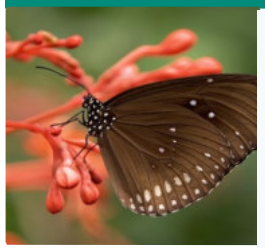
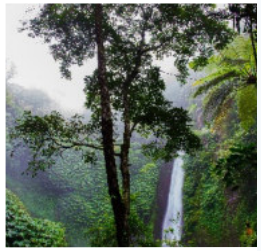
Biodiversity Observations for Decision-Making: From Data to Decision





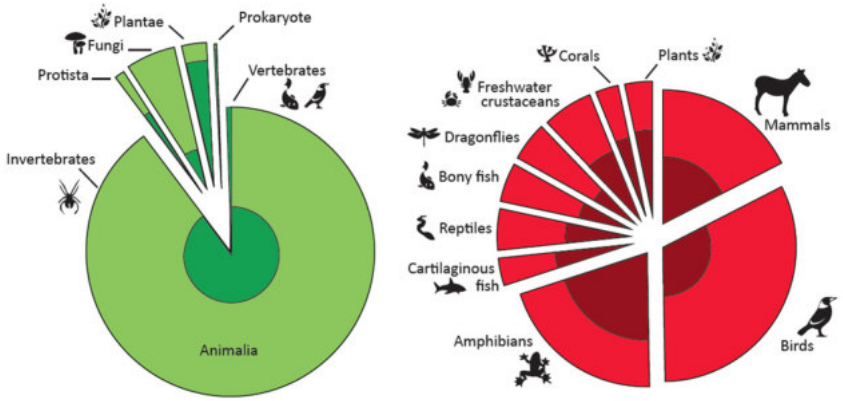

Mike Gill

GEO BON Co-Chair

Arctic Biodiversity Congress
Rovaniemi, Finland

Biodiversity Data: Many Deficiencies

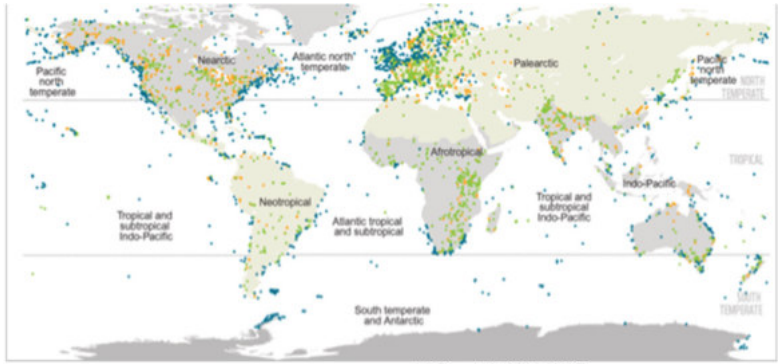
Taxonomic Bias



Pereira, H.M. et al (2012) *Annual Review of the Environment and Resources*.

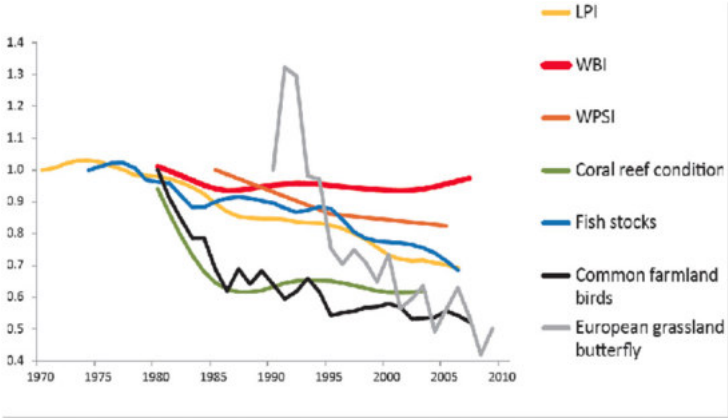
Impact & personal bias

Spatial dimension



McRae et al. (2014) WWF

Temporal dimension



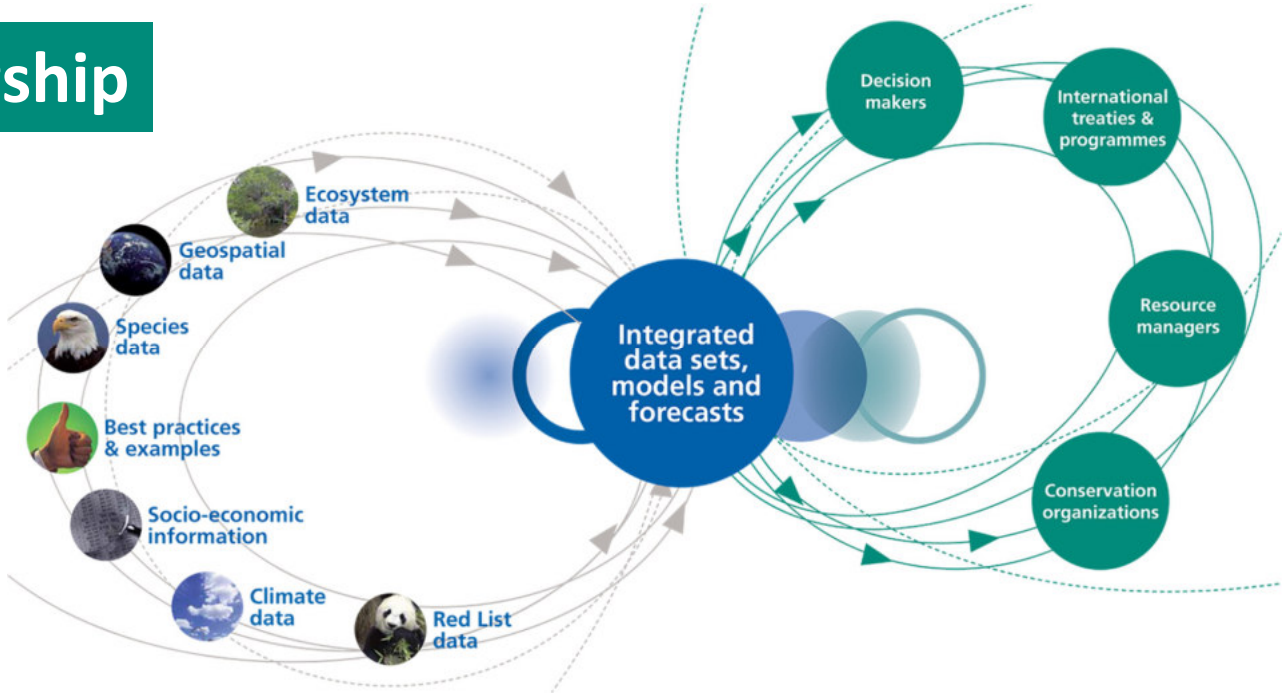
Pereira, H.M. et al (2012) *Annual Review of the Env. & Resources.*

What is GEO BON?

Mission

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

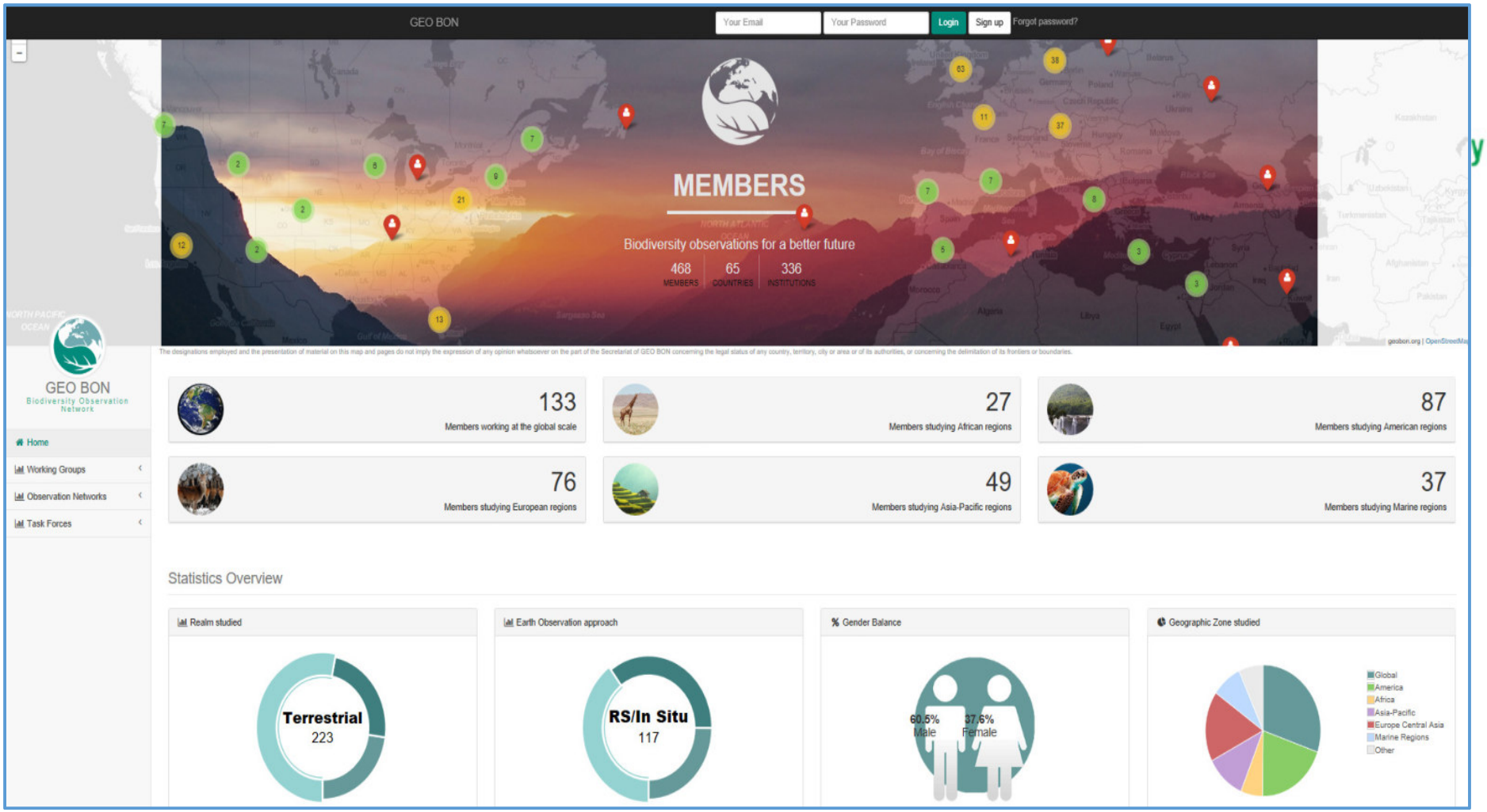
GEO Flagship



Vision

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

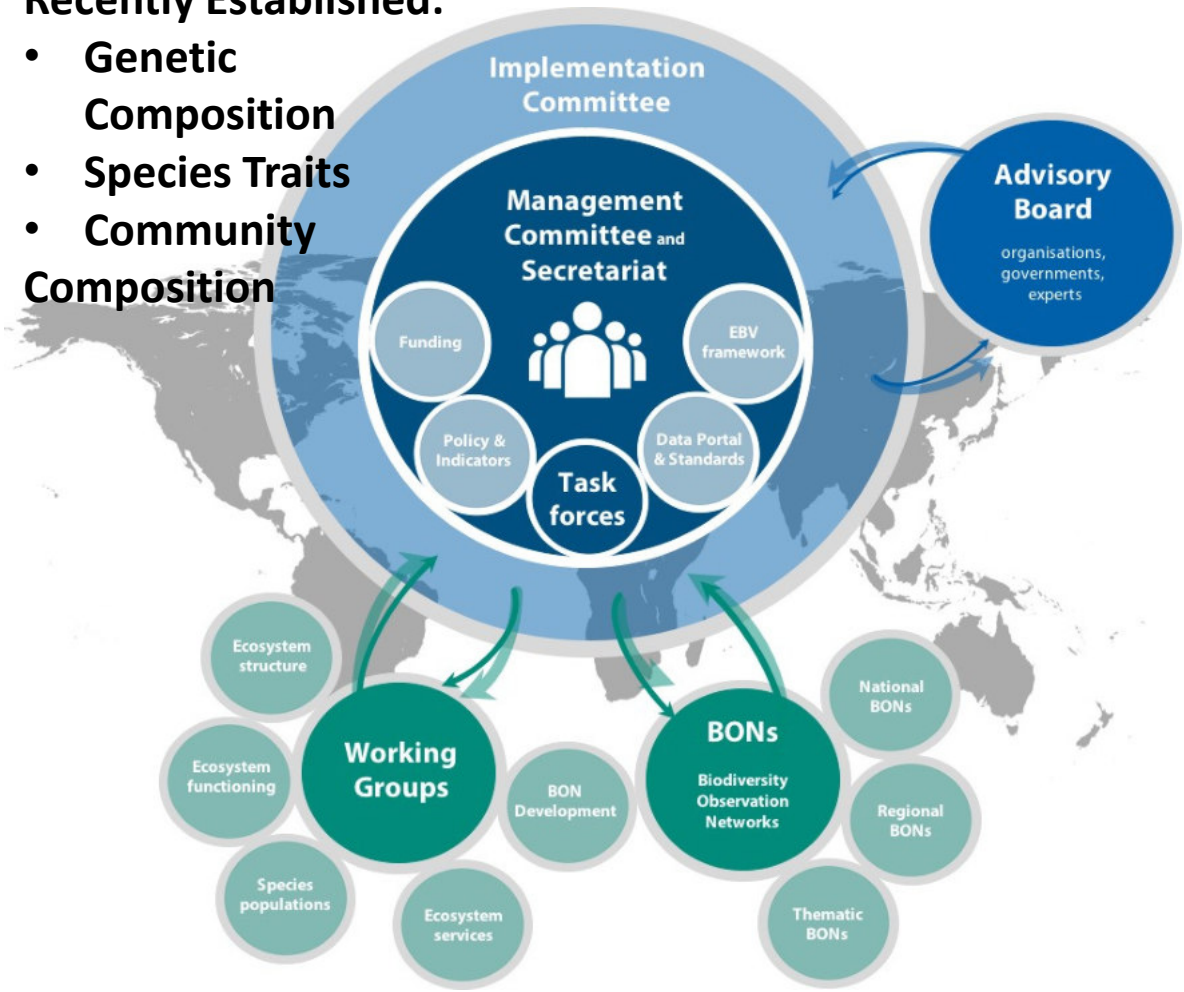
A Global Partnership – Ten Years Old



GEO BON Governance and Core Focus

Recently Established:

- **Genetic Composition**
- **Species Traits**
- **Community Composition**



Developing a standard and flexible framework for biodiversity observations

Supporting the development of Biodiversity Observation Networks

Producing policy relevant outputs

Our Network of BONs: The 'Engines' of GEO BON

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

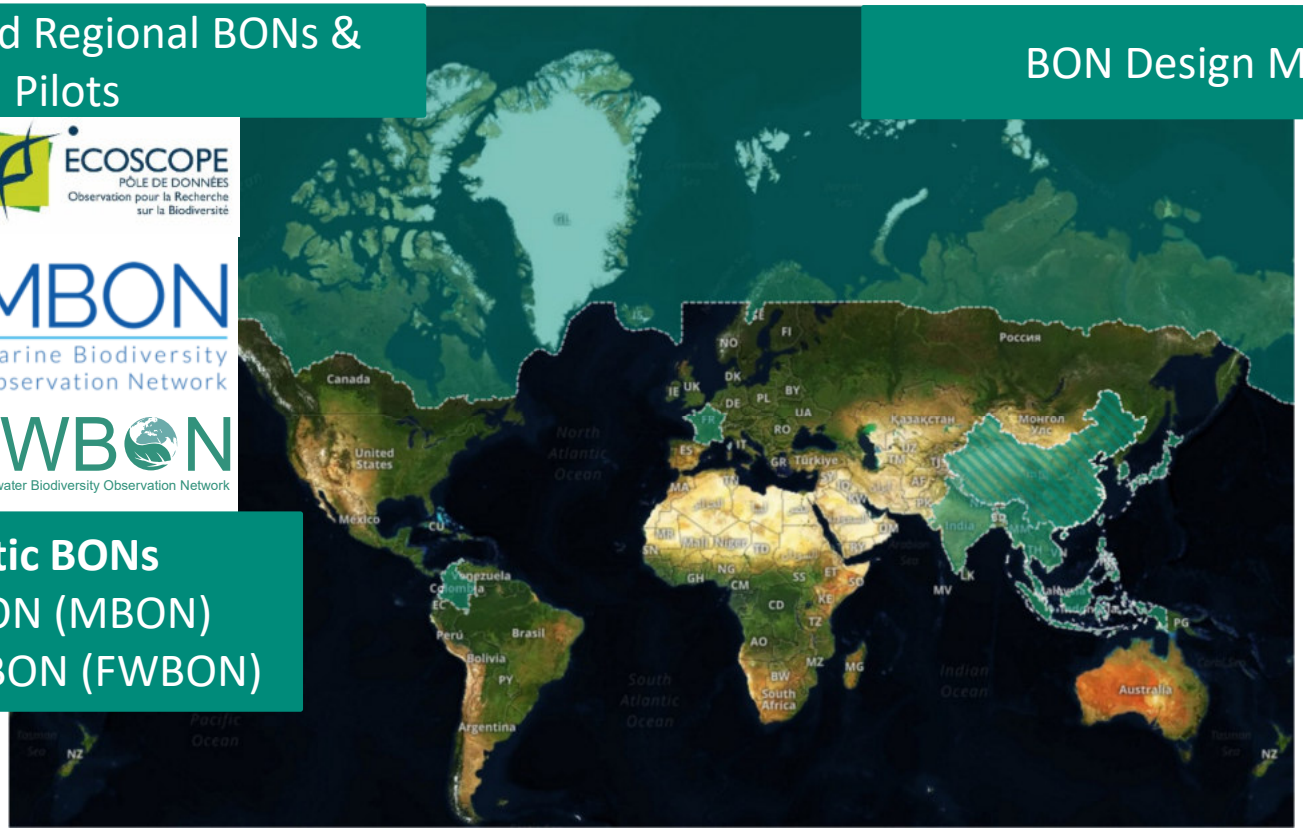
National and Regional BONs & Pilots

BON Design Manual

ECOSCOPE
PÔLE DE DONNÉES
Observation pour la Recherche sur la Biodiversité

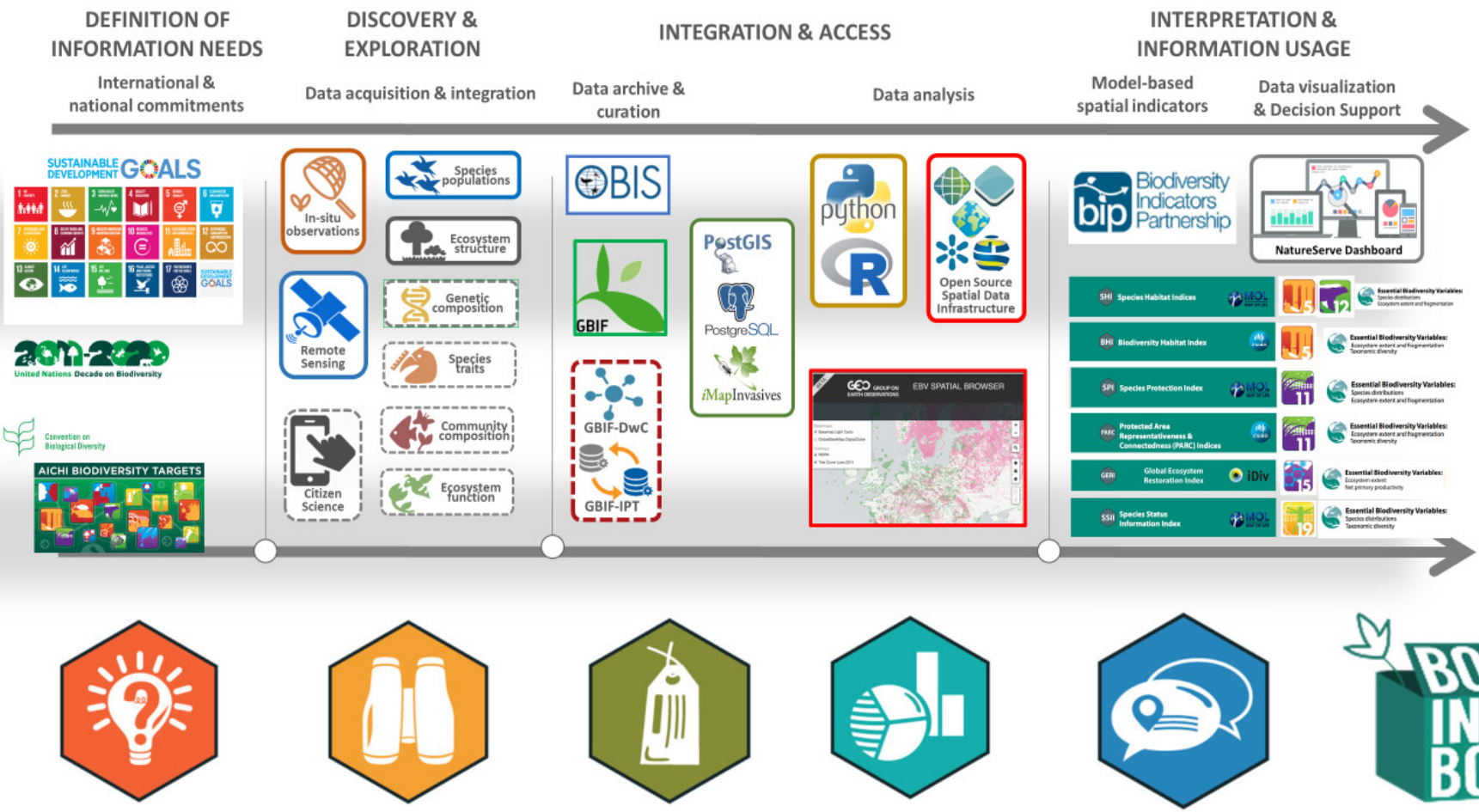
MBON
Marine Biodiversity Observation Network

FWBON
Freshwater Biodiversity Observation Network



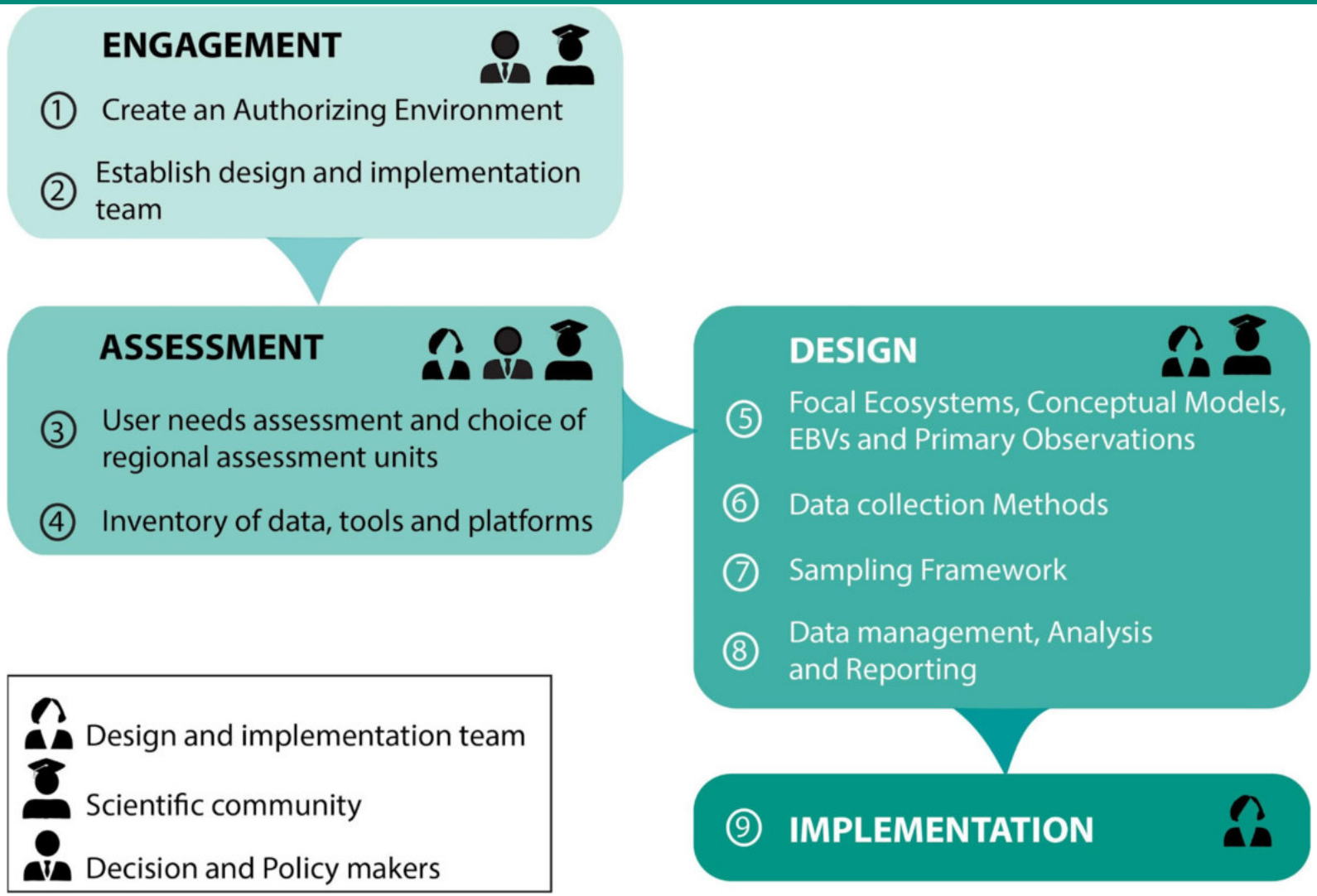
Thematic BONs
Marine BON (MBON)
Freshwater BON (FWBON)

Biodiversity Observation and Information Systems: From Data to Decision

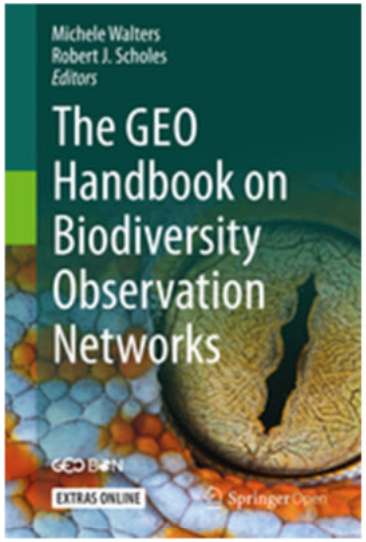


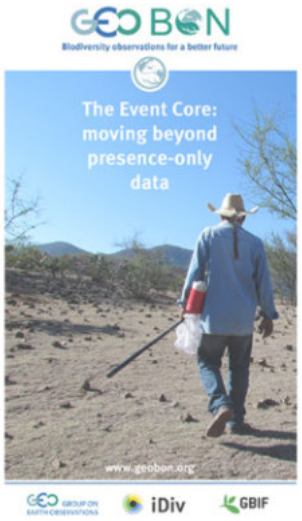
BON IN A BOX

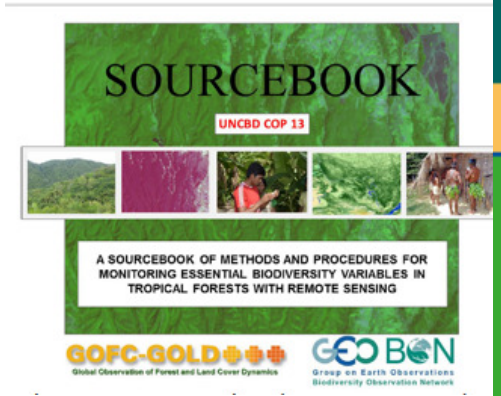
9-step BON Development Process. Figure from Navarro et al., 2017 COSUS.

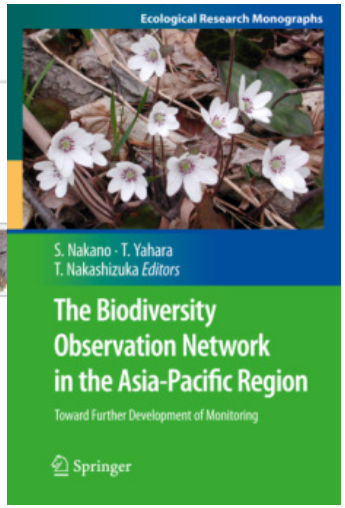


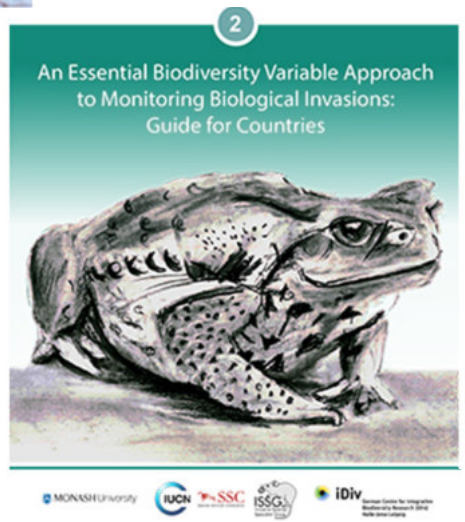
Developing Protocols and Approaches for Biodiversity Observations











TRACKING BIODIVERSITY

Ten variables

Proposed variables for satellite monitoring of progress towards the Aichi Biodiversity Targets.

Species populations
- Species occurrence

Species traits
- Plant traits (such as specific leaf area and leaf nitrogen content)

Ecosystem structure
- Ecosystem distribution
- Fragmentation and hetrogeneity
- Land cover
- Vegetation height

Ecosystem function
- Fire occurrence
- Vegetation phenology (variability)
- Primary productivity and leaf area index
- Inundation

Skidmore, A. et al (2015) *Nature*

Data standards for interoperability

Efforts to track biodiversity change have increased the amount of species information available through monitoring programmes. Beyond 'presence-only' data, these systematically collected datasets capture richer, more complex details about species quantities and frequencies. The newly introduced 'Event core' places the sampling event at the center of the simplified dataset.

This extension will enable data holders publishing through GBIF to share population abundance data (including time series population data) or presence/absence data, while documenting the sampling protocol.

The event core allows to relate data from the same sampling area, or from an atlas, which are now connected together via their "parent" event.

The events can also be used to relate data in time, for instance, from in situ measurments that are repeated every year.

Event core *(event, location, geological context)*

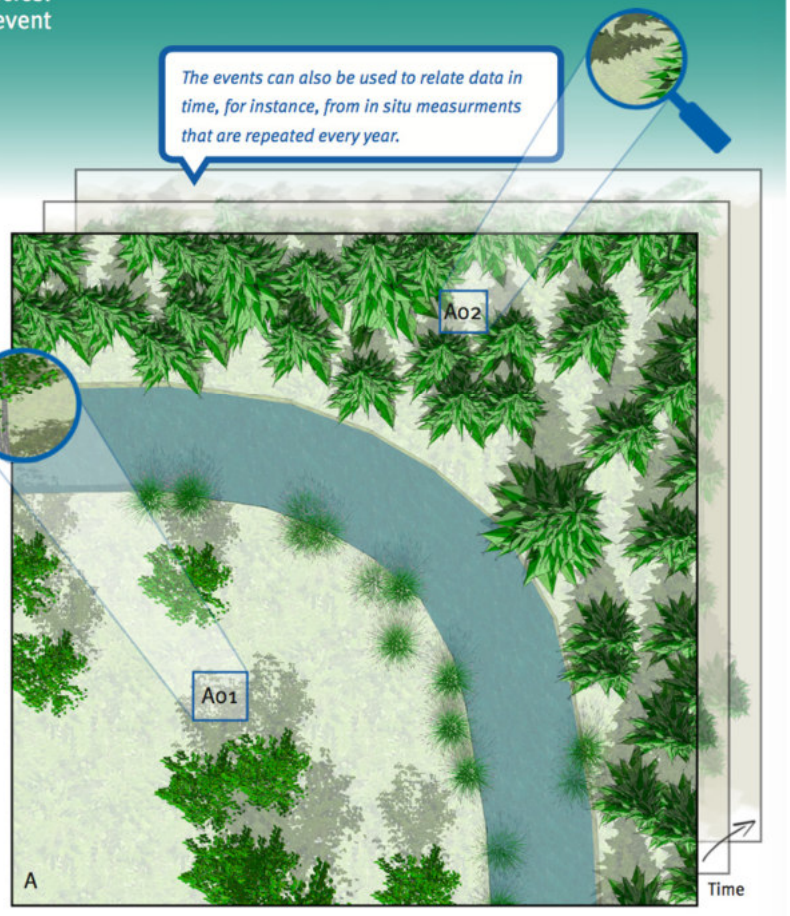
Event ID: *A01*
parentEventID: *A01*
samplingProtocol: *1 Observer x 30'*
sampleSize: *10*
sampleSizeUnit: *m²*
location: *National park XY*
lat: *50.133*
lon: *13.556*
...

Occurrence extension *(occurrence, taxon, identification)*

Event ID: *A01*
scientificName: *Papilio polyxenes*
organismQuantity: *14*
organismQuantityType: *individuals*
...

Event ID: *A01*
scientificName: *Cethosia biblis*
organismQuantity: *5*
organismQuantityType: *individuals*
...

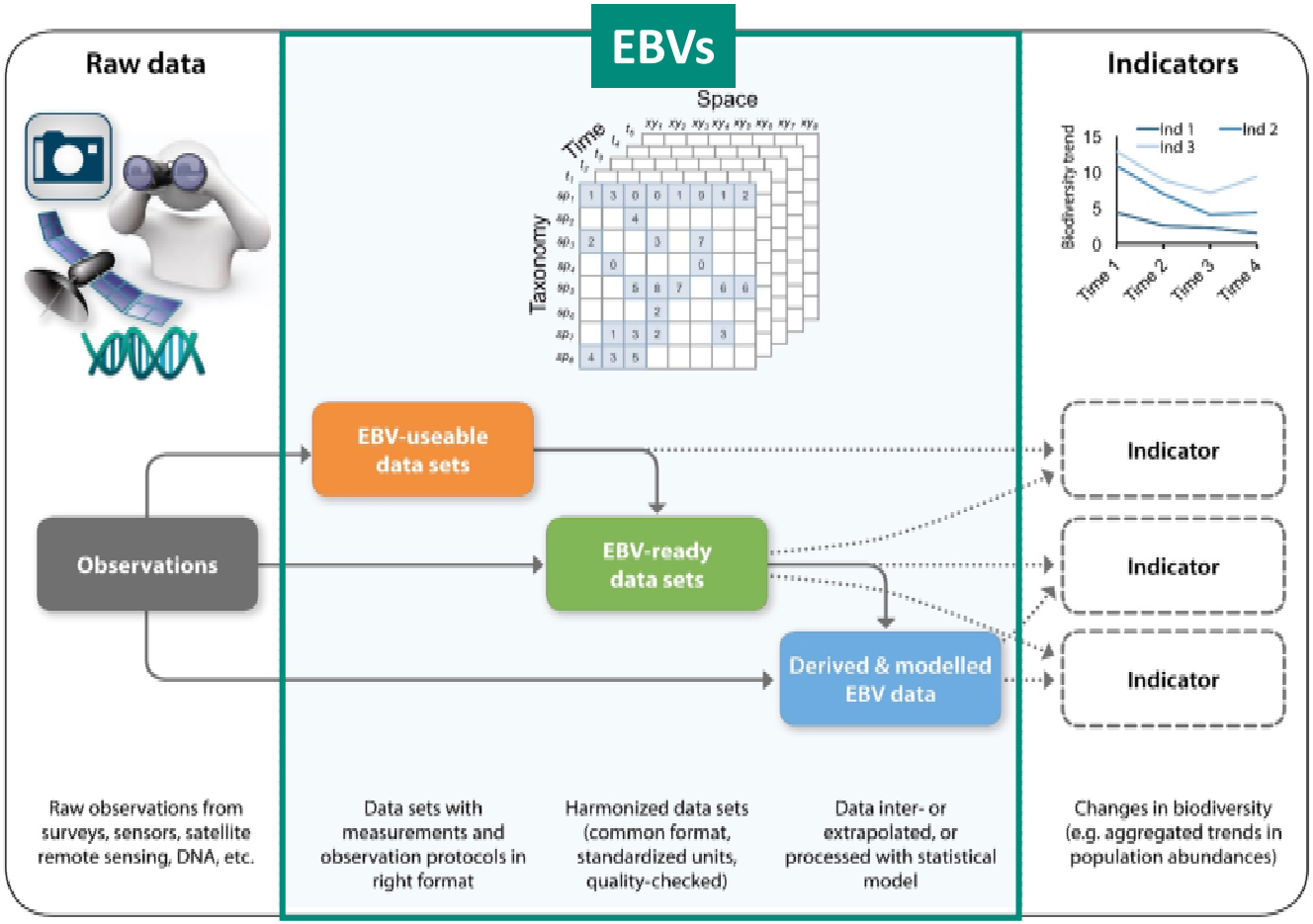
Event ID: *A01*
scientificName: *Nessaea obrinus*
organismQuantity: *10*
organismQuantityType: *individuals*
...



"Data providers can now inform on the sampling protocol, sample size, and organism quantity, in addition to the occurrence records, for each species found at each site.

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

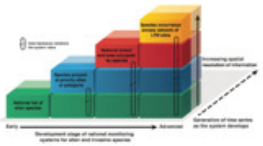
Kissling et al., (2017) Biological Reviews

Developing EBV Workflows and Bundled Toolkits

Observation Design → **Field Data Collection** → **Data Processing Management & Publishing** → **Data Analysis & Modelling & Publishing** → **Reporting & Indicators**

Field guides

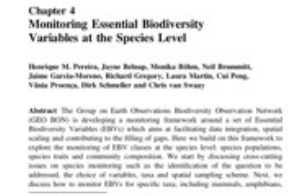
Data ingestion templates (e.g. ALA, GBIF)



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

iNaturalist

eBird



Chapter 4
Monitoring Essential Biodiversity Variables at the Species Level

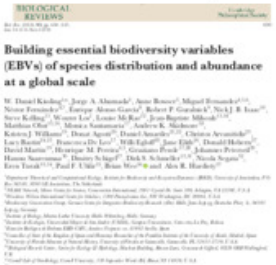
Henrique M. Pereira, Jayne Belnap, Monika Böhm, Neil Brummitt, Jaime Garcia-Moreno, Richard Gregory, Laura Martin, Cui Peng, Vânia Proença, Dirk Schmeller and Chris van Swaay

Standards:
Darwin Event Core
Humboldt Core

Tools:
GBIF IPT
Taxonomic backbone:
Catalog of Life/*best available authority*

Data Sources

Red List IUCN
GBIF
GRIIS



BIOLOGICAL REVIEWS

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

Map of Life

GDM

MaxEnt

Standards:
WMS
WFS

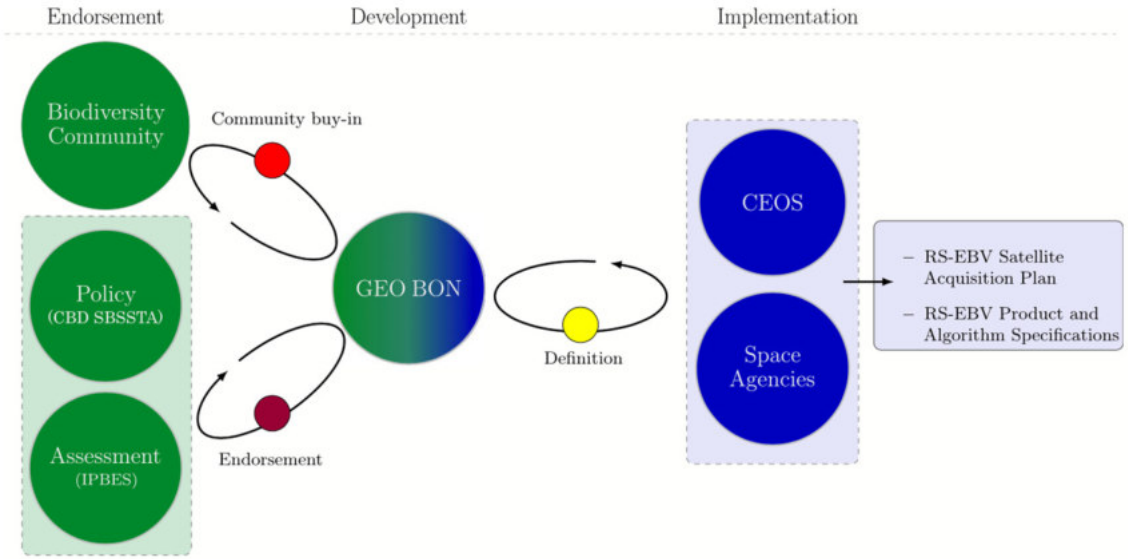
Data sharing agreements examples

Species Habitat Indicator

GEO BON Portal

Communicating Biodiversity Observation Requirements to the Committee on Earth Observation Satellites

- Refine a list of EBVs that can, in part, be produced using Remote Sensing
- Inform the the Committee on Earth Observation Satellites on the requirements for RS biodiversity observation
- Engage with CBD SBSTTA, IPBES, NGOs, government and companies, for feedback and "buy-in"
- Communicate the value and relevance (e.g. SDG) of EBVs derived from RS products to users

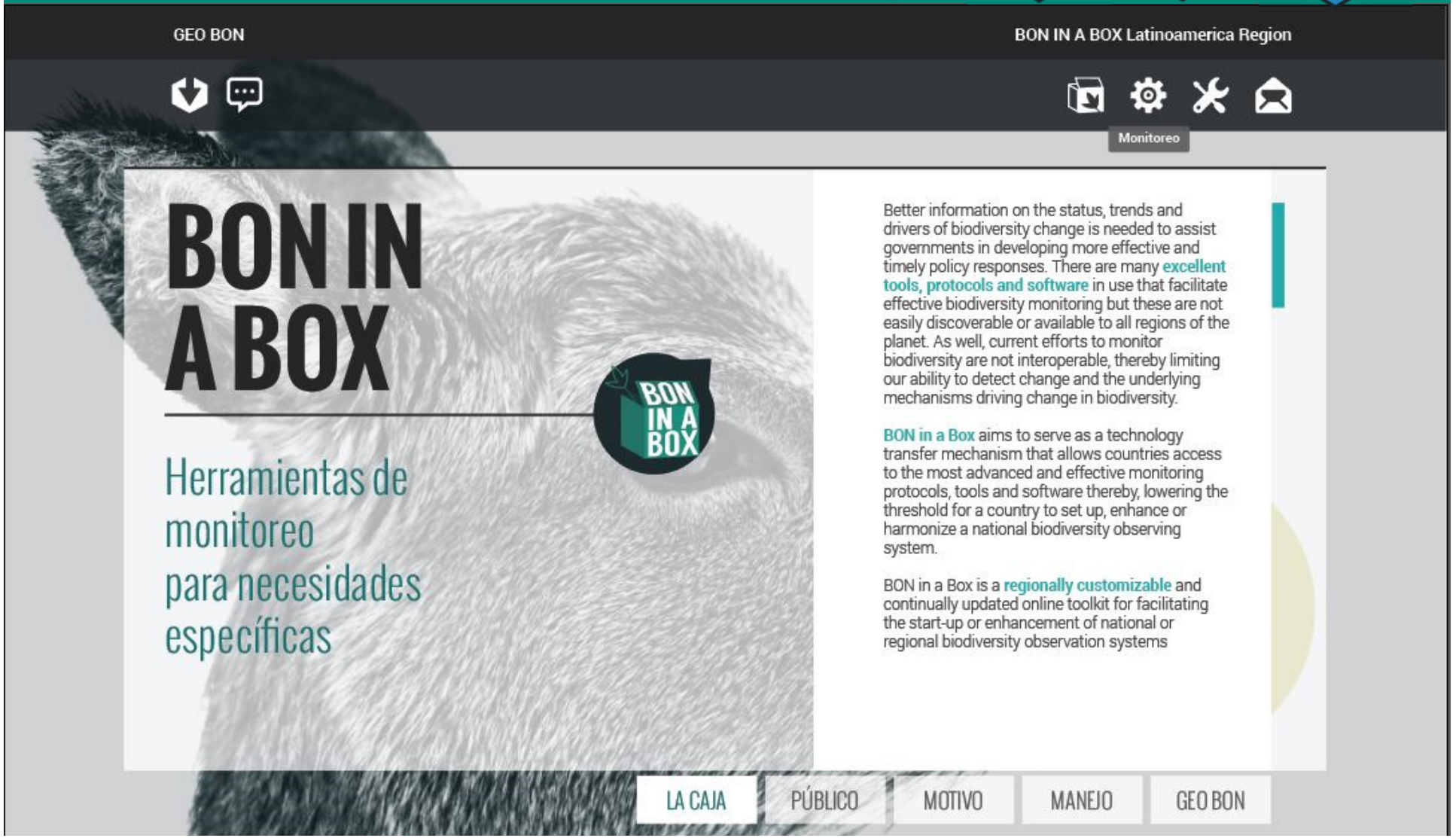


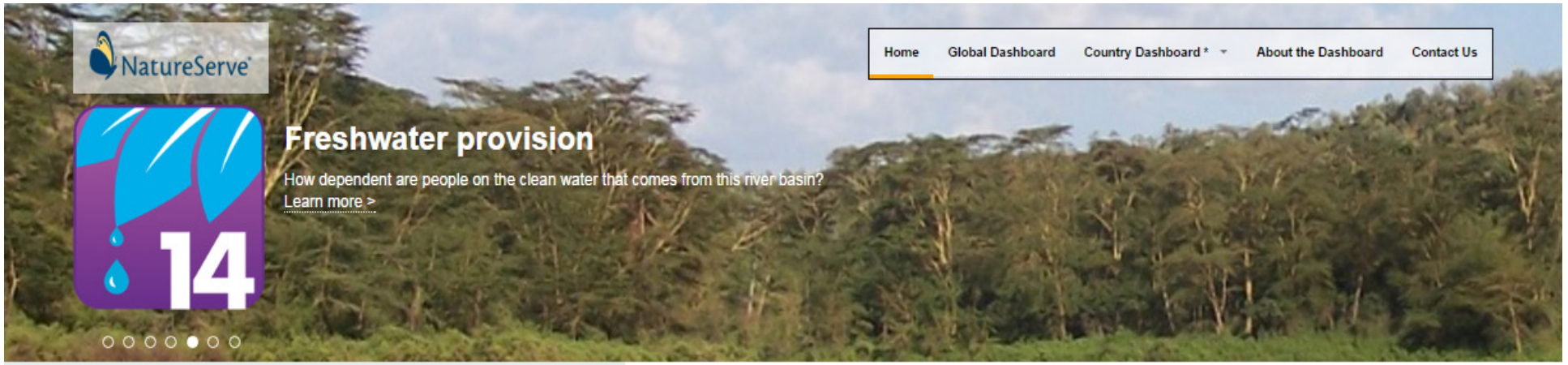
Paganini et al., 2016. Remote Sens Ecol Conserv, 2:132-140

GEO BON

Policy relevant outputs – model based indicators

BON in a Box: Improving Observation Capacity

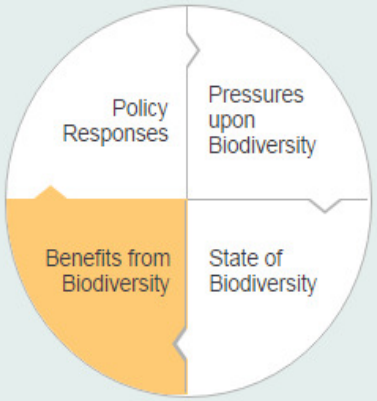




The Biodiversity Indicators Dashboard

Measuring Progress and Challenges to Conservation

How successful are our efforts to conserve biodiversity? Increasingly, we need to measure how well our actions to conserve biodiversity achieve their goals. The Biodiversity Indicators Dashboard unites diverse metrics that chart progress towards global conservation goals, such as the Aichi Biodiversity Targets.



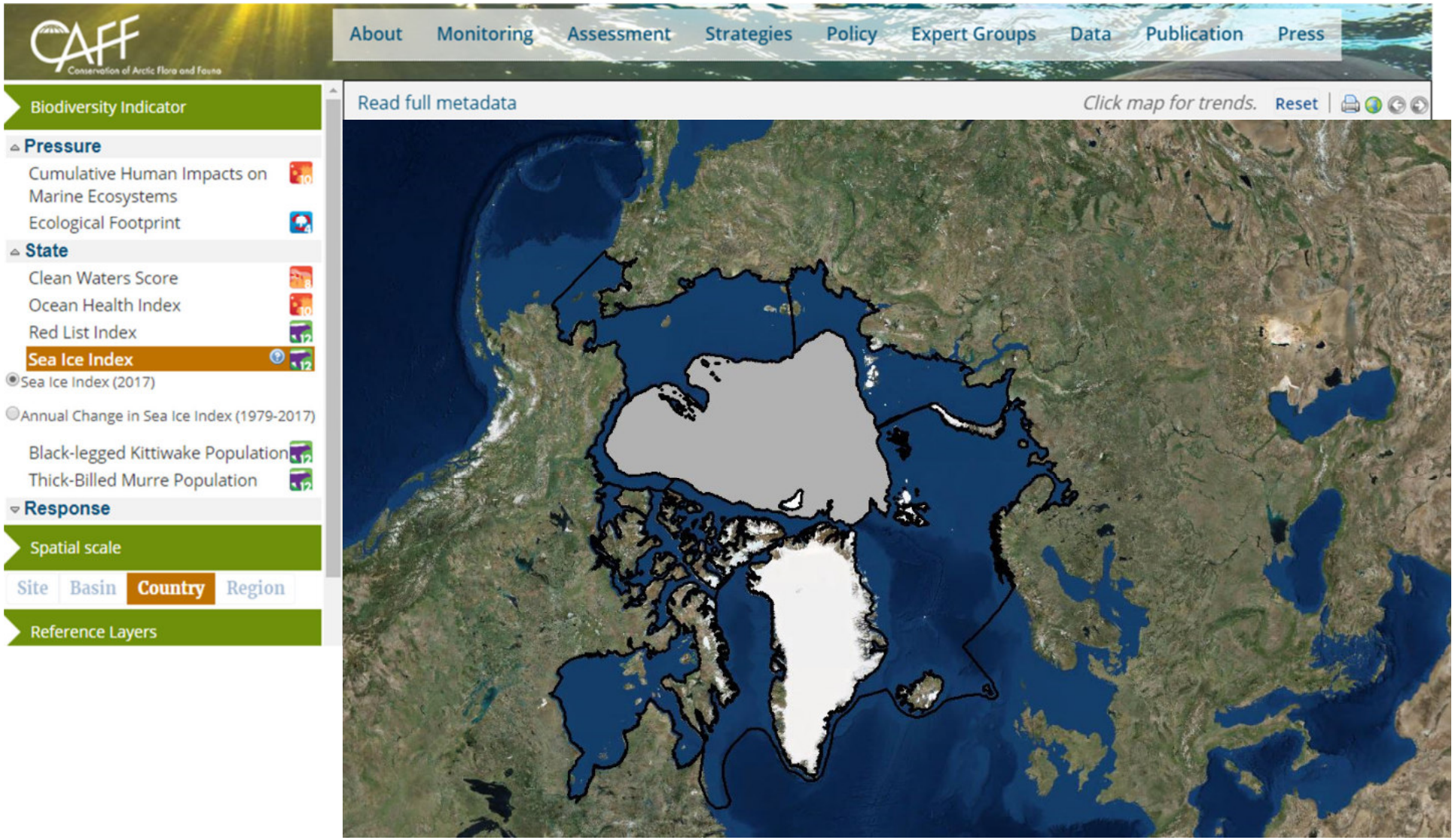
Aichi Biodiversity Targets

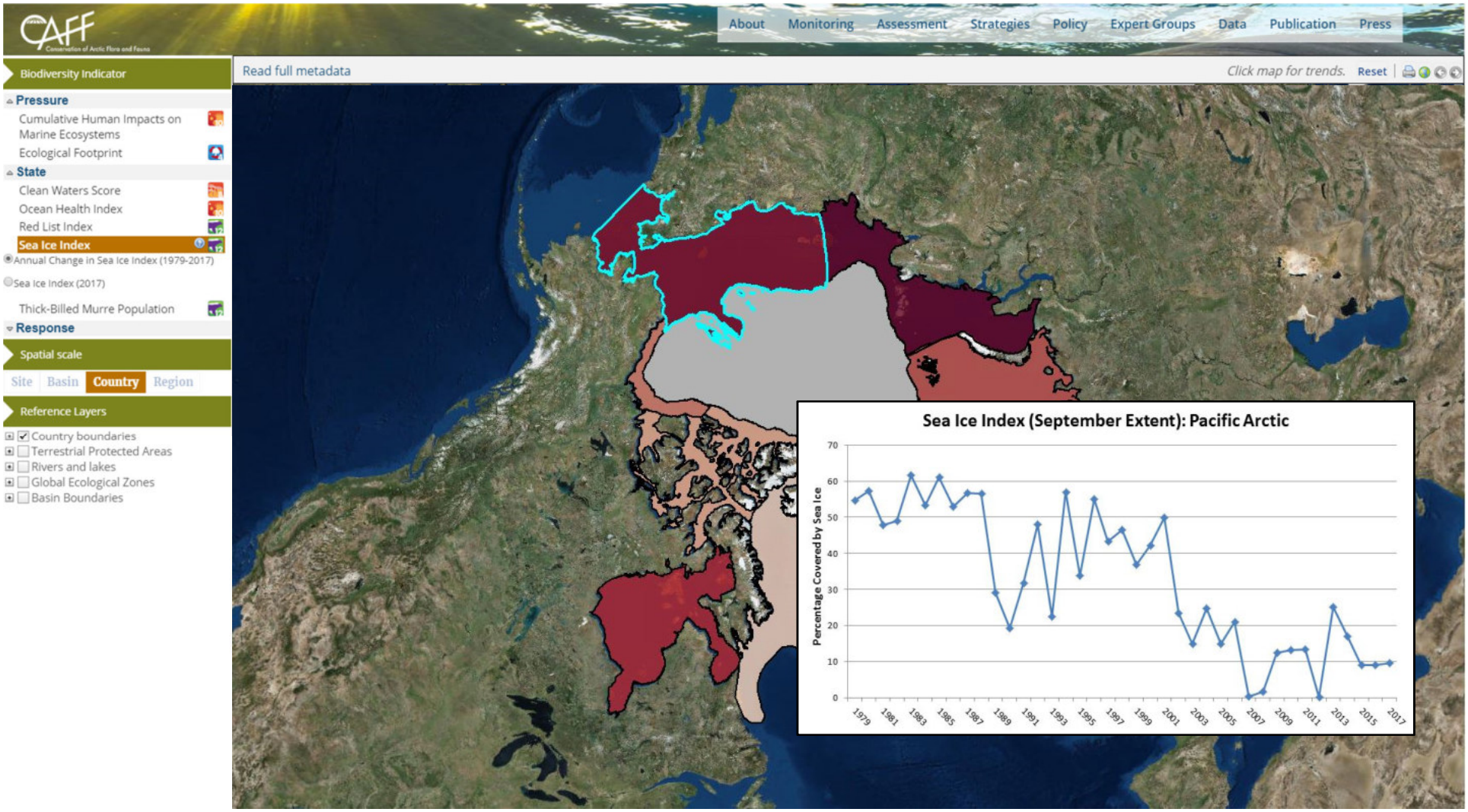
Collaborators

ASEAN CENTRE FOR BIODIVERSITY · Biodiversity Indicators Partnership · BirdLife International · European Commission · GBIF · IUCN · SSC Species Survival Commission · UNEP WCMC · MacArthur Foundation

dashboard.natureserve.org

*country list includes overseas territories and other lands


CAFF
Conservation of Arctic Flora and Fauna
About
Monitoring
Assessment
Strategies
Policy
Expert Groups
Data
Publication
Press
Biodiversity Indicator
Pressure
Cumulative Human Impacts on Marine Ecosystems
Ecological Footprint
State
Clean Waters Score
Ocean Health Index
Red List Index
Sea Ice Index
Sea Ice Index (2017)
Annual Change in Sea Ice Index (1979-2017)
Black-legged Kittiwake Population
Thick-Billed Murre Population
Response
Spatial scale
Site
Basin
Country
Region
Reference Layers
Read full metadata
Click map for trends.
Reset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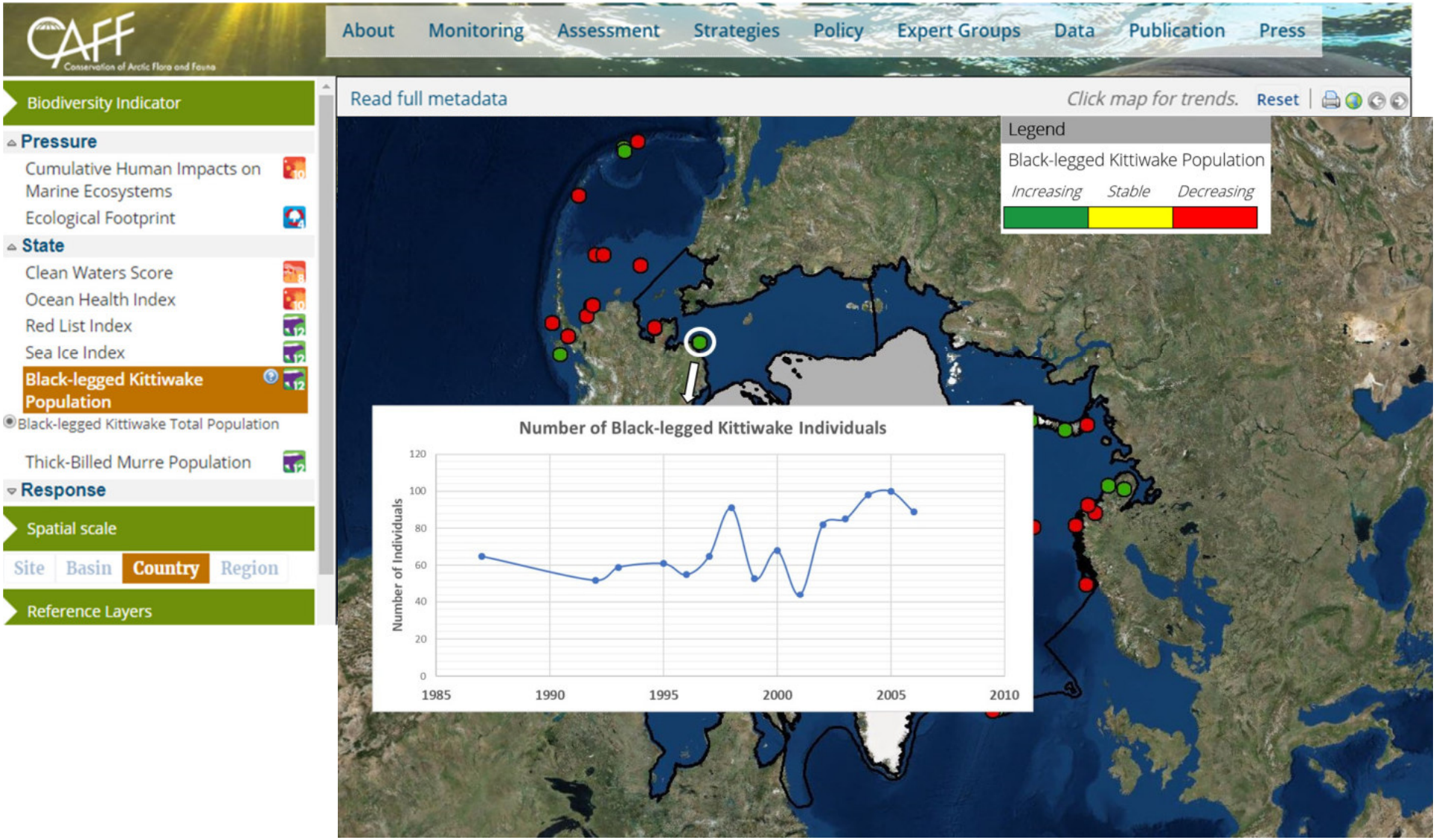
Sea Ice Index (2017)
Thick-Billed Murre Population
Response
Spatial scale
Site
Basin
Country
Region
Reference Layers
Country boundaries
Terrestrial Protected Areas
Rivers and lakes
Global Ecological Zones
Basin Boundaries
Read full metadata
Click map for trends.
Reset
Sea Ice Index (September Extent): Pacific Arctic
Percentage Covered by Sea Ice
70
60
50
40
30
20
10
0
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017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Black-legged Kittiwake Population
Black-legged Kittiwake Total Population
Thick-Billed Murre Population
Response
Spatial scale
Site
Basin
Country
Region
Reference Layers
Read full metadata
Click map for trends.
Reset
Legend
Black-legged Kittiwake Population
Increasing
Stable
Decreasing
Number of Black-legged Kittiwake Individuals
Number of Individuals
120
100
80
60
40
20
0
1985
1990
1995
2000
2005
2010

GEO BON and the CBMP – Complementary Networks Operating at Different Scales

GEO BON:

- Marine and Freshwater BONs
- Essential Biodiversity Variables
- Network of Networks Approach
- Coordination and delivery of biodiversity observations for improved policy (e.g. CBD)
- 9 step BON design process involving user assessments, ecological storylines and conceptual models for choosing EBVs

CBMP:

- Marine, Coastal, Terrestrial and Freshwater EMGs
- Focal Ecosystem Components
- Network of Networks Approach
- Coordination and delivery of biodiversity observations for improved policy (e.g. CBD)
- Structured monitoring planning process involving user assessments, conceptual models, etc. to identify FECs

CBMP as a Regional Component of GEO BON: Opportunities and Benefits

For the CBMP:

- Access to global network of expertise in:
  - Observation network design
  - Data standards and collection
  - Remote sensing
  - Model-based indicators
  - Policy-relevant data visualizations
  - Citizen Science
  - Invasive species science
- Strengthened connections to policy (e.g. CBD, IPBES, etc.) and data
- Funding opportunities

For GEO BON:

- A mature, international & operational network that can serve as:
  - A pilot for implementing GEO BON principles (e.g. EBV pilot)
  - An operational BON that can contribute to scaled analysis of harmonized biodiversity observations
  - Offering tools for BON in a Box

Kiitos!

GROUP ON EARTH OBSERVATIONS | GEO BON