Norway grants

The National Centre for Research and Development

How can Copernicus products help in assessing Norway's progress towards the targets of the COP15 Global Biodiversity Framework?

Ulrike Bayr, NIBIO, Dept. of Landscape monitoring

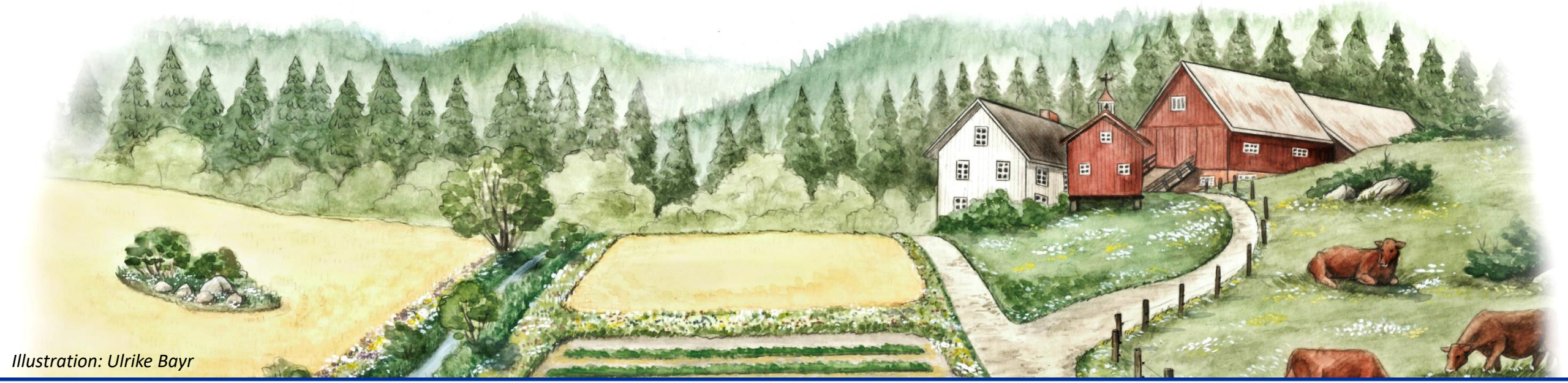


Illustration: Ulrike Bayr

IGiK

NIBIO NORWEGIAN INSTITUTE OF BIOECONOMY RESEARCH

IOŚ-PIB

Lodz University of Technology

EVERSIS

Kunming-Montreal Global Biodiversity Framework (GBF)

Signed December 2022 on the 15th meeting of the UN Biodiversity Conference CBD (COP15) in Montreal, Canada

UNs member states have committed to work towards defined goals and targets to halt and reverse nature loss by 2050

- 4 long-term goals (until 2050)
- 23 action-oriented targets (until 2030)

CBD 2022

Norway's work with the GBF so far: legislation

Norwegian Planning and Building Act («Plan- og bygningsloven»)

- adopted in 2008
- Most important legislation for land management
- 83 % of Norways land area is managed by this act on the municipality-level

National Nature Diversity Act («Naturmangfoldloven»)

- adopted in 2009
- aims to safeguard ecosystems, habitats, species, and genetic diversity, recognizing their ecological, cultural, and economic significance
- outlines regulations for managing and conserving natural resources, controlling invasive species, and promoting sustainable land use practices
- Act covers many of the GBF goals and targets

Norway's work with the GBF so far

Norwegian Environment Agency has evaluated Norway's status with respect to GBF

- GBF targets were linked to SDGs and Aichi-targets
- Evaluated existing indicators and if they can be applied also for GBF targets
- Received contribution from all sectors

Main conclusions:

- Norway in a good start position with Nature Diversity Act, but
- existing legislation and actions are insufficient to reach targets
- Conflict between national goals and local actions at municipality-level
- More funding required to implement actions

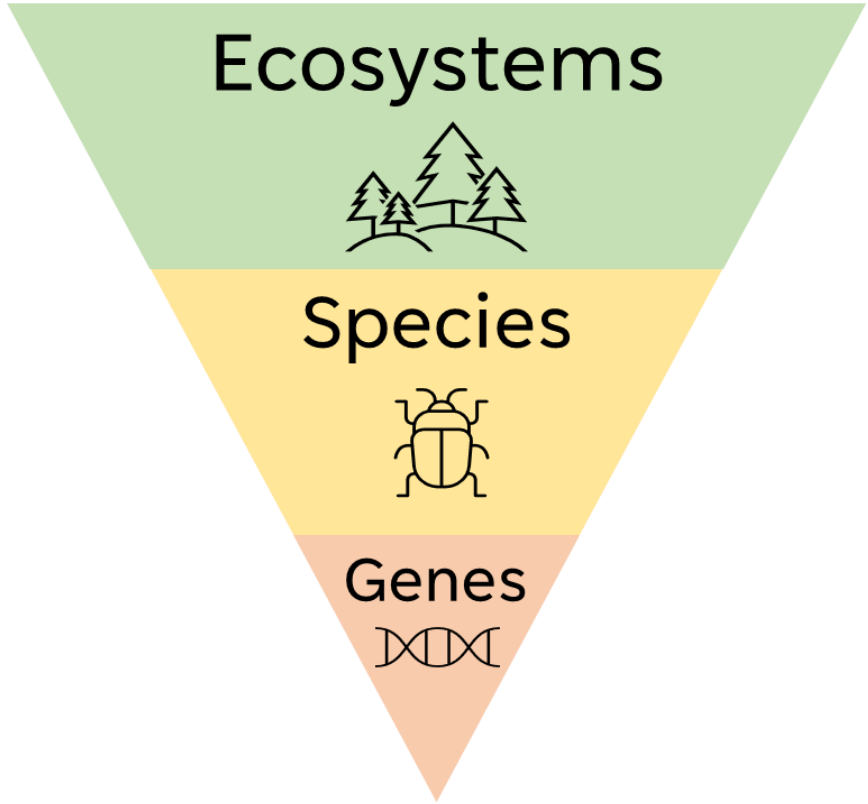
Biodiversity

"Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (CBD/COP/15)

Biodiversity consists of three components on multiple levels / spatial scales:

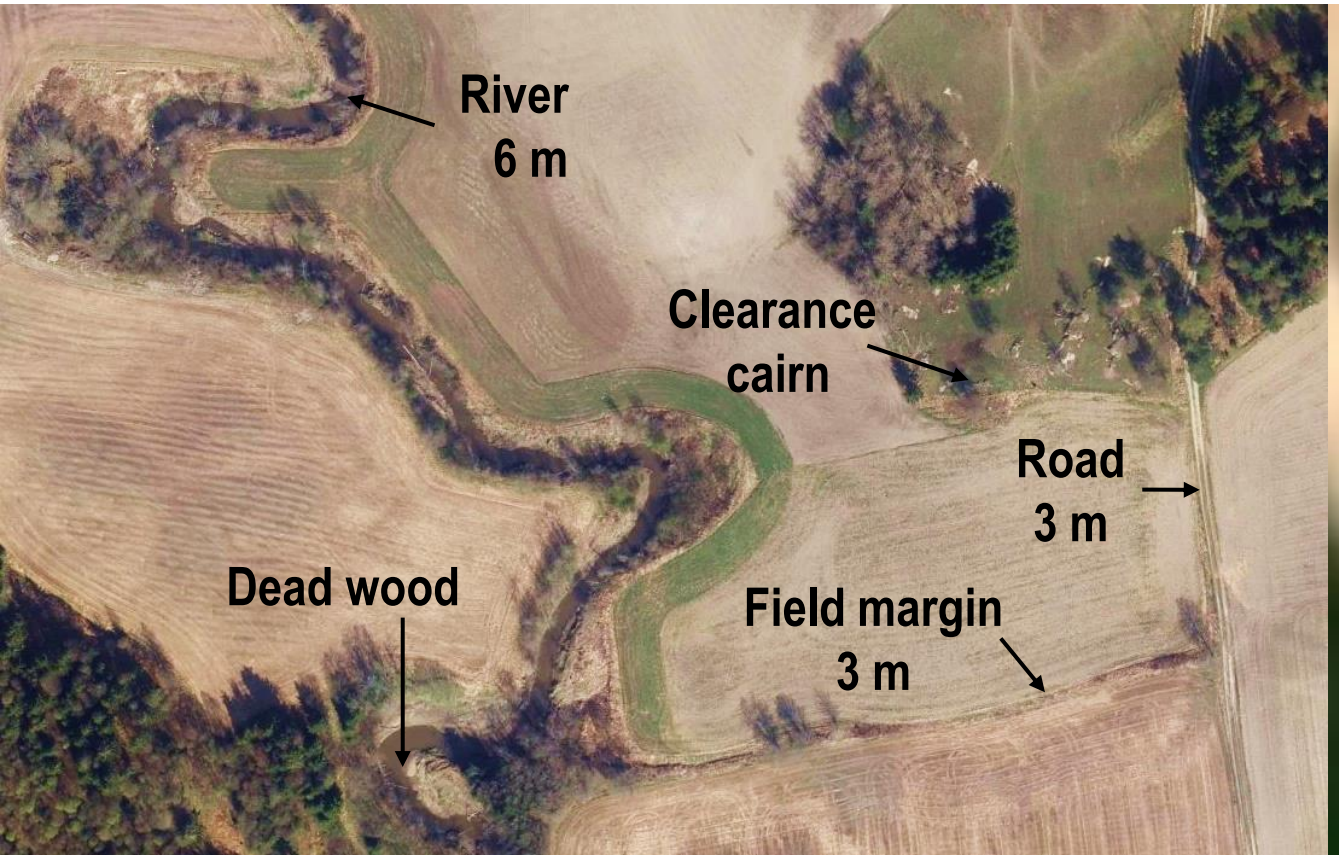
- **Diversity of ecosystems and habitats**
- **Species diversity**
- **Genetic diversity**

Complex interactions between components



Remote sensing (RS) of biodiversity: challenges

Spatial resolution insufficient for capturing important elements for biodiversity



Aerial photograph 2018 (0.1 m resolution)

Sentinel-2 2018 (10 m resolution)

Remote sensing (RS) of biodiversity: challenges

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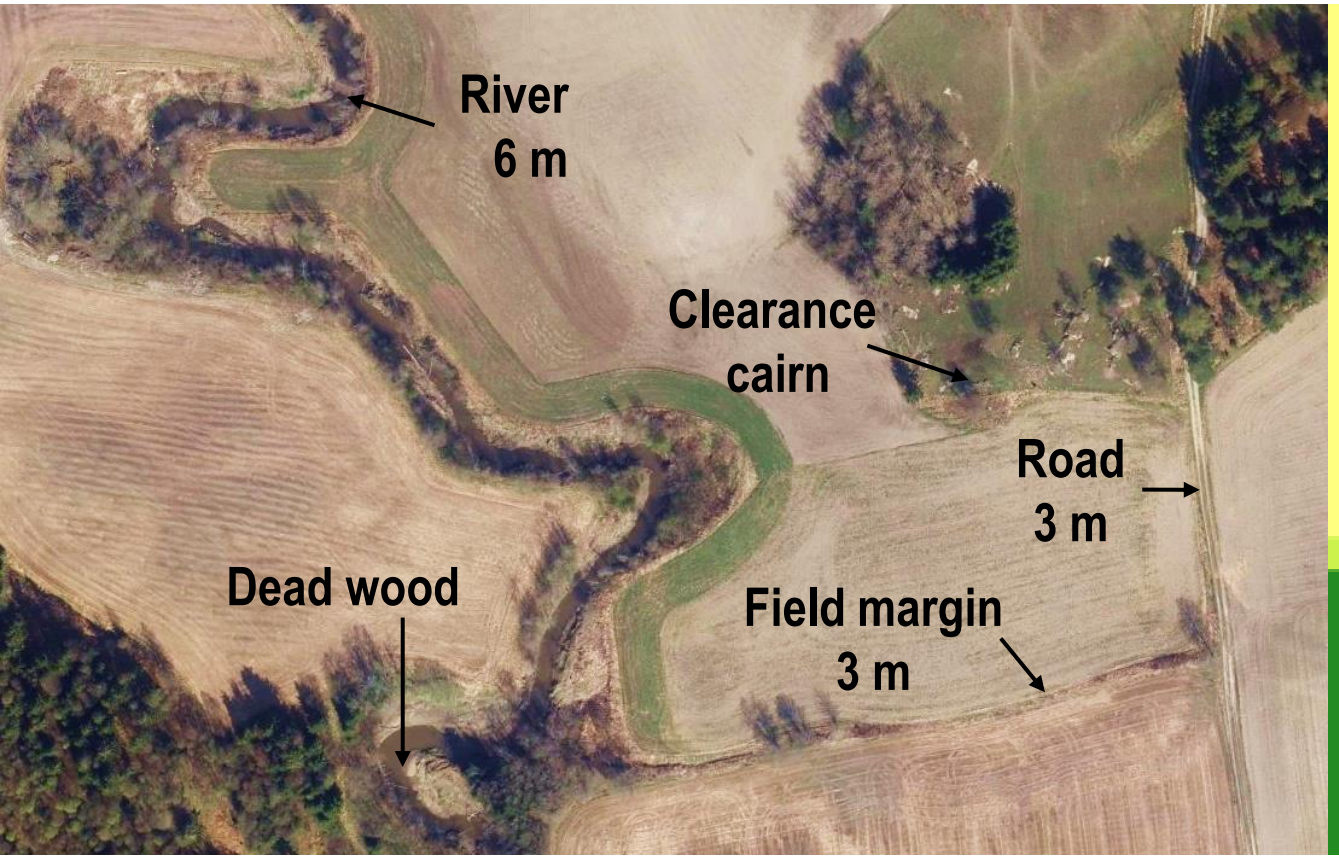

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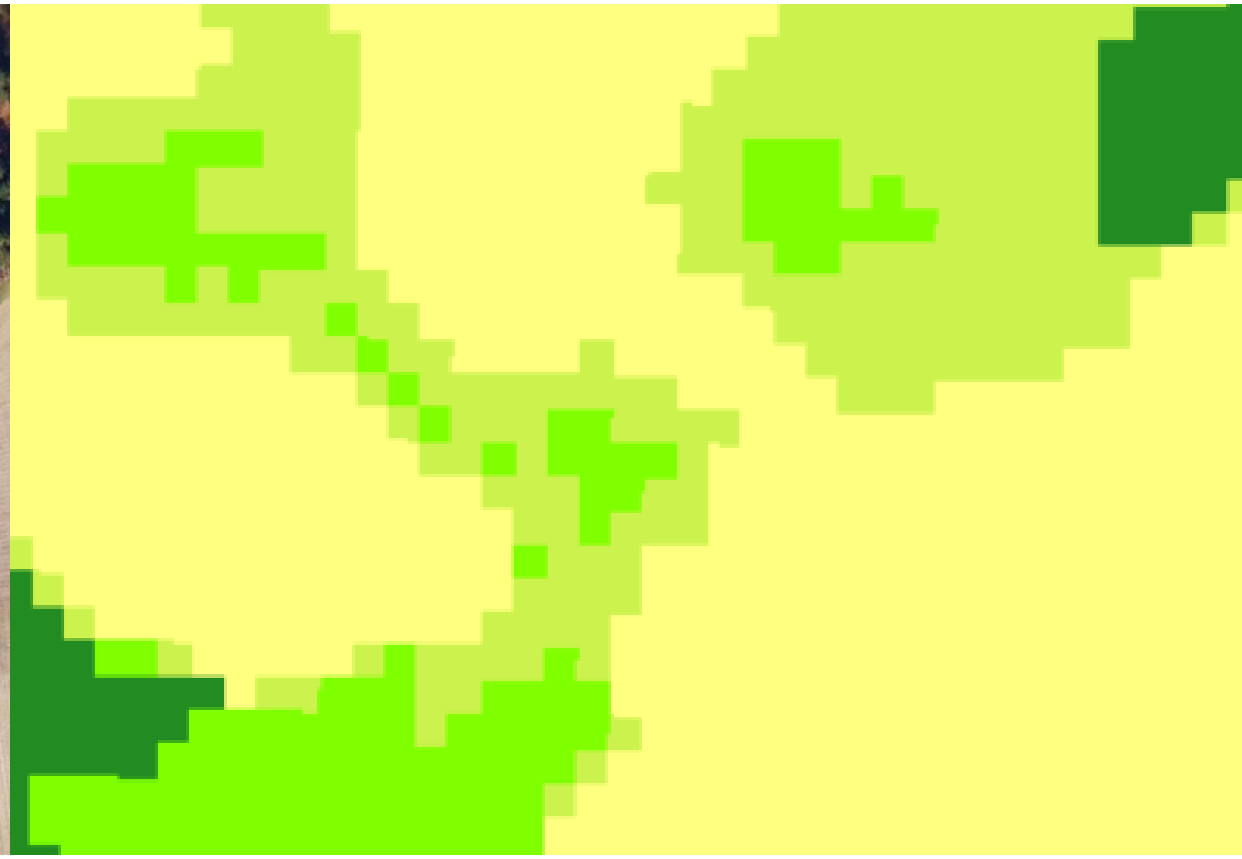

CLC+ Backbone 2018 (10 m resolution)

Remote sensing (RS) of biodiversity: challenges

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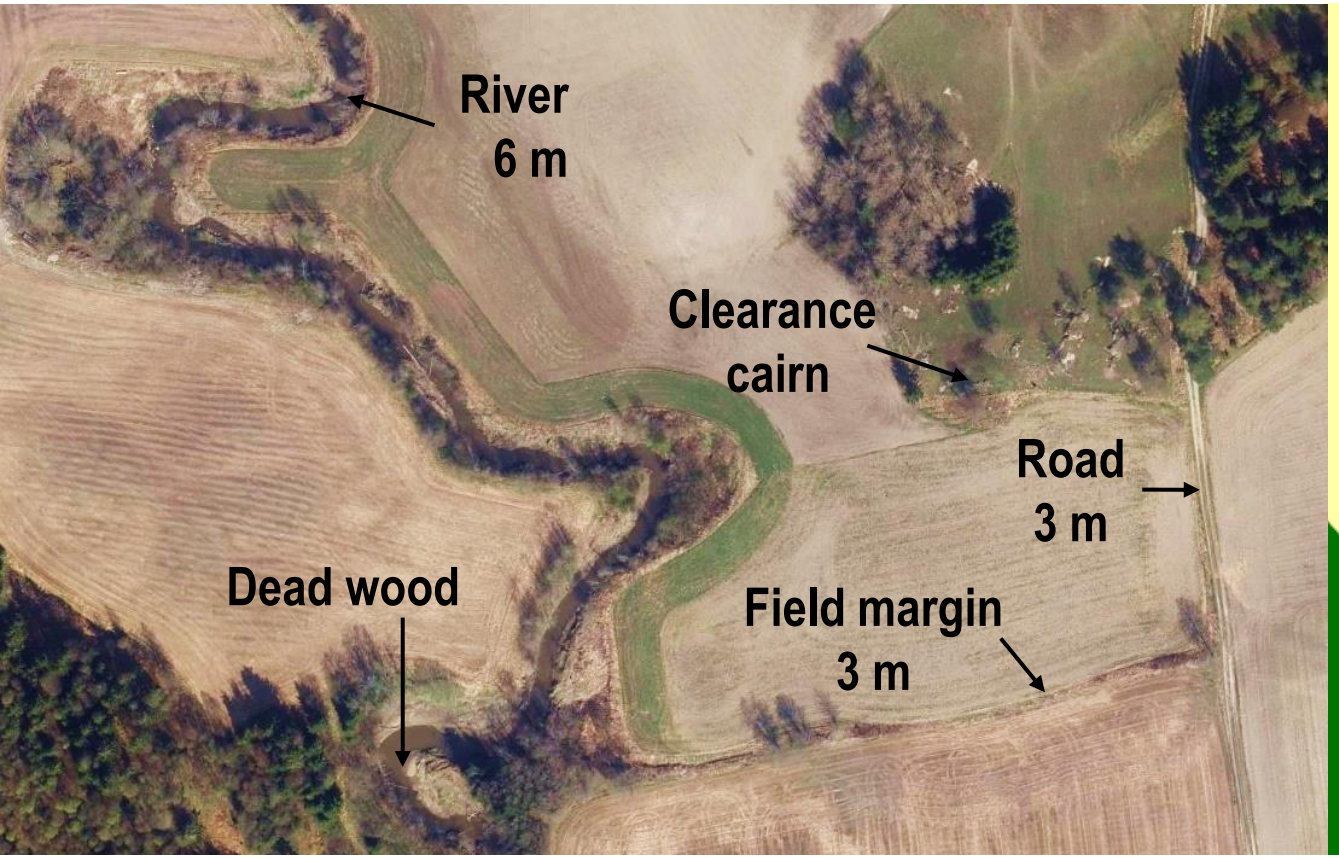
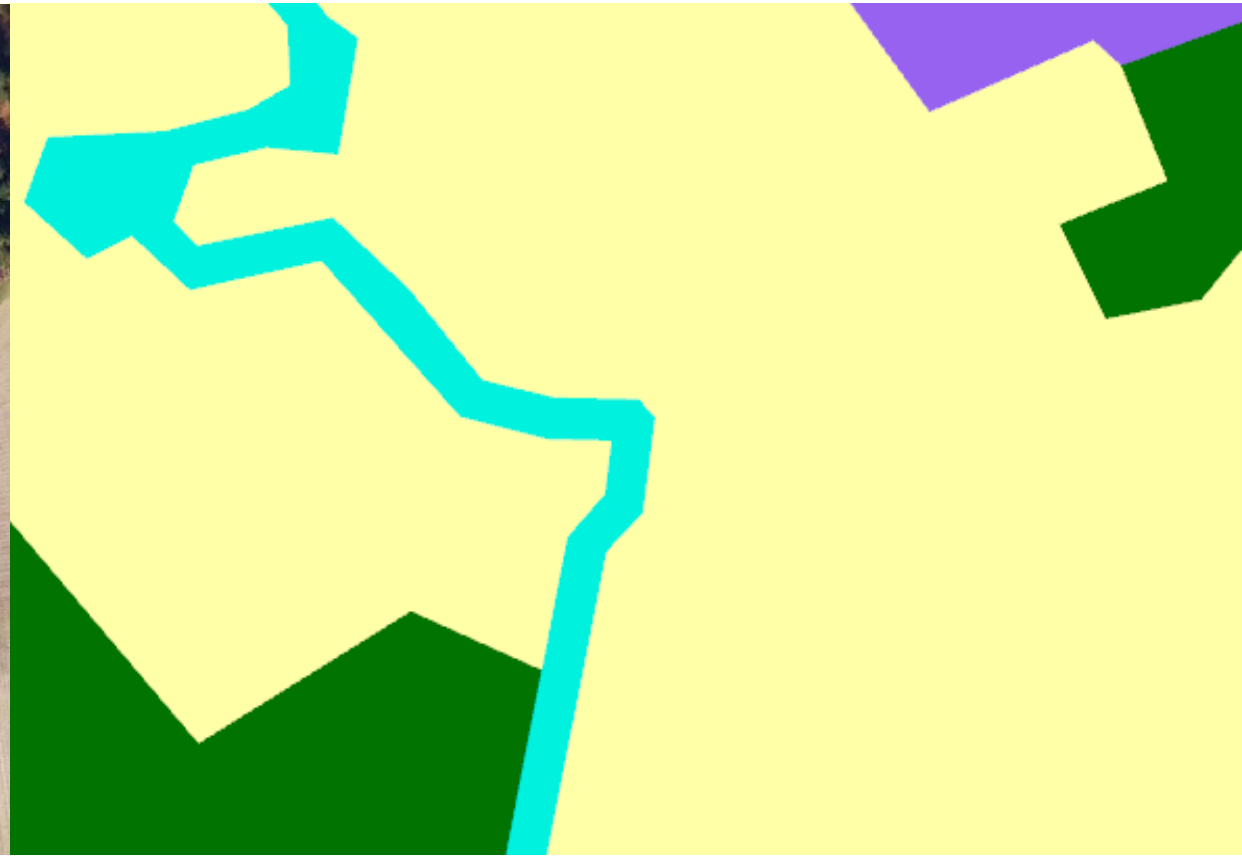


Aerial photograph 2018 (0.1 m resolution)



Riparian zones 2018 (vector)

Remote sensing (RS) of biodiversity: challenges

- Difficult to measure variables on species diversity with RS
- Even more difficult to measure genetic diversity
- Need for indirect measurements → **indicators**, e.g. essential biodiversity variables (EBV) as proposed by GEO BON

GEO BON
Group on Earth Observations
Biodiversity Observation Network

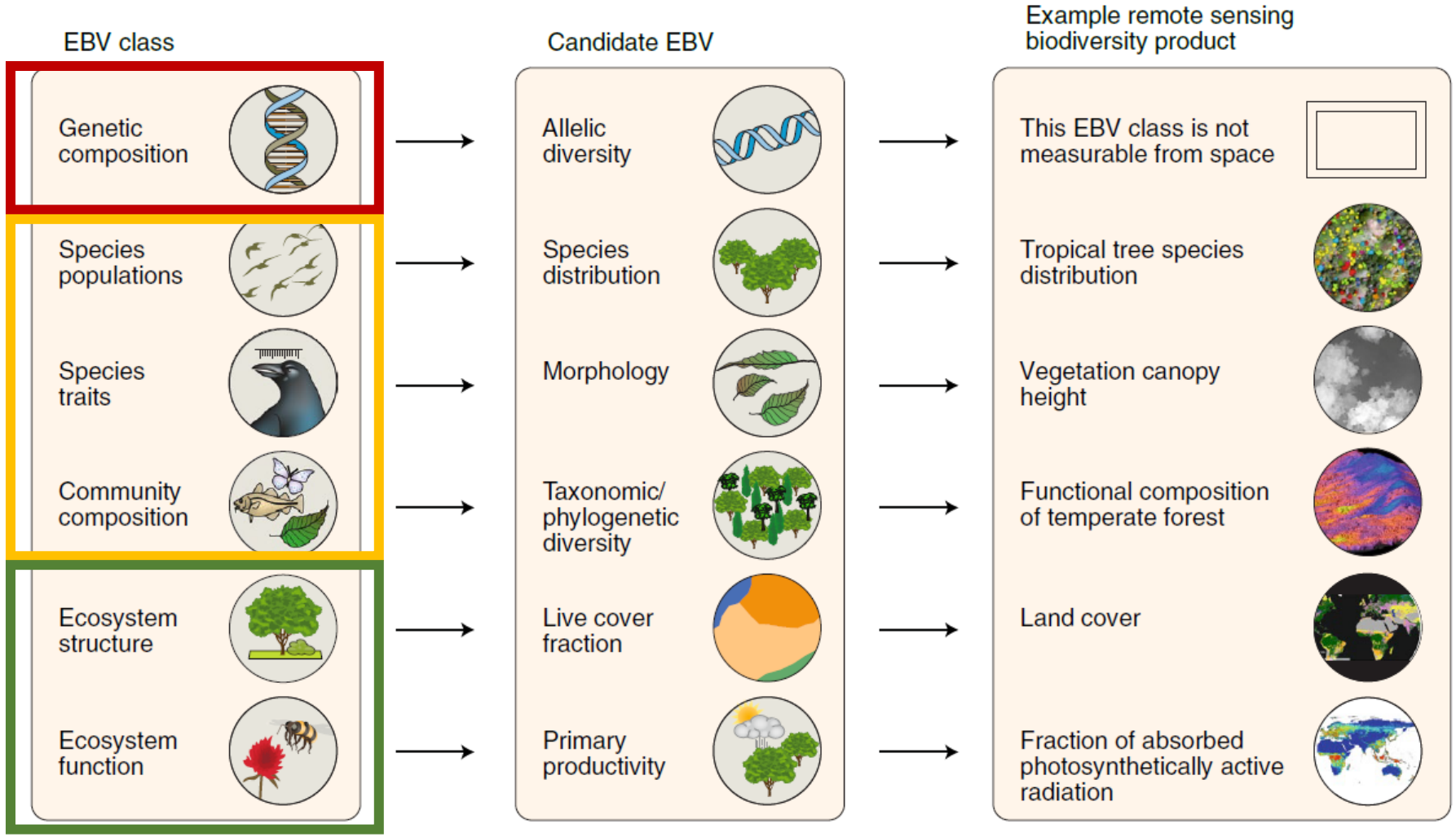
Remote sensing (RS) of biodiversity: challenges

Skidmore et.al. (2021): *Priority list of biodiversity metrics to observe from space. Nature Ecology & Evolution 5, 896-906.*

Not directly measurable from satellite RS

At present, immature and unfeasible, might improve in future

Most relevant and feasible for direct monitoring with satellite RS



GBF: CLMS's contribution

How does CLMS data contribute to Norway's work with the GBF targets?

CLMS & GBF: Evaluation of targets

Reducing threats to biodiversity		**CLMS-contribution**
1	Plan and Manage all Areas To Reduce Biodiversity Loss	minor
2	Restore 30 % of all Degraded Ecosystems	medium
3	Conserve 30 % of Land, Waters and Seas	medium
4	Halt Species Extinction, Protect Genetic Diversity, and Manage Human-Wildlife Conflicts	medium
5	Ensure Sustainable, Safe and Legal Harvesting and Trade of Wild Species	very low
6	Reduce the Introduction of Invasive Alien Species by 50% and Minimize Their Impact	minor
7	Reduce Pollution to Levels That Are Not Harmful to Biodiversity	minor
8	Minimize the Impacts of Climate Change on Biodiversity and Build Resilience	minor
Meeting people's needs through sustainable use and benefit-sharing		
9	Manage Wild Species Sustainably To Benefit People	very low
10	Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and Forestry	minor
11	Restore, Maintain and Enhance Nature's Contributions to People	medium
12	Enhance Green Spaces and Urban Planning for Human Well-Being and Biodiversity	medium
13	Increase the Sharing of Benefits From Genetic Resources, Digital Sequence Information and Traditional Knowledge	very low

Targets 14-23 not shown because they are less dependent on remote sensing

CLMS & GBF: Land management and spatial planning

Target 1: Plan and manage all areas to reduce biodiversity loss

- Requirements for data used in spatial planning are **determined by national laws**
- National data sets with higher accuracy available
- CLMS can contribute to
  - International reporting of basic indicators in cases where harmonized data are required
  - Analyses across country borders

Contribution: minor

CLMS & GBF: Nature restoration and conservation

Target 2: Restore 30 % of all degraded ecosystems

Target 3: Conserve 30 % of land, waters and seas

- Knowledge on habitat condition and biological value necessary → lack of information, need for field mapping in situ
- CLMS may contribute on a higher spatial level
  - e.g. evaluate spatial and ecological connectivity between habitat patches to identify areas that should be prioritized for restoration/conservation

Contribution: medium

Photo: Ulrike Bayr

CLMS & GBF: Species monitoring

Target 4: Halt the loss of endangered species

Target 6: Halt the spread of invansive species

- Less relevant with direct measurements from RS
- Actions should focus on maintaining habitats, e.g. by legislation and subsidies
- CLMS can contribute on the ecosystem/habitat level
  - e.g. as basis for species distribution modelling (endangered & invansive)

Contribution: minor

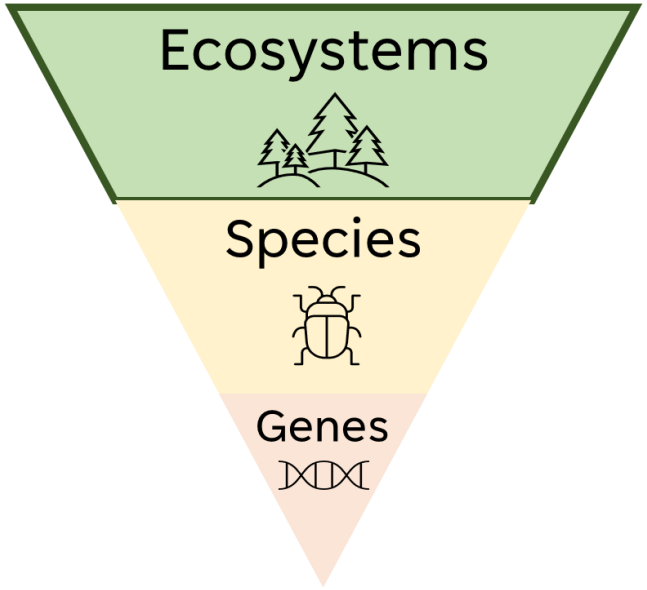
Illustration: Ulrike Bayr

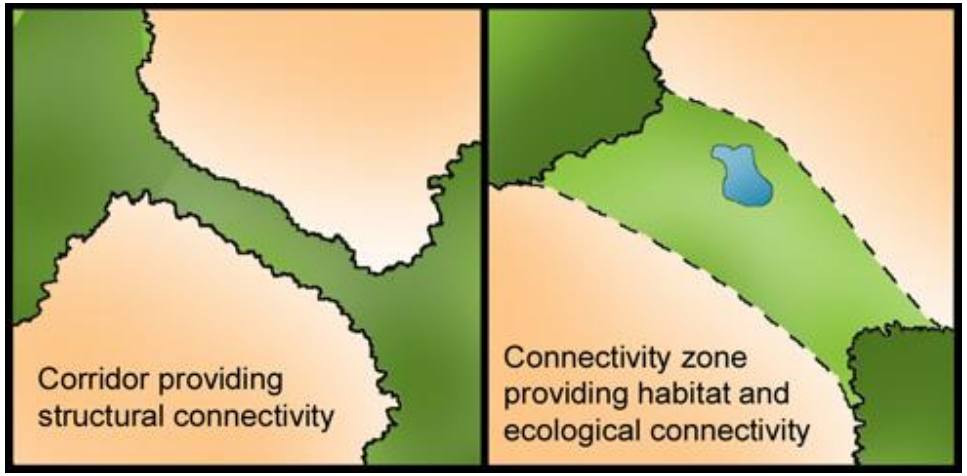
CLMS & GBF: Ecosystem and habitat monitoring

Targets 1, 2, 3, 4, 6, 7, 10, 11, 12

- CLMS facilitates landscape ecological analysis of patches, corridors and barriers
  - Habitat fragmentation & connectivity
  - Heterogeneity and land use diversity
- Spatial structure and distribution of habitats important for multiple targets
  - Prioritizing areas for restoration/conservation
  - Conservation of endangered species
  - Improved ecosystem services
  - Reduced pollution
  - Resilience to climate change

Contribution: medium





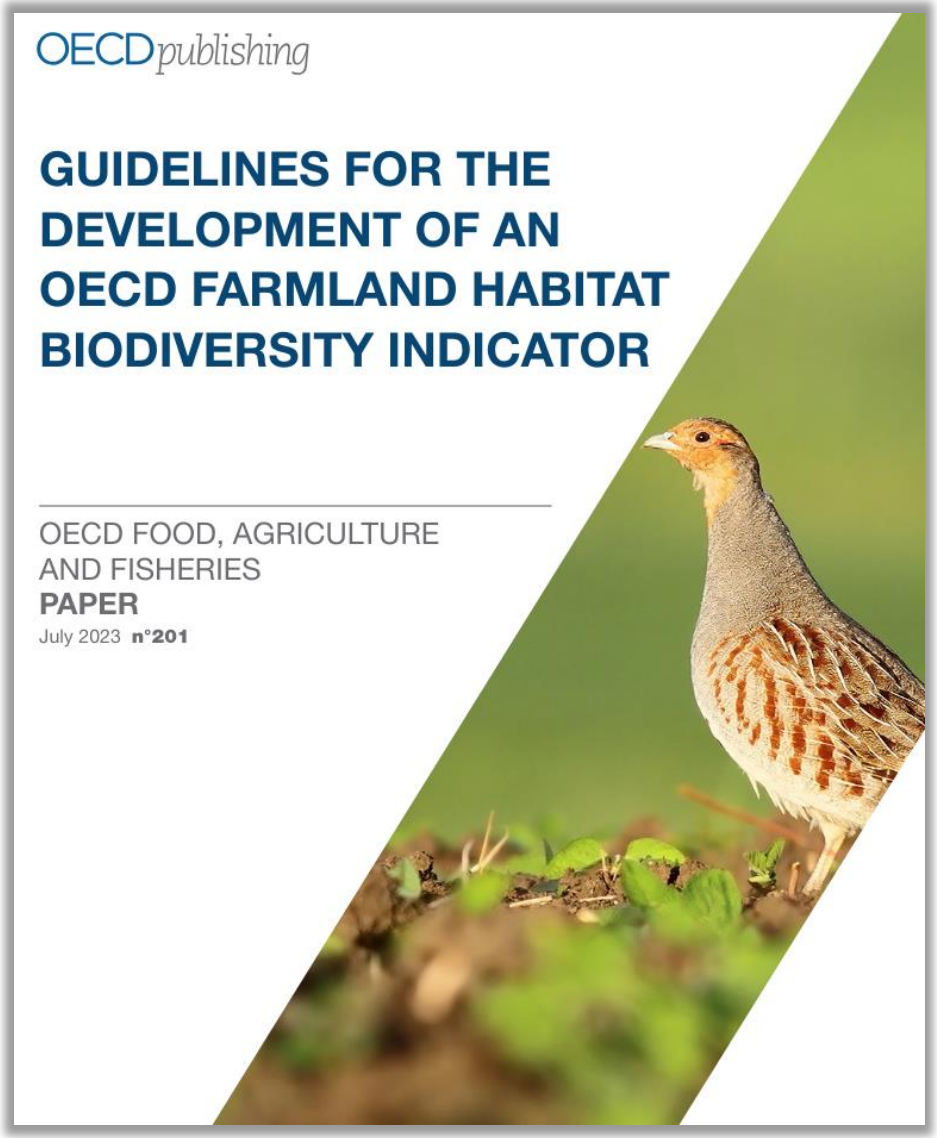
USDA National Agroforestry Center

CLMS & GBF: Ecosystem and habitat monitoring

Targets 1, 2, 3, 4, 6, 7, 10, 11, 12

- National datasets with higher spatial resolution available, but…
- Sometimes faster computation is more important than resolution
- Ecosystem and habitat structure often interesting to study across country borders
- Need for harmonized data for international indicators and reporting on biodiversity

Contribution: medium



CLMS & GBF: Climate change

Target 8: Minimize the impacts of climate change on biodiversity and build resilience

- Focus on **nature-based solutions**: actions that protect, restore and manage ecosystems sustainably
- Only small contribution from RS directly
- CLMS may be used partly
  - to study ecosystem structure and distribution (as mentioned earlier)
  - in the mapping of risk areas
  - as input data in climate models

Contribution: minor

CLMS & GBF: Sustainable land use

Target 10: Enhance biodiversity and sustainability in agriculture, aquaculture, fisheries, and forestry

- Linked to target 11 (ecosytem services)
- Measures need to be implemented on farm level
  - → Changes in management practices
  - → Need for policy instruments (e.g. financial incentives)
- High-quality national data for agriculture and forestry available

Contribution: minor

Perch for birds of prey in an agricultural landscape in Germany (natural pest management)

Photo: Ulrike Bayr

CLMS & GBF: benefits and limitations

Limitations

- resolution is too coarse for many biodiversity variables (e.g. on species level, small landscape elements)
- Some layers with too low accuracy for Norwegian conditions (e.g. wetlands, mountain grasslands)
- For most topics, Norway has access to national data with higher resolution and higher accuracy

CLMS & GBF: benefits and limitations

Benefits

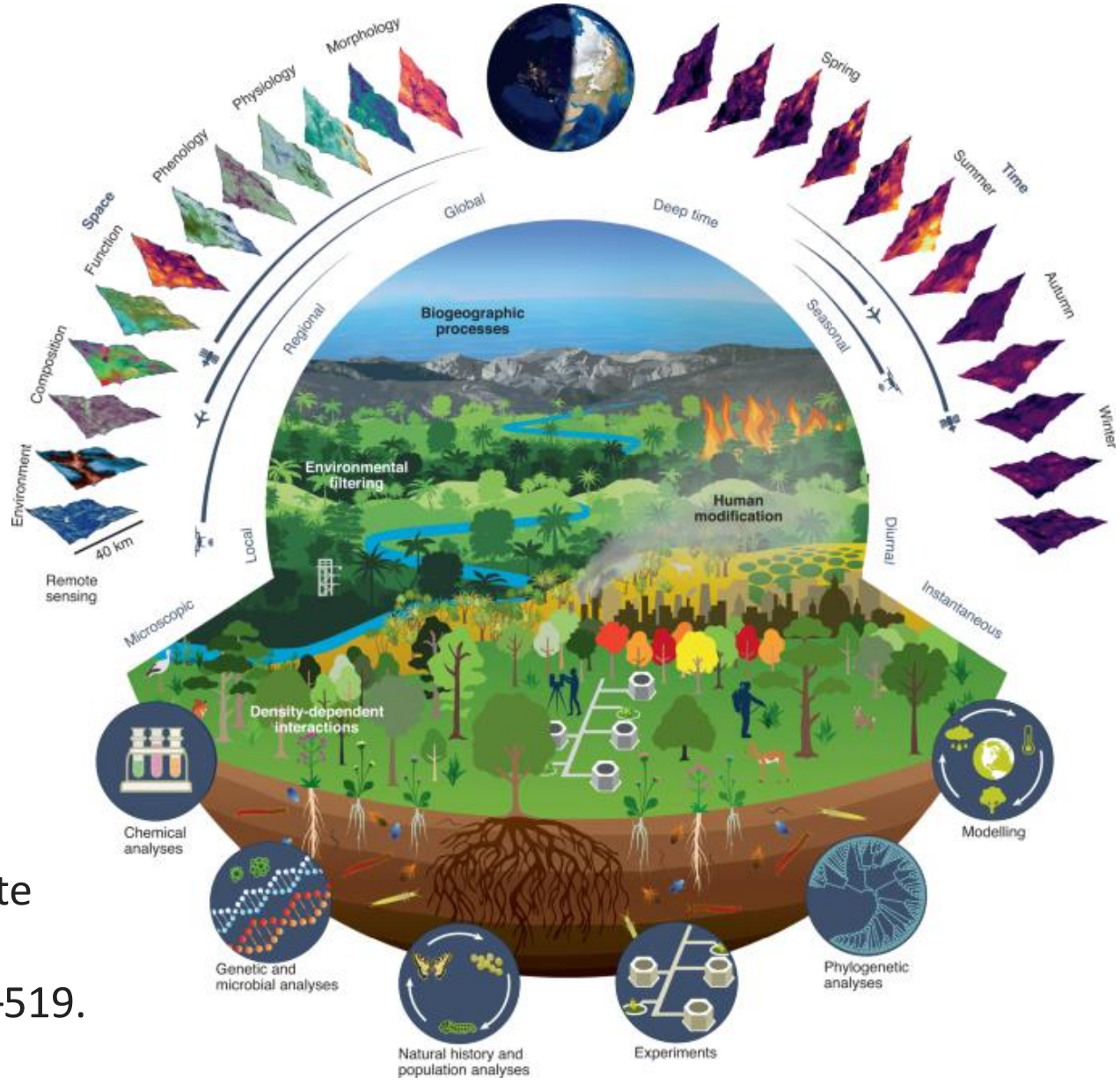
- High geographical coverage → able to fill gaps in other datasets
- Time series for monitoring
- Free and open data
- EU harmonized data suitable for international reporting of indicators

  → Facilitates international cooperation!

Multi-scale analysis to capture biodiversity

Remote sensing and field ecology complement each other.

Thus, future work should focus on combining data on different scales/sensors to capture all aspects of biodiversity!



Cavender-Bares *et al.* (2022). Integrating remote sensing with ecology and evolution to advance biodiversity conservation. *Nat Ecol Evol* **6**, 506–519.

Norway grants

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Thank you!

Photo: Ulrike Bayr