Mapping and Assessment of ecosystem services in Finland

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Finnish Environment Institute

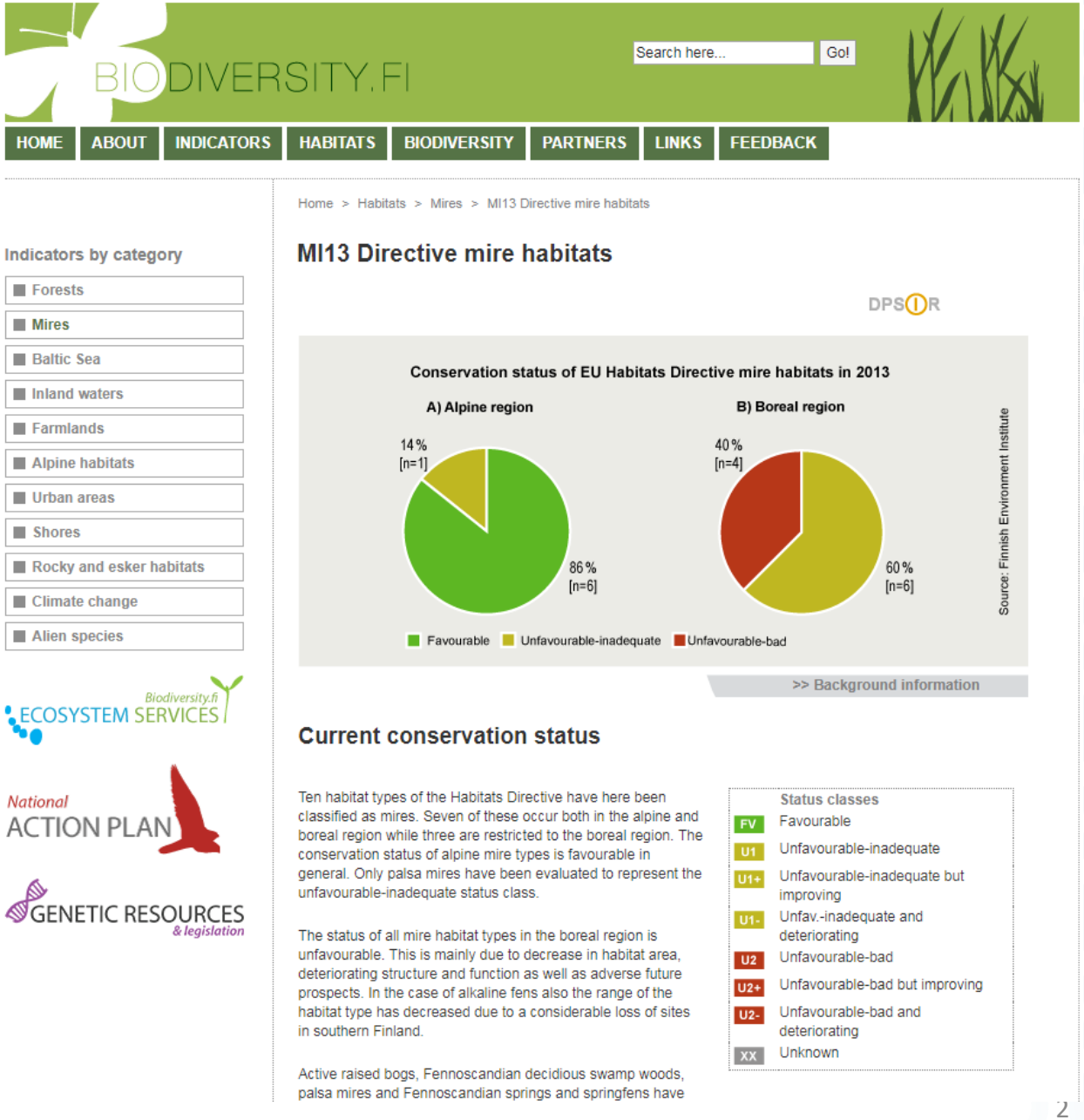
Biodiversity Centre, Ecosystem Services Unit

Value of Nature - practices and experiences in use of ecosystem services assessment, Riga, 15.1.2020

SYKE

Biodiversity.fi

- Reports the state of nature in Finlad
- 11 main ecosystem types
- 146 indicators



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Mononen et al 2016: National ecosystem service indicators: Measures of social–ecological sustainability

BETA Biodiversity.fi
ECOSYSTEM SERVICES

Search here... Go!

HOME | INTRODUCTION | ECOSYSTEM SERVICES | HABITATS | CICES | CASCADE | PARTNERS | FEEDBACK

Home > Ecosystem services > Provisioning services > Berries and mushrooms > Value

Services by category

- Provisioning services
- Regulating services
- Cultural services

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National ACTION PLAN

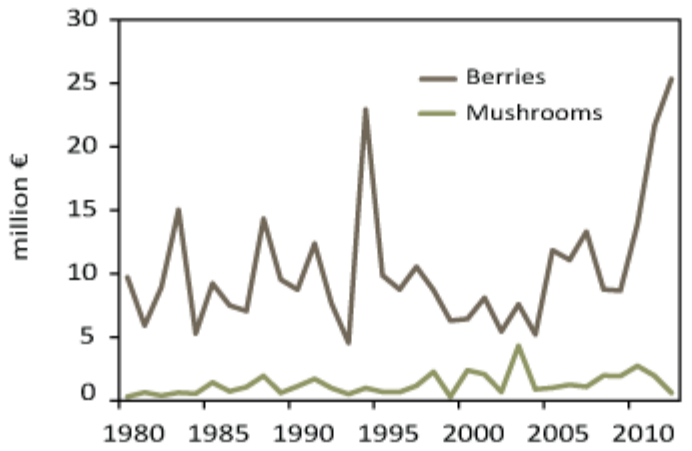
GENETIC RESOURCES & legislation

Value of berries and mushrooms

ECONOMIC VALUE

The economic value of berries and mushrooms can be assessed with gathering income. The gathering income of berries has been approximately 10 million euros although annual fluctuation is significant. The gathering income of mushrooms has been around 1 million euros annually. The annual export value of bilberry and cowberry has been altogether ca. 13 million euros since 2010.

GATHERING INCOME OF BERRIES AND MUSHROOMS



SOCIAL VALUE

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Home > Habitats & natural resources > Forests > State-owned commercial forests

Actions by category

- Cross-cutting issues
- Habitats & natural resources
- Restoration & nature management
- Sami people & northern areas
- Genetic diversity
- International issues
- Monitoring

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Biodiversity.fi ECOSYSTEM SERVICES

GENETIC RESOURCES & legislation

State-owned commercial forests

48) Safeguard and take biodiversity and ecosystem services into account in state-owned, commercially managed forests, in accordance with the environmental guide of Metsähallitus.

Responsible institutions: Ministry of Agriculture and Forestry

Schedule: 2013–2020

Status in 2018: The revised Metsähallitus Environmental Guide for Forestry was published in 2018. Compared with the previous guide published in 2011, the biggest change in terms of biodiversity was stopping the collection of dead wood.

Logging in state-owned commercial forests increased by a third in 2005–2010, but after that it has remained at a stable annual level of about six million cubic meters. The annual growth of state-owned commercial forests is estimated to be 11 million cubic meters (Figure).

The protection area network has been improved on state-owned land through the METSO programme. The monitoring of possible protection areas done by Metsähallitus was completed in 2014, and over 13 000 hectares of commercial forest was protected. This was the biggest single protection decision of the METSO programme.

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chm.cbd.int/database/record?documentID=243215

Convention on Biological Diversity

CHM THE CLEARING-HOUSE MECHANISM OF THE CONVENTION ON BIOLOGICAL DIVERSITY
INFORMATION SUBMISSION SERVICE

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PDF

Sixth National Report

SUBMITTED ON: 21 MAR 2019 LAST UPDATE

Section I. Information on the targets being pursued at the national level

Country

Finland

National Targets

1. Finnish people have at least a basic knowledge of biodiver
and are aware of its significance and their own opportunities
contribute to its conservation and sustainable use. (Target fo
2020.)

Rationale for the National Target

Practically identical with Aichi target 1.

Level of application

Jurisdiction

National / Federal

Relevance of National Targets to Aichi Targets

Aichi Target components

People are aware of the values of biodiversity
People are aware of the steps they can take to conserve and sustainably use biodiversity

Relevant documents and information

ELMA

Hae tässä... Hae!

United Nations Dec

EGIA SEURANTARYHMÄ BIODIVERSITEETTISOPIMUS PALAUTE

Etusivu > Toimintaohjelma > Yhteenveto toimenpiteistä

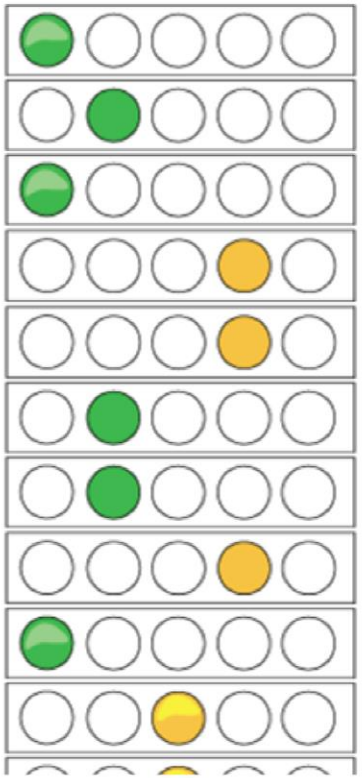
Yhteenveto toimenpiteistä

Toteutustilanne 2018 lopussa

1. Viestintäohjelma
2. pettajien koulutus
3. Biodiversiteetti opetussuunnitelmassa
4. Yhteistyö ympäristökasvatuksessa
5. Haitalliset tuet
6. Biodiversiteetin tilan seuranta
7. Yksityinen ja kolmas sektori
8. EU-ohjelmat
9. Maatalouden ympäristötuki

Petovahingot

jädännön kehittäminen



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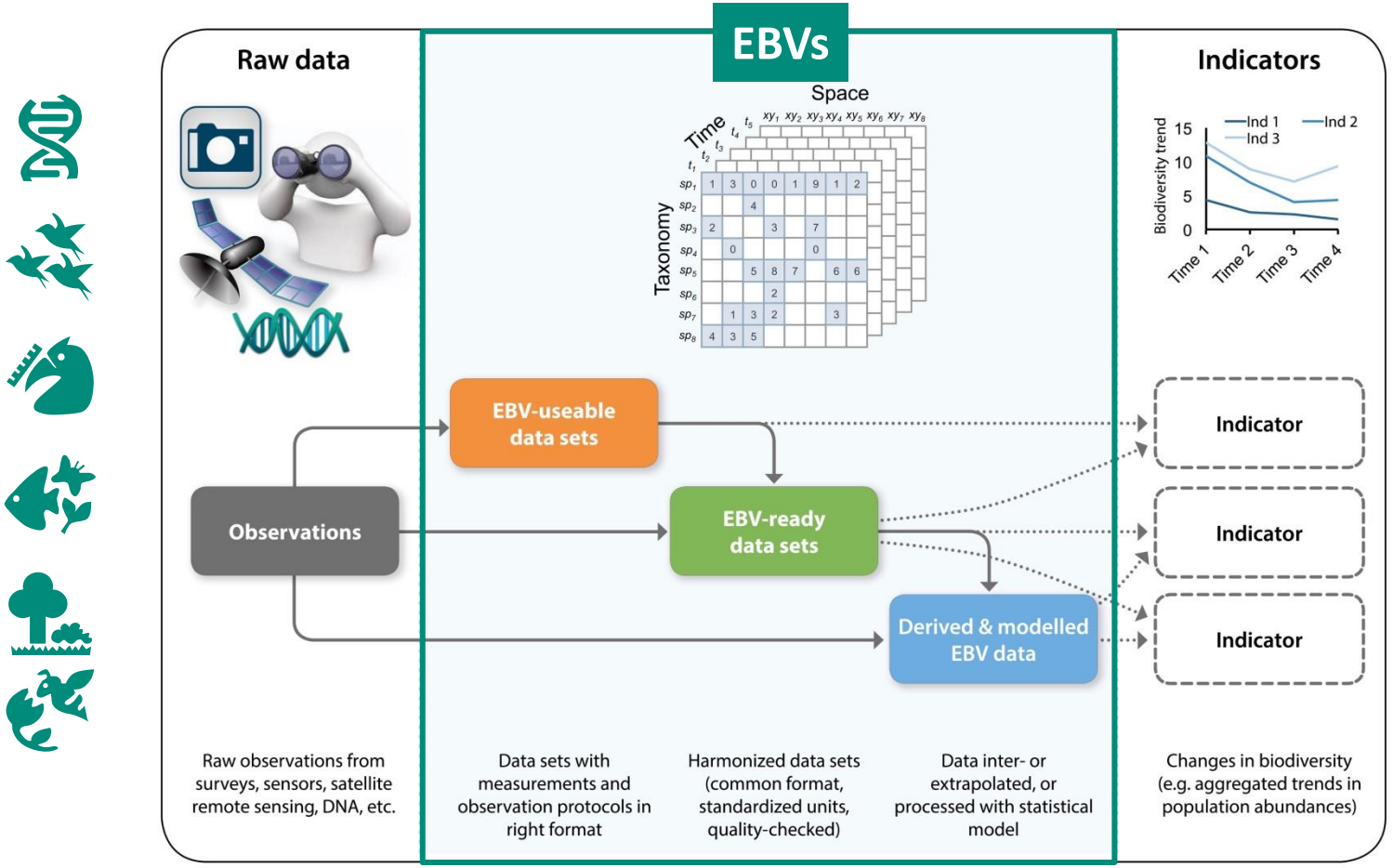
Earth System Science product development : the Essential Biodiversity Variables

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

Global Ecology and Conservation 10 (2017) 43–59

Contents lists available at ScienceDirect

Global Ecology and Conservation

journal homepage: www.elsevier.com/locate/gecco

Original research article

How Essential Biodiversity Variables and remote sensing can help national biodiversity monitoring

Petteri Vihervaara *, Ari-Pekka Auvinen, Laura Mononen, Markus Törmä, Petri Ahlroth, Saku Anttila, Kristin Böttcher, Martin Forsius, Jani Heino, Janne Heliölä, Meri Koskelainen, Mikko Kuussaari, Kristian Meissner, Olli Ojala, Seppo Tuominen, Markku Viitasalo, Raimo Virkkala

Finnish Environment Institute, Mechelininkatu 34a, P.O.Box 140, FI-00251 Helsinki, Finland

HIGHLIGHTS

- National biodiversity state indicators correspondence with EBVs was assessed.
- EBV approach revealed gaps in the current biodiversity monitoring scheme.
- Monitoring could be improved by using remote sensing applications and EBV approach.
- Four EBVs could benefit substantially from the use of remotely sensed data.
- Three new EBV-candidates were suggested to describe ecosystem function more comprehensively.

ARTICLE INFO

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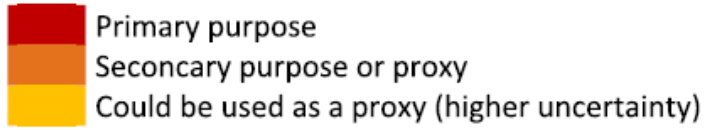
Earth Observation
In situ
Indicators
Ecosystem services
Aichi targets

ABSTRACT

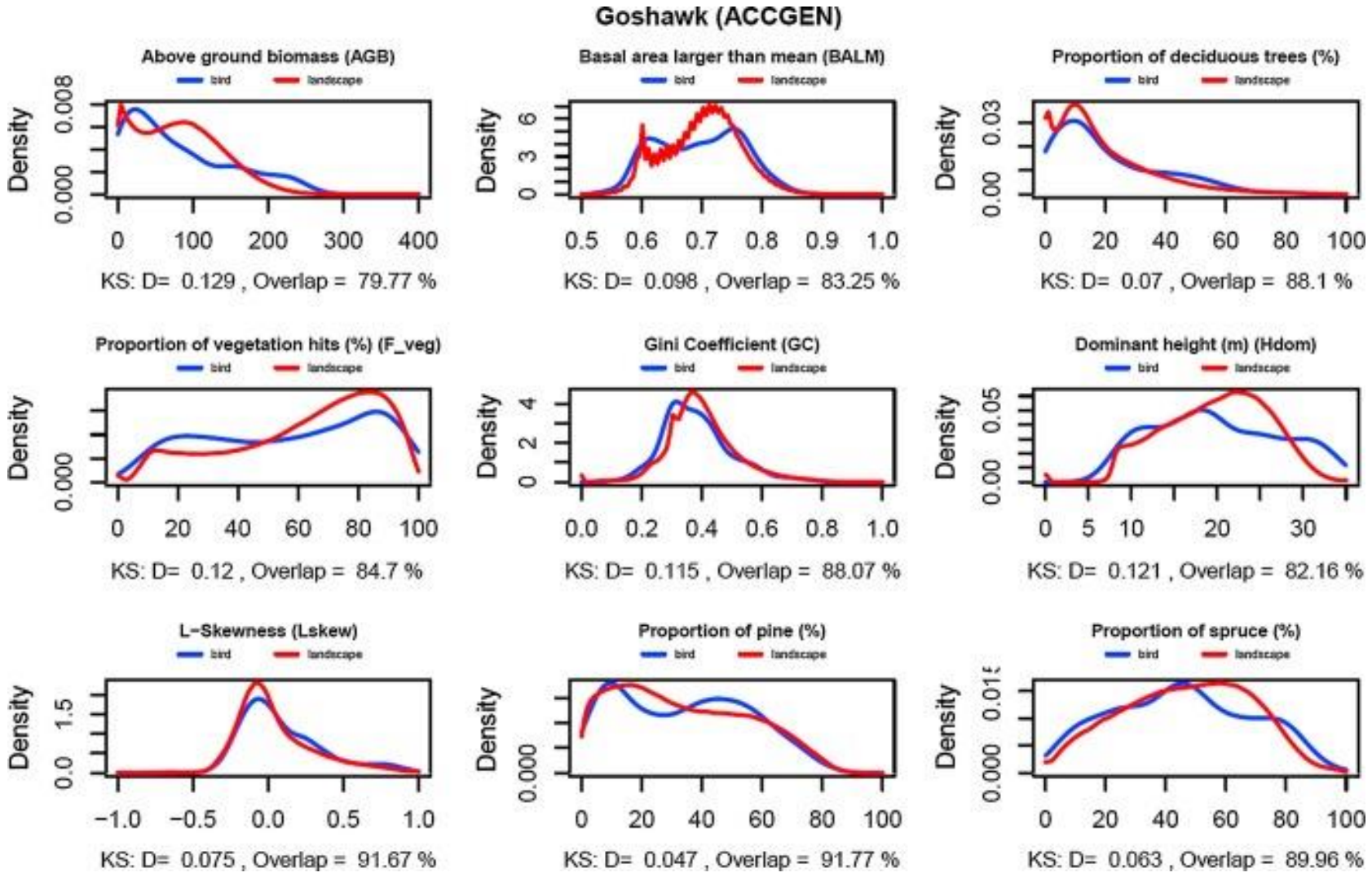
Essential Biodiversity Variables (EBVs) have been suggested to harmonize biodiversity monitoring worldwide. Their aim is to provide a small but comprehensive set of monitoring variables that would give a balanced picture of the development of biodiversity and the reaching of international and national biodiversity targets. Globally, GEO BON (Group on Earth Observations Biodiversity Observation Network) has suggested 22 candidate EBVs to be monitored. In this article we regard EBVs as a conceptual tool that may help in making national scale biodiversity monitoring more robust by pointing out where to focus further development resources. We look at one country –Finland –with a relatively advanced biodiversity monitoring scheme and study how well Finland's current biodiversity state indicators correspond with EBVs. In particular, we look at how national biodiversity monitoring could be improved by using available remote sensing (RS) applications. Rapidly emerging new technologies from drones to airborne laser scanning and new satellite sensors providing imagery with very high resolution (VHR) open a whole new world of opportunities for monitoring the state of biodiversity and ecosystems at low cost. In Finland, several RS applications already exist that could be expanded into national indicators. These include the monitoring of shore habitats and water quality parameters, among others. We hope that our analysis and examples help other countries with similar challenges. Along with RS opportunities, our analysis revealed also some needs to develop the EBV framework itself.

Table 1
Links between Finnish Biodiversity indicators and Essential Biodiversity Variables. Abbreviations: Forests (FO), Mires (MI), Baltic Sea (BS), Inland waters (IW), Farmlands (FA), Alpine habitats (AL), Urban habitats (UA), Shores (SH), Rocky and esker habitats (RE), and Climate change (CC). Indicators with names in blue on the left column are under preparation. EBV sub-classes marked in red are additions suggested by the authors. An asterisk (*) refers to a monitoring scheme at risk of being discontinued. Question mark (?) relates to some uncertainty in the correspondence of the biodiversity indicator and EBV.



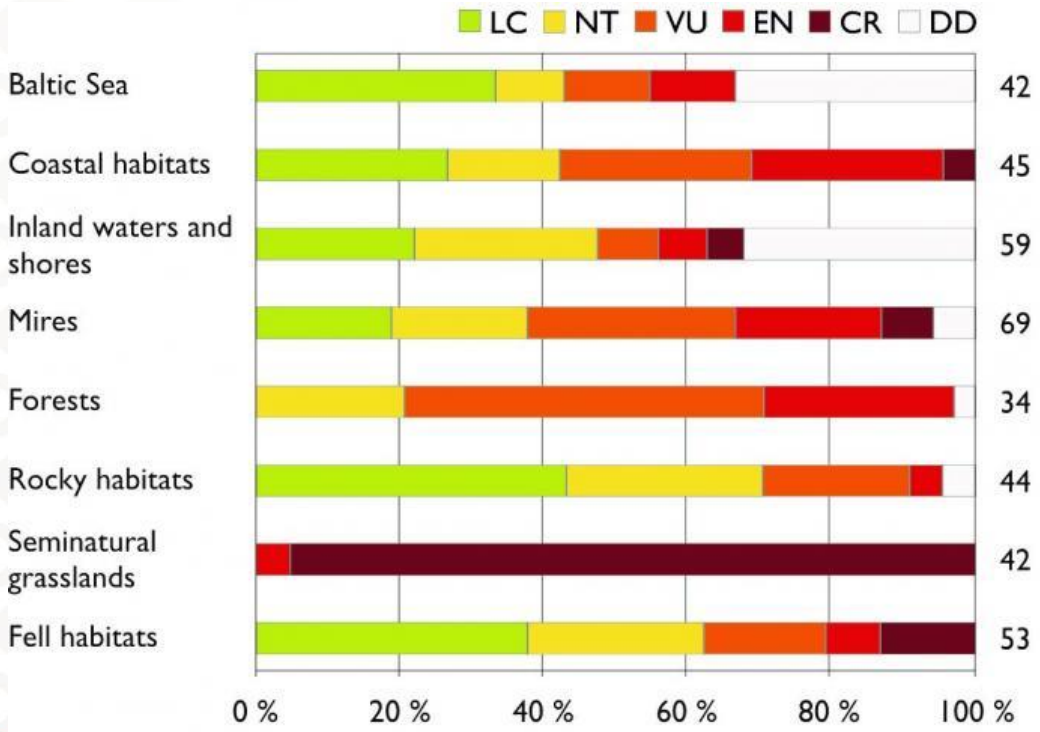
	Essential Biodiversity Variables																							
	Genetic composition				Species populations			Species traits						Community composition			Ecosystem structure			Ecosystem function					
Finnish Biodiversity Indicators	Co-ancestry	Allelic diversity	Population genetic differentiation	Breed and variety diversity	Species distribution	Population abundance	Population structure by age/size class	Phenology	Body mass / Biomass	Natal dispersal distance	Migratory behaviour	Demographic traits	Physiological traits	Taxonomic diversity	Species interactions	Functional diversity	Habitat structure / condition	Ecosystem extent and fragmentation	Ecosystem composition by functional type	Net primary productivity	Secondary productivity	Decomposition	Nutrient retention	Carbon sequestration	Water filtration & retention	Disturbance regime
FO: Dead wood																									
FO: Forest fragmentation																									
FO: Forest age structure						?																			
FO: Tree species composition								?																	
FO: Forest birds																									
FO: Wildlife richness																									
FO: Forest vegetation														*	*	*									
MI: Fragmentation of pristine mires																			?						
MI: Dead wood on wooded mires																									

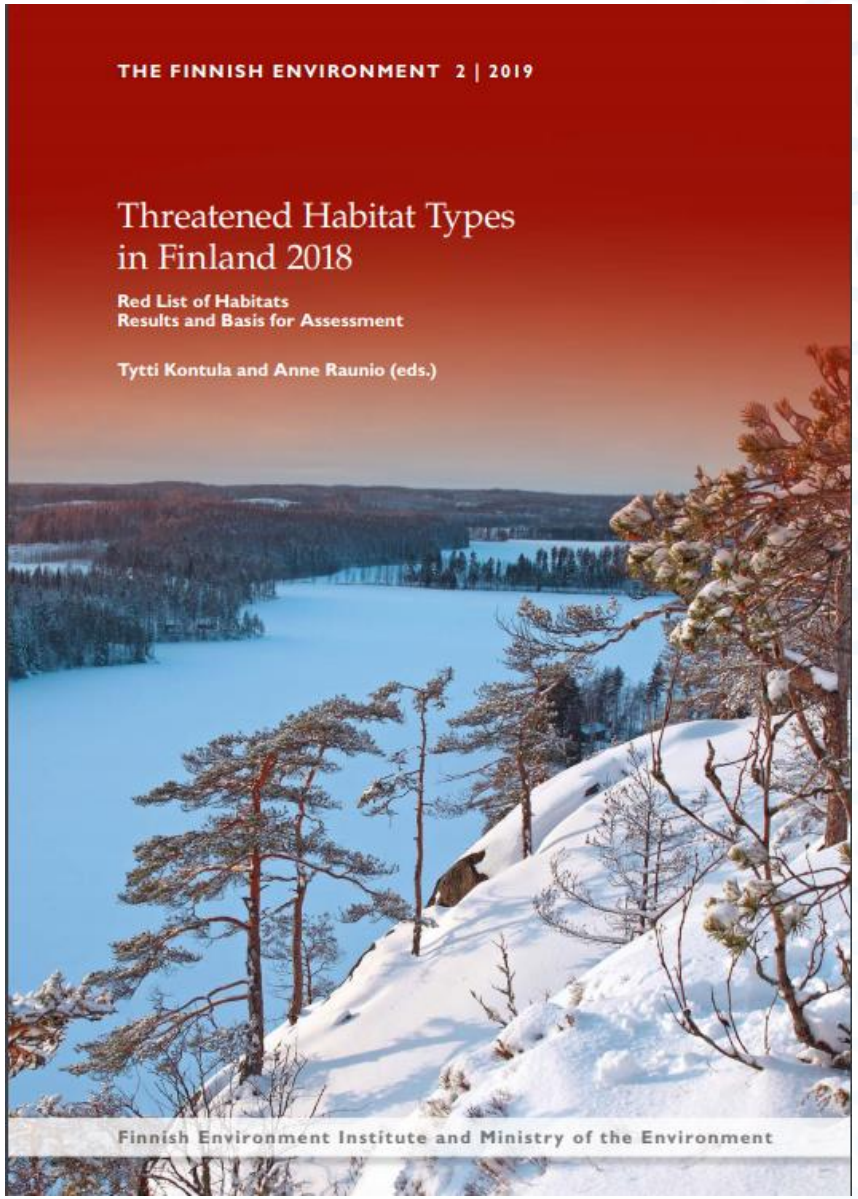
Mononen et al., 2018.
Usability of citizen science observations together with airborne laser scanning data in determining the habitat preferences of forest birds



Red List of ecosystems

- IUCN Red List of Ecosystems Categories and Criteria
- ~400 habitat types
- 120 Experts





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FINNISH ECOSYSTEM OBSERVATORY

Observatory:

From ob- + servō (“watch, keep safe”).

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Reporting:

- CBD
- EU
- National

Monitoring etc.

- Agenda 2030
- SEEA-EEA
- GEO BON
- LTER

FEO: decision-making

- MAES
- Indicators, biodiversity.fi
- NCA
- Ecological compensations

FEO: *In-Situ observations*

FEO-1: Information management system

- Use cases
- Data links
- Processing libraries

FEO: Eearth observations

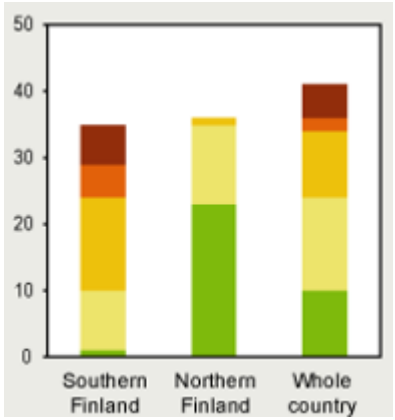
FEO: Algorithms & processing libraries

Citizen observations and services

Data

- Forest and park services
- LUOMUS


MERIHAKA
HELSINKI
KATAJAN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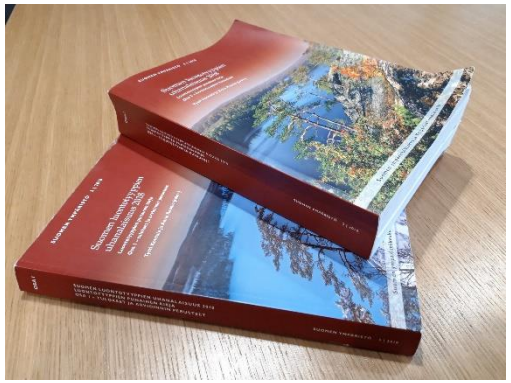
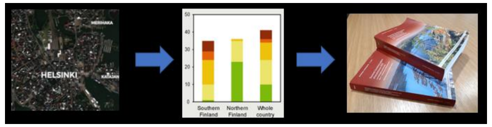
Southern Finland
Northern Finland
Whole country

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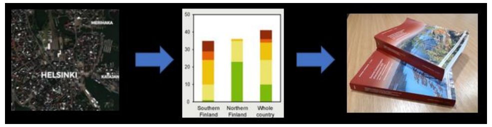
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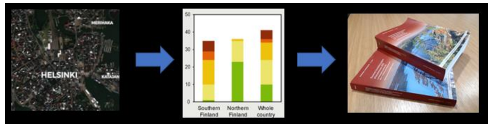
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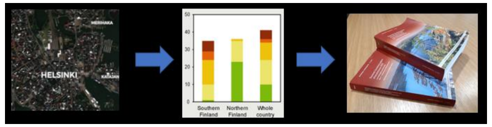
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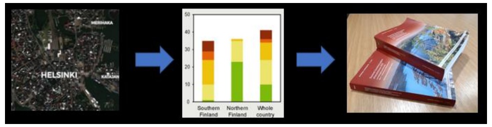
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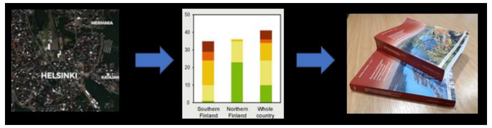
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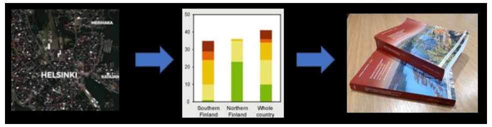
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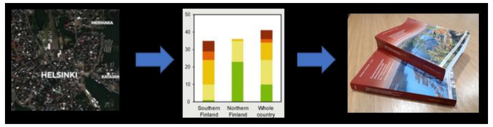
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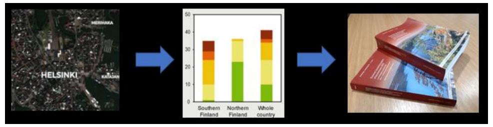
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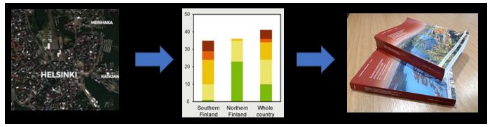
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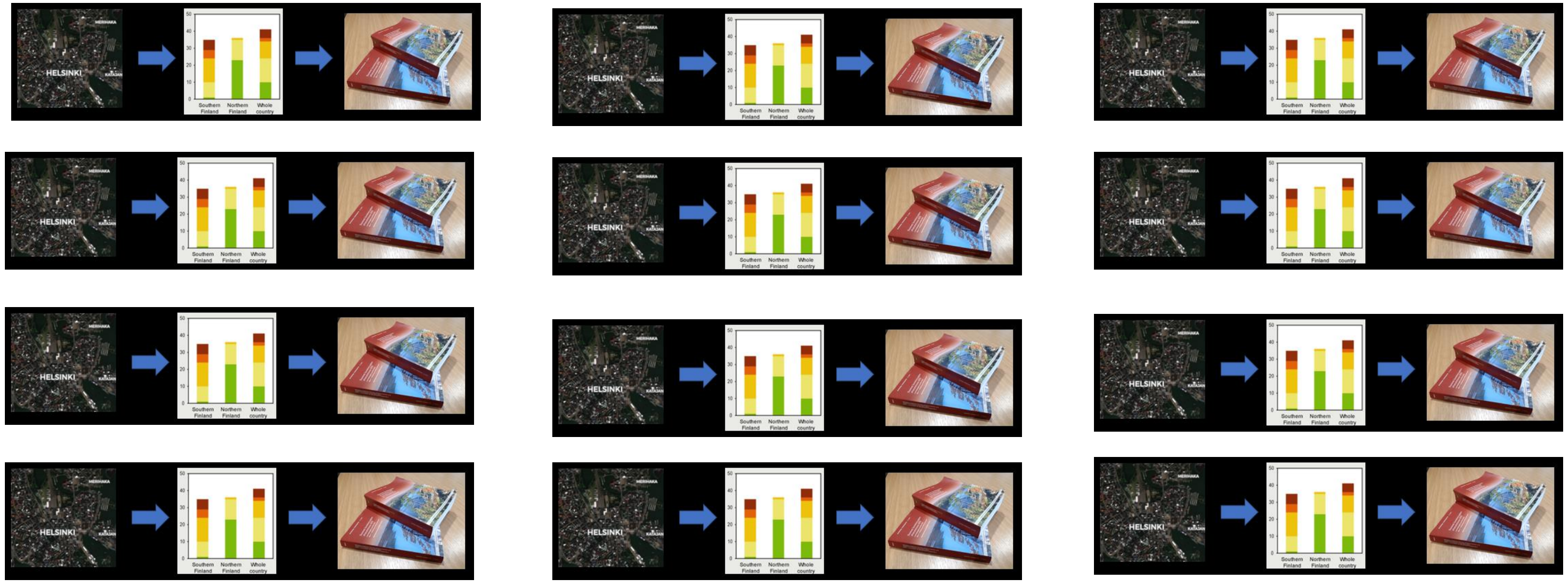
FEO


HELSINKI
Southern Finland
Northern Finland
Whole country

FEO – information system

ADVANTAGES:

- Reduces work load
  - Avoid repetition
  - Build on previous experiences
- Increases transparency
  - Processes and data retrievable
  - Re-analyses and comparisons
- Reduces errors
  - Processes are refined
  - Good documentation
- Improves data use
  - Enhances use if EO data
  - Supports accessibility

CHALLENGES:

- Flexibility for all cases – ease of use - Required skills
- Accessibility
  - Citizens – researchers – public officers
  - Data use rights
  - Delicate data
- Long term funding

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Eurostat Grant 2019 & 2020

- From existing environmental and economic data and models to experimental accounting of marine, freshwater and forest ecosystem services in Finland (Eurostat Grant, 2019)
- Novel methods for the accounting of forest ecosystems and circular materials to address secondary material flow accounts and related methods in the context of circular economy (Eurostat Grant, 2020)
  - address secondary material flow accounts and related methods in the context of circular economy
  - develop novel remote-sensing and machine-learning methods for ecosystem accounting, in particular forest-related ecosystem services

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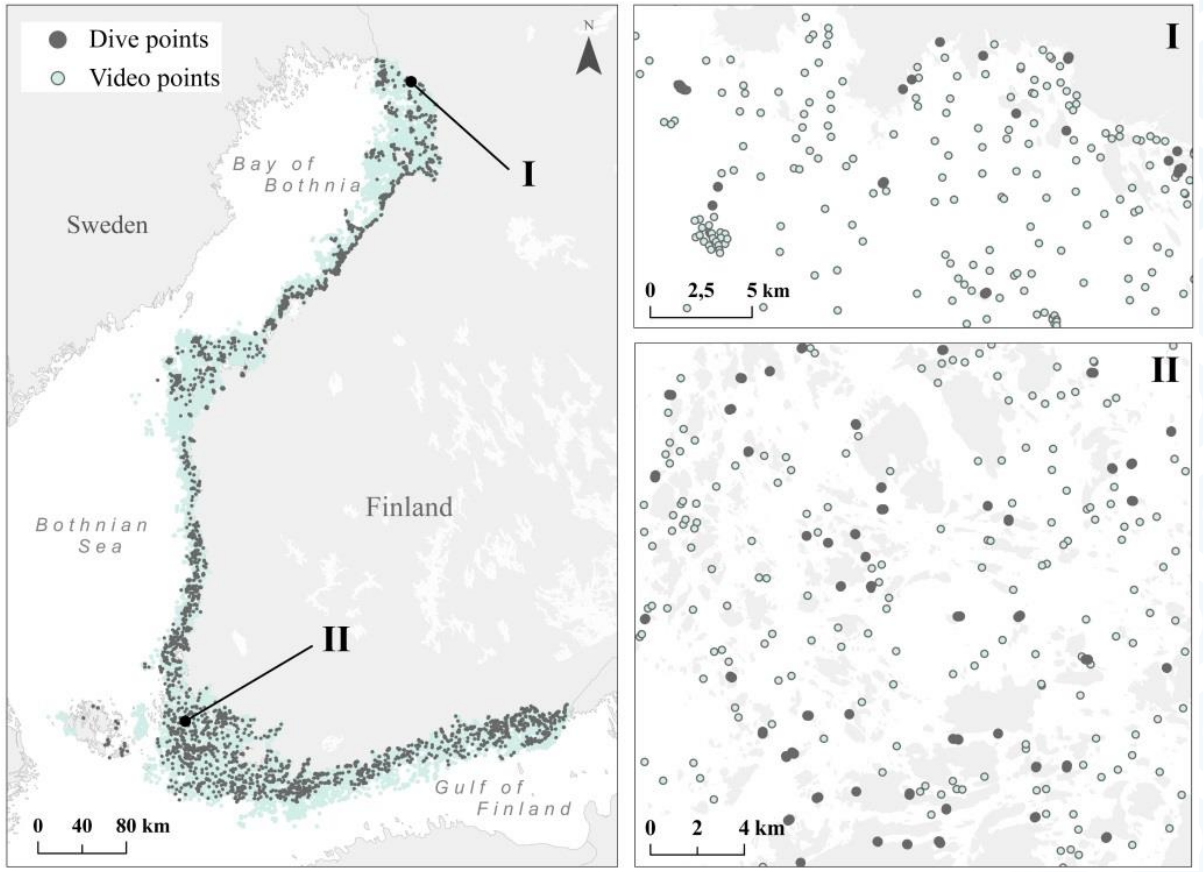
VELMU KARTTAPALVELU

- The Finnish Inventory Programme for the Underwater Marine Environment (2004 -)
- Systematic survey
  - Geological – topography
  - Biological (~144 000 samples) – Video, Dives, Grab Samplers, Spawning areas
  - Remote sensing - LIDAR, earth observations, aerial photography



Virtanen etal. 2018. https://doi.org/10.3389/fmars.2018.00402

SYKE

extent

⇩

condition

⇩

ES supply

⇩

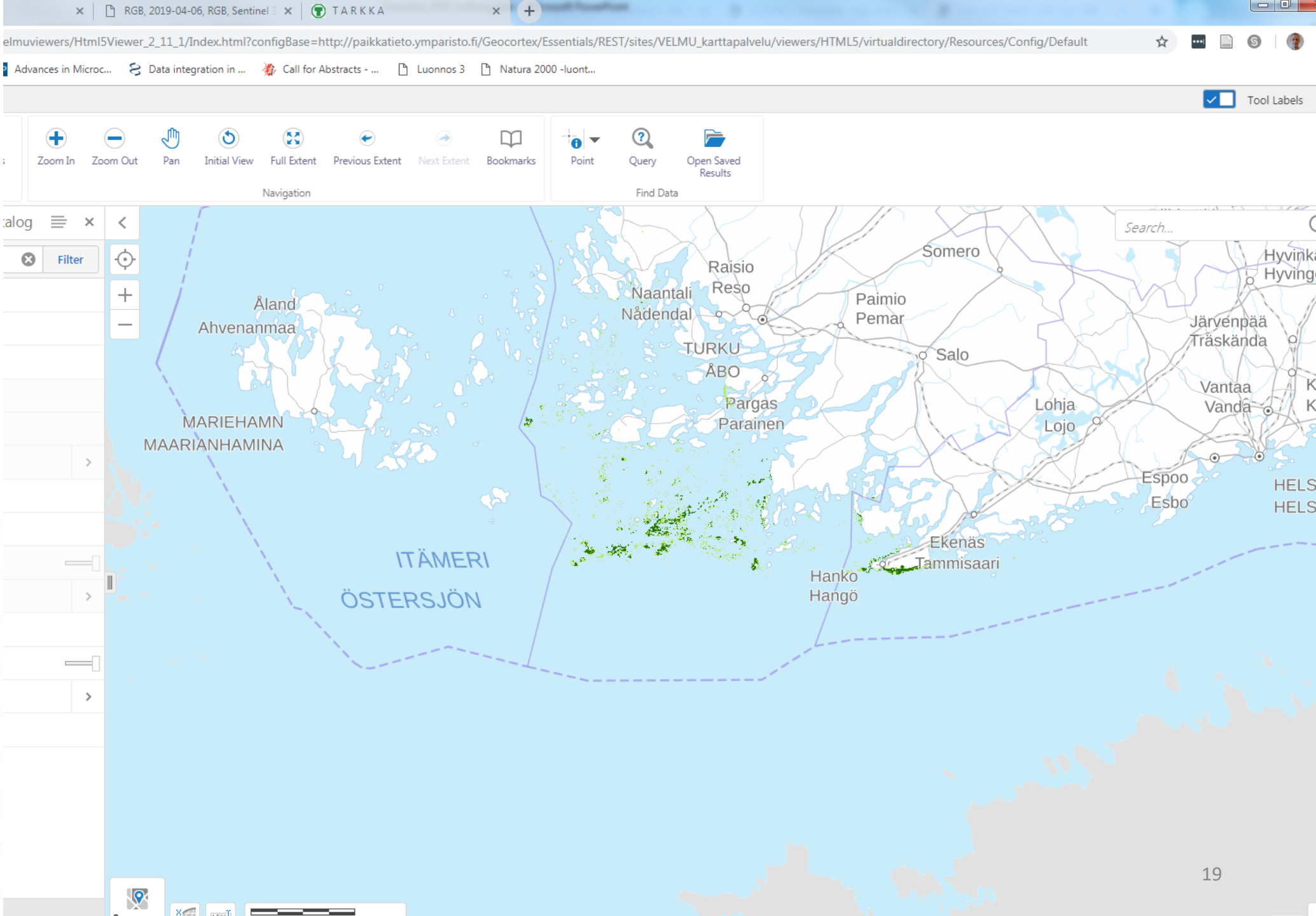
ES demand

⇩

ES flow

⇩

ES value



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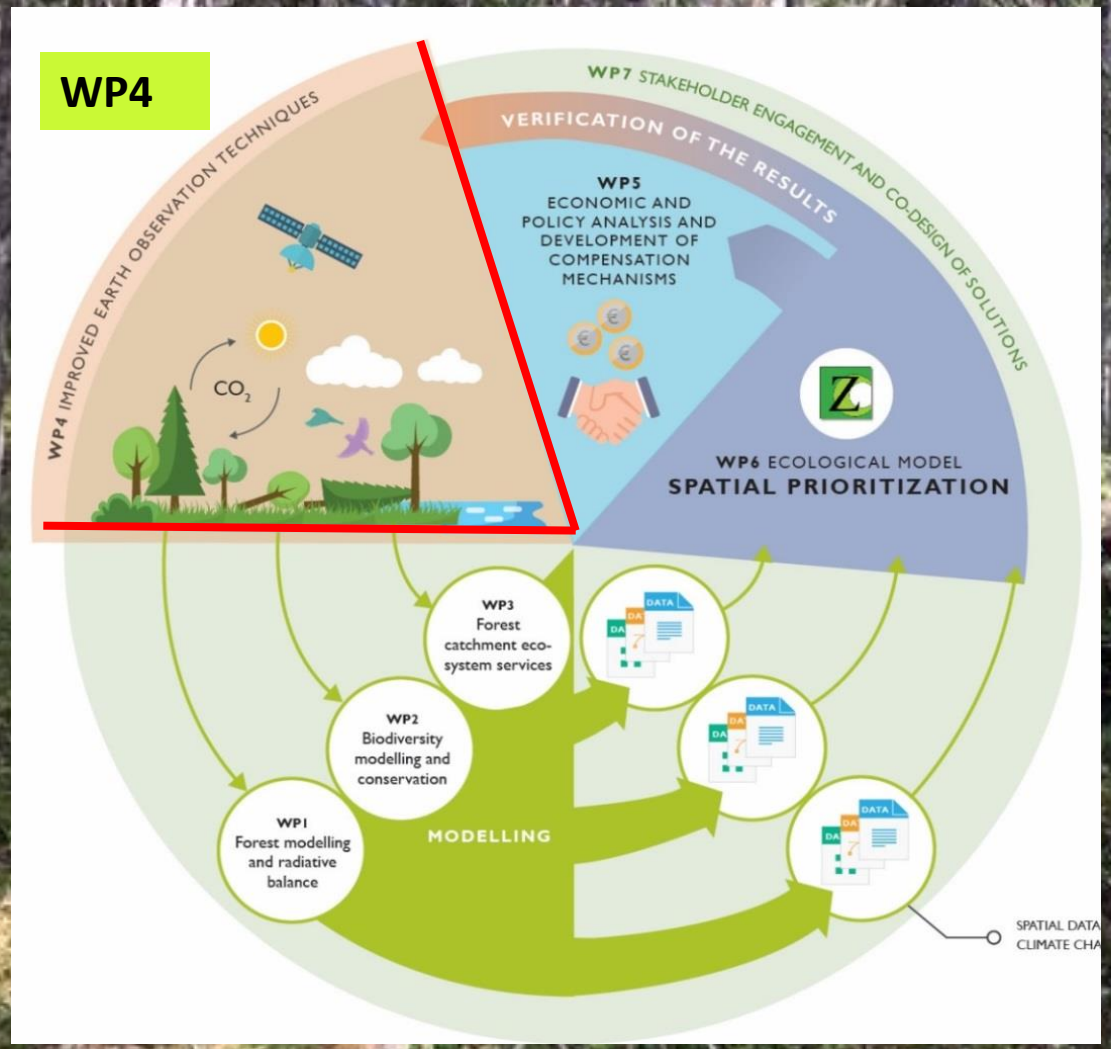
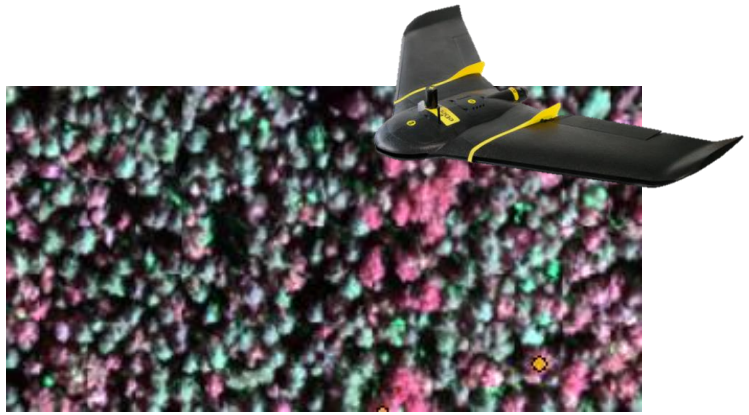
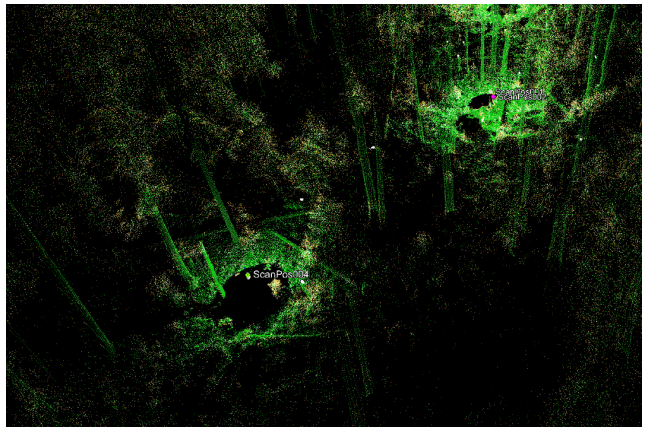
Integrated Biodiversity Conservation and Carbon Sequestration in the Changing Environment (IBC-CARBON):

- aims at integrative research and planning to identify feasible options for securing forest biodiversity, important ecosystem services and sustainable forest use in Finland







Our aim is:

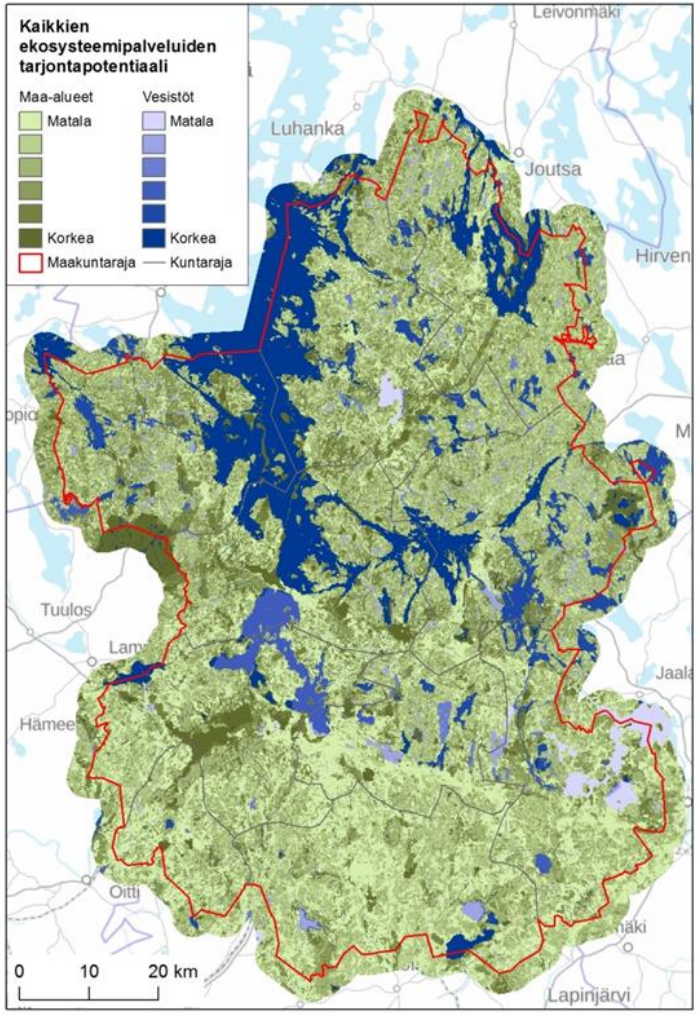
To provide and apply novel Earth Observation (EO) data at various spatial and temporal scales.

To develop and study EO-variables for measuring and monitoring of biodiversity and carbon sequestration.

Key data sets include:
1) Hyperspectral data (airborne and drone) , 2) Multispectral data (drone, aerial photographs, satellite images), 3) Airborne laser scanning (ALS) data, 4) Terrestrial laser scanning (TLS) data.
5) forest inventory sample plots with soil samples, 6) canopy leaf samples, 7) vegetation, moss and lichen inventories etc.

Regional and local MAES-type studies in Finland

- Mapping and assessing green infrastructure and ecosystem services in a co-creative process in Päijät-Häme Region – contributing to a regional planning issue of locating a new regional recycling site*
- Other MAES type studies conducted also in the Pirkanmaa Region**, Oulu City Region, Kymenlaakso Region, City of Espoo, City of Vantaa, City of Helsinki, City of Lahti, City of Turku,…



Ecosystem services provision potential in Päijät-Häme, Finland. Mapped using the GreenFrame method.

*Kopperoinen, L., Hurskainen, P., Viinikka, A., Marttunen, M. 2019. Results presented in a PowerPoint for the Päijät-Häme Regional Council.

**Tammi, I., Mustajärvi, K., Rasinmäki, J. 2017. Integrating spatial valuation of ecosystem services into regional planning and development. Ecosystem Services 26: 329-344.

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Possible key future interests

1. Wider implementation of the Finnish Ecosystem Observatory
2. EBVs, e.g. fragmentation, phenology, canopy chlorophyll content
3. Data integration, e.g. SAR + multispec., in situ + EO
4. Time series to detect change