

Biomass supply and cost supply assessments

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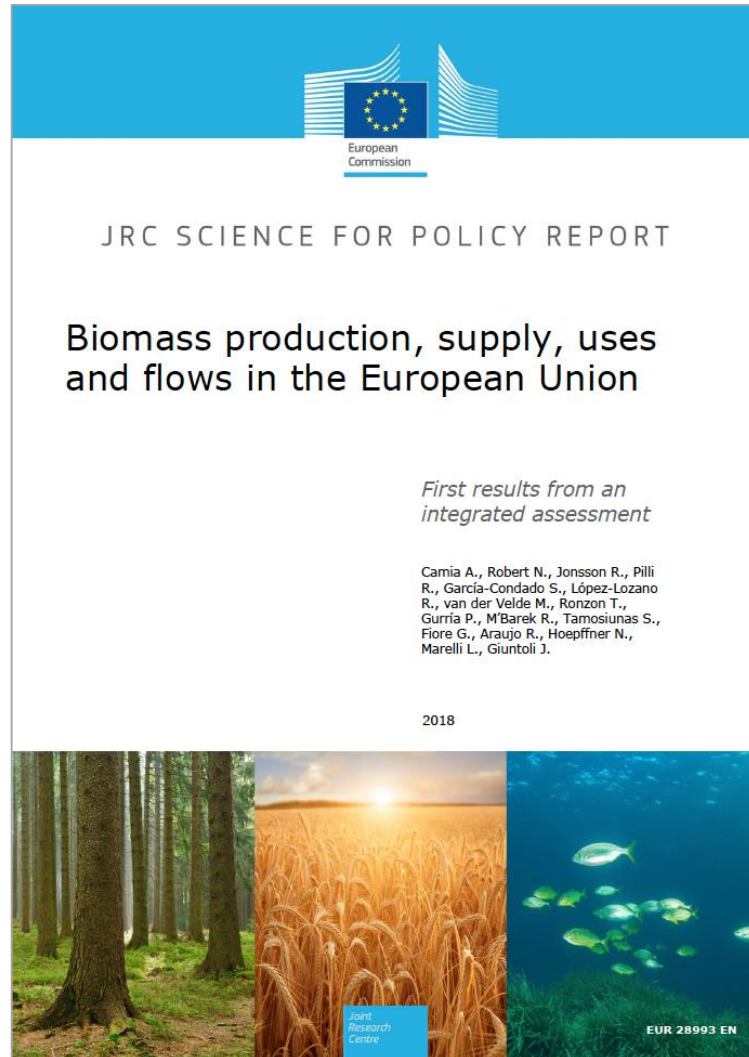
EC Joint Research Centre, Directorate for Sustainable Resources, Bioeconomy Unit

EUROPEAN TECHNOLOGY AND INNOVATION PLATFORM BIOENERGY

9th Stakeholder Plenary Meeting

Brussels 20-21 November 2019

JRC Biomass Assessment Study



Mandate to JRC on global and EU biomass supply and demand on a long term basis (2015)

Approved by EC services:

RTD, SG, AGRI, CLIMA, DEVCO, ENER, ENV, GROW, MARE, MOVE, REGIO and TRADE

2018 EU bioeconomy strategy action plan

3

UNDERSTAND THE ECOLOGICAL BOUNDARIES OF THE BIOECONOMY



Enhance knowledge on bioeconomy

JRC



Monitor progress towards a sustainable bioeconomy



Promote good practices to operate the bioeconomy within **safe ecological limits**



Enhance the benefits of biodiversity in **primary production**

Long term institutional commitment of several JRC Units (D1, D4, D2, D5, C2)

Biomass supply and uses in the EU

MATERIAL USES



24 %

BIOENERGY



23 %

ANIMAL FEED AND BEDDING



43 %

PLANT-BASED FOOD



9 %

SEAFOOD



<1 %

40 mt

NET EXPORT

used

1.2 billion tonnes

67 mt

NET IMPORT

sourced

1 billion tonnes

CASCADING USE OF WOOD



73 mt

PAPER AND BOARD BIOWASTE



52 mt

OTHER BIOWASTE



85 mt

SECONDARY SOURCES

AGRICULTURAL CROPS



52 %

COLLECTED CROP RESIDUES



10 %

GRAZED BIOMASS



12 %

FORESTRY



27 %

FISHERIES AND AQUACULTURE



<1 %

2015 data
dry matter

JRC Biomass Study

Biomass supply by secondary sources

+ 0.2 billion tonnes 
supplied by **SECONDARY SOURCES**

CASCADING USE OF WOOD



73 million tonnes

PAPER AND BOARD BIOWASTE



52 million tonnes

OTHER BIOWASTE

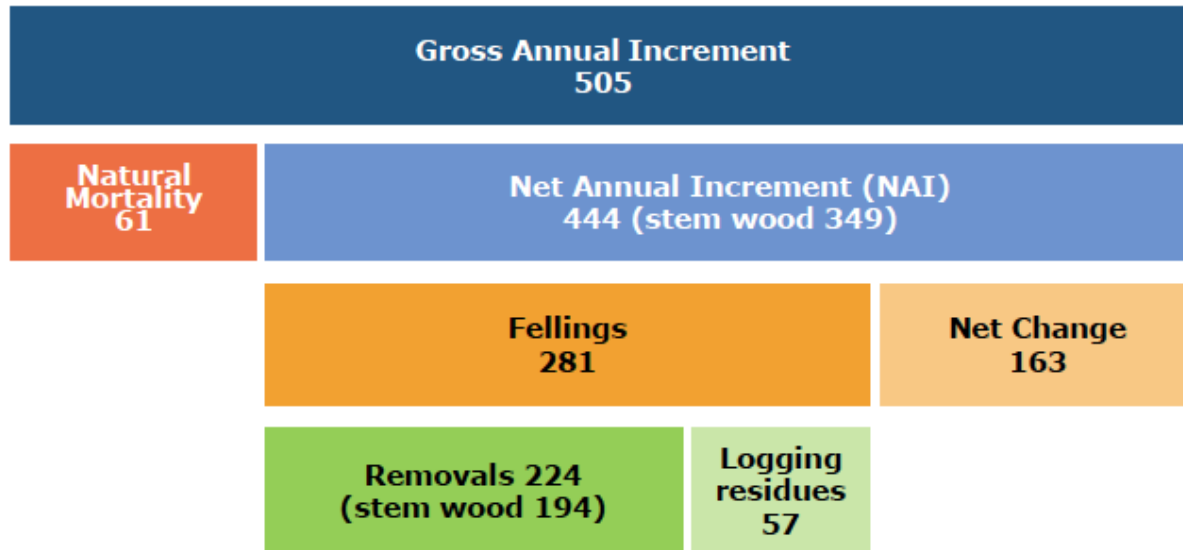


85 million tonnes

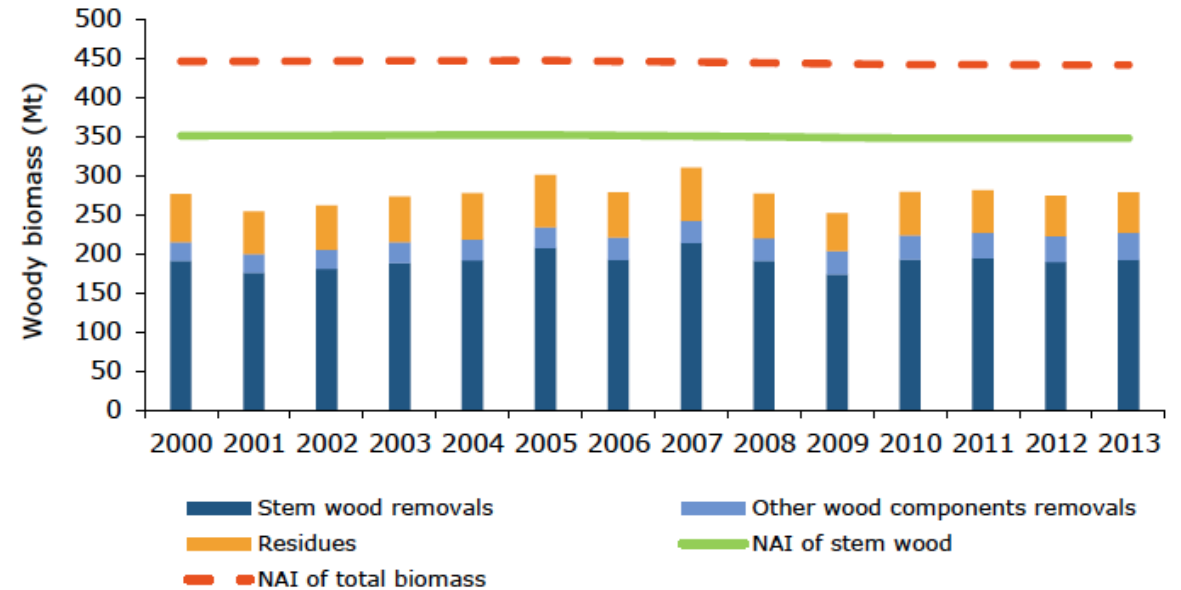
2015 data
dry matter

Woody biomass from forestry

Increment, fellings, and removals in EU28 (10 years averages in Mt/a dry matter)



Removals and net annual increment in EU28

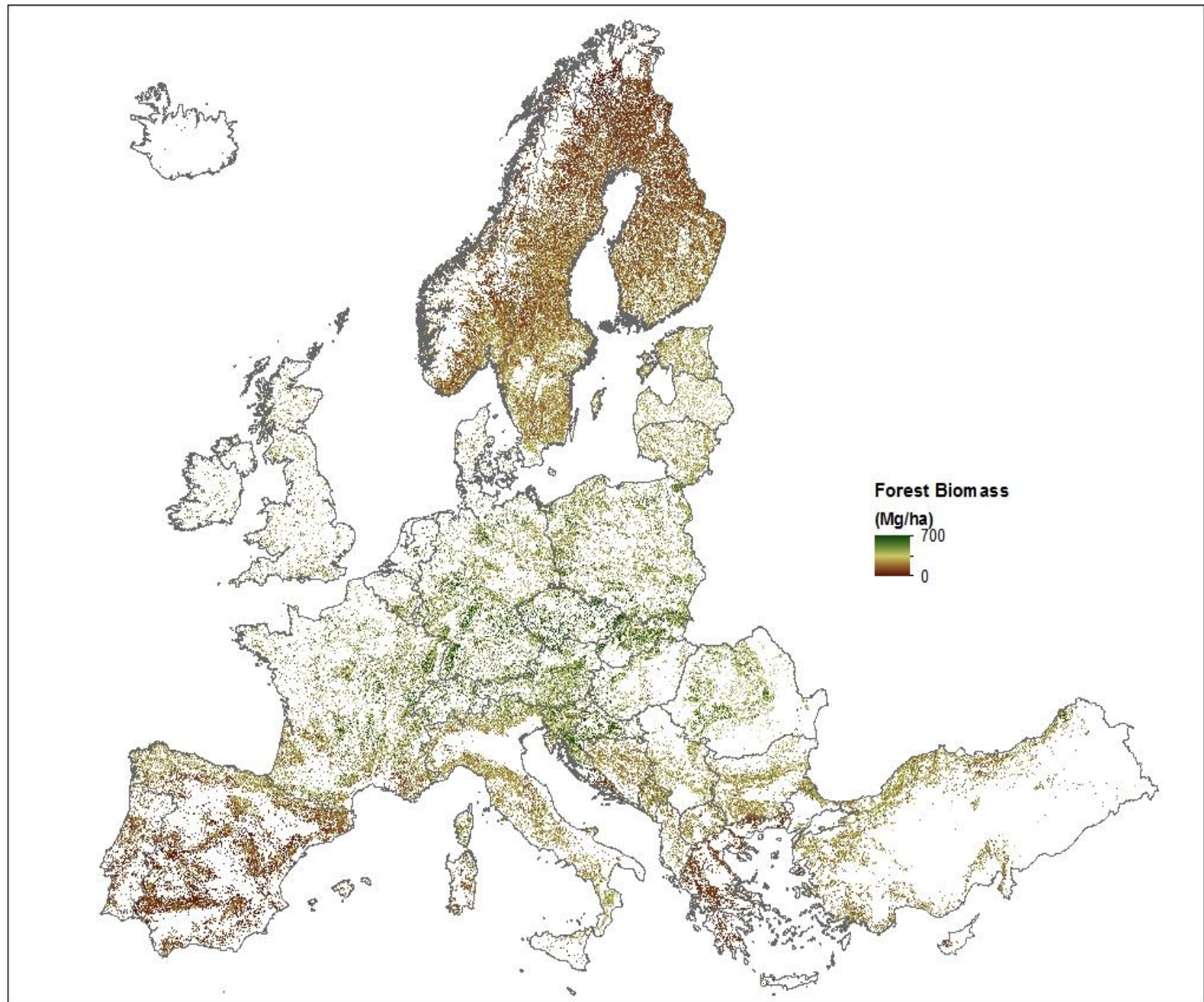


Source: EC Knowledge Centre for Bioeconomy, Brief on forestry biomass production

Data sources: Eurostat and NFI

Forest Biomass Map

- Recalibration of ESA GlobBiomass map
- Map: 100 m, 2010
- Matching NFI statistics for:
 - Forest area
 - Biomass density & stock
- NFI statistics harmonized for:
 - Biomass definition (AGB)
 - Year (2010)



Mapping Forest Available for Wood Supply

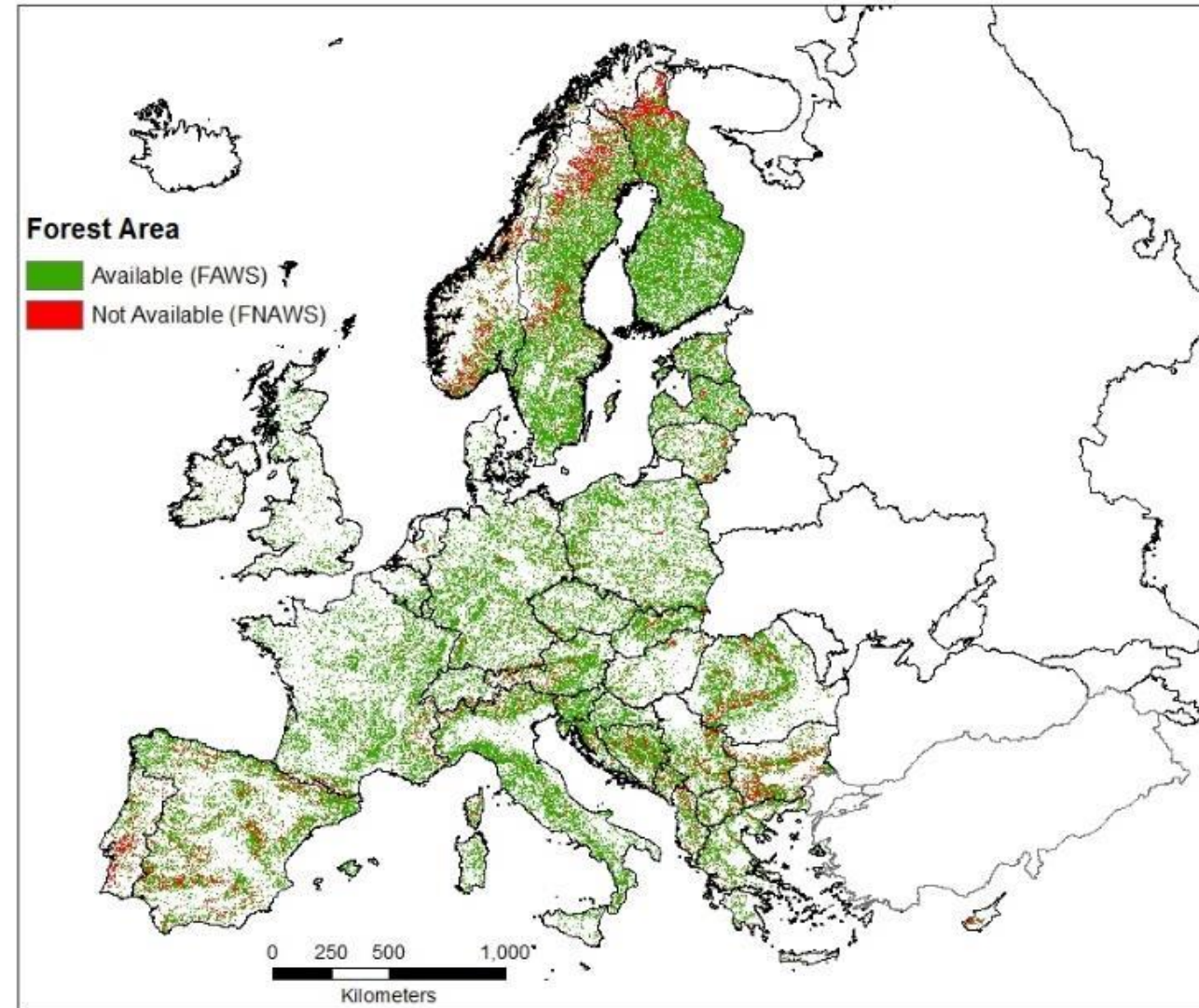
Based on restrictions identified with National Forest Inventories (NFIs)

Applied restrictions:

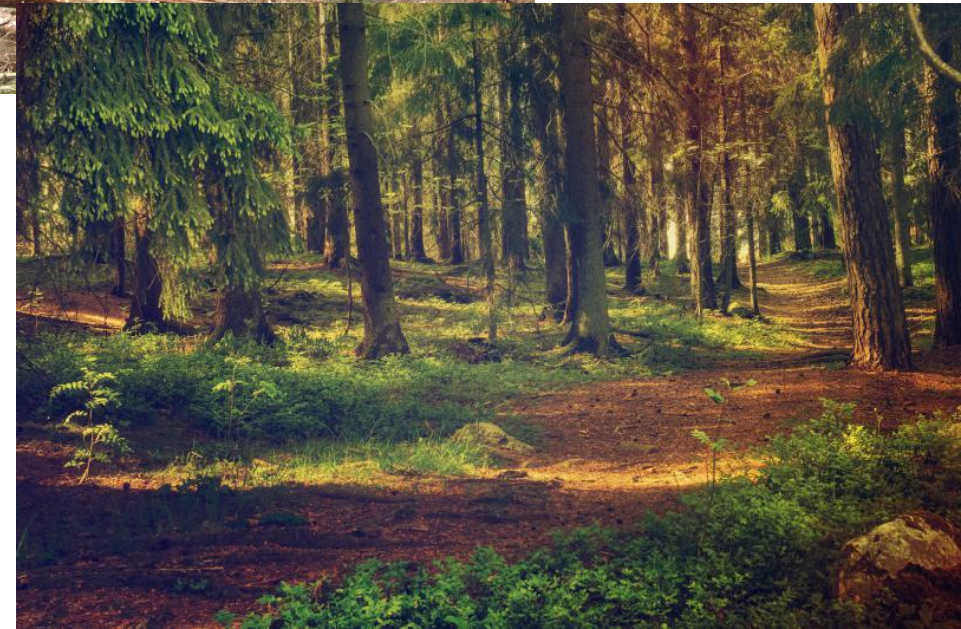
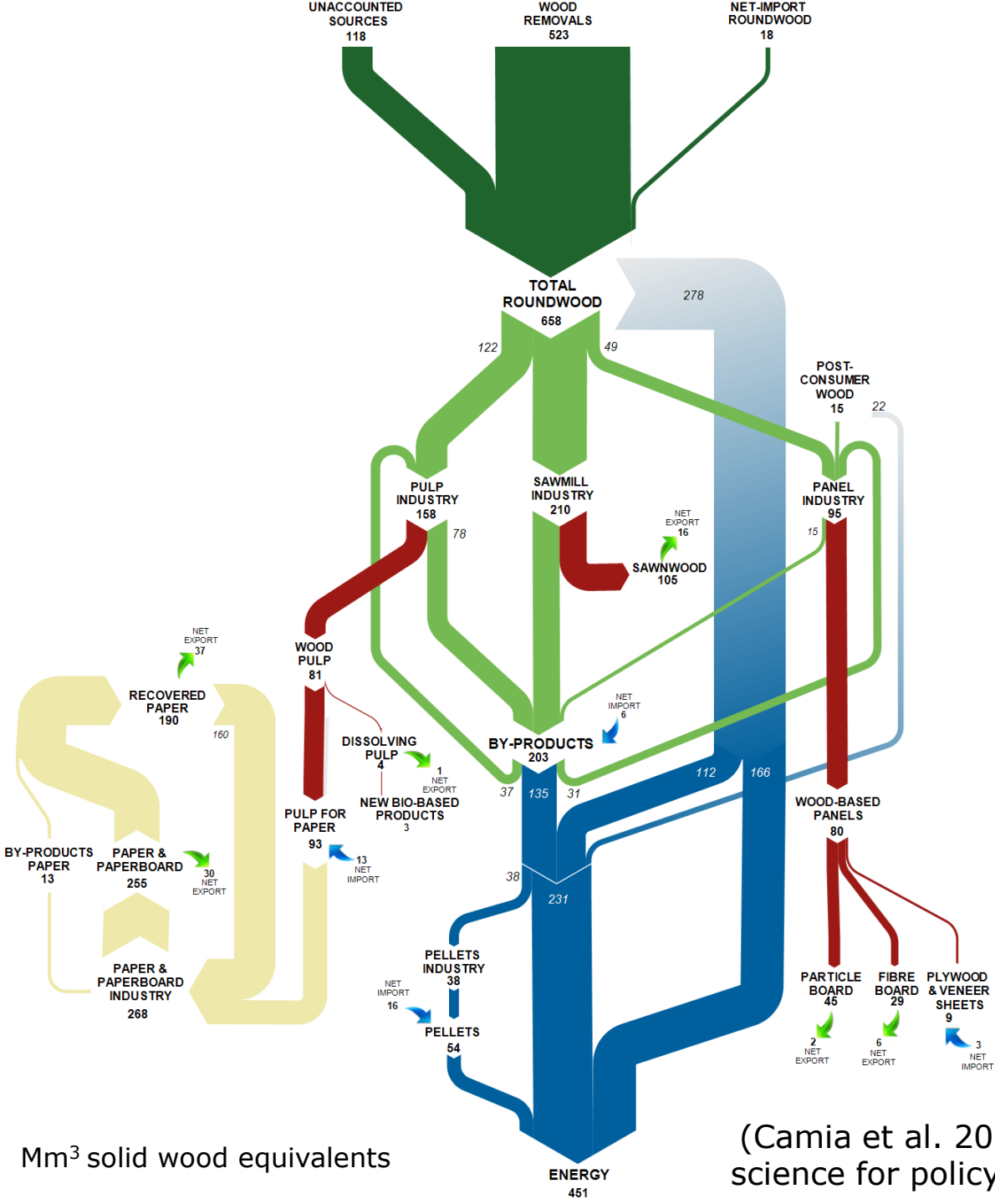
1. Limited increment (too little yield for wood supply)
2. Protected Areas
3. Slope
4. Distance from roads
5. Tree species
6. Natura2000

Country-specific thresholds defined

Preliminary results



EU-28 Wood flows 2015

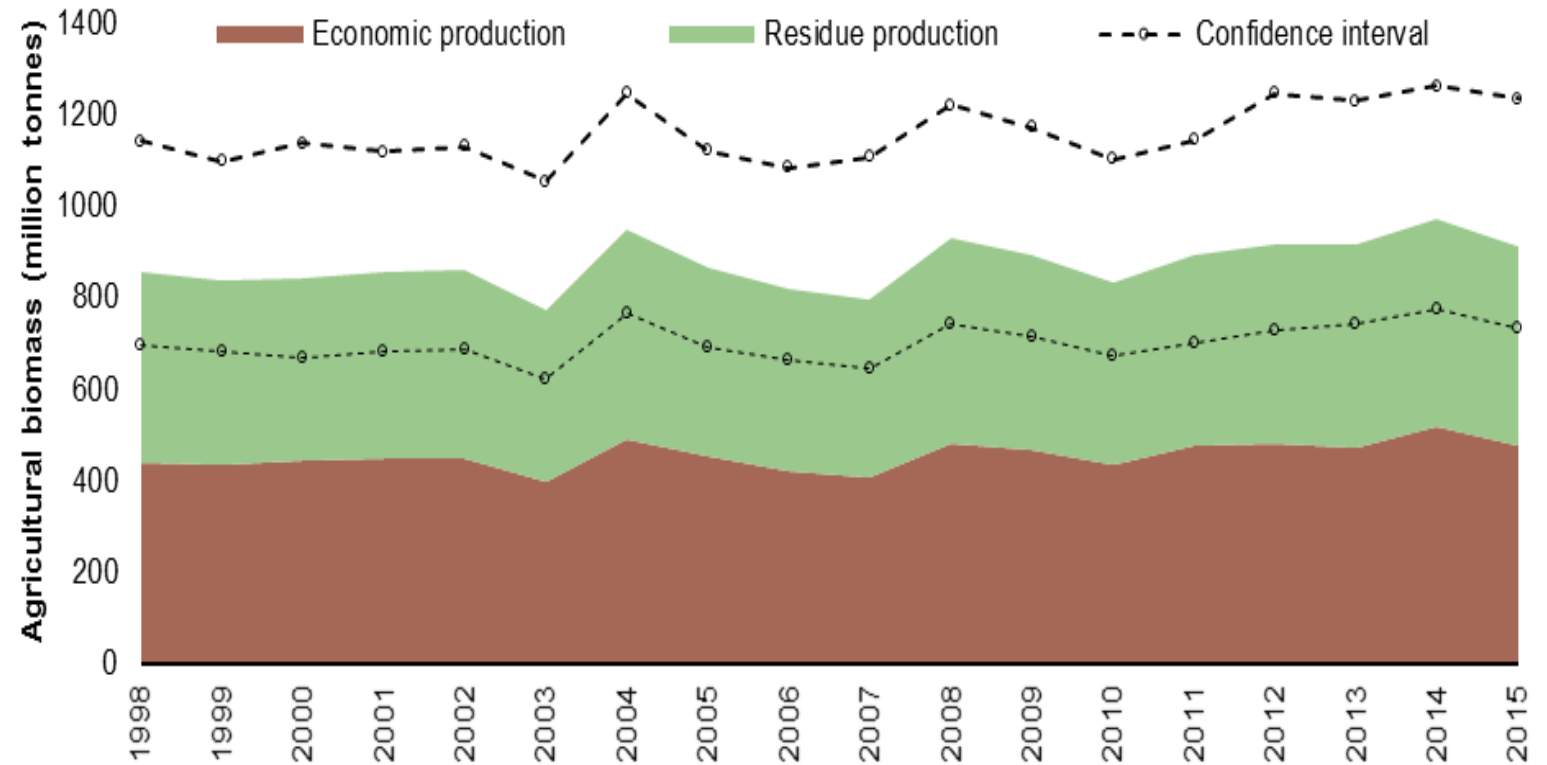
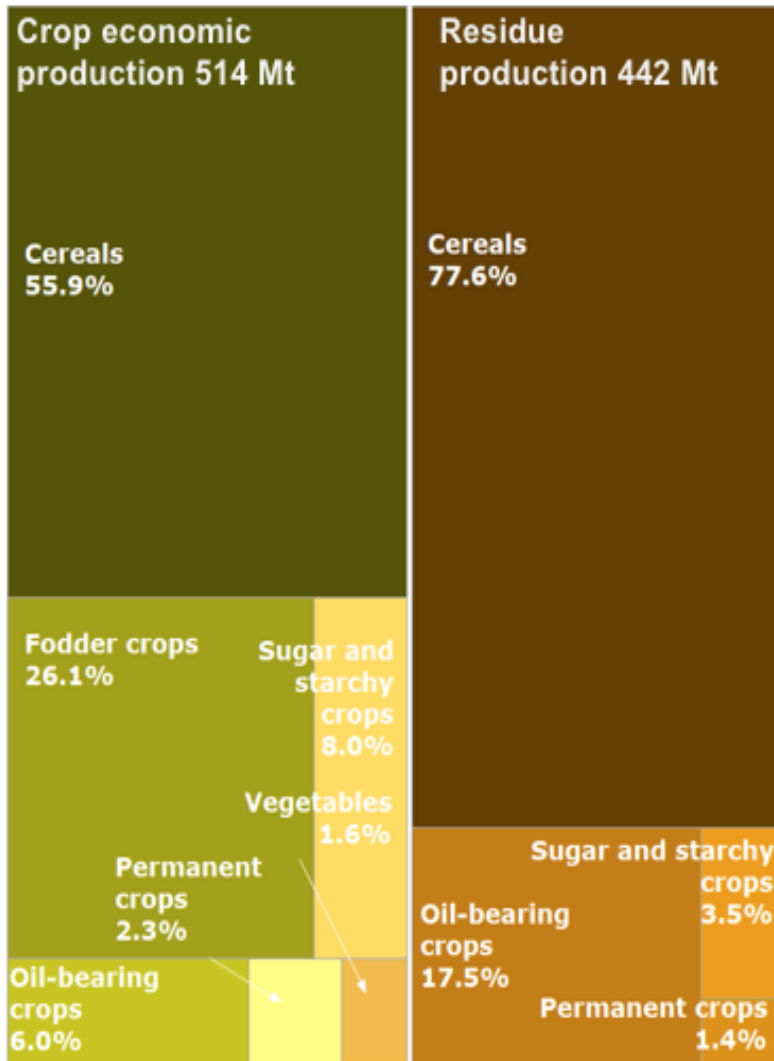


(Camia et al. 2018, JRC science for policy report)

Mm³ solid wood equivalents

Agricultural Biomass

EU-28 Agricultural biomass



(Camia et al. 2018, JRC science for policy report)

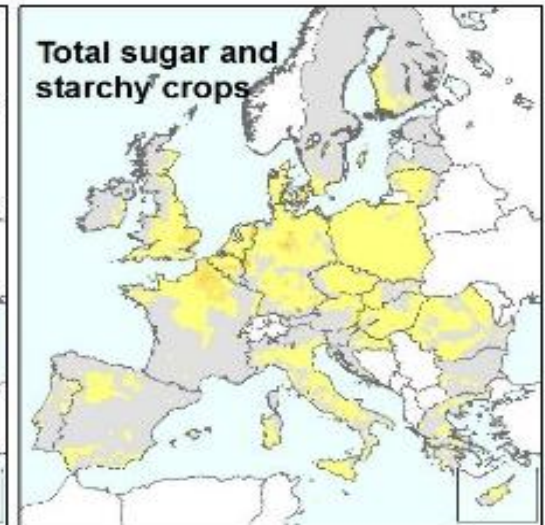
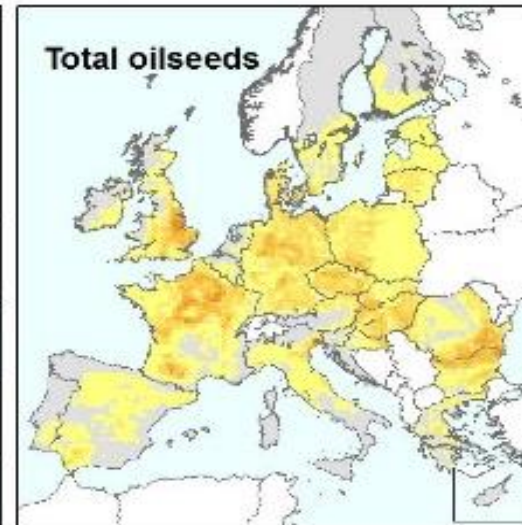
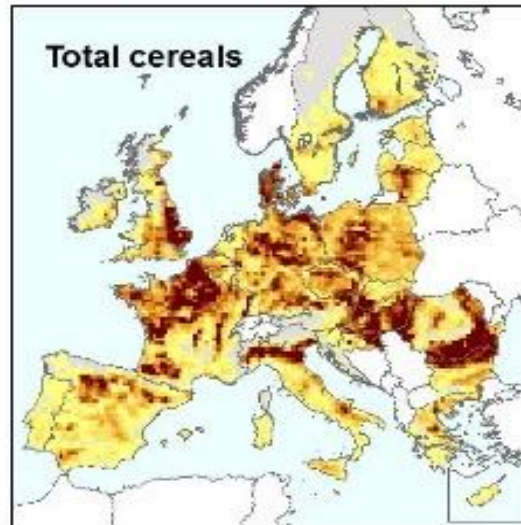
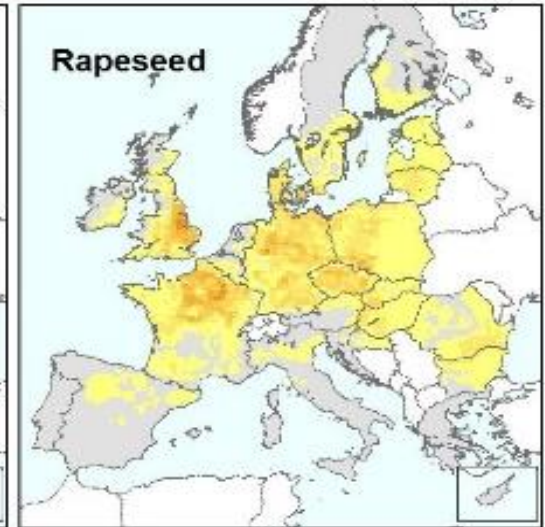
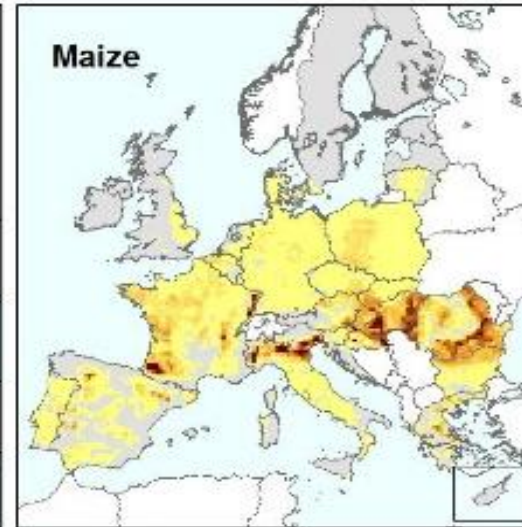
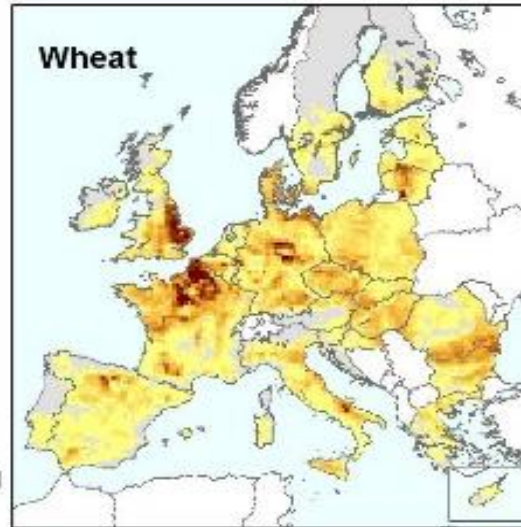
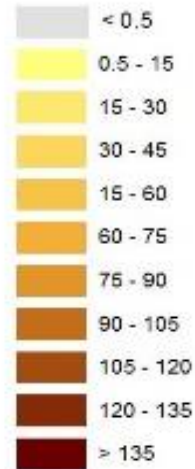
Mapping crop residues production

Spatially explicit

- Total residue production
- Crops and crop groups

Crop residues
production in the EU

kt y-1 per 25 km cell



Estimating cost of wood removals



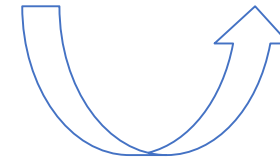
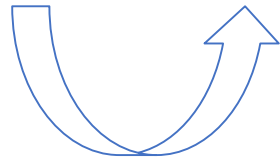
Harvesting



Transport to
landing site



Processing at
landing site



1. Define the supply-chain: all the operations needed to harvest, collect, treat and transport roundwood and primary residues
2. Determine the cost of each operation (country-specific, fixed and variable costs)
3. Assess the total cost, given harvested biomass

Harvesting cost

$$C_{fixed,i}^{harvest} [\text{€}/hr] = \left(C_{capital,i} \cdot \frac{(1 - s_i)}{T_i} + (r_{int,i} + r_{ins,i}) \cdot \left((C_{capital,i} - S_i) \cdot \frac{(T_i + 1)}{2 \cdot T_i} + S_i \right) \right) / t_{productive}$$

$$C_{variable,i}^{harvest} [\text{€}/hr] = (1 + OVC) \cdot \left((Fuel_i \cdot (1 + Oil_i) \cdot C_{fuel}^{MS}) + \left(ReM_i \cdot C_{capital,i} \cdot \frac{(1 - S_i)}{T_i \cdot PT_i} \right) \right) + \left(\frac{SMH_i}{PT_i} \cdot wage^{MS} \right)$$

For harvest we identified two machines: the **harvester** and the **chainsaw**

Cost can be divided in a fixed and in variable component

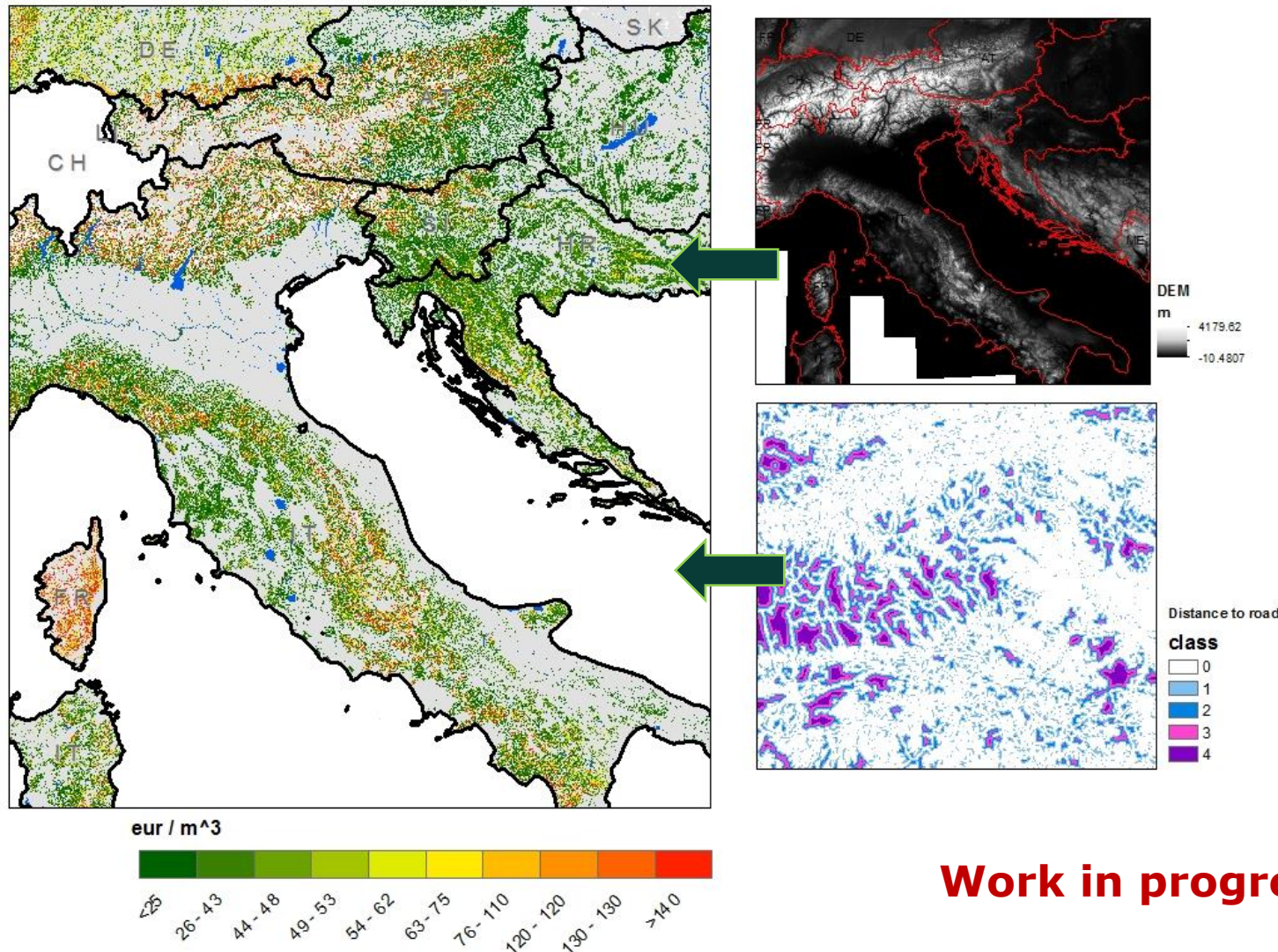
Each machine has its own analytical cost profile

The cost per cubic meter depends on the productivity (or efficiency) of the selected machine

$$C_{volume,i}^{harvest} [\text{€}/m^3] = \frac{C_i^{harvest}}{\text{productivity}}$$

Similar equations are used for estimating cost of transport to landing site and of processing

Mapping cost of wood removals

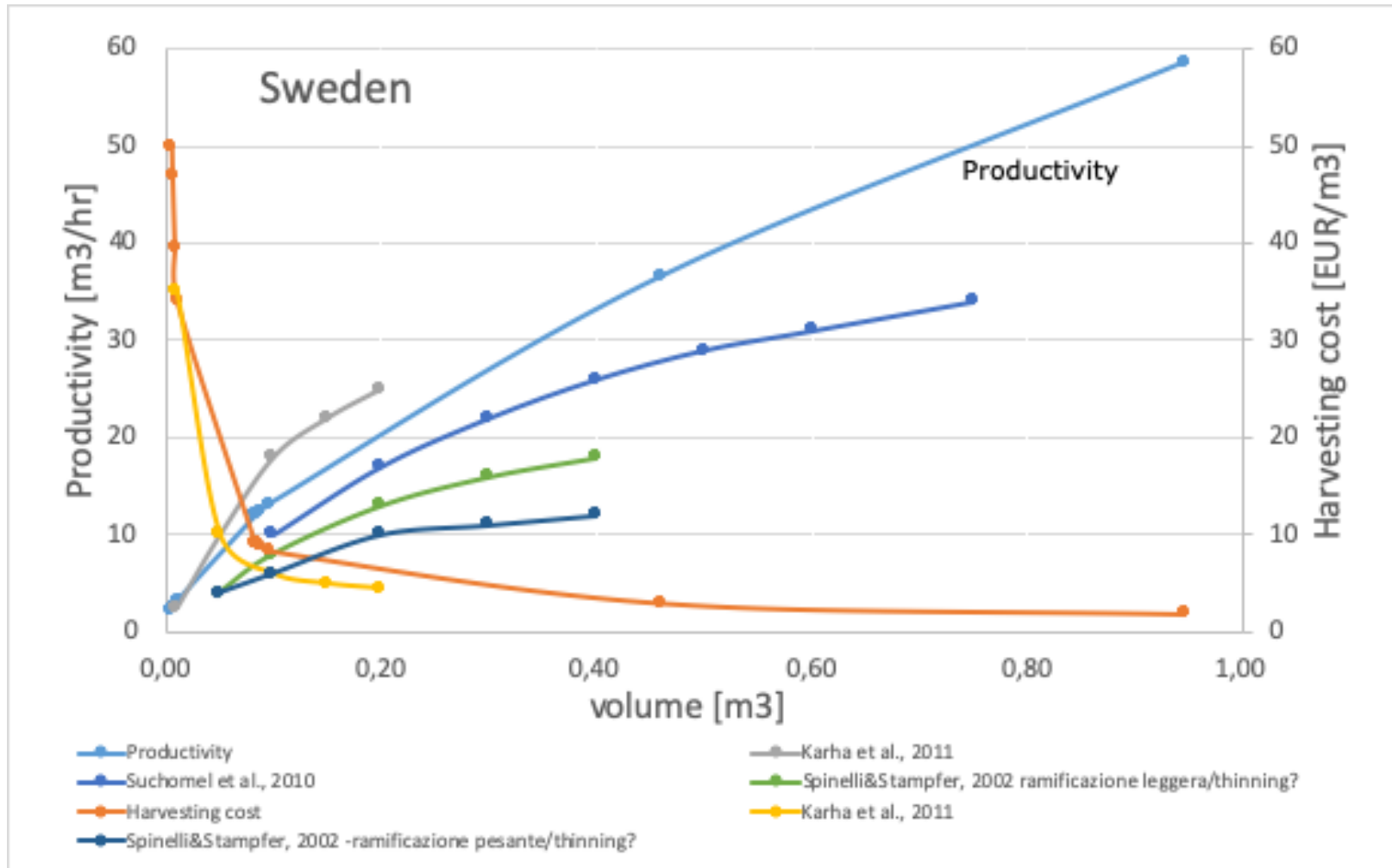


- Cost functions with country-specific fixed and variable costs
- Terrain slope
- Distance from roads

Cost of wood removals for each hectare of forest land in the EU (productivity not yet included)

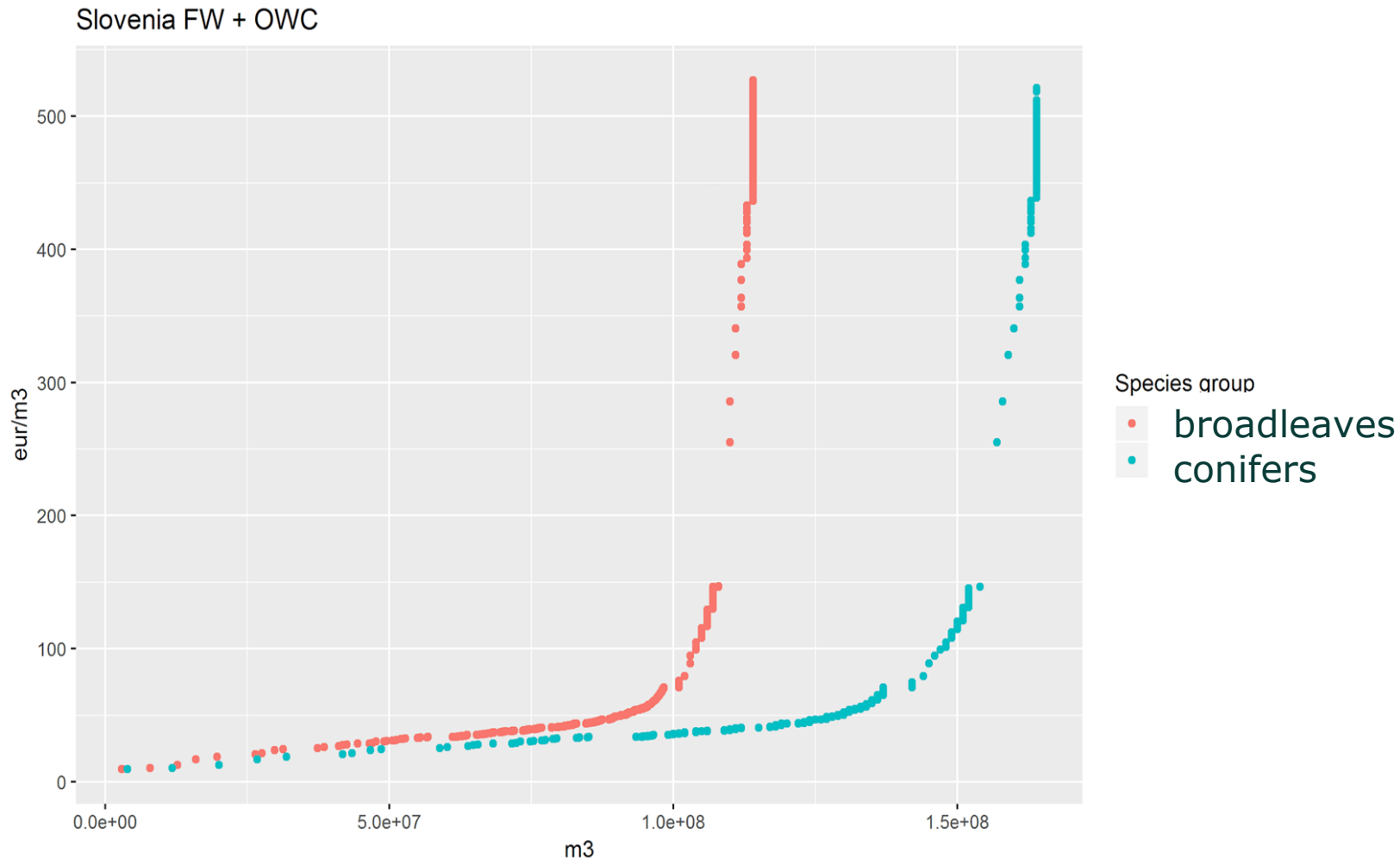
Work in progress!

Tree size, productivity and harvesting cost



Preliminary data - work in progress!

Cost supply of wood removals



Preliminary data - work in progress!

To be derived from:

- Spatially explicit assessment of harvesting costs, slope, distance from roads
- Maps of forest available for wood supply, woody biomass and average tree size classes

Knowledge Centre for Bioeconomy

- *Identifying and filtering relevant information from different sources and making it accessible*
- *Bringing together researchers, policymakers and other experts in the fields through a Community of Practice*
- *Analysing, synthesising and communicating available evidence*
- *Enhancing the knowledge base (for policymaking) on the bioeconomy*

The European Commission's Knowledge Centre for Bioeconomy



<https://ec.europa.eu/knowledge4policy/bioeconomy>



Thanks

Any questions?

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