

Species Populations EBVs

GEO BON core focus

Developing the Essential Biodiversity Variables

Developing the Biodiversity Observation Networks

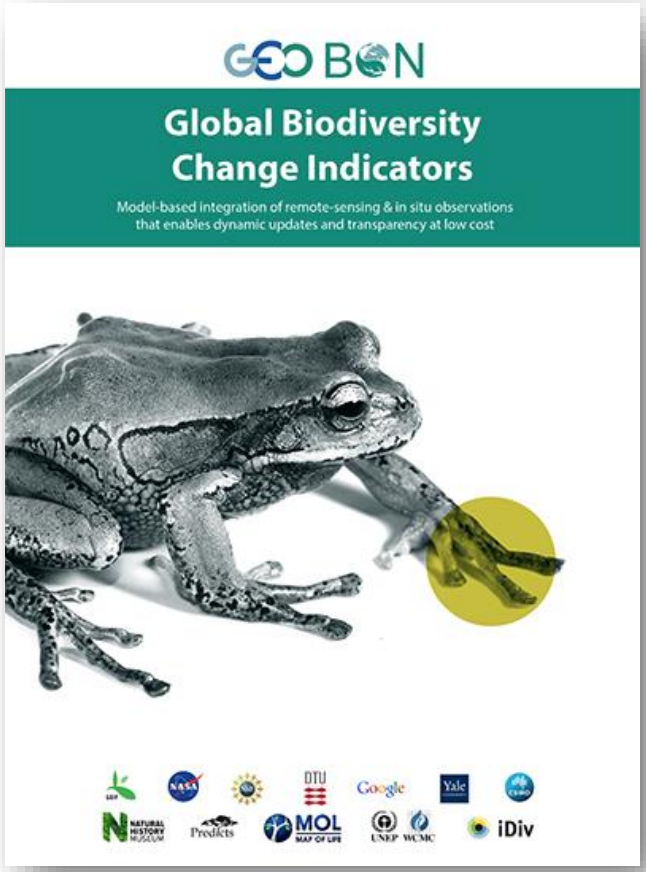
Producing Policy Relevant Outputs

Policy relevant outputs: Supporting users' reporting needs

Convention on Biological Diversity

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

		Essential Biodiversity Variables
SHI Species Habitat Indices	MOL Map of Life	Species distributions; Ecosystem extent and fragmentation
BHI Biodiversity Habitat Index	CSIRO	Ecosystem extent and fragmentation; Taxonomic diversity
SPI Species Protection Index	MOL Map of Life	Species distributions; Ecosystem extent and fragmentation
PARC Protected Area Representativeness & Connectedness (PARC) Indices	CSIRO	Ecosystem extent and fragmentation; Taxonomic diversity
GERI Global Ecosystem Restoration Index	iDiv	Ecosystem extent; Net primary productivity
SSII Species Status Information Index	MOL Map of Life	Species distributions; Taxonomic diversity



Supporting decision-making

The **Beijing 2018 call on biodiversity observations for post-2020 decision-making: ”**We call on the Parties to the CBD to step up efforts on the collection, analysis and delivery of biodiversity observations [...]”.

Participation in the **CBD COP 14**, including with two main side-event submitted:
”**From biodiversity data to reporting**” (co-organized with GBIF Sec. and NatureServe)
”**Global Biodiversity Change Indicators**” (Presentation of the GBCIs and their applications to parties, Presentation of the EBV portal)

Convention on Biological Diversity

UN BIODIVERSITY CONFERENCE
Investing in biodiversity for people and planet
COP 14 - CP/MOP9 - NP/MOP3
Sharm El Sheikh, Egypt, 2018

By December 2018, invitation to contribute to the CBD’s **post-2020 strategy for Biodiversity**

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

ありがとう!

For more information:

www.geobon.org

@GEOBON_org

www.geobon.org
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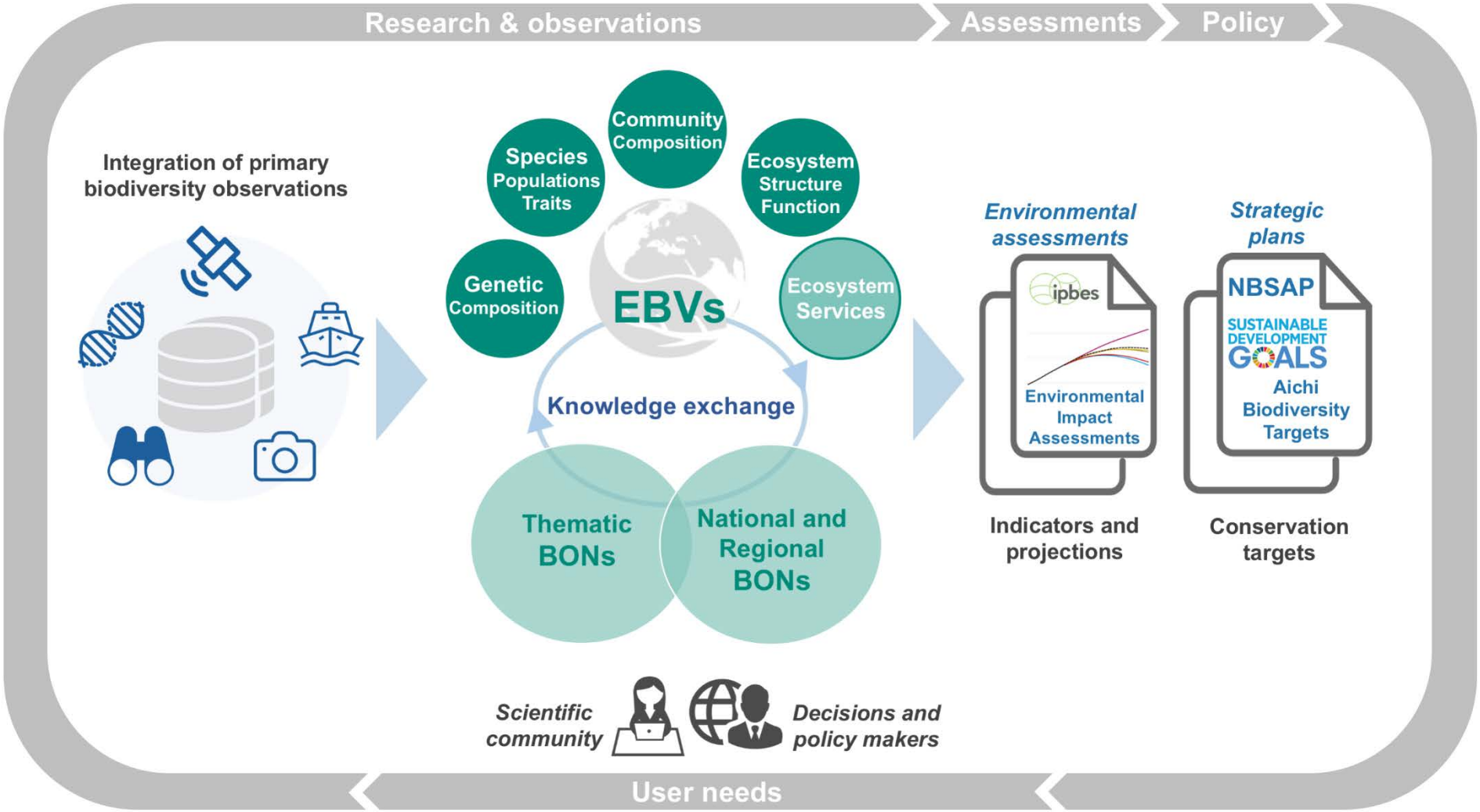

Navarro et al. *(2017) Current Opinion in Environmental Sustainability*

EBV Labeling System:
Minimum Information Standards for an EBV

Is the EBV dataset fit for purpose?

- Report on the maturity / readiness of EBV products (Draft in progress)

- Template for reporting biodiversity change at different levels from subnational to global, and in a way that datasets are flagged according to their usability at each of these levels

EBV Labeling System:
Minimum Information Standards for an EBV

Spatial Extent

High: Global
Intermediate: National to supranational (inc. marine exclusive zone)
Low: Subnational (e.g. P.A. network)

Spatial coverage

High: Fully continuous
Intermediate: Interpolated (incl. modelled)
Low: Site sampling distribution

Spatial resolution

High: Relevant for local management
Intermediate: Relevant (supra) national
Low: Only for global-level applications

Temporal extent

High: Temporal length of observations allows to inform long-term biodiversity targets.
Intermediate:
Low: Temporal length only can inform short-term (regional to local) decisions

Temporal coverage

High: ≥ 2 time slices that already allow to detect changes relevant for management/policy decisions
Intermediate: ≥ 2 time slices but insufficient to detect relevant changes
Low: One temporal slice (no possibility to detect change)

Data uncertainty

High: Uncertainty assessed. Likelihood of capturing significant changes is reliable
Intermediate: Uncertainty assessed. Likelihood of capturing significant change is uncertain.
Low: Insufficient or missing uncertainty assessment