Experiences from Norway – Early Adopter

Mr. Jørn Kristian Undelstvedt, Statistics Norway (jku@ssb.no)

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Athens, 22 & 23 May 2024

esa

Statistisk sentralbyrå
Statistics Norway

Agenda

- Introduction
- Extent mapping
- Condition assessments
- Condition indicators
- Wood provision account
- Norway: Need for development
- PEOPLE-EA Feedback
- Activities besides PEOPLE-EA
- R&D needs for using EO in SEEA EA

Introduction

- The EEA Agreement :
  - Mandatory reporting from Norway to EU on environmental accounts
  - To be extracted from national environmental accounts (Official Statistics)

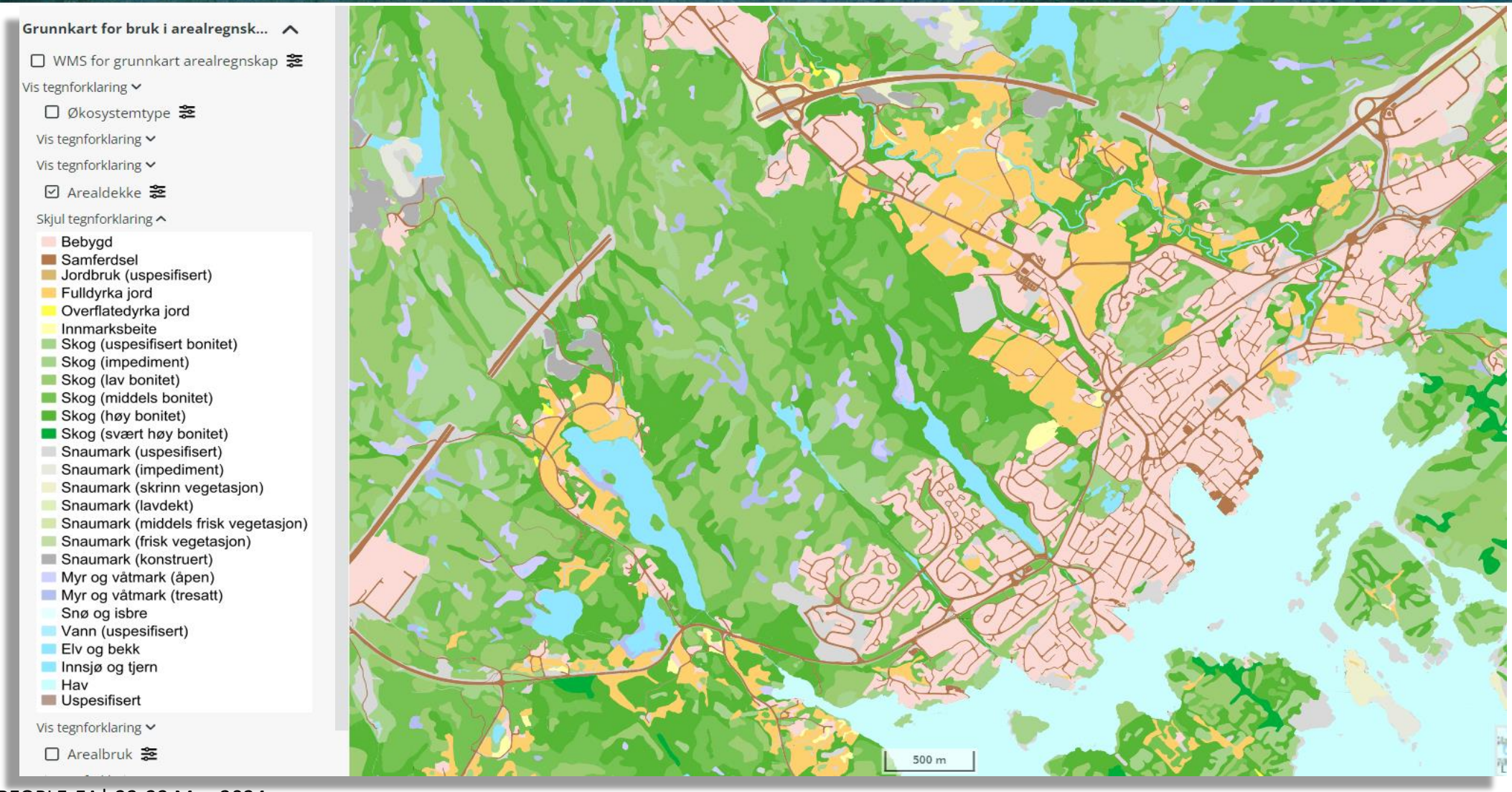
- Co-operation agreement on ecosystem accounts
  - **The Norwegian Environment Agency**: All nature-related parts of environmental accounts (field work, monitoring, data registration, assessments, panels/peer reviews)
  - **Statistics Norway**: National authority for development, preparation and dissemination of Official Statistics (including international reporting)

- Support from:
  - The Norwegian Institute of Bioeconomy Research (NIBIO)
  - Norwegian Institute for Nature Research (NINA)
  - Research institute for water and the environment (NIVA)
  - and others

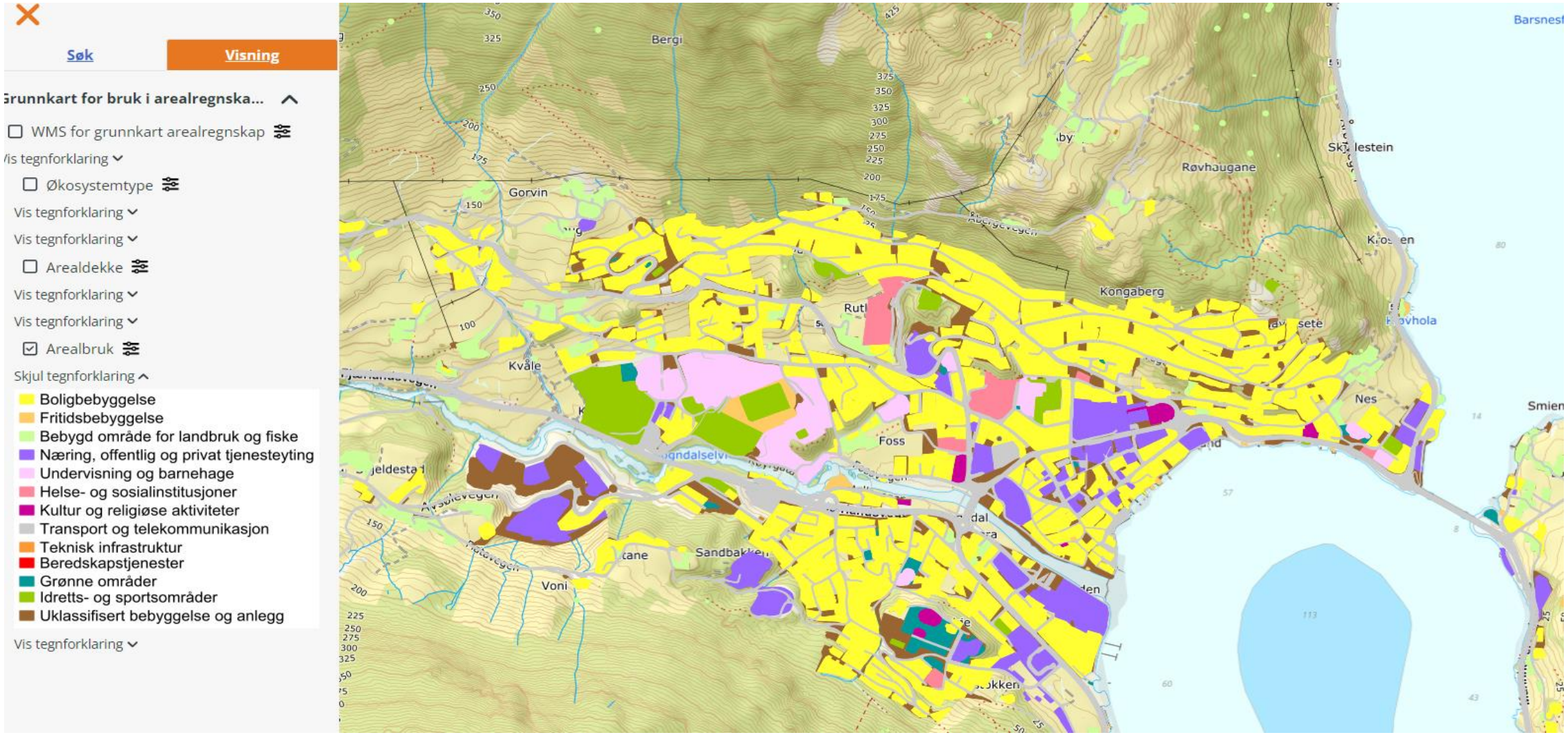
Extent mapping

- Prepared for extent accounts - base map for land cover and land use accounts:
  - Land cover
  - Land use
  - Ecosystems
- Trial/pilot version

Extent – Land cover

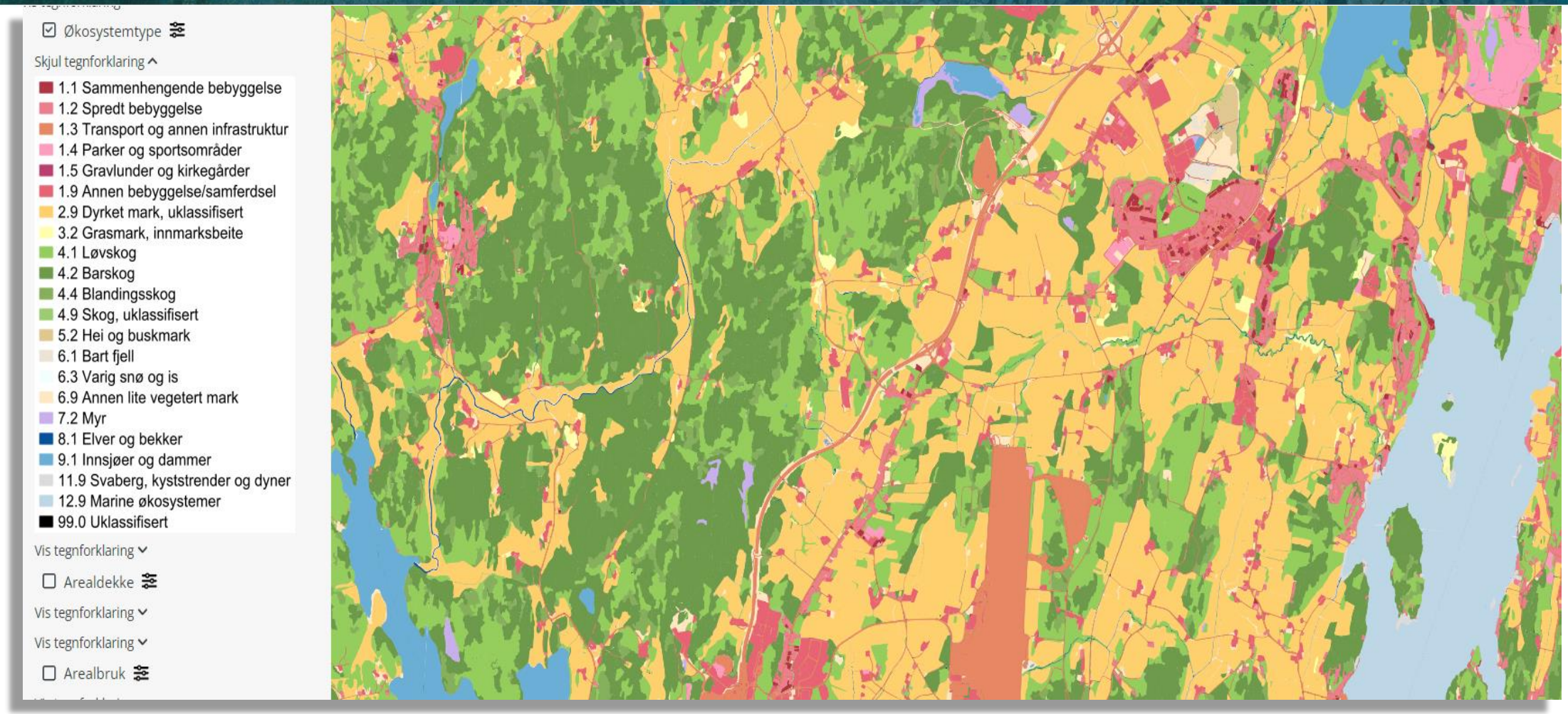


Extent – Land use



Extent - Ecosystems

Extent - Ecosystems



Main ecosystems in Norway - service

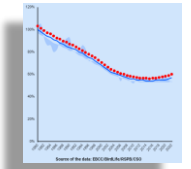
Condition

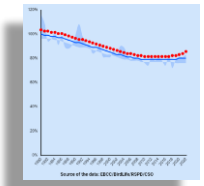
Research institutes commissioned by the Norwegian Environment Agency:

- Assessing the ecological condition of Norwegian ecosystems
- Methods
  - The Index-Based Ecological Condition Assessment (IBECA)
  - Panel-based Assessment of Ecosystem Condition (PAEC) (scoping, analysis, assessment and reporting & peer review)

Condition indicators

Ecosystem type	Indicator	Status
Settlements and other artificial areas	m^2 green areas per inhabitant	Land use in urban settlements - Statbank table 11016, do the calculation. National average?
	Concentration of particulate matter with a diameter up to 2.5 µm or 10 µm to be reported in µg/m^3 as a national average for the reporting period	Norwegian Environment Agency – indicator 4.6.2
Croplands	Soil organic carbon content in topsoil shall be reported in tonnes/ha, as a national average for the reporting period	National monitoring of SOC started in 2023. Planned duration (2023–2032) and (2033–2042). NINA report – estimates: Carbon storage in Norwegian ecosystems
Grasslands	Soil organic carbon content in topsoil shall be reported in tonnes/ha, as a national average for the reporting period	See above
Croplands and grasslands together	Common farmland bird index shall be reported as a national aggregate index for the reporting period	PanEuropean Common Bird Monitoring Scheme
Coastal wetlands, beaches, and dunes	Artificial impervious area cover shall be reported in %, as a national average for the reporting period	Statistics Norway - GIS overlay analysis using base map for land cover and land use accounts. Do the calculation.
Forests and woodlands	Dead wood shall be reported in m^3 /ha, as a national average for the reporting period	National Forest Inventory – article. National average 2017: 11.1 m^3/ha
	Tree cover density shall be reported in %, as a national average for the reporting period	To be calculated from national forest resources map (SR16). By NIBIO og Statistics Norway.
	Common forest bird index shall be reported as a national aggregate index for the reporting period	PanEuropean Common Bird Monitoring Scheme





Condition indicators – Carbon storage

NINA-report:

- Stored in key ecosystem types: Norway has approximately 0.18% of all global carbon stocks, with a land mass that is 0.07% of the planet.
- 30% of Norway's carbon is stored in forests, followed by the alpine zones, wetlands and sediments in freshwater lakes.
- Forests and lower alpine zones of shrub vegetation sequester the most carbon with an annual average: 5.5 and 5.3 Tg C yr−1, respectively.
- When corrected for area, it is lake sediments, wetlands and the permafrost in the cryosphere that store the most carbon per km^2.
- **No numbers on SOC?**

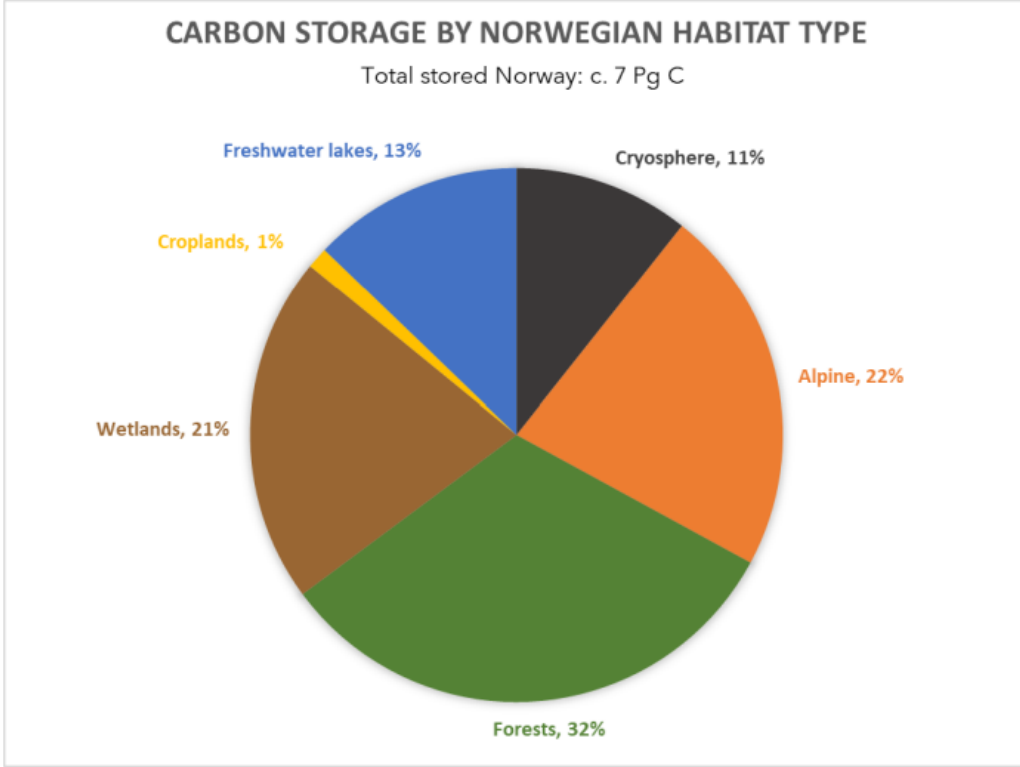
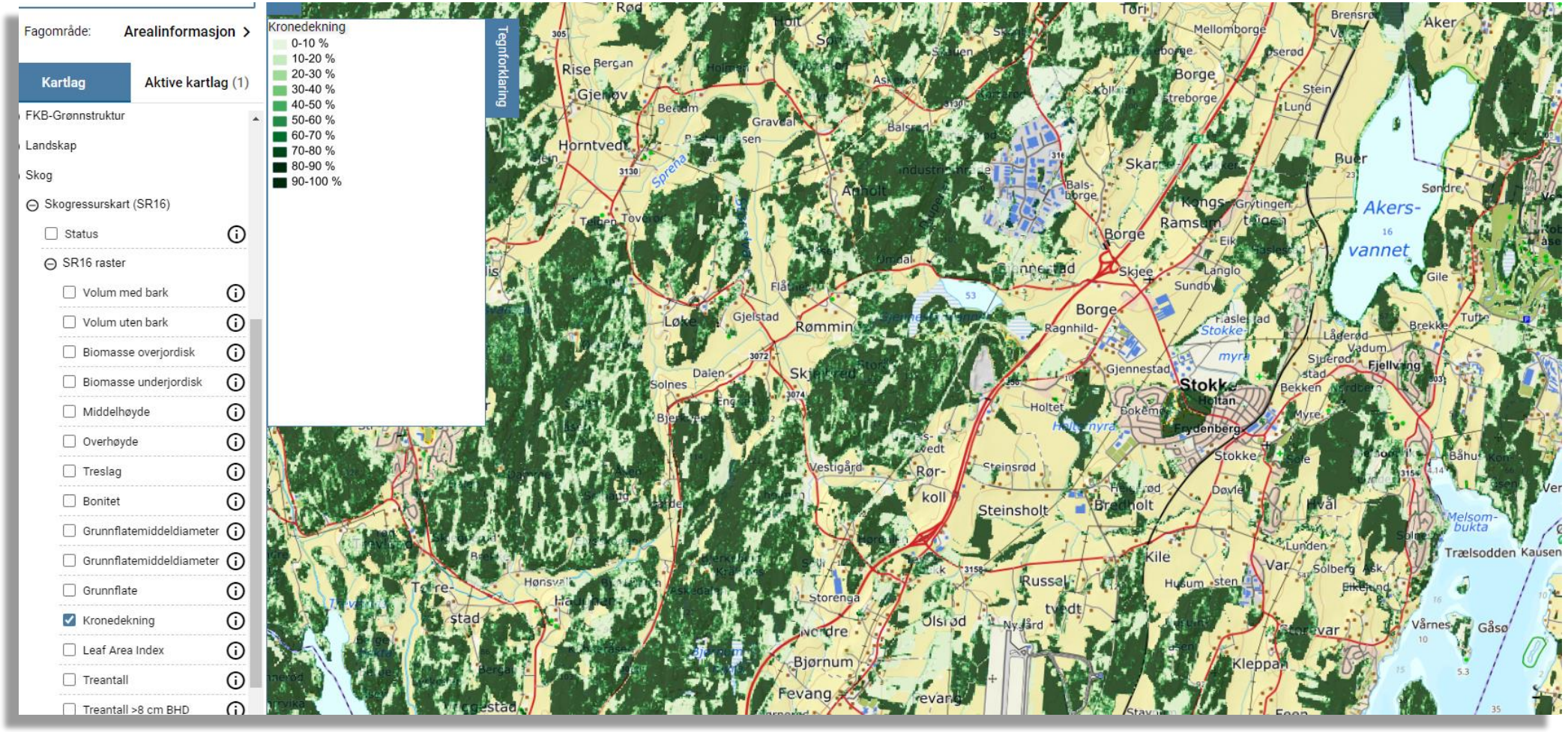


Figure 8. *Approximate amount of carbon stored in Norwegian habitat types, as a proportion of the total carbon stored. Where ranges of carbon storage are reported, the average between high and low is taken. Carbon in freshwater is largely from deep lake sediment. (See Table 6).*

Condition indicators – Forest and woodlands

- **Tree cover density**: SR16-map



Condition indicators– Forest and woodlands

- **Common forest bird index** (FI, NO, SE):

All data in one graph: No

Confidence limits: Yes

Reset | Show

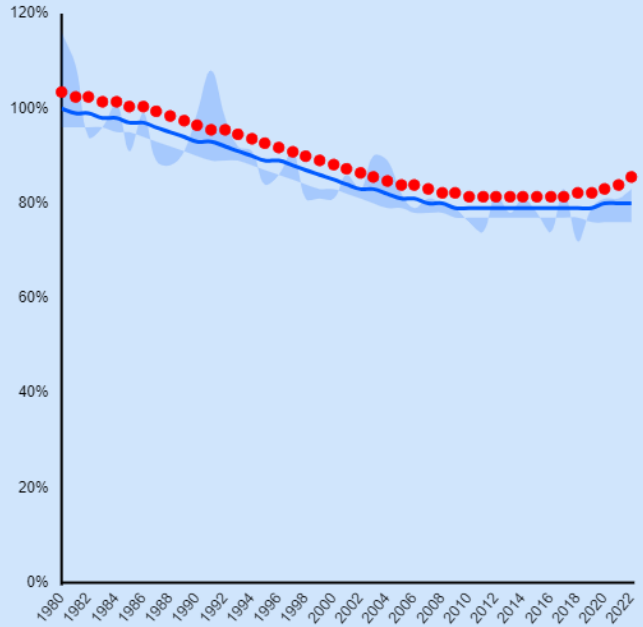
Confidence limits may be shown only if the option *All data in one graph* is set to no.

Common forest birds indicator, North Europe, single European species habitat classification, 1980-2022

List of species and their trends
List of countries

Trend of species contributing to the indicator:

- Moderate decline 15
- Moderate increase 6
- Stable 3
- Steep decline 0
- Strong increase 0
- Uncertain 0

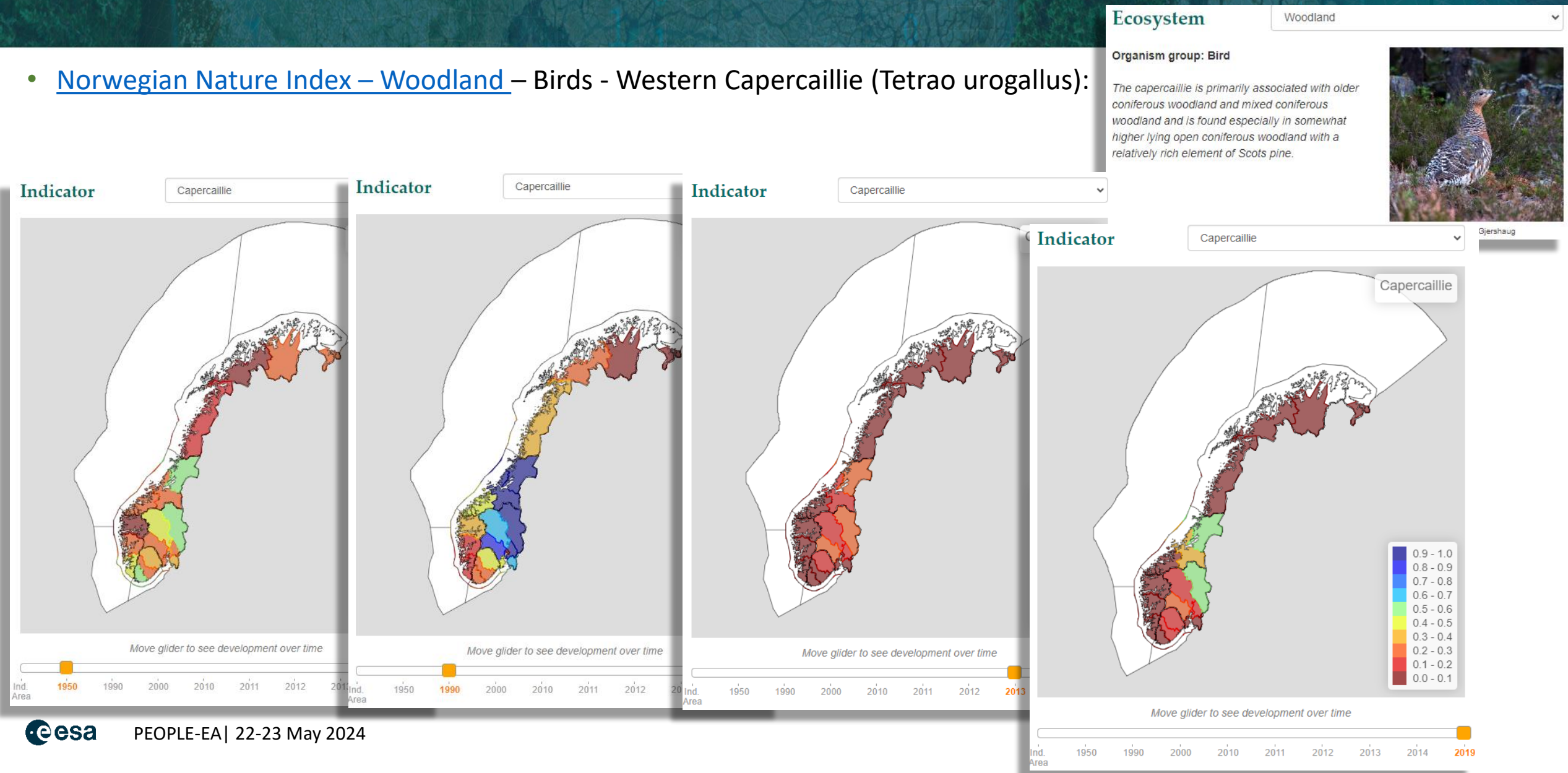


Source of the data: EBCC/BirdLife/RSPB/CSO

Common bird indicators, Europe, single European species habitat classification

Condition indicators– Forest and woodlands

- Norwegian Nature Index – Woodland – Birds - Western Capercaillie (Tetrao urogallus):



Wood provision account

"net increment in thousand m^3 over bark"

From PEOPLE-EA project:

WP account for NO year 2021
Note: this is still an experimental algorithm
Note2: forest area represent the "productive forest land" as defined by NINA (living trees with boniteit over 6)

CNTR_CODE	NAME_LATN	FOREST_ID	NAI [m3 overbark]	mean_NAI_per_ha [m3 overbark]	forest_area [ha]	NAI [1000 m3 overbark]	forest_area [km2]	productive forest area [km2] by ssb.no	dif
NO	Oslo and Viken	FMNO01	4 415 176	4,1	1 076 515	4 415,18	10 765	11 671	-7,76 %
NO	Rogaland, Vestland and More og Romsdal	FMNO05	3 521 113	3,1	1 135 711	3 521,11	11 357	10 293	10,34 %
NO	Trøndelag	FMNO06	2 819 319	2,5	1 126 883	2 819,32	11 269	10 987	2,57 %
NO	Troms og Finnmark	FMNO08	1 155 342	1,3	861 044	1 155,34	8 610	8 241	4,48 %
NO	Innlandet	FMNO02	5 877 166	3,0	1 959 810	5 877,17	19 598	21 540	-9,02 %
NO	Vestfold og Telemark	FMNO03	2 810 378	4,2	672 228	2 810,38	6 722	6 880	-2,29 %
NO	Agder	FMNO04	2 574 535	4,1	626 072	2 574,53	6 261	6 263	-0,04 %
NO	Nordland	FMNO07	1 266 325	1,9	662 814	1 266,32	6 628	6 628	0,00 %
	TOTAL		**24 439 354**	**3,0**	**8 121 077**	**24 439,35**	**81 211**	**82 503**	**-1,57 %**

Wood provision account

The National Forest Inventory

Choose table → Choose variables → Show result

06289: Growing stock under bark and annual increment under bark (1 000 m³), by species of tree, contents and year

- About table
- Change view
- Edit and Calculate
- Save result as
- Save your query
- Hide empty rows

Pivot counterclockwise | Pivot clockwise | Pivot manual | Excel (xlsx) | Fullscreen

	Annual increment
	2021
Total	24 049
Spruce	12 827
Pine	5 418
Broad-leaved	5 804

						NAI [1000 m3 overbark]	forest_area [km2]	productive forest area [km2] by ssb.no	dif
						4 415,18	10 765	11 671	-7,76 %
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Wood provision account

13328: Annual increment under bark (1 000 m³), by region, species of tree, interval (year) and contents

https://www.ssb.no/en/statbank/table/13328/tableViewLayout1/

	Total 2018-2022 Productive forest area	Other type of land	Total
0 The whole country	21 807	2 187	23 994
03+30 Oslo and Viken (2020-2023)	4 008	258	4 266
11+46+15 Rogaland, Vestland and Møre og Romsdal	3 005	412	3 417
50 Trøndelag - Tröndelage	3 122	328	3 450
54 Troms og Finnmark - Romsa ja Finnmárku (2020-2023)	682	140	822
34 Innlandet	5 742	346	6 088
38 Vestfold og Telemark (2020-2023)	2 264	244	2 508
42 Agder	1 760	237	1 997
18 Nordland - Nordlánnda	1 225	221	1 446

						NAI [1000 m3 overbark]	forest_area [km2]	productive forest area [km2] by ssb.no	dif
NO	Oslo and Viken	FMNO01	4 415 176		4,1	1 076 515	4 415,18	10 765	11 671	-7,76 %
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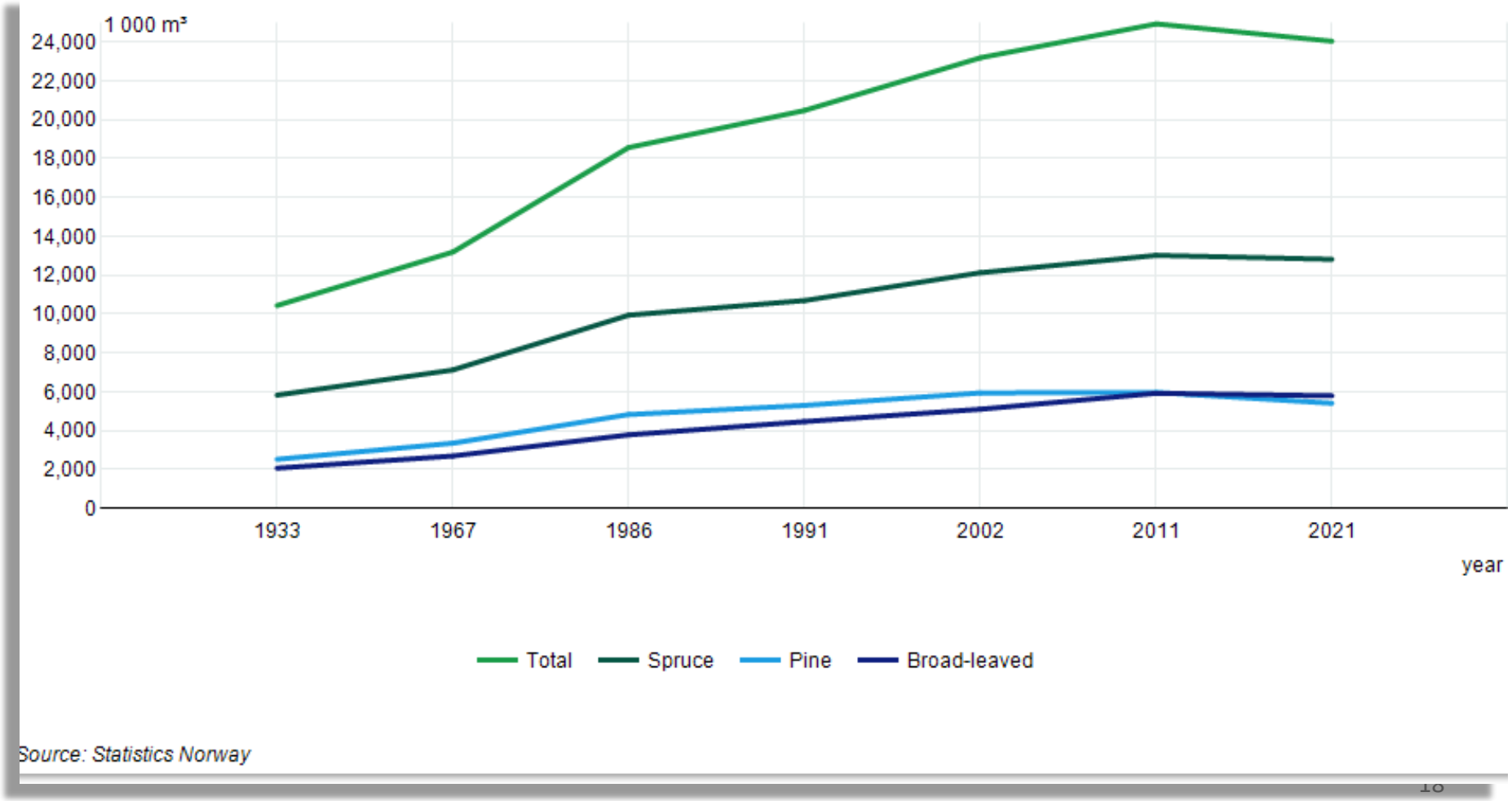
	TOTAL		**24 439 354**		**3,0**	**8 121 077**	**24 439,35**	**81 211**	**82 503**	**-1,57 %**

Wood provision account

StatBank Table 06289 annual increment under bark (1 000 m³), by species of tree



Norway: Need for development

The Norwegian Environment Agency – in National Ecosystem Accounting Concept Study 2022 (in Norwegian only):

- Wood provision
  - Increment data for non-forest ecosystems
- Crops
  - Households' cultivation of crops
  - Grazing intensity
- Pollination
  - The distribution of wild pollinator habitats and distance to pollinator-dependent crops are crucial to assess whether the conditions in the ecosystems can support the need for pollination.
  - NINA recommends development of spatially explicit models of pollinator habitats and pollinator-dependent crops, and that these are used as the basis for accounting.

Norway: Need for development

- Air filtration
  - LAI for urban areas/ecosystems
- Global climate regulation
  - Total carbon uptake and carbon storage per ecosystem type by storage unit (biomass, soil, etc.).
  - Establish a method based on the recommendations from Eurostat guidelines.
- Local climate regulation
  - EO on high resolution land surface temperature?
  - Machine learning model to predict LST for the entire country and then predict LST in a scenario where all vegetation is removed. Calculate the differences.

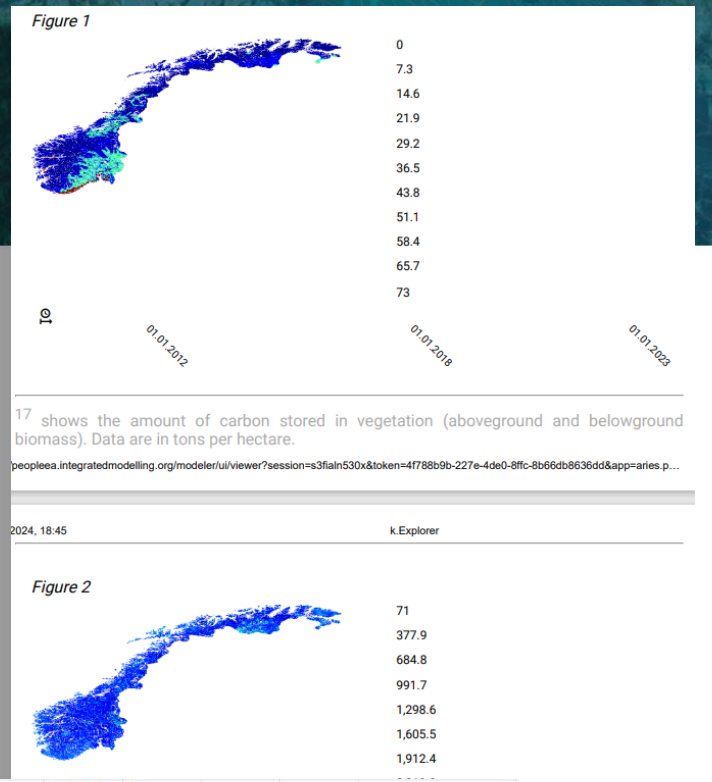
Norway: Need for development

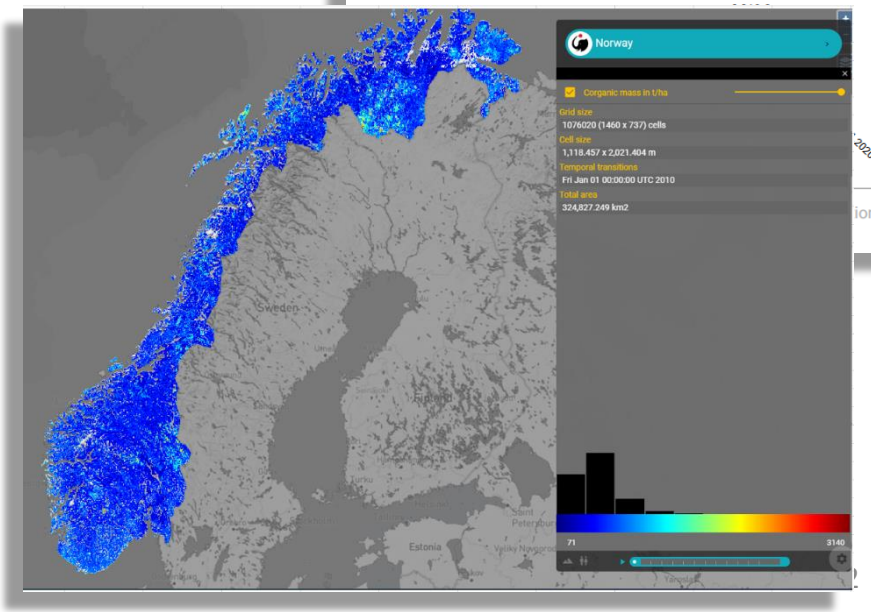
- Recreation and tourism-related services
  - Survey the suitability of various areas for outdoor activities and link this to data on degree of urbanization and accommodation statistics.
  - Develop Recreation Opportunity Spectrum (ROS) and ESTIMAP for Norway

PEOPLE-EA Feedback

- **Global climate regulation service**: «tonnes of net sequestration of carbon and tonnes of carbon stored in ecosystems including above ground and below ground in the first 1 meter of the soil (including in peatlands)»

  - For learners/Early Adopters, the number and titles of outputs on carbon is confusing.
  - Too many tabs to look for outputs – that varies in shape and content:
    - Tables
    - Maps
    - Graphs -under some maps
    - Reports
  - Some downloaded tables without unit of measure





PEOPLE-EA Feedback

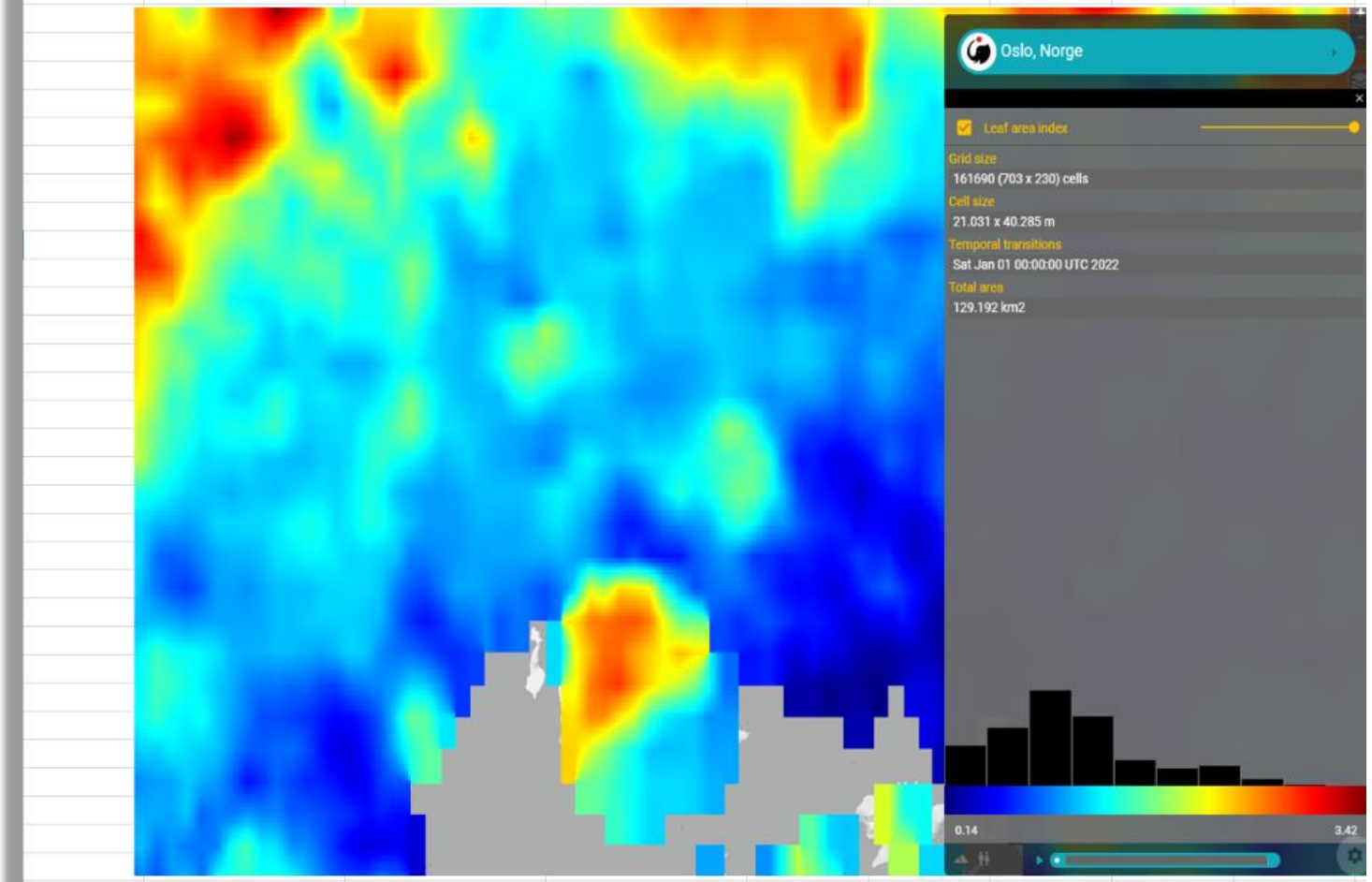
- **Air filtration service**: «tonnes of fine particulate matter (PM2.5) absorbed»

Leaf Area Index (LAI) – Oslo "city"

- Used "Map boundaries", zoomed in to city area. Looks reasonable. Hard to repeat exactly.
- (Have not tried to import national dataset "urban settlements".)

- **Q:** How much is absorbed per unit (cm^2?) of leaf surface?

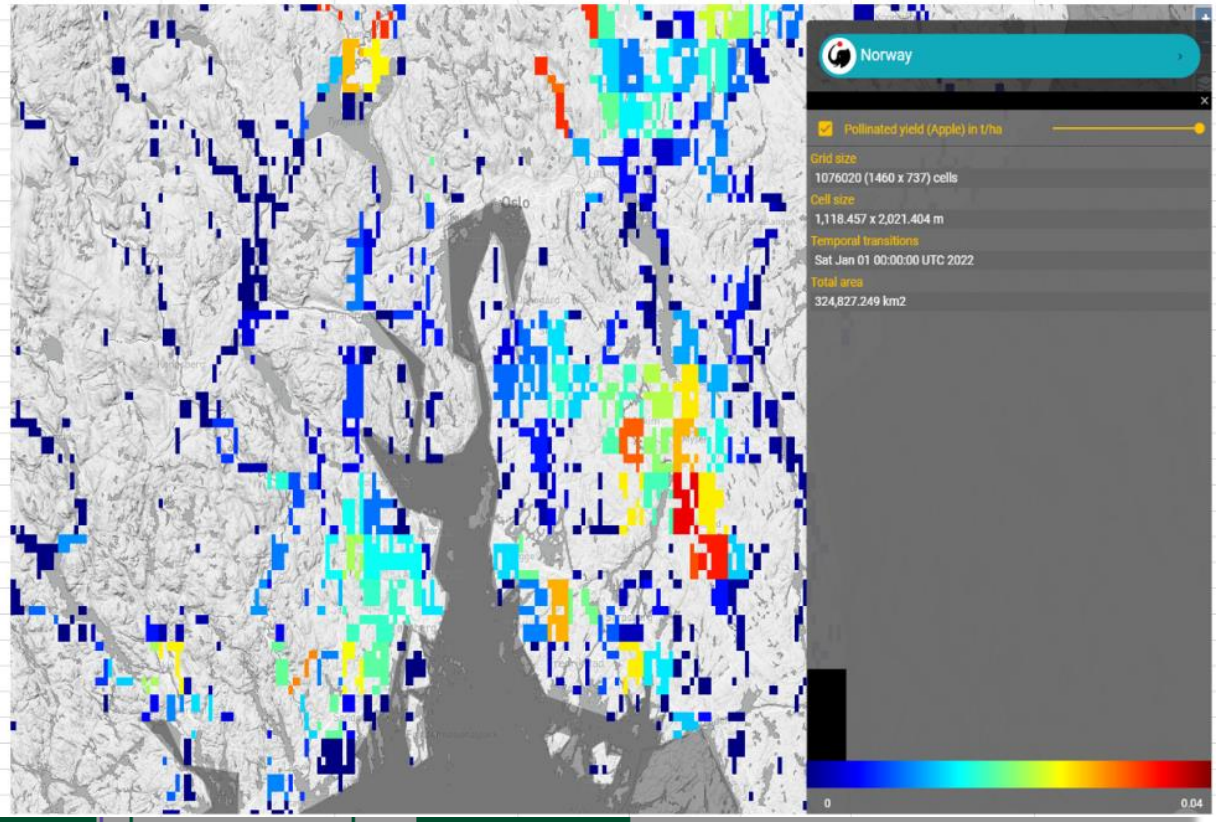
	Coniferous forest, Boreal	Transitional woodland scrub, Boreal	Mixed forest, Boreal
Year 2022	2.3600619462983614	2.2205667674286405	2.1124506555162044



PEOPLE-EA Feedback

- **Pollination service**: «tonnes of pollinator-dependent crops that can be attributed to wild pollinators»
- **Apples** as example:
  - Statbank: 17 000 tonnes
  - PEOPLE-EA: 3 600 tons (metric?)
  - Map - pollination yield in t/ha
  - Strange graph

	Cucumber	Apple	Peach	Pumpkin	Watermelon	Pear	Plum
Production 2022 (tons)	4254.486274402152	3640.0197964829117	0.0	0.0	0.0	134.49069246792016	479.24490940307913
Production 2022 (tons)	4254.486274402152	3640.0197964829117	0.0	0.0	0.0	134.49069246792016	479.24490940307913
Net change	0.0	0.0	0.0	0.0	0.0	0.0	0.0



10507: Yield and area, by year, contents and horticultural crop

- About table
- Change view
- Edit and Calculate
- Save result as

Pivot counterclockwise | Pivot clockwise | Pivot manual | Excel (xlsx) | Fullscreen

	Yield (tonnes)			
	Apples	Pears	Plums	Ridge cucumber
2022	17 106	582	2 014	2 102

NO - Activities besides PEOPLE-EA

From Norwegian Institute for Nature Research (NINA):

INCA-Tool testing – no results yet

- Wood provision
  - Looking at differences in output due to different types of input data:
    - Maps for ecosystem extent such as CLC, NIBIO's new base map for land cover and land use accounting, Dynamic World, etc.

    - Data for biomass growth such as SR16 (forest resources map), yield classes, etc.

R&D needs for using EO in SEEA EA

- **Local climate regulation service**: - the presence of vegetation and how it contributes to *«reduction of temperature in cities during heat days or periods (with a temperature over 25 degrees C)»*

- Could not find **LST** in PEOPLE-EA Explorer
  - EO on high resolution land surface temperature?
  - Predict LST for the urban areas - then in a scenario predict LST where all vegetation is removed?
  - Calculate the differences

R&D needs for using EO in SEEA EA

From NINA:

- Develop annually updatable input data that also includes uncertainty estimates.
  - Zander Venter and a group at NINA - written an article about it: ‘Uncertainty audit’ for ecosystem accounting: Satellite-based ecosystem extent is biased without design-based area estimation and accuracy assessment - ScienceDirect

Thank you for listening!