

living planet symposium | BONN

23–27 May
2022

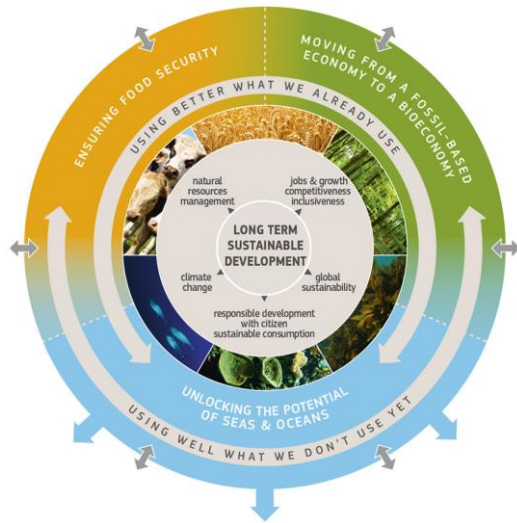
TAKING THE PULSE
OF OUR PLANET FROM SPACE



Harmonizing maps and inventory data on forest biomass in Europe

V. Avitabile, A. Camia, G. Duveiller, S. Mubareka, R. Pilli, I. Alberdi, S. Barreiro, M. Bosela, J. Breidenbach, J. Čavlović, C. Fischer, T. Gschwantner, H. Henttonen, K. Korhonen, G. Kulbokas, A. Lanz, K. Makovskis, G. Marin, F. Morneau, M. Nilsson, T. Nord-Larsen, D. Pantic, B. Pesty, J. Redmond, T. Riedel, M. Skudnik, A. Snorrason, N. Stoyanov, T. Stoyanov, A. Talrczyk, J. Uva

Rationale



EU Bioeconomy Strategy



EU Forest Strategy



EU Biodiversity Strategy



Rationale

- How much biomass is (and will be) available for wood supply in Europe?



1. Biomass stock



2. Forest available for wood supply



3. Biomass increment

Data sources

Ground sampling

=

unbiased estimates

Remote Sensing maps

=

Wall-to-wall coverage

... and they refer to:

- Forest definition (Area)
- Biomass definition (Unit)
- Temporal domain (Year)

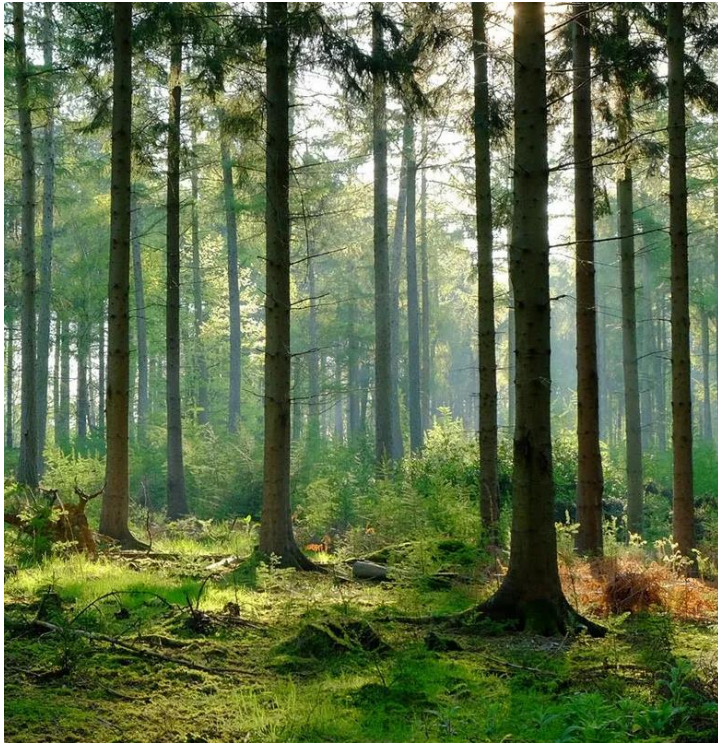
Need of comparable reference data

- NFI Statistics: National definitions
- FAO Statistics: Partially harmonized
- ENFIN Statistics: Ad-hoc harmonized



Overview

- How much biomass is (and will be) available for wood supply?



1. Biomass stock

1. Biomass stock

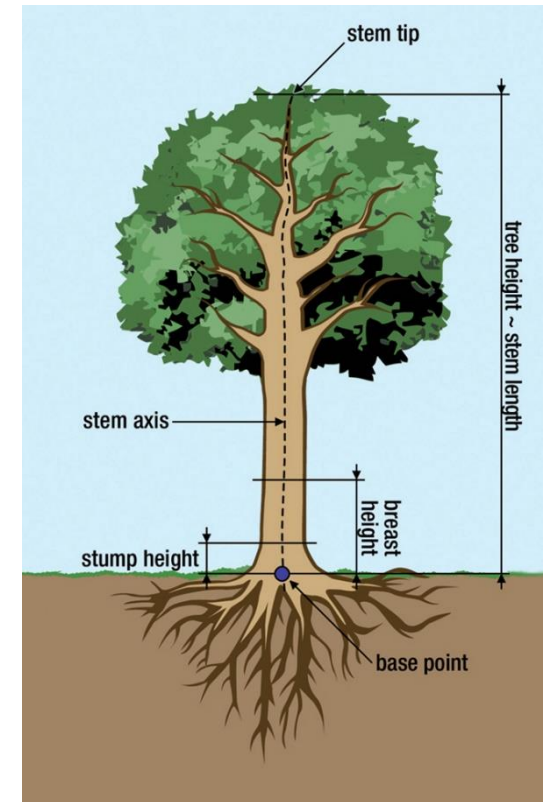
- Harmonize NFI statistics
- Assess biomass maps
- Match maps with statistics

Harmonization: Biomass pool



- ENFIN harmonization:
 - Common biomass definition: Expansion factors
 - Common estimator: E-Forest (Lanz, 2012)

EUROPEAN
NATIONAL
FOREST
INVENTORY
NETWORK



Harmonization: Reference year

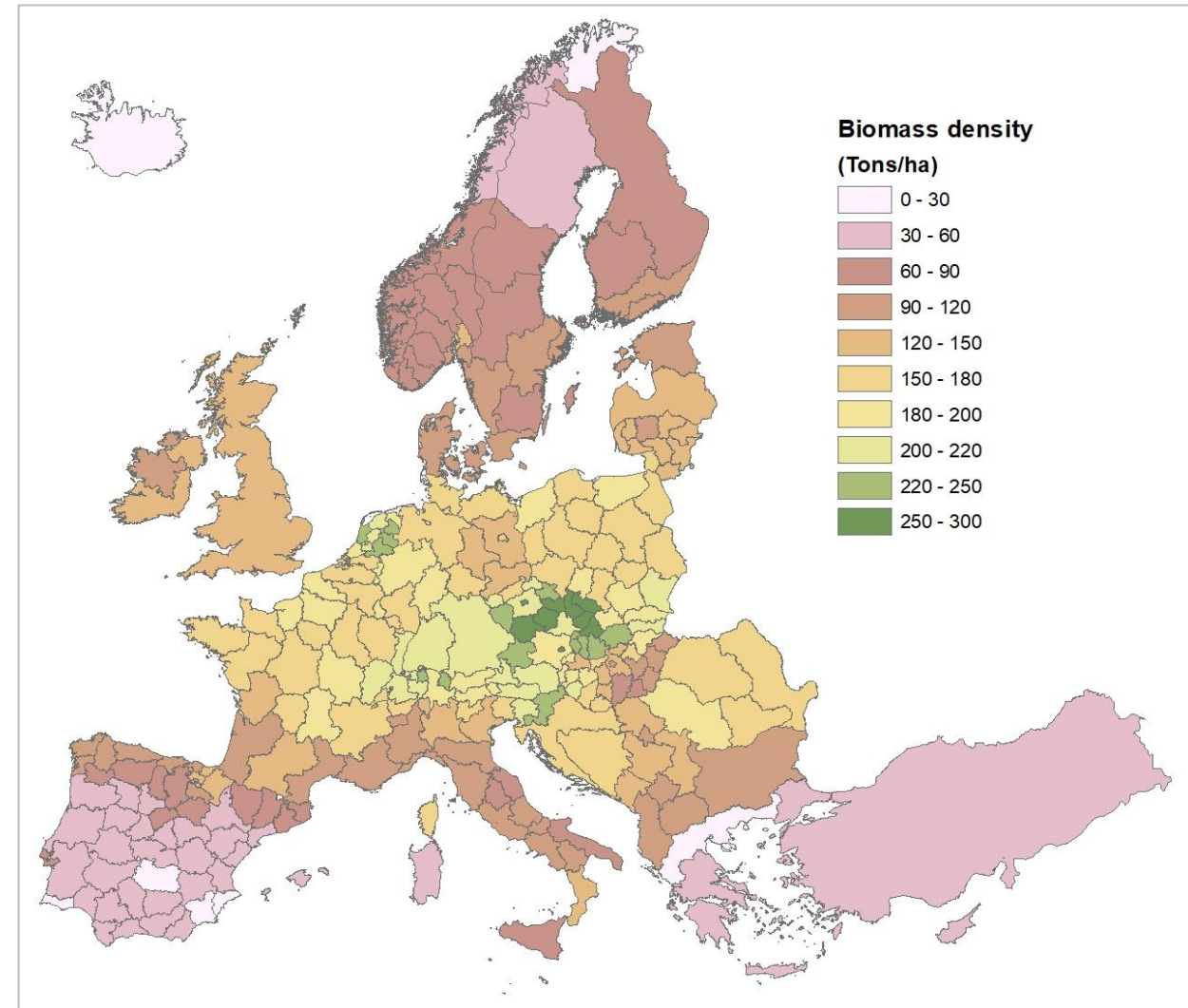
- Update NFI statistics to same year
- Tool: Carbon Budget Model
 - Growth rate
 - Disturbances
 - Forest area change



Biomass stock: Harmonized statistics

Reference database with:

- Same biomass pool
- Same year (2020)
- Sub-national resolution



Biomass maps

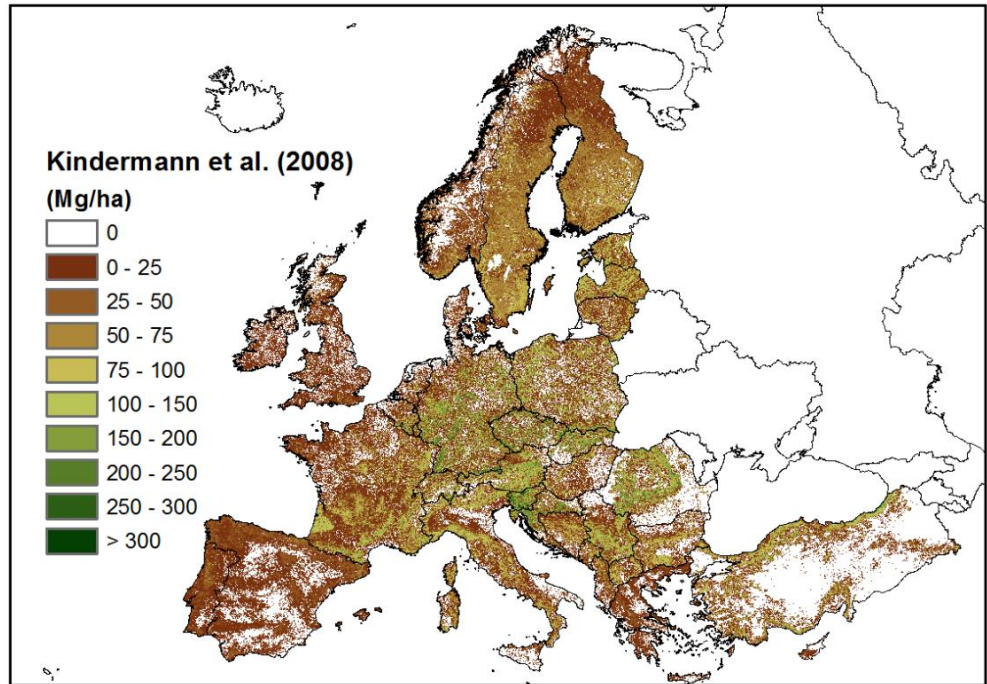
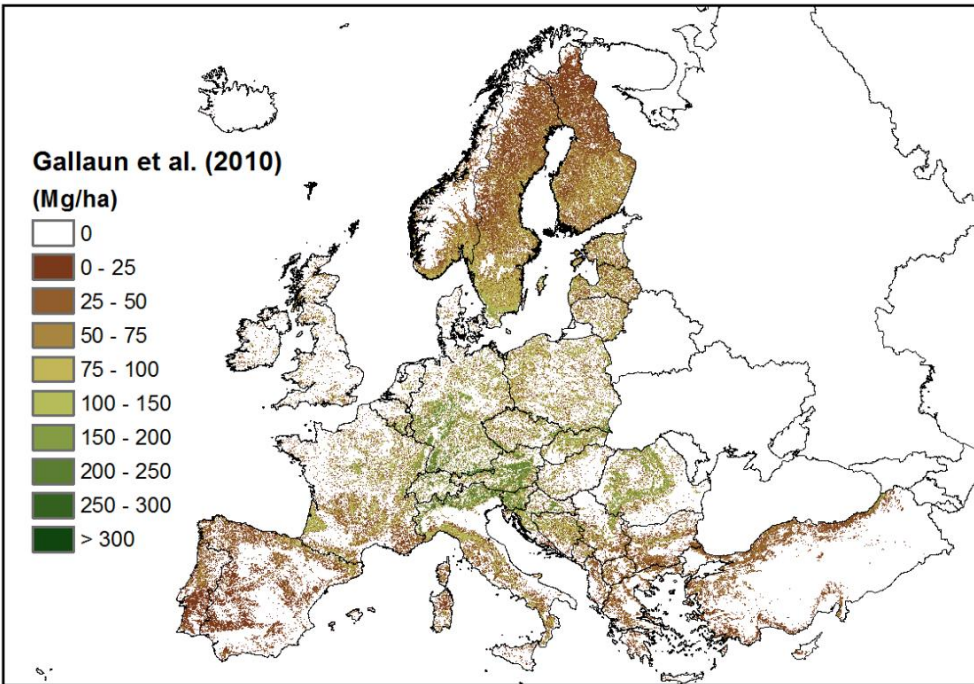
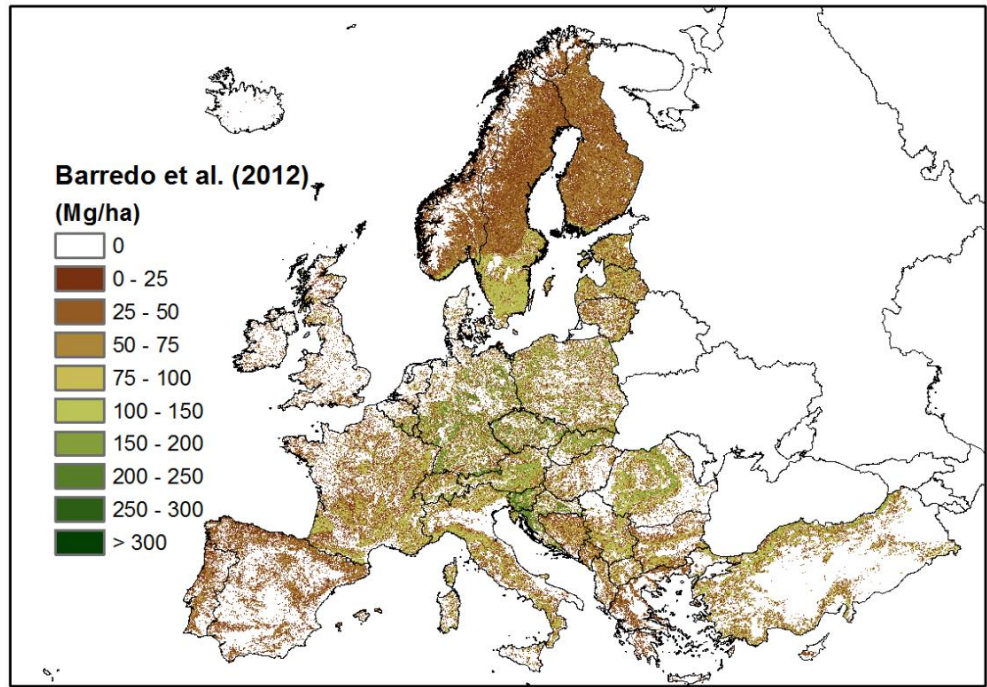
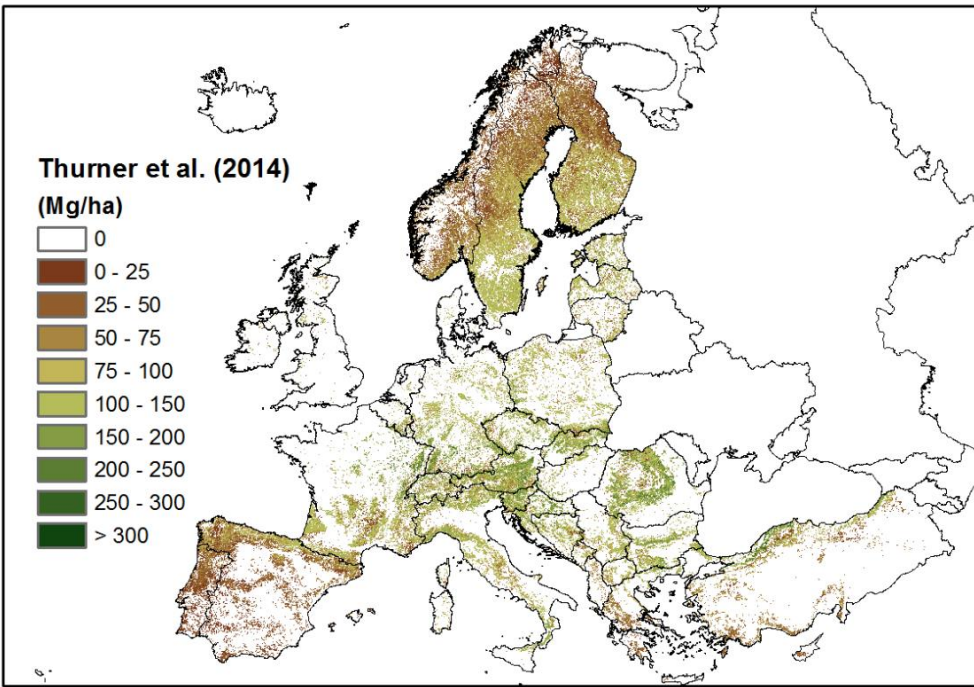
“First generation”

- Kindermann et al. 2008 1000 m
- Barredo et al. 2012 1000 m
- Thurner et al. 2014 1000 m
- Gallaun et al. 2010 500 m

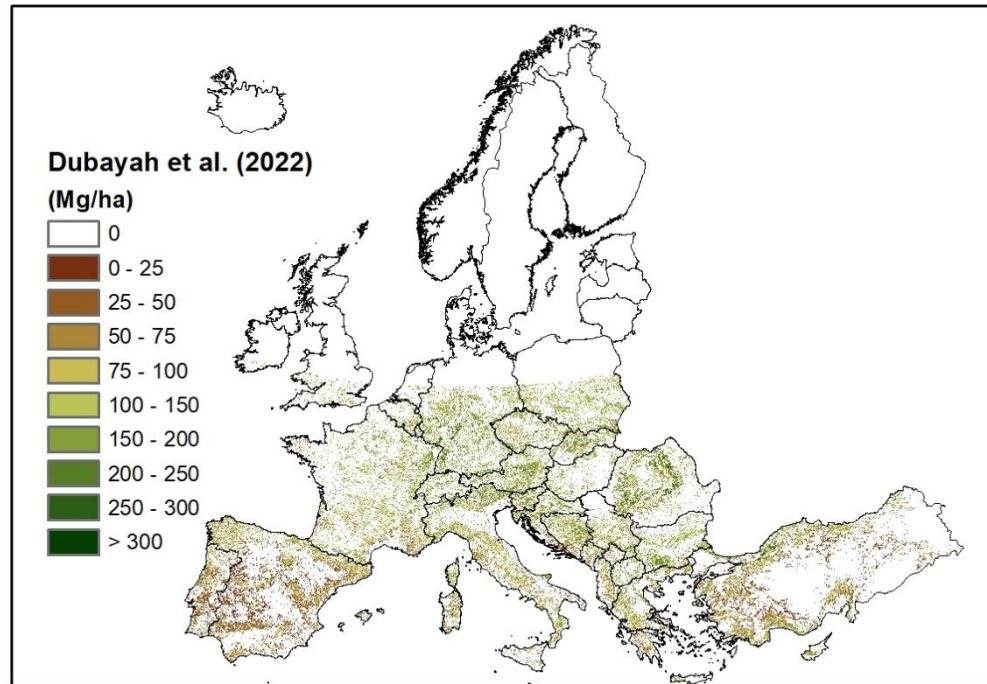
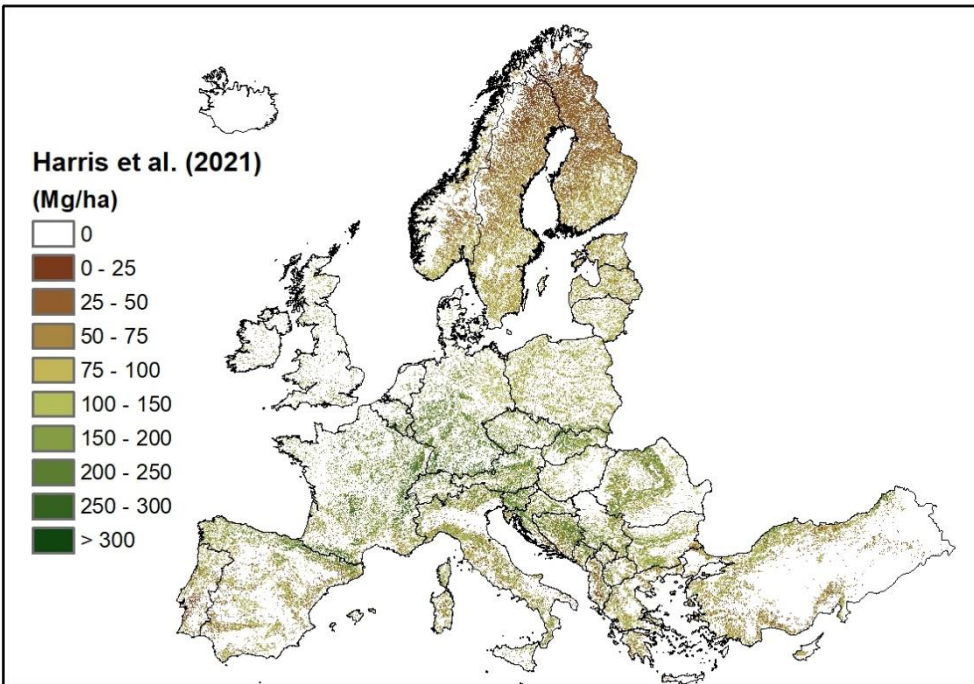
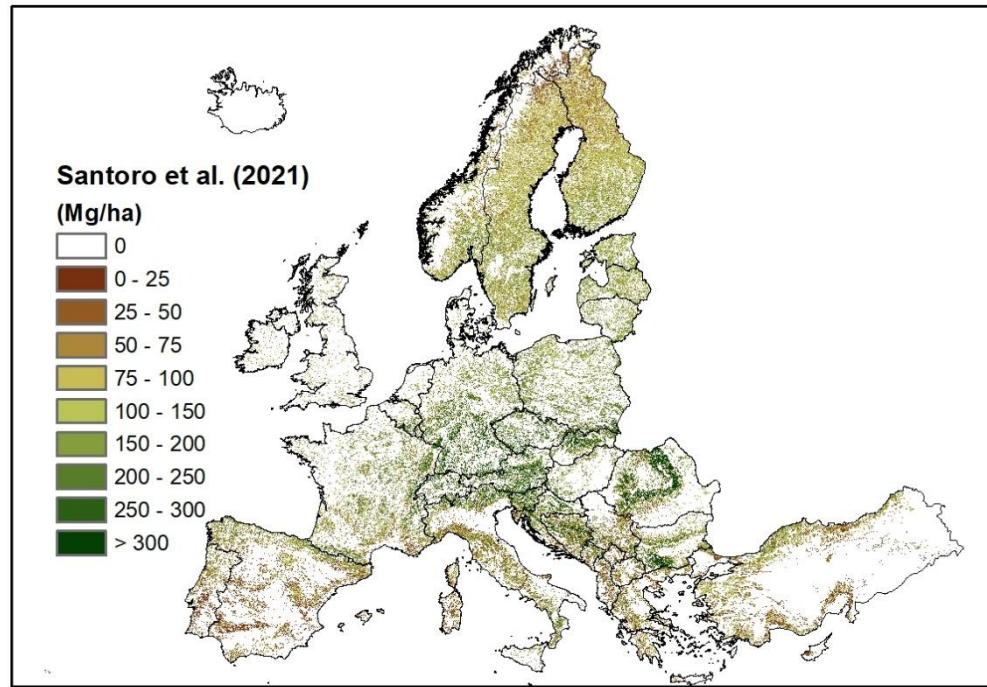
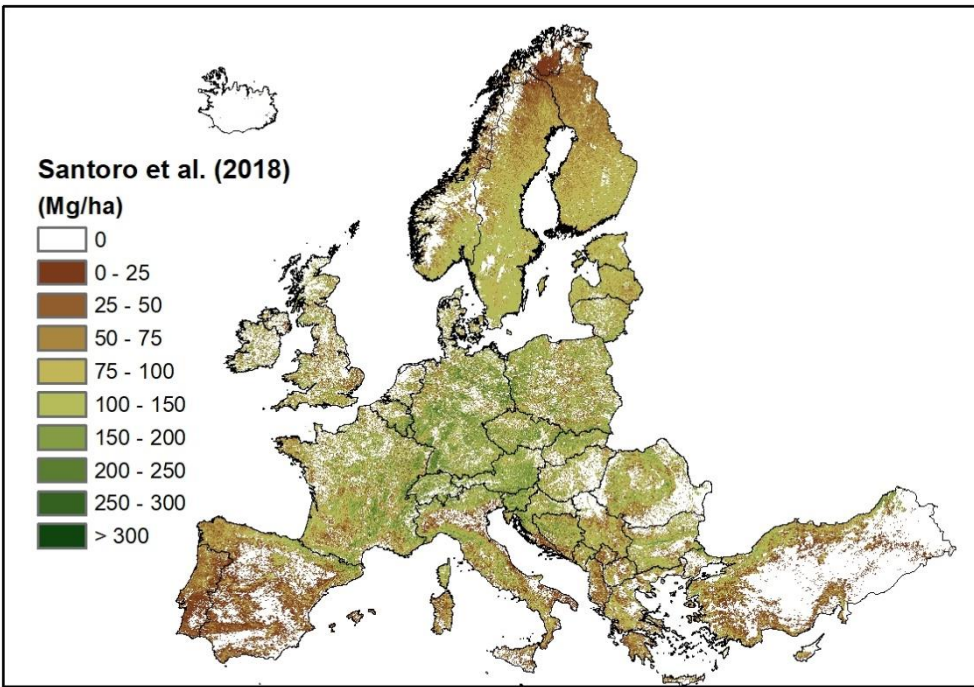
“Second generation”

- Dubayah et al. 2022 (*GEDI*) 1000 m
- Santoro et al. 2018 (*GlobBiomass*) 100 m
- Santoro et al. 2021 (*CCI Biomass*) 100 m
- Harris et al. 2021 (*WHRC*) 30 m

Biomass maps



Biomass maps

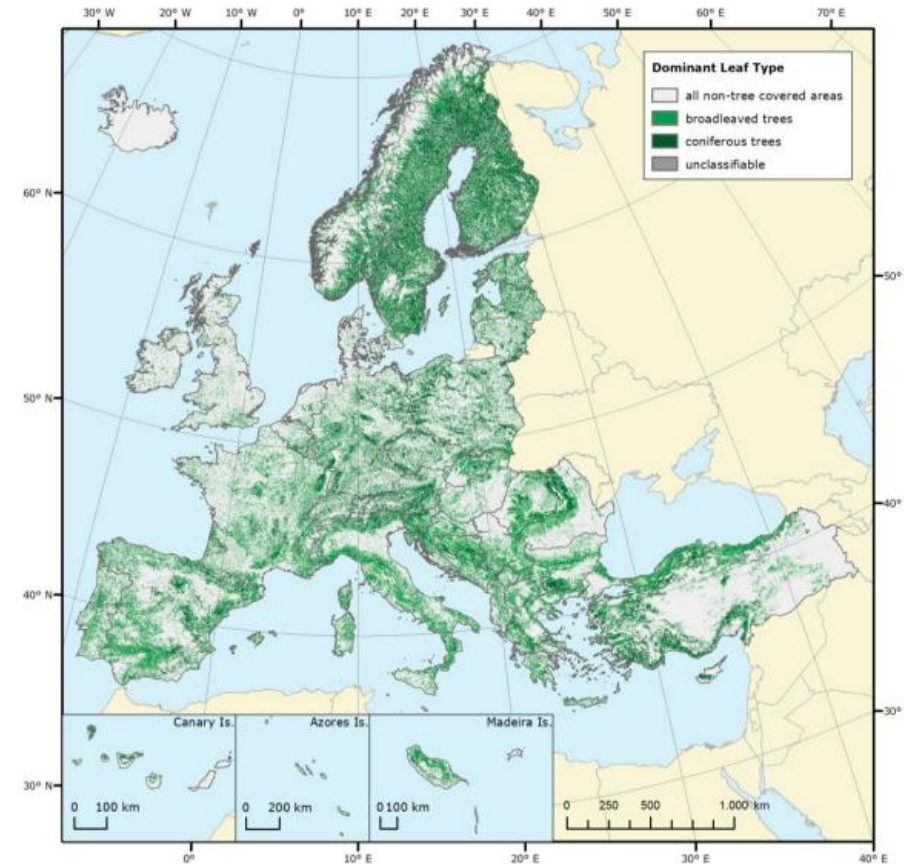
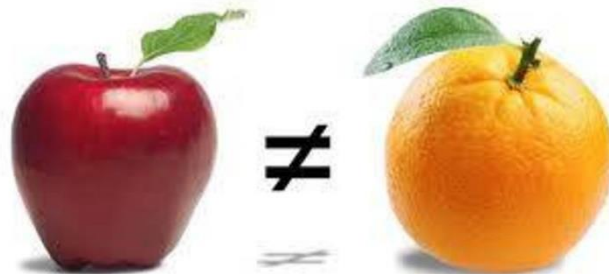


Biomass maps

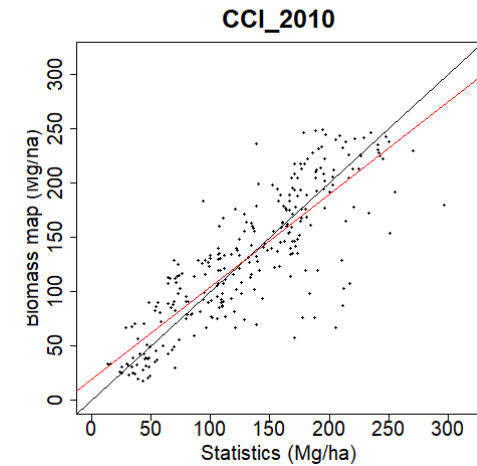
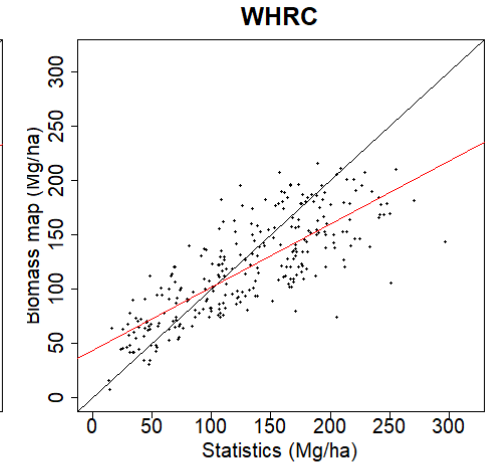
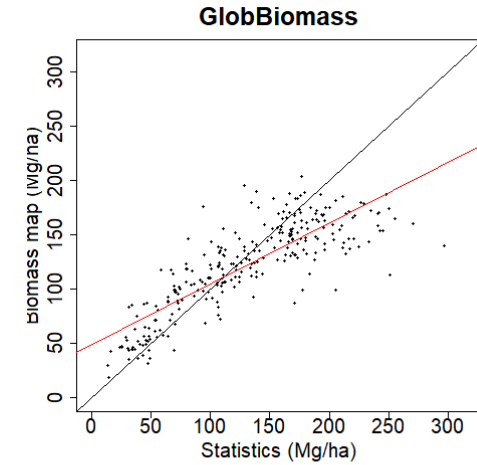
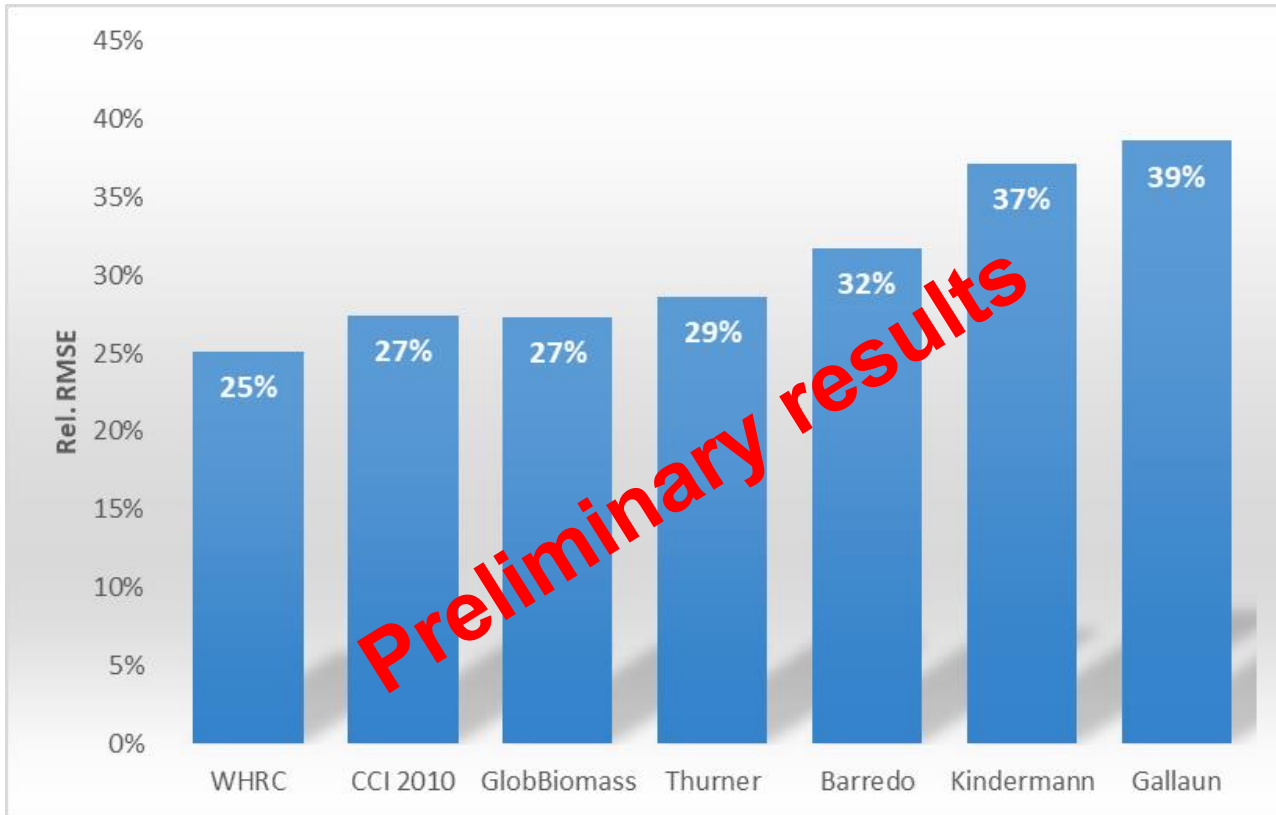


Assessing biomass maps

1. Statistics refer to a certain forest area
2. Maps vs. Statistics?
-> Need of a **Forest mask** matching the forest area of the Statistics
3. Relative error weighted by forest area



Assessing biomass maps

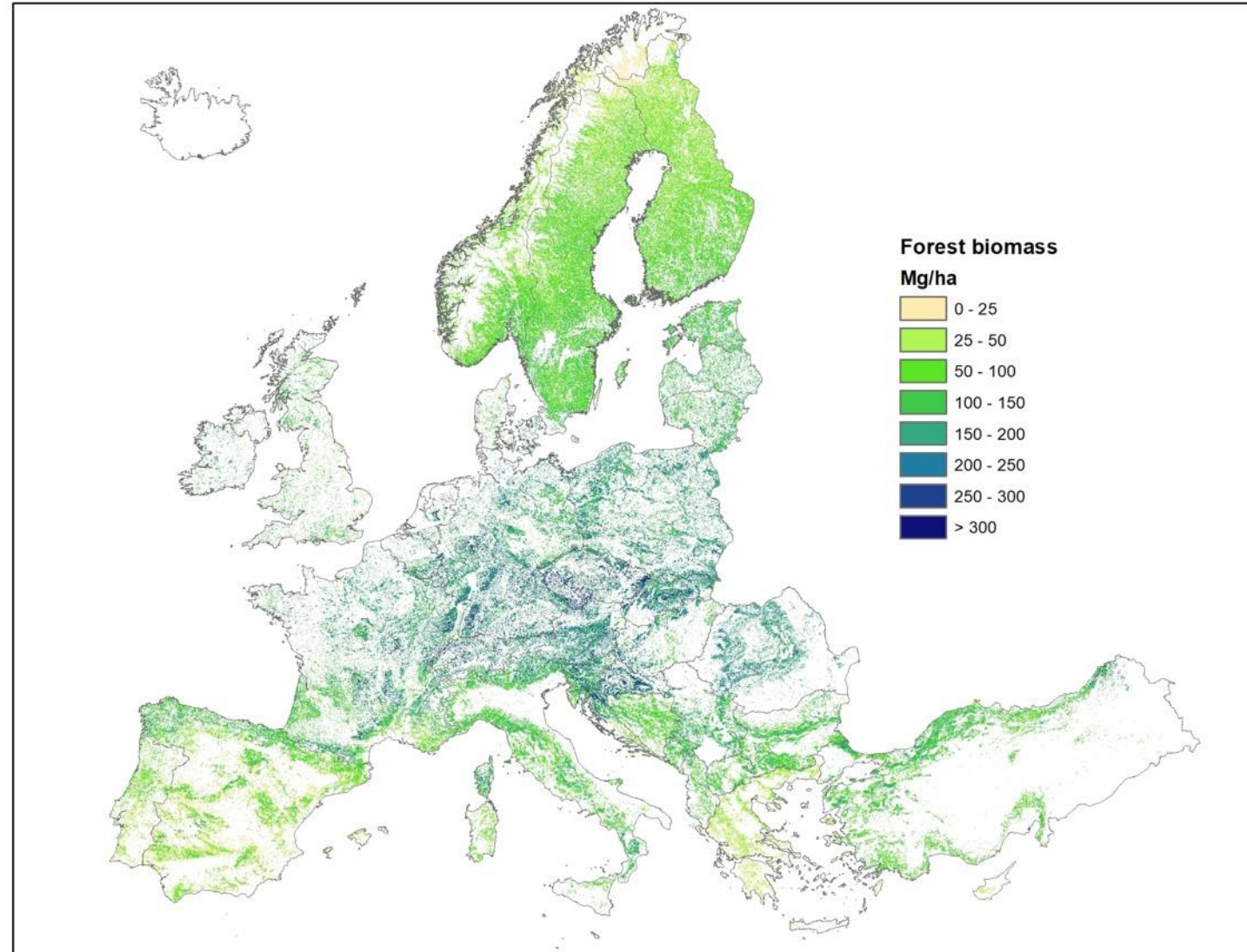


GEDI L4A/L4B:
Coming soon!

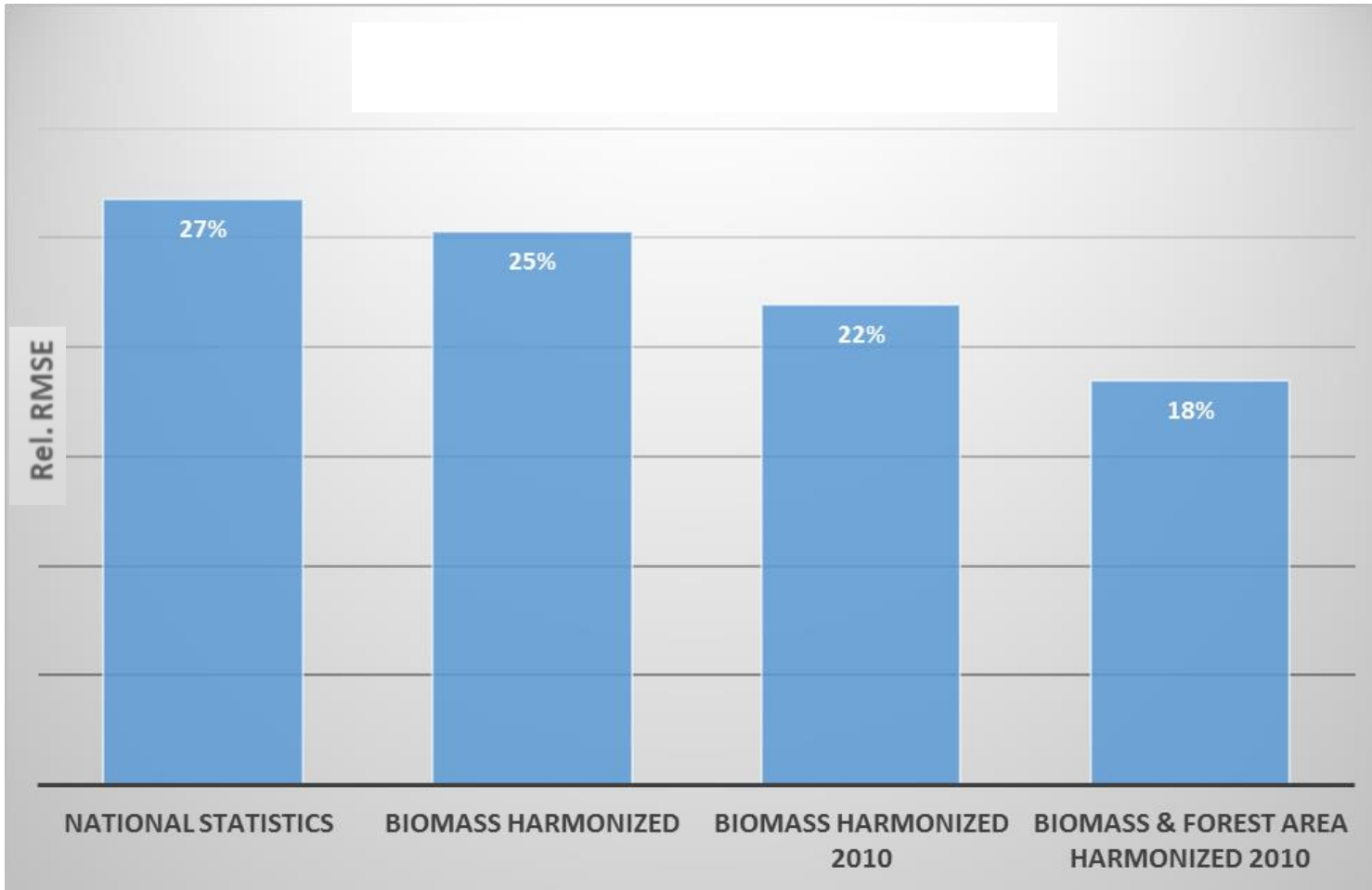
Adjusted Biomass map

The CCI Biomass map
is adjusted to match the
harmonized NFI statistics for:

- Forest area
- Biomass density & stock
- At sub-national scale



Harmonization: Effect on map accuracy



- ✓ Biomass definition
- ✓ Temporal domain
- ✓ Forest definition

Overview

- How much biomass is (and will be) available for wood supply?



2. Forest available for wood supply

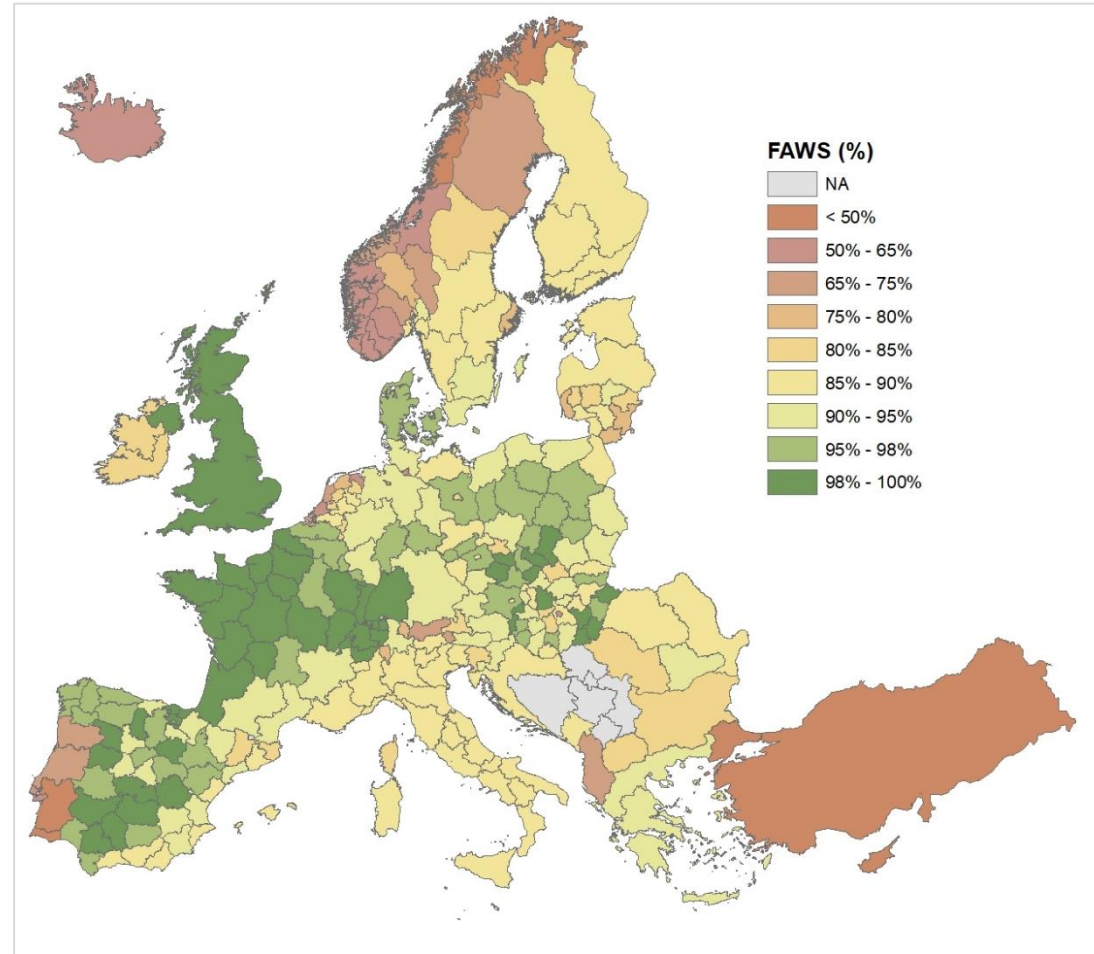
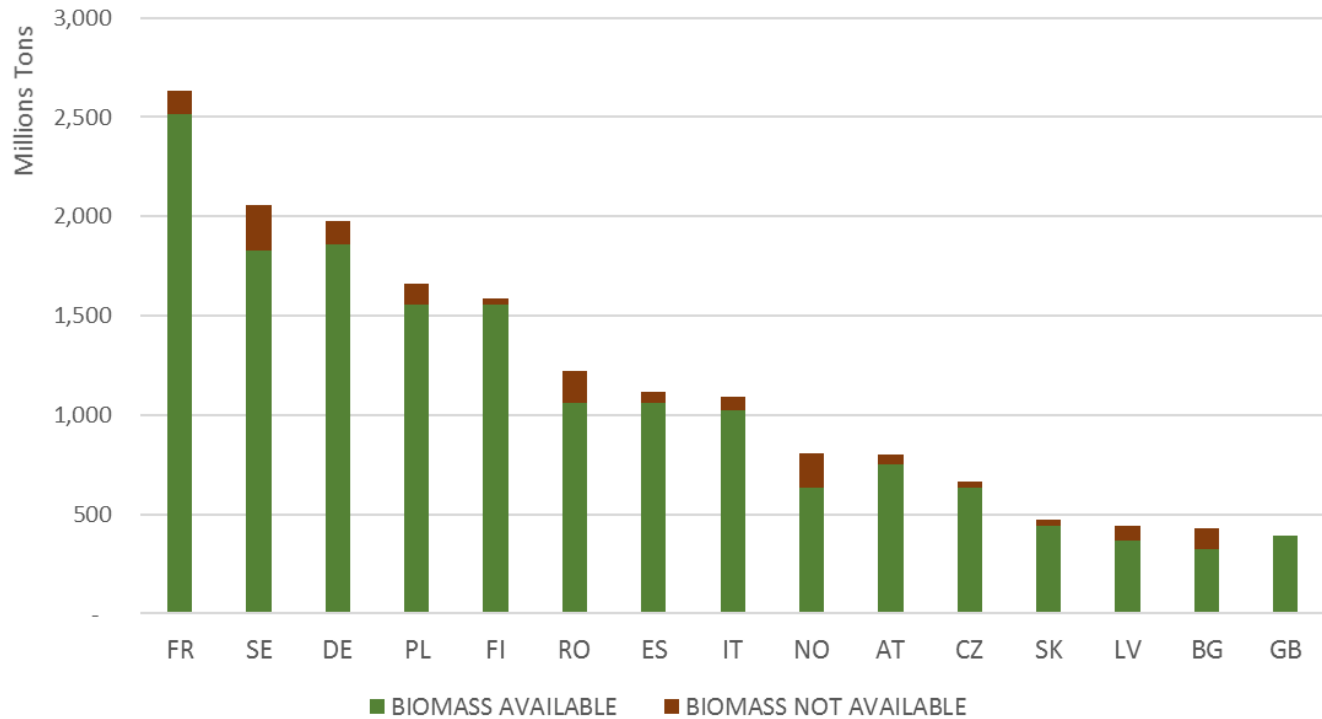
2. Forest Available for Wood Supply (FAWS)

- Harmonize NFI statistics
- Mapping restrictions
- Mapping FAWS

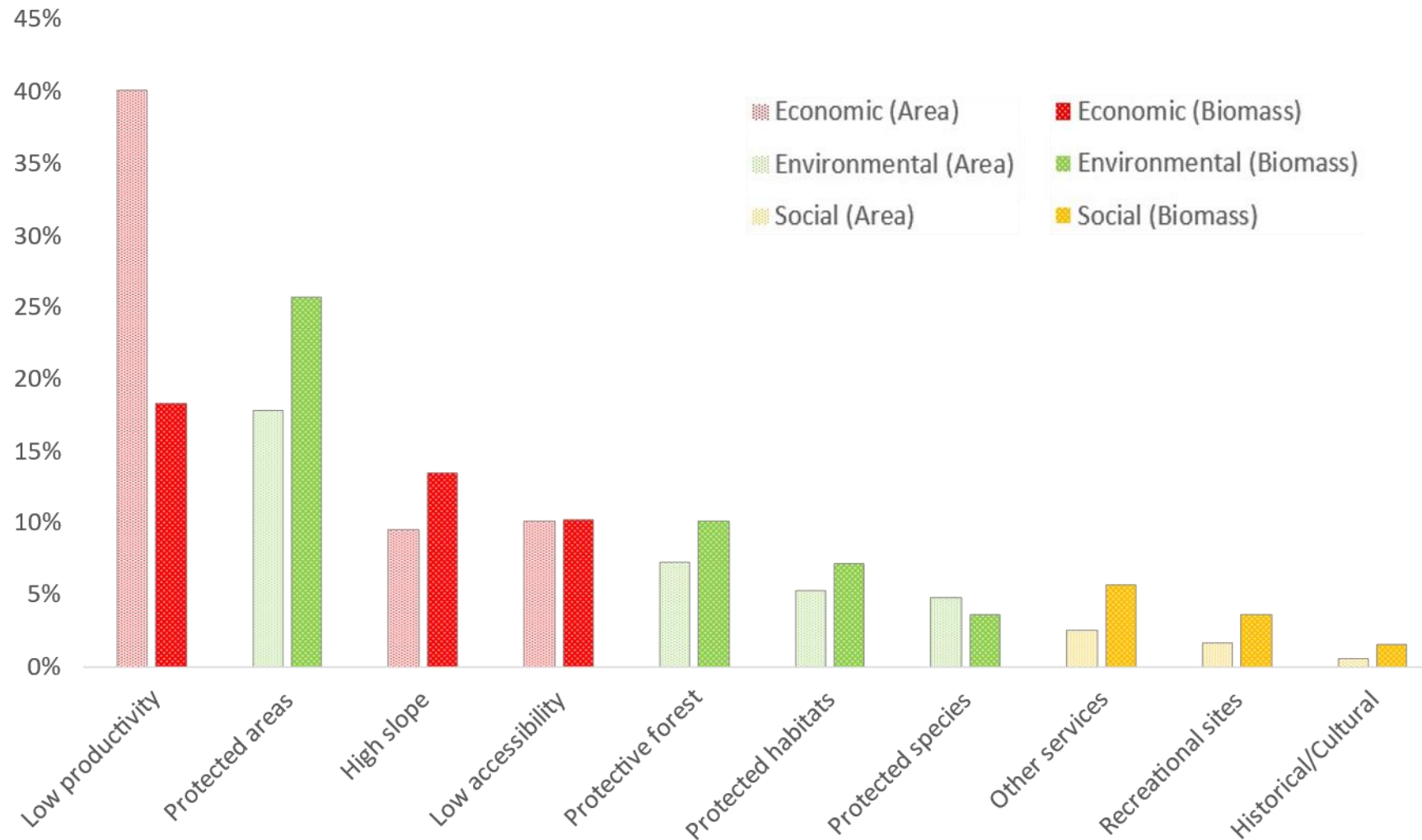
Reference statistics of biomass availability

- ENFIN: harmonization of definitions & restrictions
- Sub-national statistics

Biomass stock: total and available for wood supply

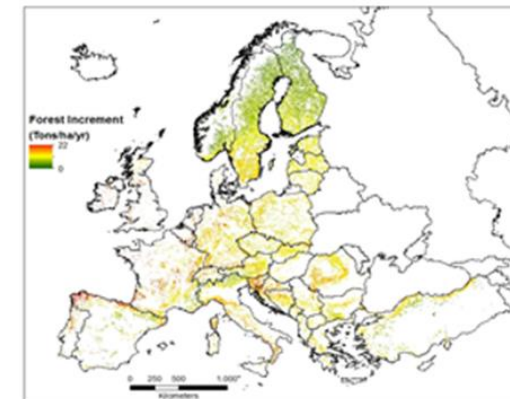
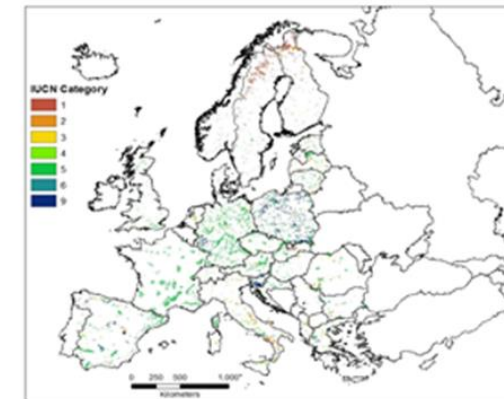
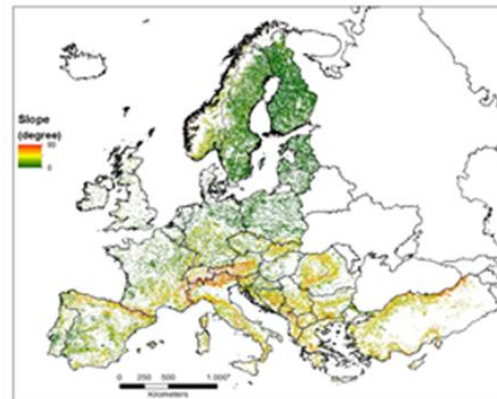
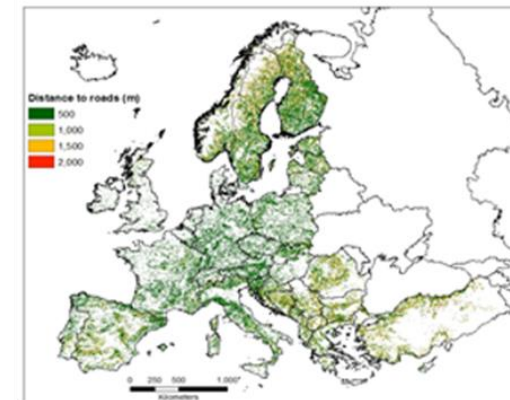
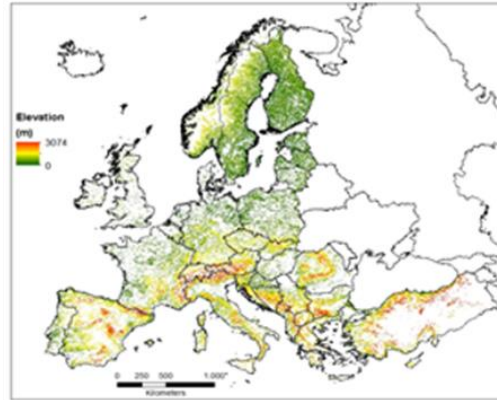


Why the biomass is not available?



Restrictions (that can be mapped)

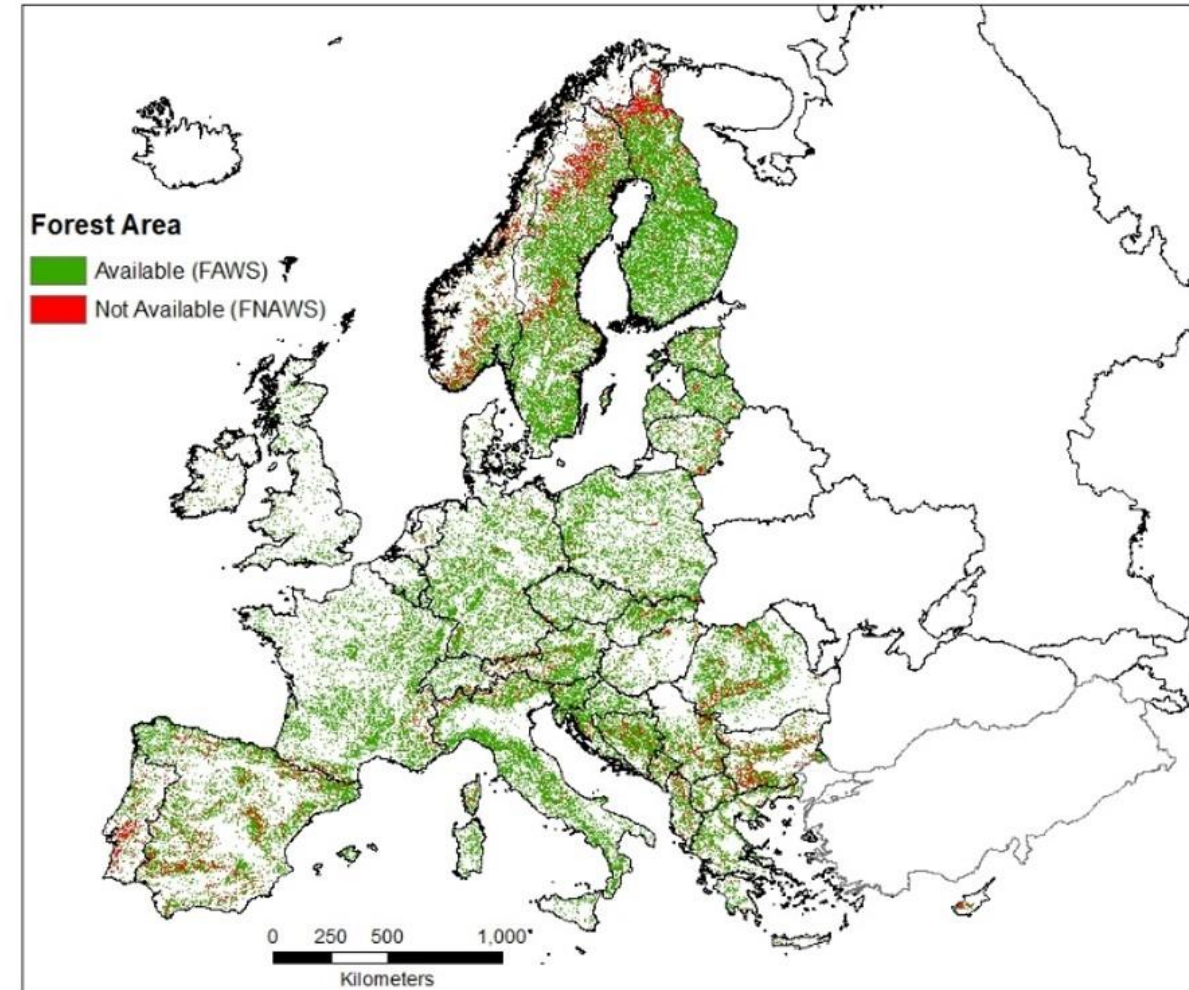
- Productivity: **k-NDVI**
- Protected areas: **IUCN**
- Slope: **DEM**
- Elevation: **DEM**
- Accessibility: **OSM**
- Protected species: **JRC Atlas**



Forest Available for Wood Supply - Map

FAWS map for Europe:

- Based on the Copernicus Forest Map
- Calibrated with harmonized statistics
- Country-specific thresholds



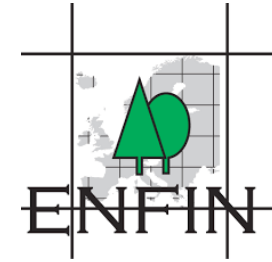
Overview

- How much biomass is (and will be) available for wood supply?



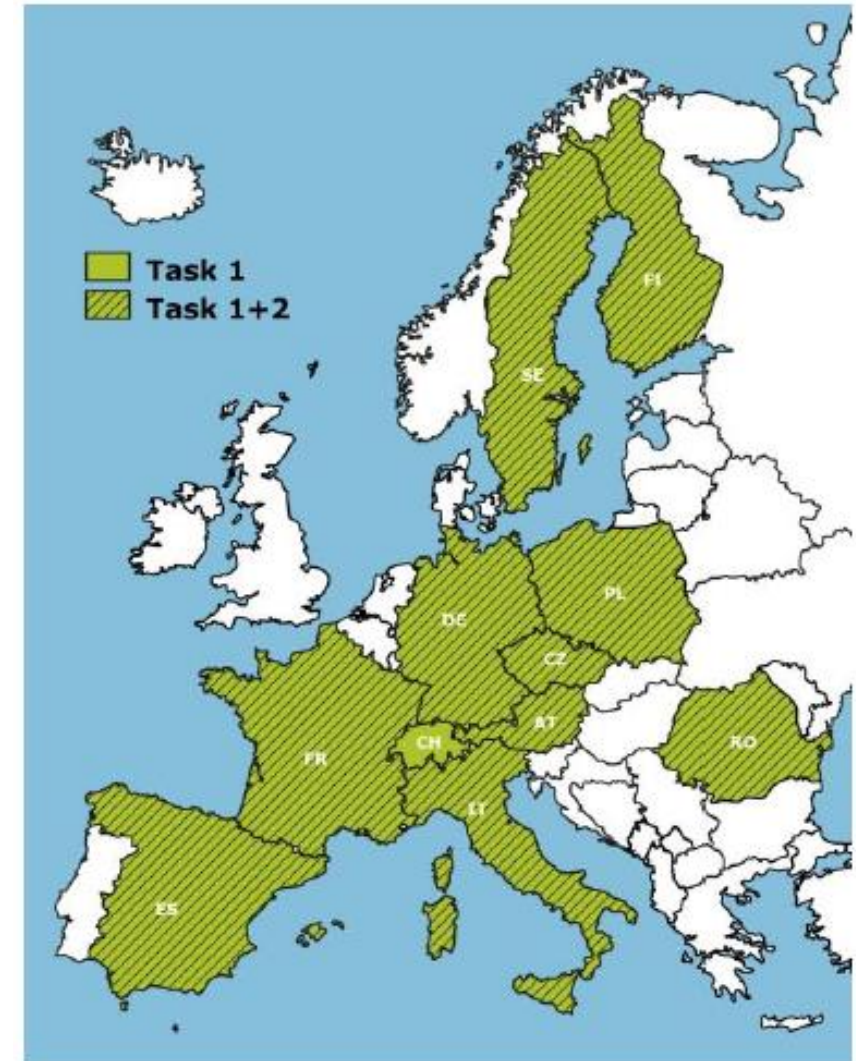
3. Biomass increment

3. Net Annual Increment

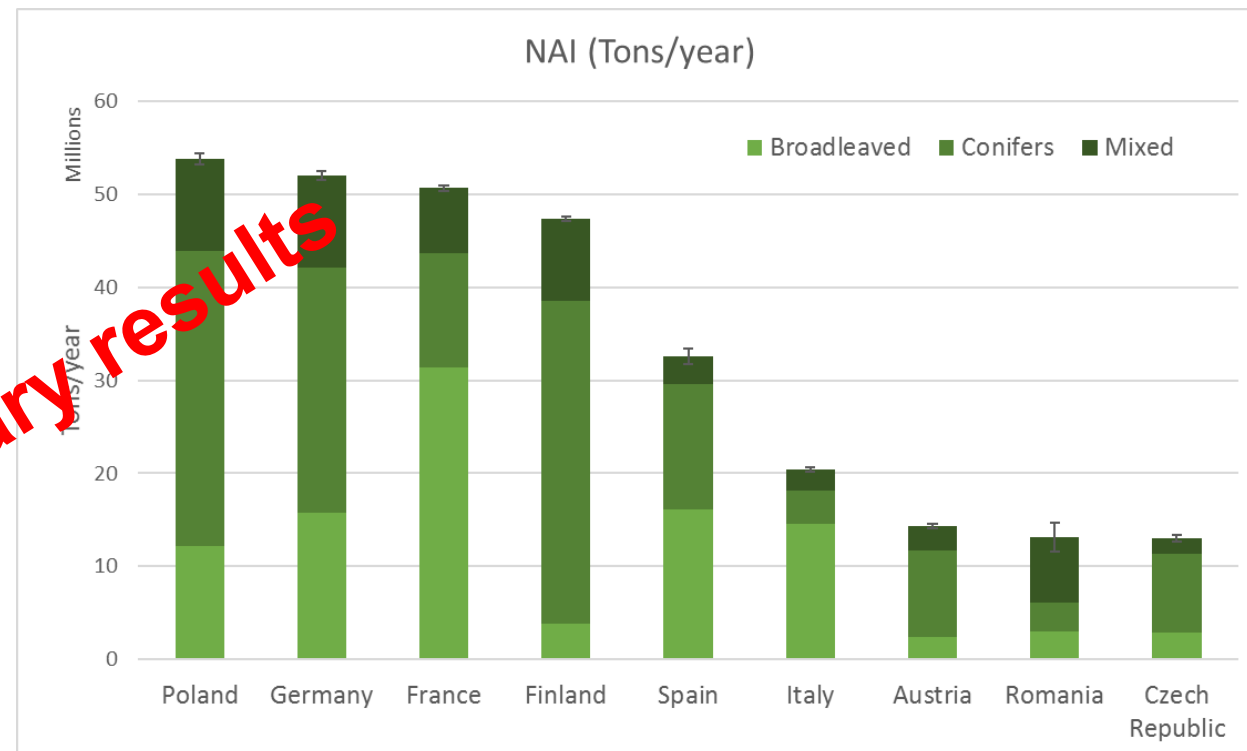
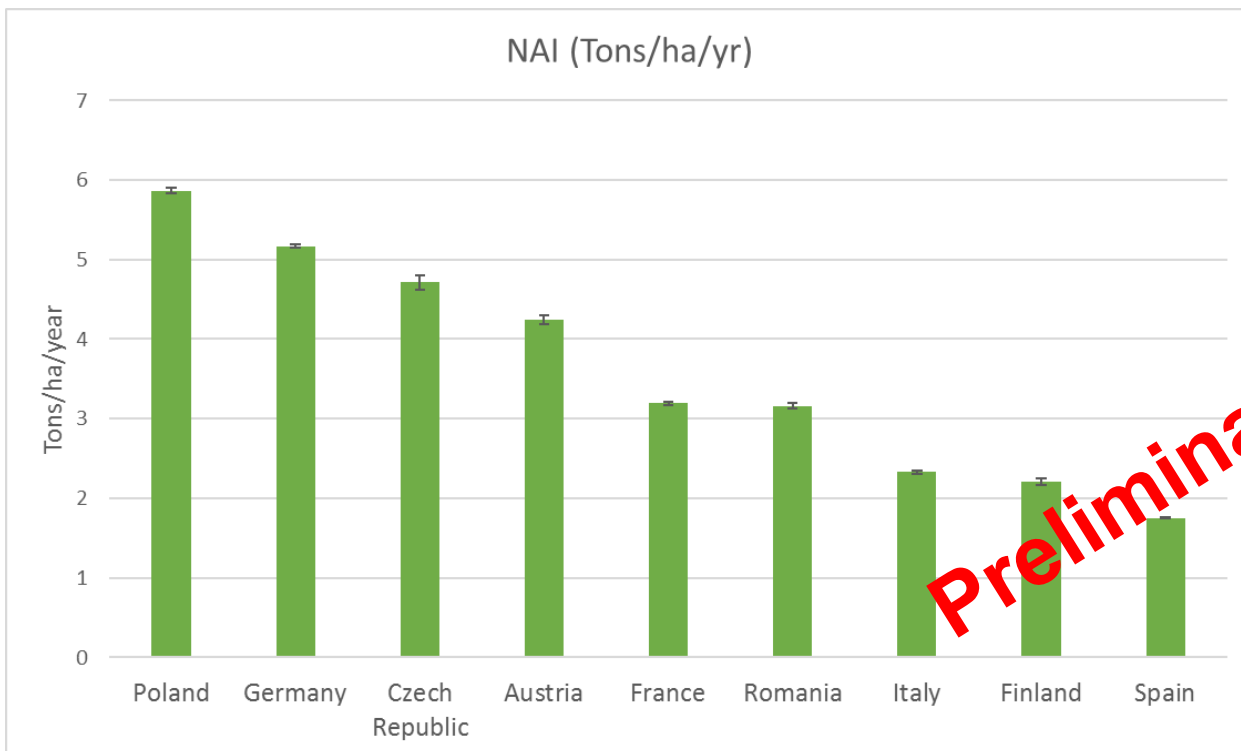


- ENFIN: Harmonized definition & method
 - Net = Gross - Losses
 - Volume & Biomass increment
 - Sub-national & Forest type

| | | | |
|-----------------|------------------|----------|------------|
| Gross increment | | | |
| Natural losses | Net increment | | |
| | Fellings | | Net change |
| | Logging residues | Removals | |



Net Annual Increment - Biomass



Conclusions

Improved assessment of forest resources in Europe requires:

- Harmonized forest data across countries
- Integration of NFI data with EO maps & models

Conclusions

Towards a better integration and support of:

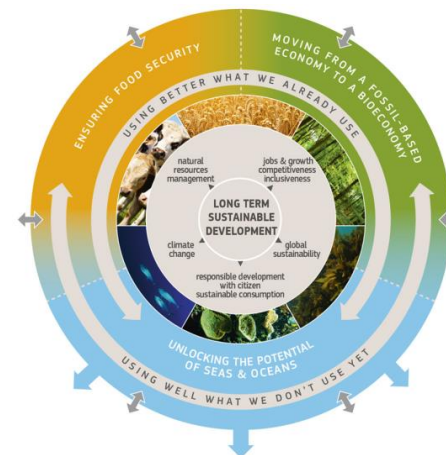
Data



Policies

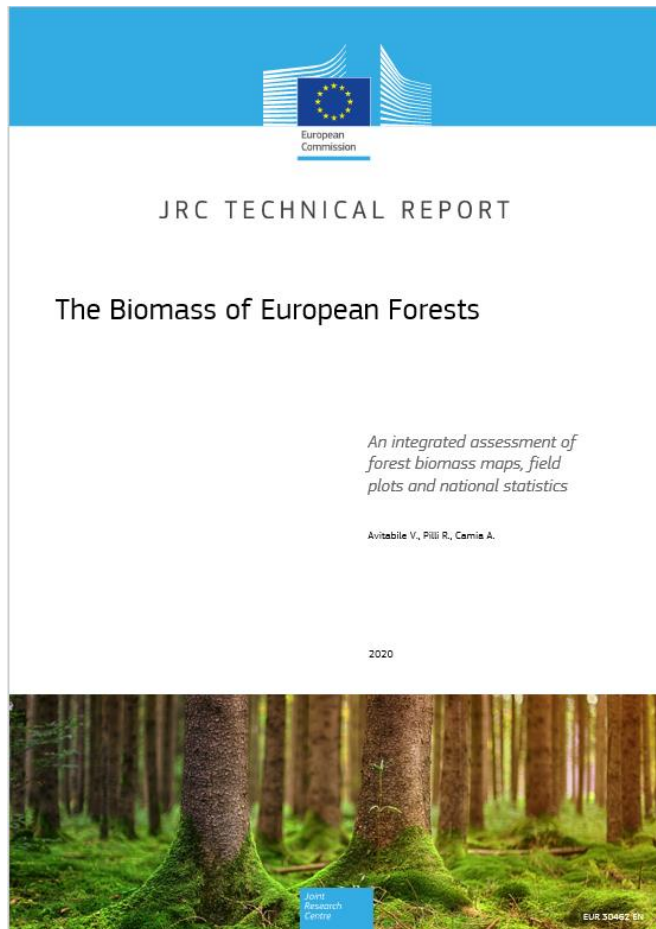
COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

New EU Forest Strategy for 2030

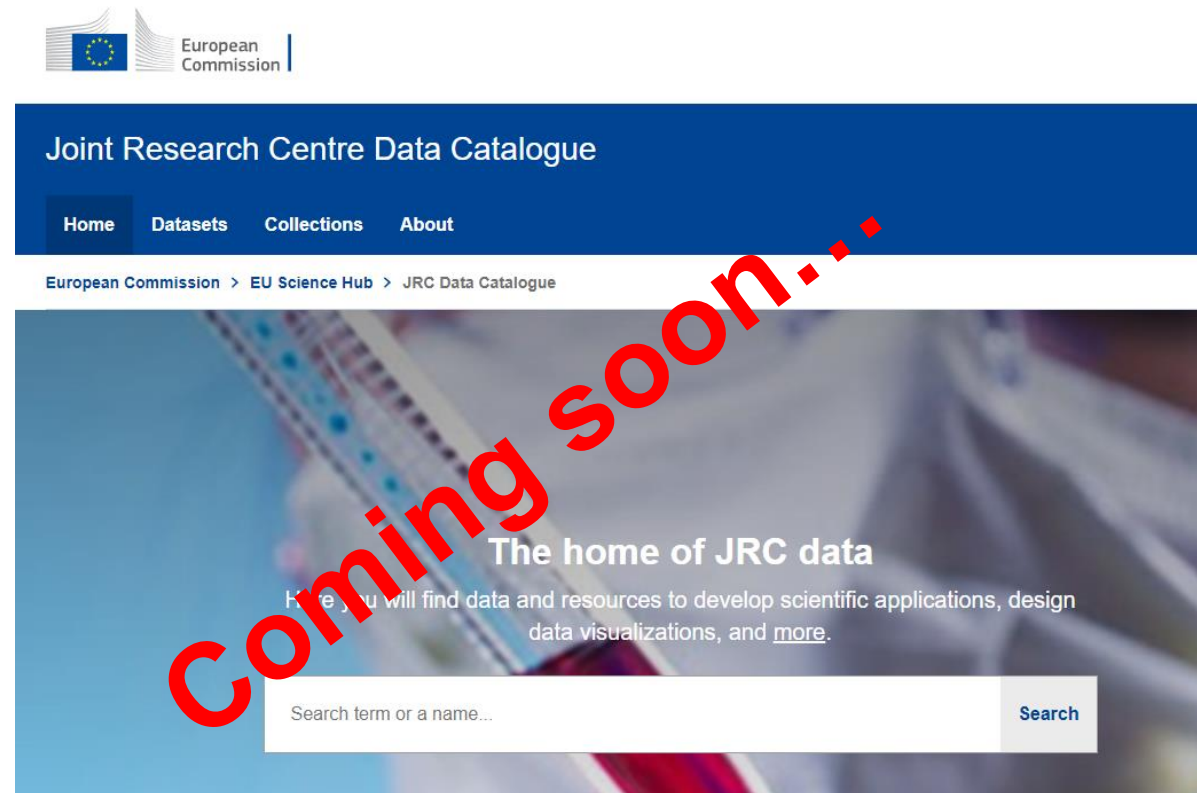


Where to find the data?

JRC Reports



JRC Data Catalogue



Thank you

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ENVIRONMENTAL STUDIES

A unified vegetation index for quantifying the terrestrial biosphere

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$$\text{kNDVI} = \tanh \left(\left(\frac{\text{NIR} - \text{red}}{2\sigma} \right)^2 \right)$$