Monitoring the Strategic Plan for Biodiversity

Group on Earth Observations
Biodiversity Observation Network

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Instituto de Alexander von Humboldt

Mike Gill

Group on Earth Observations – Biodiversity Observation Network

What is GEO?

A Global, Coordinated, Comprehensive and Sustained System of Observing Systems

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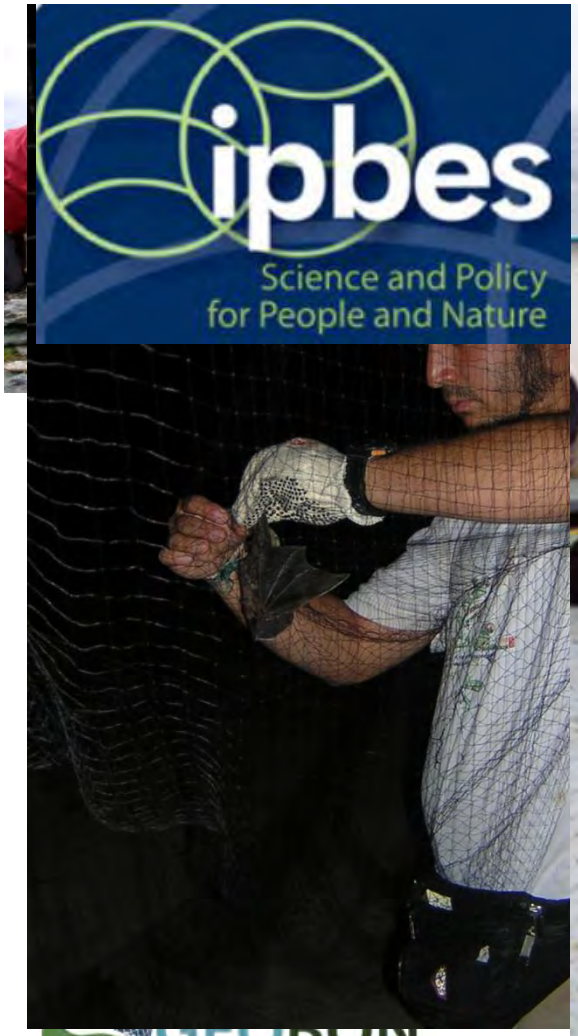
What is GEOBON?

Coordinated global network for improving biodiversity observations



Connections to the CBD

- GEO BON is **user-driven**, producing **tools and products useful at the national scale**
- Specific **focus on the CBD** and the **Strategic Plan for Biodiversity**
- GEO BON **highlighted** in a number of **CBD Decisions**:
  - Decision COP XI/3 (13) – continue work on the EBVs
  - SBSTTA Recommendation 17/1 – EBVs and BON in a Box
  - Decision COP XII/1 - invite parties & others to collaborate with GEO BON to build observation systems addressing priority needs.
- SBSTTA19 Session3 – majority of statements pointed to the **need for effective biodiversity observation systems**

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GEO BON Approach

- Provide a robust, extensive and harmonized framework for biodiversity observations and systems that meet user needs
- Top-Down:
  - Focus on a targeted set of variables (e.g. EBVs) and develop global observation frameworks (e.g. GWOS, GSEO, etc.) and products (biodiversity change indicators)
- Bottom-Up:
  - Facilitate enhanced and new biodiversity observations through national and regional capacity building (e.g. national and regional BONs and BON in a Box)

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Top Down:
Essential Biodiversity Variables

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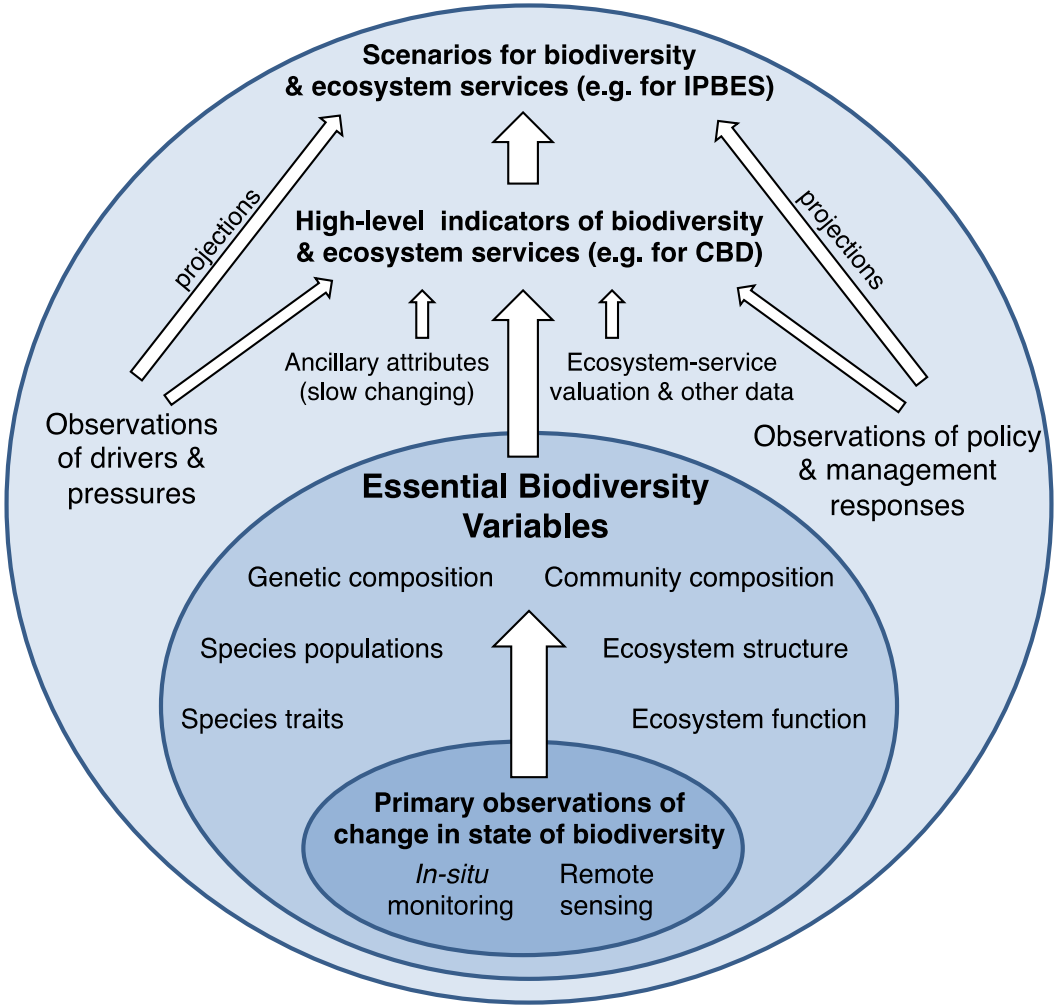
Cover dimensions of biodiversity
Allow aggregation and disaggregation
Ability to detect change

Pereira, H.M. et al (2013)
Science

Examples of candidate Essential Biodiversity Variables

EBV class	EBV examples	Measurement and scalability	Temporal sensitivity	Feasibility	Relevance for CBD targets and indicators (*1*,*9*)
Genetic composition	Allelic diversity	Genotypes of selected species (e.g., endangered, domesticated) at representative locations.	Generation time	Data available for many species and for several locations, but little global systematic sampling.	Targets: 12, 13. Indicators: Trends in genetic diversity of selected species and of domesticated animals and cultivated plants; RLI.
Species populations	Abundances and distributions	Counts or presence surveys for groups of species easy to monitor or important for ES, over an extensive network of sites, complemented with incidental data.	1 to >10 years	Standardized counts under way for some taxa but geographically restricted. Presence data collected for more taxa. Ongoing data integration efforts (Global Biodiversity Information Facility, Map of Life).	Targets: 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15. Indicators: LPI; WBI; RLI; population and extinction risk trends of target species, forest specialists in forests under restoration, and species that provide ES; trends in invasive alien species; trends in climatic impacts on populations.
Species traits	Phenology	Timing of leaf coloration by RS, with in situ validation.	1 year	Several ongoing initiatives (Phenological Eyes Network, PhenoCam, etc.)	Targets: 10, 15. Indicators: Trends in extent and rate of shifts of boundaries of vulnerable ecosystems.
Community composition	Taxonomic diversity	Consistent multitaxa surveys and metagenomics at select locations.	5 to >10 years	Ongoing at intensive monitoring sites (opportunities for expansion). Metagenomics and hyperspectral RS emerging.	Targets: 8, 10, 14. Indicators: Trends in condition and vulnerability of ecosystems; trends in climatic impacts on community composition.
Ecosystem structure	Habitat structure	RS of cover (or biomass) by height (or depth) globally or regionally.	1 to 5 years	Global terrestrial maps available with RS (e.g., Light Detection and Ranging). Marine and freshwater habitats mapped by combining RS and in situ data.	Targets: 5, 11, 14, 15. Indicators: Extent of forest and forest types; mangrove extent; seagrass extent; extent of habitats that provide carbon storage.
Ecosystem function	Nutrient retention	Nutrient output/input ratios measured at select locations. Combine with RS to model regionally.	1 year	Intensive monitoring sites exist for N saturation in acid-deposition areas and P retention in affected rivers.	Targets: 5, 8, 14. Indicators: Trends in delivery of multiple ES; trends in condition and vulnerability of ecosystems.

Essential Biodiversity Variables



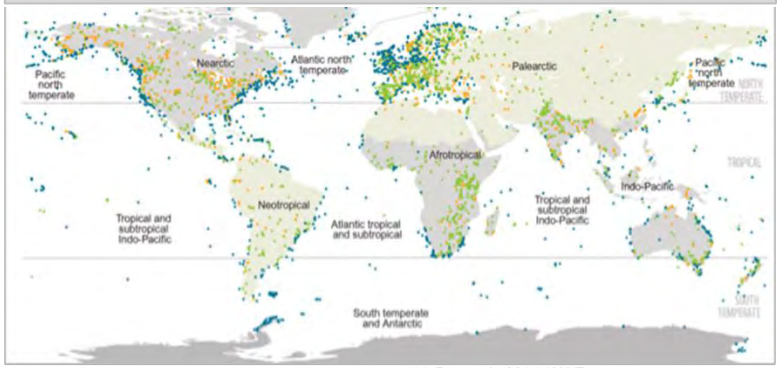
Pereira, H.M. et al (2013) *Science*

Challenges for monitoring biodiversity from in-situ measurements

Taxonomic dimension

Personal bias

Spatial dimension



McRae et al. (2014) WWF

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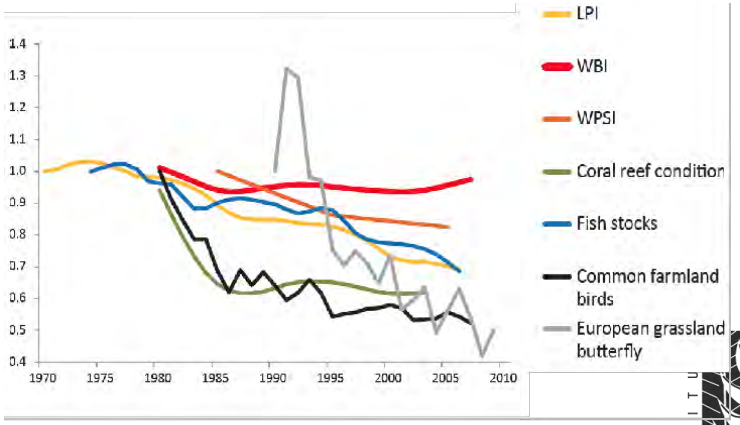
Temporal dimension



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

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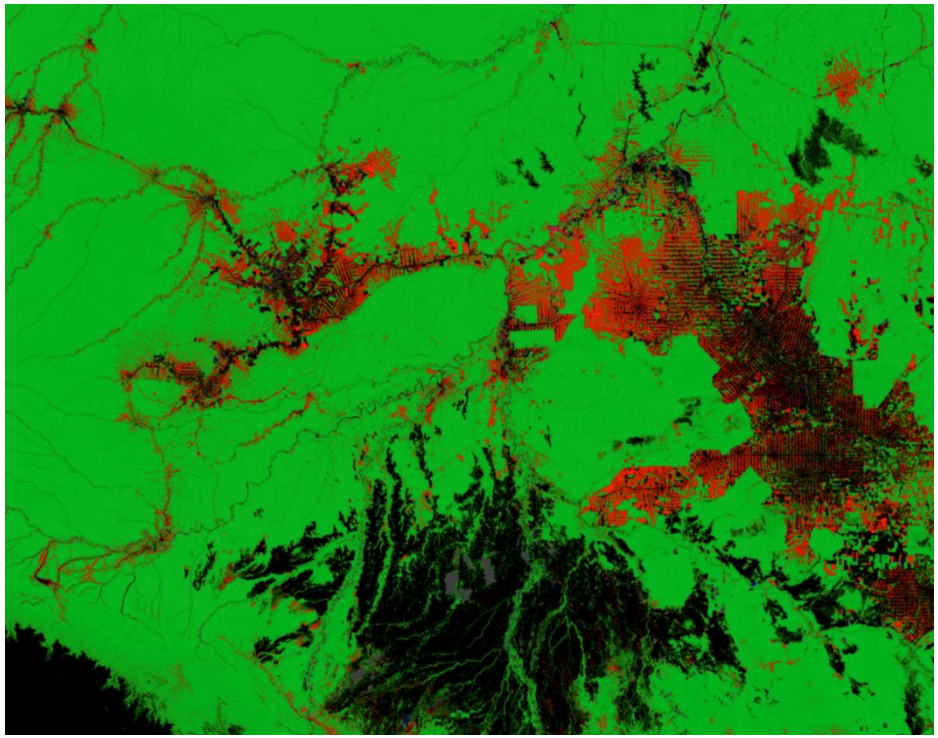
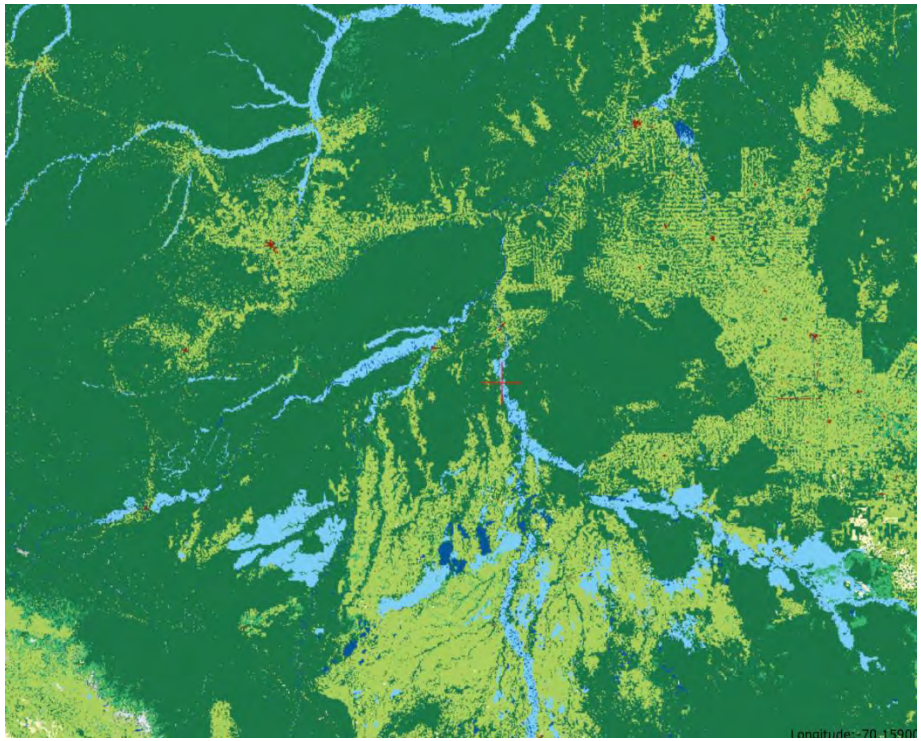
Approaches for monitoring biodiversity from space





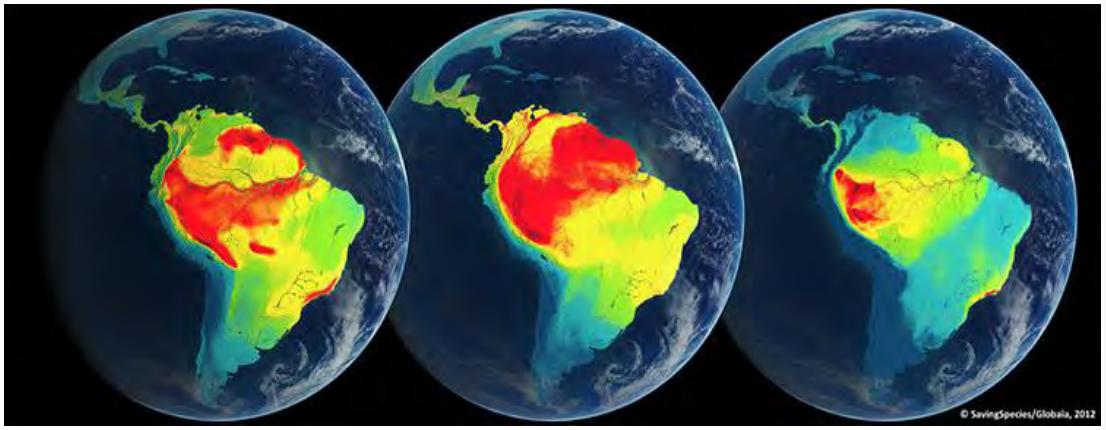
Global Forest Change
University of Maryland-NASA

Landsat based at 30 meter resolution that looks at time series of forest cover loss from 2000 to 2013 for every year

GLOBELAND30
National Geomatics Center of China

Landsat based at 30 meter resolution with 10 classes for years 2000 and 2010 within a four year period

Global Biodiversity Observation Network: components



- Spatially explicit
- Improve our understanding of biodiversity change
- Allows to connect local trends to regional and global trends

UNEP/CBD/ID/AHTEG/2015/INF/13

Global Biodiversity Change Indicators
Global Ecosystem Restoration Index

Miguel Fernández, Nestor Fernandez,
Florian Wolf & Henrique Pereira

Global Biodiversit
Outlook 4
A mid-term assessment of pro
ntation
of the Strategic Plan for Bi
50+ Indicators to address biodiversity change
No indicator for Target 15

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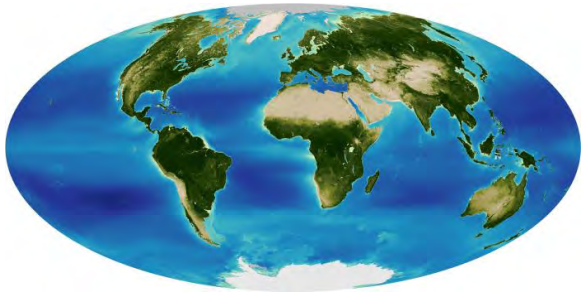
Ecosystem function class
Net primary productivity

Ecosystem structure class
Ecosystem extent and fragmentation

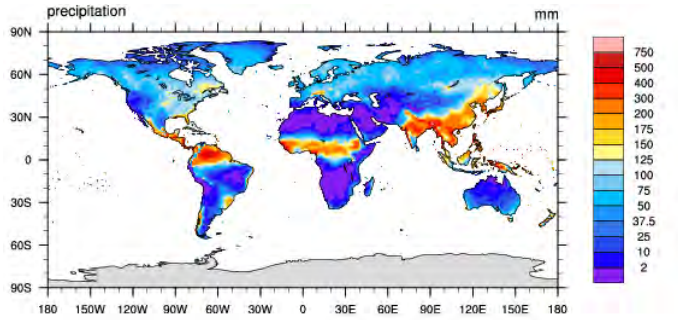
1st Component

Change in land productivity, from a functional perspective.
Rain Use Efficiency (RUE defined as the ratio between NPP and PPT)
PPT Climate Research Unit gridded dataset (CRU TS v. 3.23).
NPP using MODIS NDVI as proxy
Ecologically meaningful

NPP



PPT



CRU TS3.21: July precipitation (PPT) for 1991-2000.

Global Ecological Land Units

GEOBON

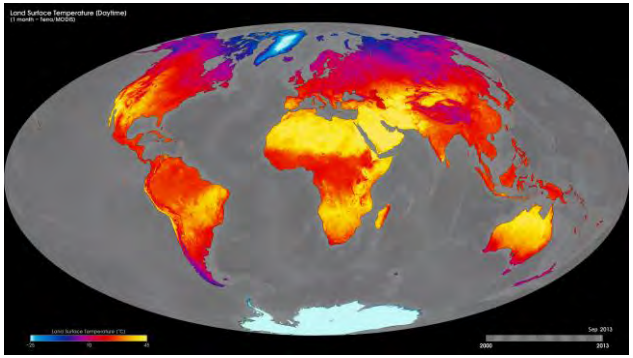
2nd Component

Change in energy balance.

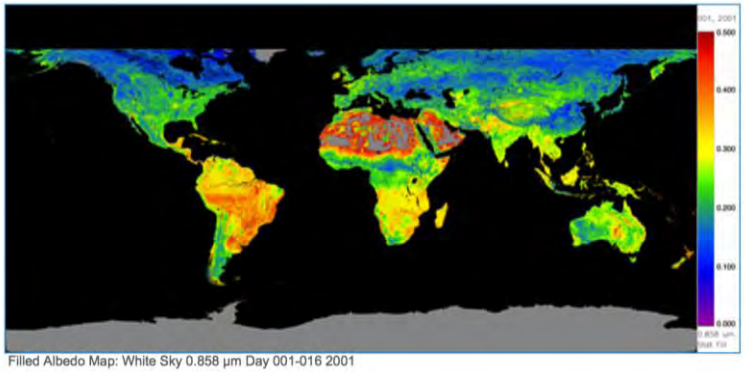
Non-evaporative fraction (energy partition between latent and sensible heat).

MODIS temperature, albedo and vegetation

Temperature

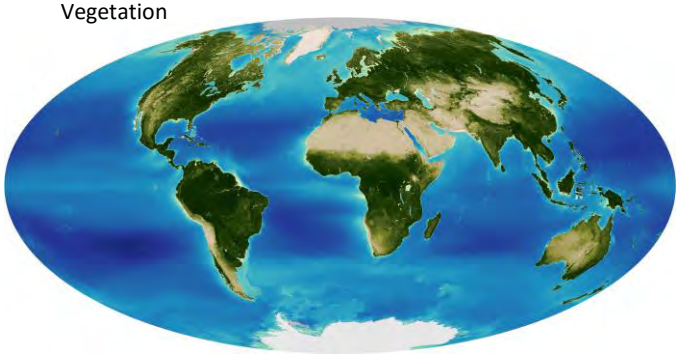


Albedo



Filled Albedo Map: White Sky 0.858 µm Day 001-016 2001

Vegetation



Ecosystem function class
Net primary productivity

Ecosystem structure class
Ecosystem extent and fragmentation

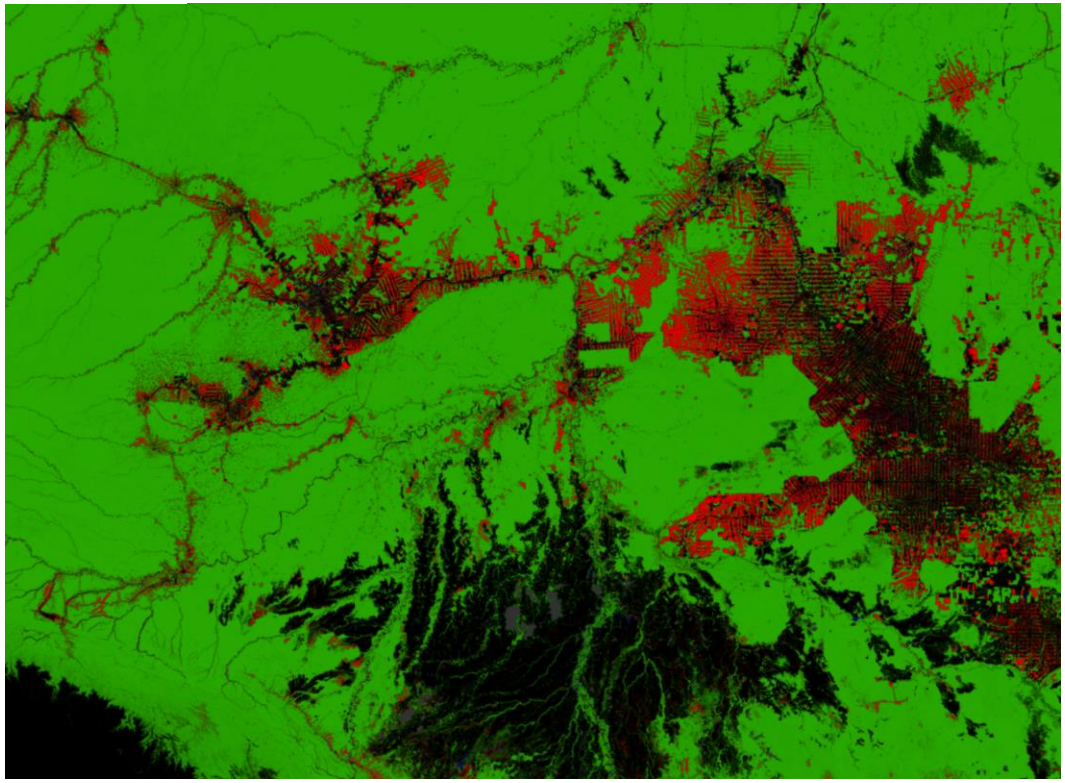
GERI

Global Ecosystem Restoration Index

15

3rd Component

Transitions in land cover.
Forest to non-forest



Global Forest Change
University of Maryland-NASA

Landsat based at 30 meter resolution that looks at time series of forest cover loss from 2000 to 2013 for every year

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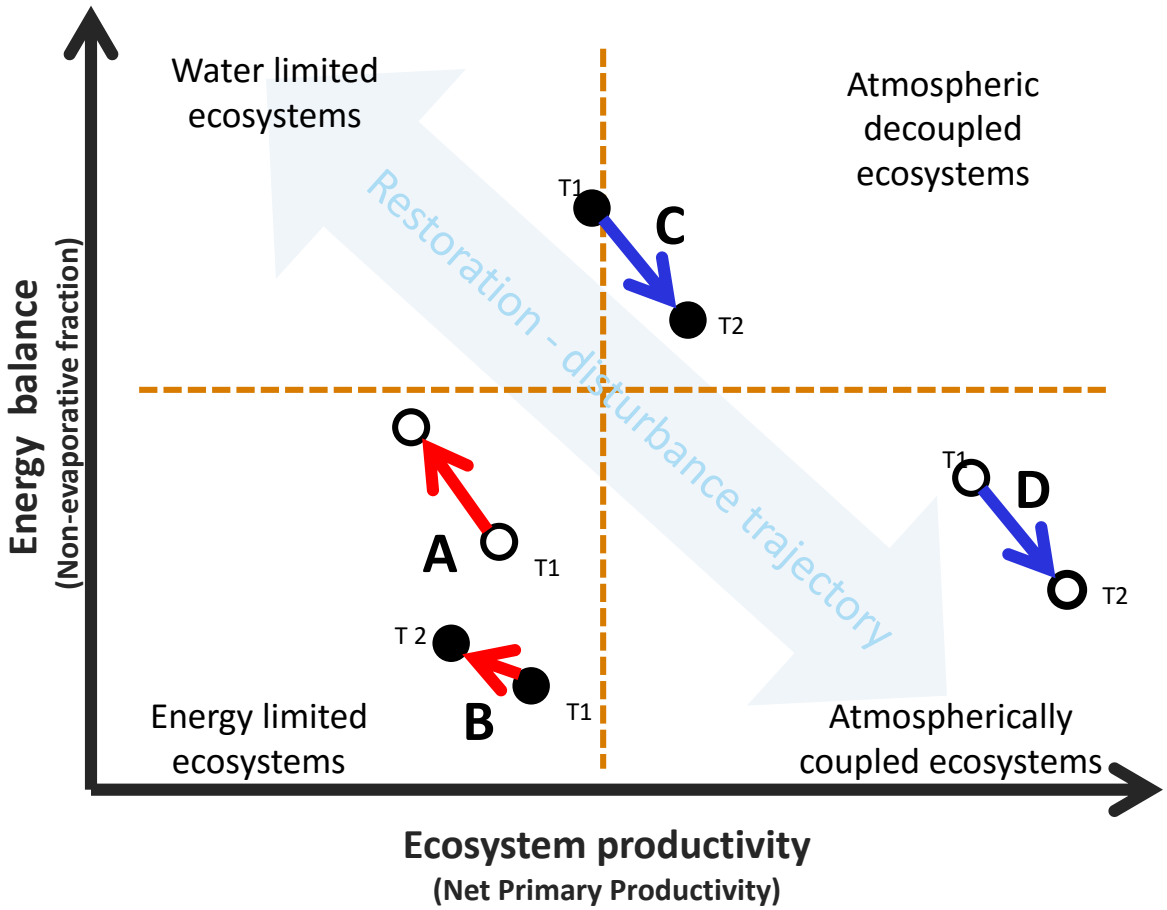

Change captured by a transition in land cover
Change not captured by a land cover transition

Ecosystem restoration trajectory
Ecosystem degradation trajectory

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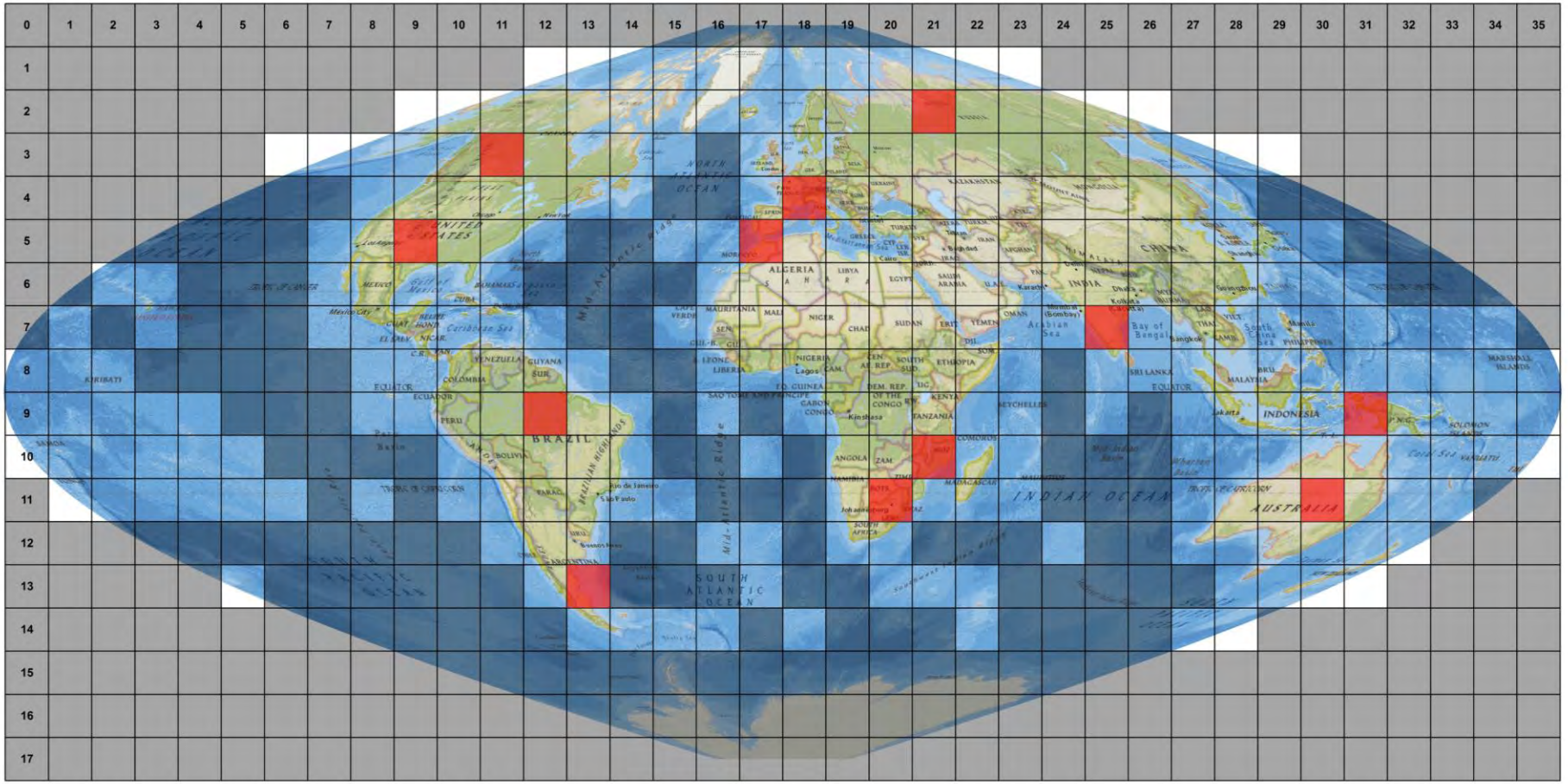
Modified after Nemani & Running (1997), in Ecological Applications



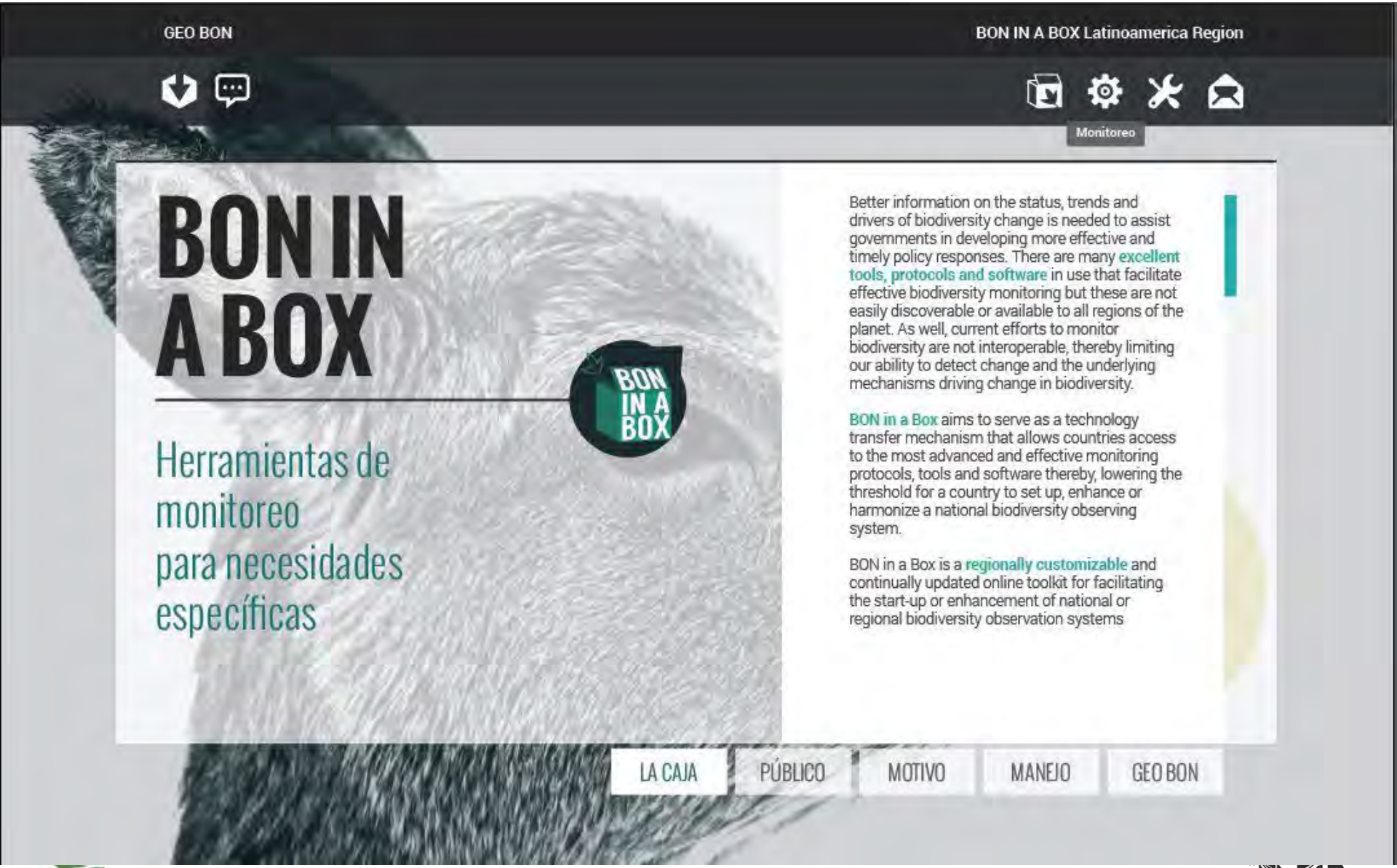
NORTH ATLANTIC OCEAN
UNITED STATES
ALGERIA
CHINA
INDIA
BRAZIL
INDIAN OCEAN
AUSTRALIA
SOUTH ATLANTIC OCEAN
INDONESIA

GEOBON

iDiv

Questions to:
miguel.fernandez@idiv.de

Bottom-Up: BON in a Box



BON in a BOX

BON-in-a-Box is a **digital, customizable, 'smart' toolkit for biodiversity observations**

Purpose

1. Serve as a **technology transfer mechanism** allowing access to the most advanced and effective monitoring protocols, tools and software;

2. Lower the threshold for a country to set up, enhance or harmonize a national biodiversity observing system.

3. Foster **regional sharing** of best practices and technology; and,

4. Advance i**nteroperability** – promote uptake of harmonized observations, data management, analysis & reporting through the use of consistent tools, protocols and data.

5. Improve the power to detect & attribute biodiversity trends

Workshop
Abril 2015

Bolivia, Brasil, Colombia,
Costa Rica, Ecuador,
Panamá, Perú, México

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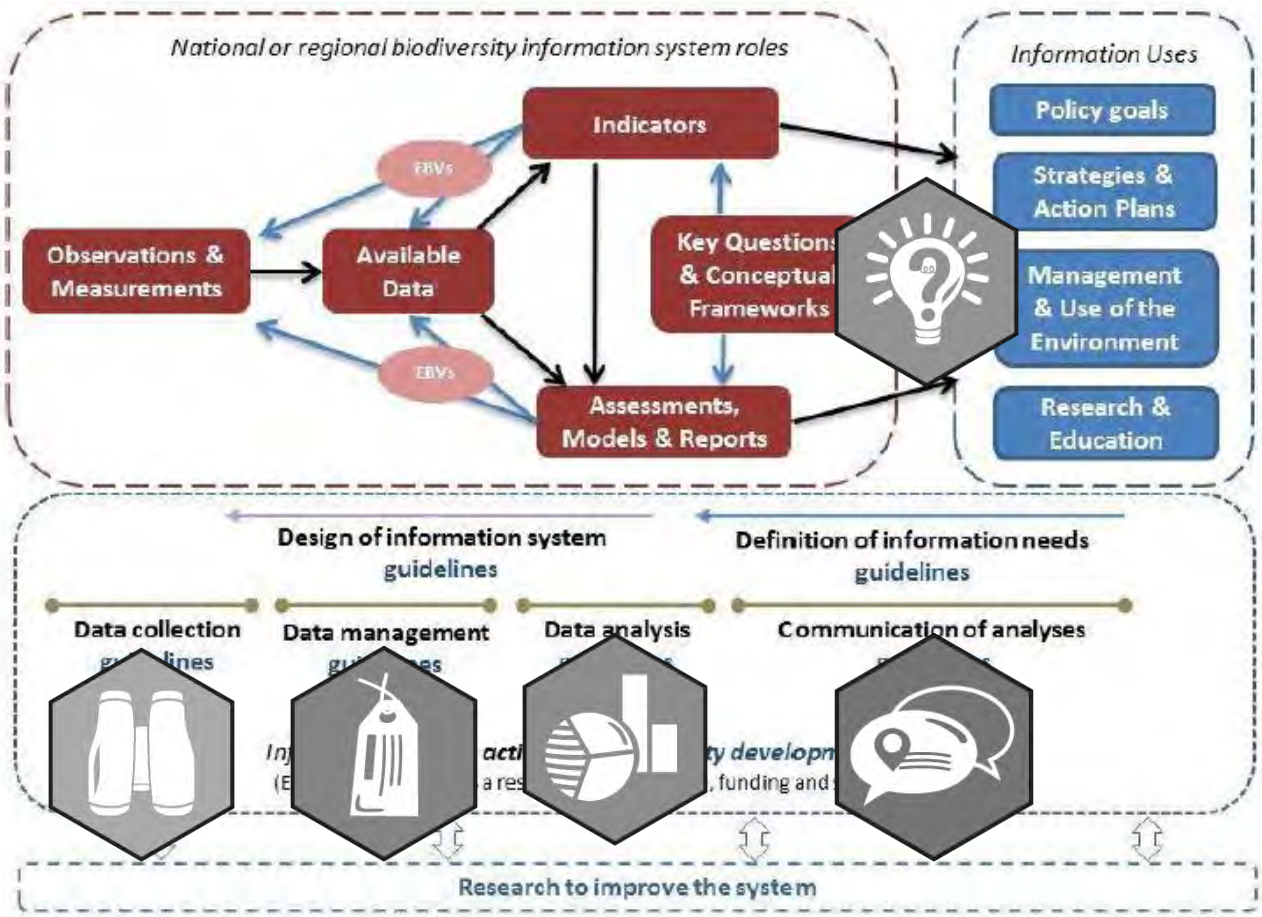
Framework for a National Biodiversity Information System



Framwork design by Philip Bubb, UNEP World Conservation Monitoring Centre

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TOOLS

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Pick up the tools, to make up the observation system, or fulfill your need.

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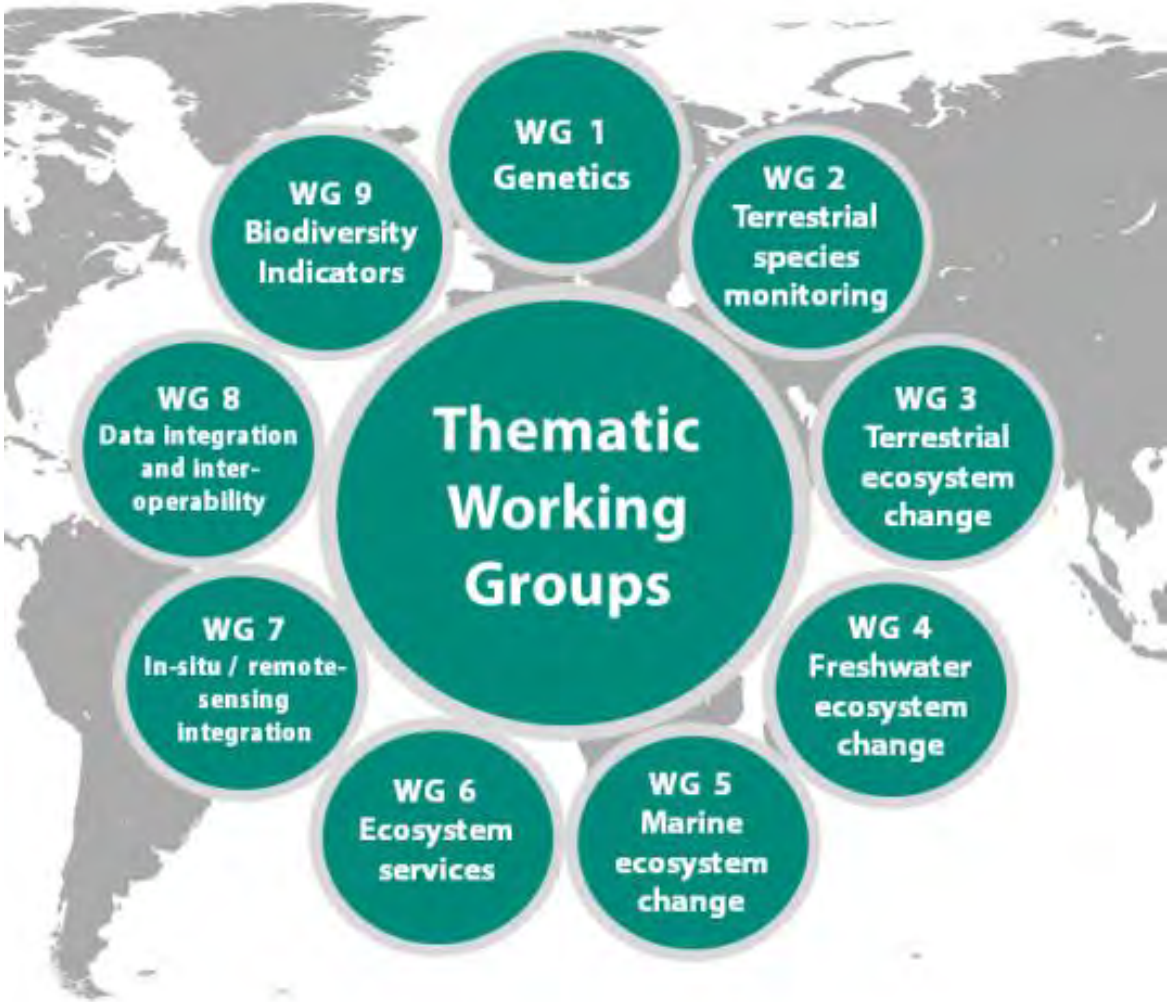
How do you find the **tools you need** in BON in a BOX?

GEO BON Working Groups



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https://boninabox.geobon.org/

GEOBON

https://www.youtube.com/watch?v=i3CrrU9XlSo

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EN

MONITORING COMPONENTS

EBV

DATA MANAGEMENT

Standards and Interoperability

There is an enormous amount of biodiversity information that comes from many sources and different types of formats. To be able to take advantage of this depends on the use of standards. Data standards **ensure interoperability of the major initiatives of biodiversity information** in the world to organize and unify how they are issued. Under this label you will find documentary and technological tools such as web platforms and software that allow data standardization and publication of resources.

Data collection

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ESSENTIAL BIODIVERSITY VARIABLES

EBV

EBV By Theme

COMMUNITIES COMPOSITION

Diversity and interactions between species

Under this label you will find specific tools to **capture, analyze and/or communicate data at the level of biological communities**, meaning information on which species live together. Includes multi-taxa observations and data obtained with metagenomic techniques. Also tools for observations of interactions between species and/or species networks. For example, plant-animal systems such as dispersers and pollinators.

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FILTERS BY KIND

EBV

By Kind

DATASET

Metadata, data and information

A dataset is a collection or group of records that share a grouping criteria. This criteria can be a methodology, an obtaining purpose, a geographic area, a time reference, etc. Datasets should refer to a set of metadata, which describes the content, quality, condition and other characteristics of the data in a standardized format, **ensuring the viability and permanence of the data sets**, in order to ease their use for multiple purposes and in different contexts. Under this label you'll find the link to the main portals that give access to data sets on biodiversity observations.

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citizen science

SEARCH

BIOMODELOS

BIODIVERSITY AND ECOSYSTEM SERVICES RESEARCH

Biomodels is a digital tool that enables communication between biodiversity experts to develop distribution models of species existing in Colombia in a collaborative and open way.

MAP OF LIFE

YALE UNIVERSITY

Map of Life endeavors to provide 'best-possible' species range information and species lists for any geographic area.

KEY ISSUES AND NEW APPROACHES IN EVALUATING CITIZEN SCIENCE LEARNING OUTCOMES

EARTHWATCH INSTITUTE

Peer reviewed article that reviews multiple approaches to evaluating learning outcomes from citizen science projects.

ALEXANDER VON HUMBOLDT INSTITUTE COLOMBIA

COLOMBIA

Humboldt Institute's mission is to promote, coordinate and conduct research that contributes to knowledge, conservation and sustainable use of biodiversity as a factor of development and welfare of the Colombian population. Work network with multiple organizations with capacity to influence decision-making and public policy.

CONTACT WEB SITE

MONITORING MATTERS (FOR COMMUNITIES)

NORDISK FOND FOR MILJØ OG UDVIKLING

EVALUATING LEARNING OUTCOMES USER GUIDE

EARTHWATCH INSTITUTE

This users guide helps to evaluate learning outcomes from participants on citizen science projects.

WALTER JETZ

UNITED STATES

Walter is interested in global biodiversity science. His research combines elements of biogeography, community ecology, landscape ecology, macroecology, global change ecology, evolutionary and comparative biology, biodiversity informatics and conservation.

CONTACT WEB SITE

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EVALUATING LEARNING OUTCOMES USER GUIDE

http://www.birds.cornell.edu/citscitoolkit/evaluation
cbp6@cornell.edu

The User's Guide for Evaluating Learning Outcomes from Citizen Science was developed by Cornell Lab of Ornithology researchers for practitioners who want to evaluate learning outcomes from their citizen science projects. It includes a practical overview of evaluation techniques, tips, and best-practices for conducting evaluations, a glossary of terms, and an extensive set of templates and worksheets to help with evaluation planning and implementation.

MARK CHANDLER

www.earthwatch.org
mchandler@earthwatch.org

EARTHWATCH INSTITUTE

Earthwatch engages people worldwide in scientific field research and education to promote the understanding and action necessary for a sustainable environment.

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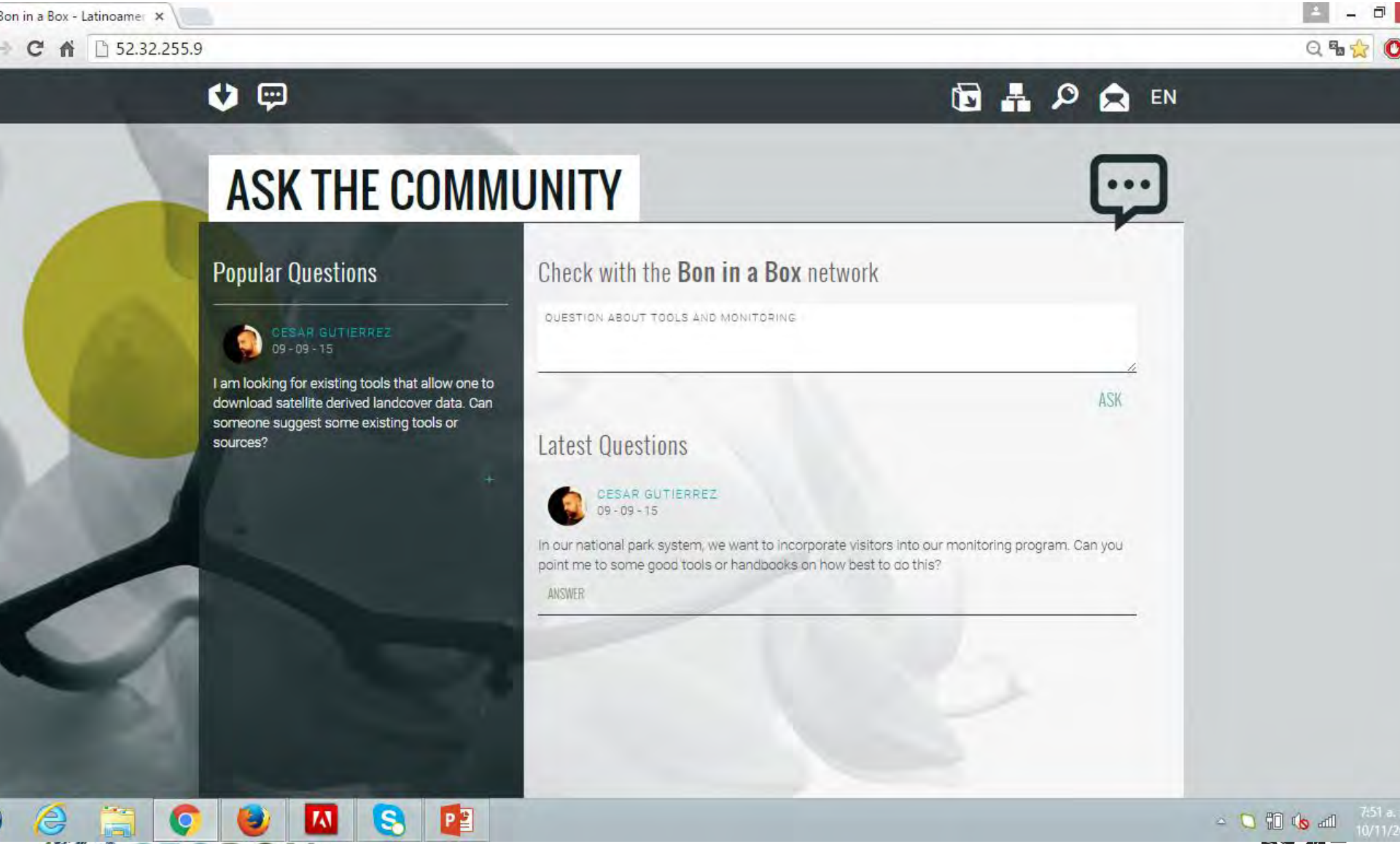
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ASK THE COMMUNITY
Popular Questions
CESAR GUTIERREZ
09 - 09 - 15
I am looking for existing tools that allow one to download satellite derived landcover data. Can someone suggest some existing tools or sources?
Check with the Bon in a Box network
QUESTION ABOUT TOOLS AND MONITORING
ASK
Latest Questions
CESAR GUTIERREZ
09 - 09 - 15
In our national park system, we want to incorporate visitors into our monitoring program. Can you point me to some good tools or handbooks on how best to do this?
ANSWER

THANKS!!!

GEO BON GROUP ON EARTH OBSERVATIONS | GEO BON

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