Connecting the Dots: Earth Observations from a User’s Perspective

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Questions We Need to Address

• How do we bring the remote sensing, in-situ and decision-making communities closer together?
• What do national policy makers need to make informed and effective decisions? What are their obstacles? How do we bridge the gap between science and policy-making?
• How do we equip countries with limited monitoring capacity in a sustainable way?
The Challenge: Connecting the Dots

- **Limited, patchy and often hidden data**: Biodiversity information is spatially and temporally patchy, difficult to discover and hard to synthesize.
- **Limited capacity**: nations challenged to develop and sustain monitoring programs and keep up with continually changing sensors and methodology.
- **Limited integration**: in-situ and remote sensing observing systems could be better harmonized.
- **Weak links** between data collectors and policy-makers.
Gaps in biodiversity monitoring

Living Planet Index Populations

Taxonomic gaps

Estimated species richness

Species assessed in the Red List

Resulting in...

- Limited and often, ill-informed conservation decisions
- Untapped potential for using earth observation data to support effective decision-making

Figure 10: Number of CBD Parties reporting 'additional' indicators to CBD global indicators in 4\textsuperscript{th} national reports, within CBD headline indicator categories

Remote Sensing: Opportunities and Challenges

- Significant, accelerating advances in sensor technologies and methods
- Growing global datasets - disaggregate datasets to fill gaps?
- Improved models blending in-situ with remotely sensed data
- Rapid response to address pressures

Mapping and responding to forest degradation in the Brazilian Amazon

Source: Scaramuzza. 2013. Is it possible to reduce deforestation in the Brazilian Amazon? Secretary of Biodiversity and Forests.
What obstacles do users face?

- **Limited resources**: Data and analytical constraints
- **Lack of adequate connection** - between user needs and opportunities provided by remote sensing
What is a ‘User’?

- Anyone who can use biodiversity data to make or support a good policy decision:
  - National and sub-national governments
  - Conventions (e.g. Convention on Biological Diversity, Ramsar Convention, etc.)
  - Academic Institutions
  - Conservation NGOs
Selected key obstacles

- **Data access**
  - Restrictive data access policies
  - Internet access
  - Search and order systems

- **Level of product development**
  - Derived products easy to use for non-experts

- **Lack of capacity & training**
  - Developing countries & conservation organizations

- **Inconsistent data processing methodologies**
  - Harmonization at national and international level

- **Low temporal resolution and time series**
  - Inconsistency with fast rate of change and trend analysis

- **Uncertainty in long-term continuity**
  - Challenge for securing funding
Opportunities

- 11 out of 20 Aichi Targets could be (partially) derived from RS data
  - Unevenly distributed among the five Strategic Goals

- 54 out of 99 indicative indicators (decision XI/39 could be (partially) derived from RS data
<table>
<thead>
<tr>
<th>Strategic Goal</th>
<th>Aichi Biodiversity Target</th>
<th>Current remote sensing adequacy</th>
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<td>A</td>
<td>1. Awareness of biodiversity values</td>
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<td>2. Integration of biodiversity values</td>
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<td>3. Incentives</td>
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<td>4. Sustainable production and consumption</td>
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<td>5. Habitat loss, fragmentation and degradation</td>
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<td>6. Sustainable exploitation of marine resources</td>
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<td>7. Biodiversity-friendly agriculture, forestry and aquaculture</td>
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<td>8. Pollution reduction</td>
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<td>9. Control of invasive alien species</td>
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<td>10. Coral reefs and other vulnerable ecosystems</td>
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<td>11. Protected areas</td>
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<td>12. Prevented extinction of threatened species</td>
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<td>13. Genetic diversity of socio-economically and culturally valuable species</td>
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<td>14. Ecosystem services</td>
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<td>15. Ecosystem resilience</td>
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<td>16. Access and benefit sharing</td>
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<td>17. NBSAPs</td>
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<td>18. Traditional Knowledge and customary use</td>
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<td>19. Biodiversity knowledge improvement and transfer</td>
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<td>20. Resource mobilisation</td>
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Key Recommendations

- **Remote sensing is not a fit-for-all solution**
  - EO data best used as part of a wider observation system ideally with quality ground data
  - Manage expectations of policy end users in what RS data can provide

- **Listen and cater for end user needs in RS product development**
  - Prioritize areas for future development (e.g. long-term Land Cover Change products)

- **Establish a set of minimum requirements and common standards to inform the EO community**
  - Initiatives such as the EBVs led by GEO BON could offer the necessary conceptual framework
Key Recommendations

- Free and open access to all taxpayer-funded satellite remote sensing imagery
  - Back to back with more available processed images easier to use by non-remote sensing specialists

- Guarantee long term continuity of EO
  - Key to avoid funders to restrain to invest in projects

- Establish a hub to concentrate and coordinate existing information and is easily accessible globally as a unique reference point
  - Initiatives such as the BIP could offer a model
Group on Earth Observations
Biodiversity Observation Network

INFORMATION FOR THE BENEFIT OF SOCIETY
GEO BON Approach

• Provide a harmonized global framework for biodiversity observations and systems
  – Top-Down approach:
    • Focus on a reduced set of variables, indicators and methodologies (e.g. Essential Biodiversity Variables)
  – Bottom-Up (e.g. regional and national capacity building – BON in a Box)
Essential Biodiversity Variables – A Connecting Framework

• What are the most important variables to understand global biodiversity change?
  – Biodiversity observation and information systems would be structured around these variables: protocols, sampling schemes, etc.

• Users of the EBV’s:
  – Scientists will use the data for the study of global biodiversity change
  – Conservation professionals would assess effectiveness of management strategies
  – NGO’s would develop communication tools (e.g. indicators)
  – Policy-makers would be able to assess both national targets and global targets
Questions EBVs must help answer

1. How is biodiversity changing?
2. Why is biodiversity changing?
3. What are the consequences for human well-being?
4. Are responses being taken effective?
5. What is the future risk of harmful biodiversity change?
Essential Biodiversity Variables

Scenarios for biodiversity & ecosystem services (e.g. for IPBES)

High-level indicators of biodiversity & ecosystem services (e.g. for CBD)

Ancillary attributes (slow changing)

Ecosystem-service valuation & other data

Observations of policy & management responses

Essential Biodiversity Variables

Genetic composition

Community composition

Species populations

Ecosystem structure

Species traits

Ecosystem function

Primary observations of change in state of biodiversity

In-situ monitoring

Remote sensing

Observations of drivers & pressures

Projections

Projections

Pathway to biodiversity indicators for the Aichi Targets from in-situ and remotely sensed data and the role of EBVs
Main Classes of EBVs

• Community composition
• Ecosystem structure
• Ecosystem function
• Species populations
• Species traits
• Genetic composition
Bottom-Up: BON-in-a-Box

- GEO BON is initiating development of BON-in-a-Box (Biodiversity Observing Network in a Box)
- Purpose:
  - Lower the threshold for a country or region to get started on developing or enhancing an existing Biodiversity Observation Network;
  - Improve biodiversity observations to better meet user needs;
  - Improve the power to detect and attribute biodiversity trends and bridge the science-policy gap.
  - Foster regional cooperation
What is BON-in-a-Box?

• **Digital, downloadable toolkit** easily customized to meet specific national and/or regional needs and interests;

• Providing nations/regions with a common set of:
  – Biodiversity variables,
  – Monitoring guidelines and templates,
  – Manuals,
  – Resource links,
  – Baseline land-cover maps,
  – Data standards; and,
  – Data management and reporting tools and platforms.

• **Can the remote sensing community contribute cost-effective, user-friendly and sustainable products?**
Connecting the Dots: A Way Forward?

- **Free and open access** to remote sensing data and processed (geo-referenced & ortho-rectified) imagery
- **Connect data products to decision-makers** – in formats that they can use
- **Capacity-building**: transfer of user-friendly, cheap and feasible technology, platforms and methodology
- **Disaggregate** global datasets to fill national and regional gaps
- **Essential Biodiversity Variables** provide a potential framework for bringing the in-situ and remote sensing communities together and helping space agencies prioritize primary observations and processing
Thank You