



Study on Optimised Cascading Use of Wood

CDG Forestry and Cork
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DG Growth

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Cascading use of wood has been envisaged by:

- *EU Industrial Policy Communication (COM2014)*
- *Strategic Implementation Plan of EIP RM (COM2013)*
- *Blueprint on Forest-Based Industries (COM2013)*
- *EU Bioeconomy Strategy Action Plan (COM2012)*
- *Communication on Roadmap to a Resource Efficient Europe (COM2011) (indirectly)*

Context



Waste
Hierarchy

Cascading
Principle

Resource efficiency

Applies only to waste

Applies to whole life-
cycle (including raw
material)

Applies to all type of
raw materials

Applies only to bio-
based materials

Enshrined in EU
legislation

Only a policy principle

The study on Optimised Cascading Use of Wood:

- *The study is undertaken under the Horizon 2020 program – SC5 WP2014/15.*
- *The results of the study will serve as a basis to develop good practice guidance on the cascading use of biomass for the policy-makers and value-chain stakeholders.*
- *Lead by DG GROW Unit C.2 but also other DGs are involved (AGRI, CLIMA, ENER, ENV, RTD, etc.)*

Consortium



- BTG Biomass Technology Group (NL)
Project Leader



- Information systems for resources individual enterprise (DE)



- Institute for European Environmental Policy (UK)



- Nova-Institut für politische und ökologische Innovation (DE)



- INTECUS GmbH (DE)

Objectives



- *Definition of cascading use of wood*
- *Definition of the cascading socio-economic and environmental impact*
- *To analyse barriers to cascading use of wood*
- *Define best practises and possible measures adapted to local conditions to overcome the barriers*



Cascading use is the efficient utilisation of resources by using residues and recycled materials to extend total biomass availability within a given system.

Cascading use of wood takes place when wood is processed into a product and this product or occurring residues are used at least once more either for material or energy purposes.



All flows are given in million m³ sww (solid wood equivalent)
AWS: available biomass for wood supply
NAWS: not available biomass for wood supply

Legend to dimensions

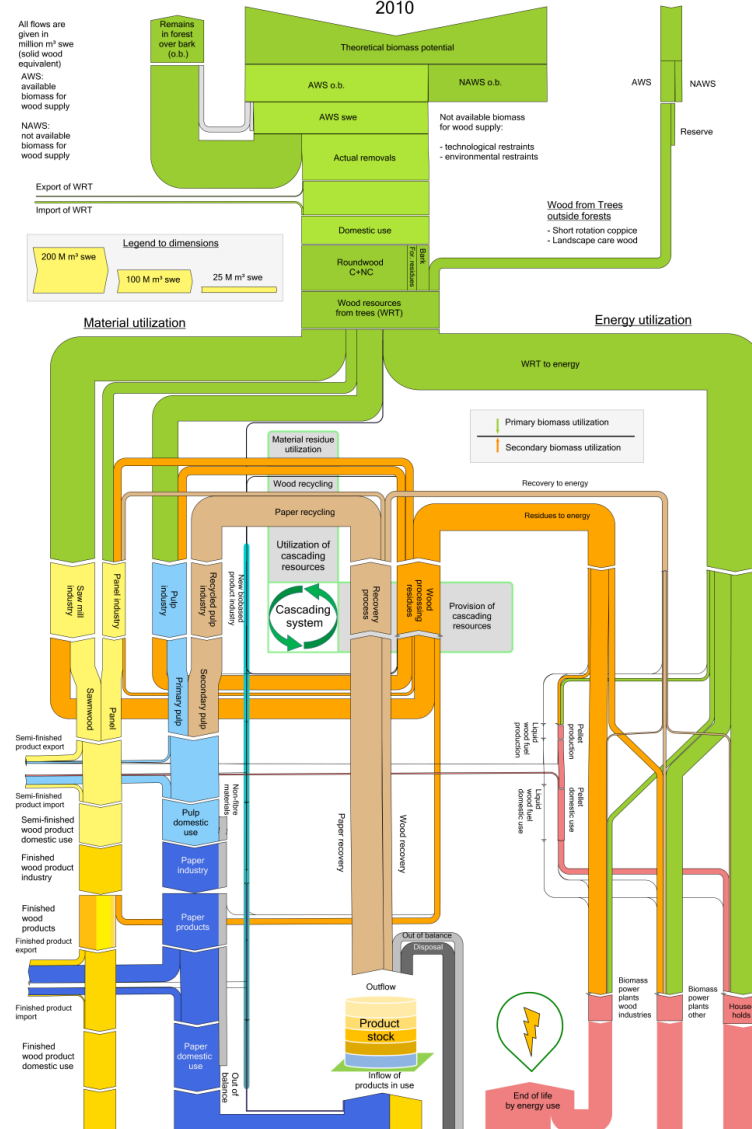


200 M m³ swe

100 M m³ swe

25 M m³ swe

Energy utilization



Quantification



Dimensions of the cascading system:

Utilization rate:

How much material is used and where does it come from?

Provision rate:

How much material for cascading is available and from which sources?

Residues



Recycled material



Residue Input

Recycling Input

Residue Output

Recycling Output

Quantification



Quantification results

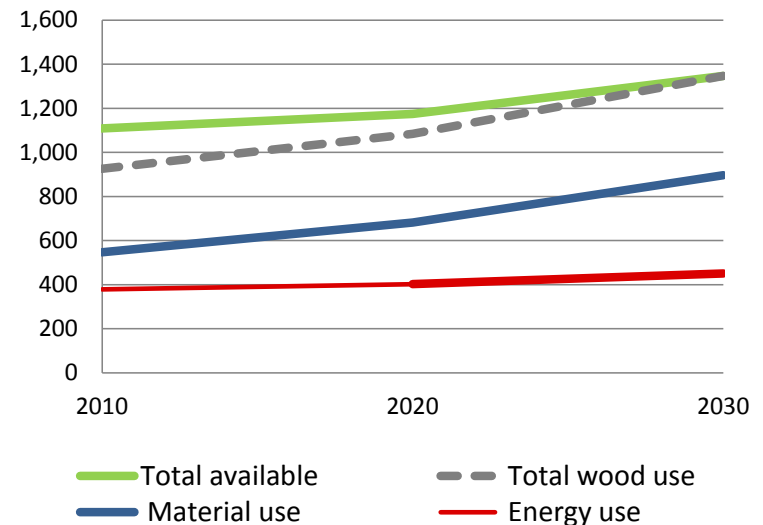
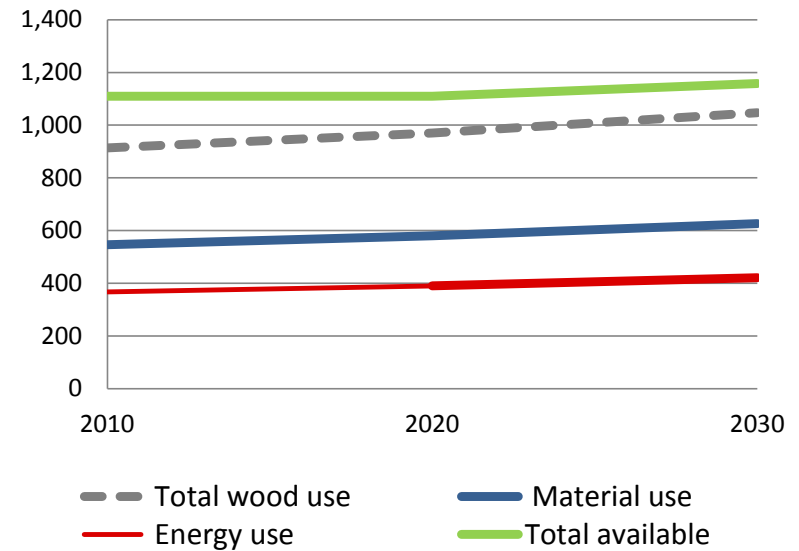
	Cascading dimension Sector/product	Provision		Utilisation	
		in M m ³	rate	in M m ³	rate
Sector	Sawmill industry	82.4	1.45	0.0	1.00
Product	Coniferous sawnwood	74.0	1.45	0.0	1.00
	Non-coniferous sawnwood	8.3	1.46	0.0	1.00
Sector	Panel industry	10.9	1.12	48.6	2.08
Product	Particleboard	2.8	1.05	37.4	2.99
	Fibreboard	1.3	1.05	11.2	1.79
	Plywood	4.9	1.56	0.0	1.00
	Veneer	1.9	1.55	0.0	1.00
Sector	Pulp industry	59.6	1.22	160.4	2.51
Product	Chemical wood pulp	59.0	1.53	27.2	1.32
	Semi-chemical wood pulp	0.6	1.04	0.7	1.05
	Mechanical wood pulp	0.0	1.00	6.4	1.34
	Recovered pulp	0.0	1.00	126.0	∞
Sector	NBP	2.0	1.59	1.2	1.57
Product	Wood plastic composites	0.0	1.00	0.1	3.33
	Dissolving wood pulp	2.0	1.61	1.2	1.56
	Polymers	0.0	1.00	0.0	1.56
	Other NBPs	0.0	1.00	0.0	1.00
Production level	Total semi-finished product industry	154.8	1.28	210.2	1.62

Scenarios



Reference: Moderate growth of wood products is assumed. It is further assumed that energy demand changes with the same growth rates.

Material: In the material use scenario all energy uses are kept constant on the level of the year 2010. All additional available forest biomass under sustainable conditions is used for material uses.



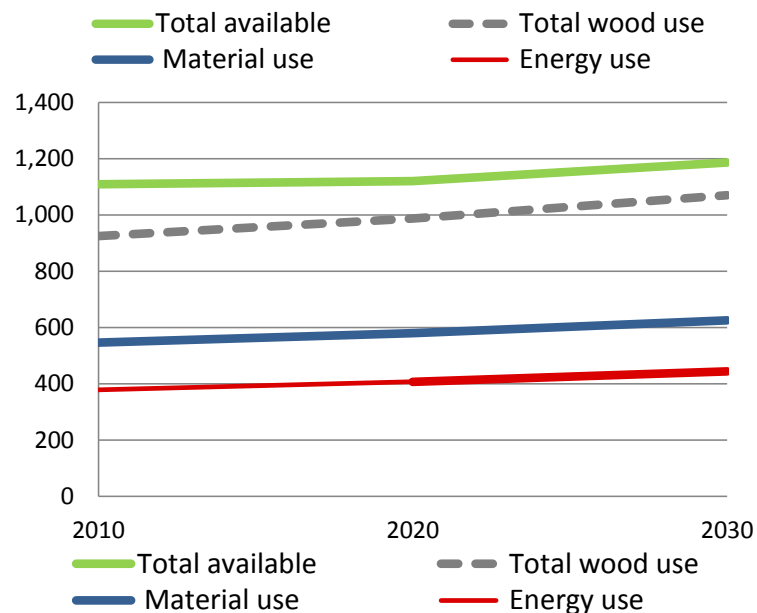
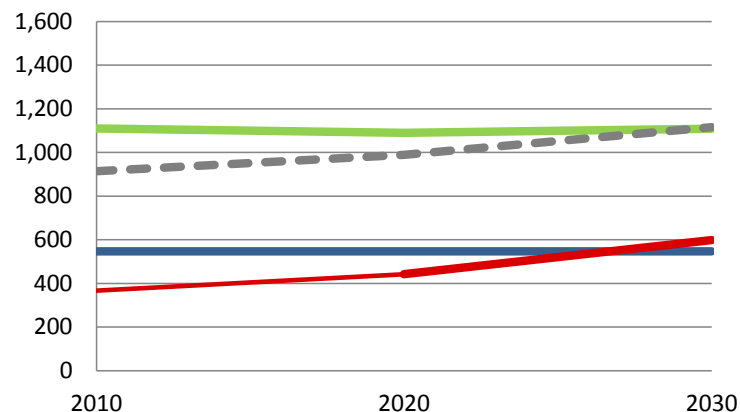
Scenarios



Energy: In the energy scenario all material uses are kept constant on the level of the year 2010 as well as post-consumer wood. All additional available wood under sustainable conditions is used for energy uses.

Post-consumer wood:

The PCW scenario represents the consequences of elimination of barriers and implementation of measures to promote the use of post consumer based on the reference scenario.



Impacts between 2010 and 2030

Resource Efficiency: In the value chain of material uses we find cascading effects and “multiplier effects”. In a cascading effect the amount of primary biomass is extended by using residues and recycled material (cascade utilisation rate 1.62). In a multiplier effect the resource basis is not extended, but a wooden product is used again in another production process (panel in furniture industry). This doesn’t extend the resource base, but it leads to more impacts (employment, added-value). **Thus the multiplier effect of wood processing (3.70) in relation to primary biomass input is even higher than the cascade effect of the used biomass (1.62).**

Direct carbon effects: Even if no difference is made between sequestration of carbon in wooden products and substitution of fossil fuels by bioenergy the carbon effect of material scenario is 1.39 times higher than in the energy scenario.

Impacts between 2010 and 2030

Employment: The comparison of the material and energy scenario shows a much higher employment effect of the material utilisation of wood. Comparing the whole processing value chain material utilisation has a 3.6 times higher employment effect than energy utilisation.

Added Value: The changes over the scenarios indicate a similar effect for added value (total 92 billion Euro) as for employment. 45% of the total added value earned in the sector of finished wood products, 23% in the sector of semi-finished wood products and 7% in the energy sector. The forest sector contributes with 22% to the added value and the recycling sector with 3%



- **Barriers to the provision of wood**

- Barriers to the provision of primary wood

- Barriers to the provision of recovered wood

- Barriers to the quality of collected wood

- **Barriers to the utilisation of wood**

- Technical barriers

- Market barriers

- Governance barriers

- Impact of public incentives to bioenergy on cascading use of wood

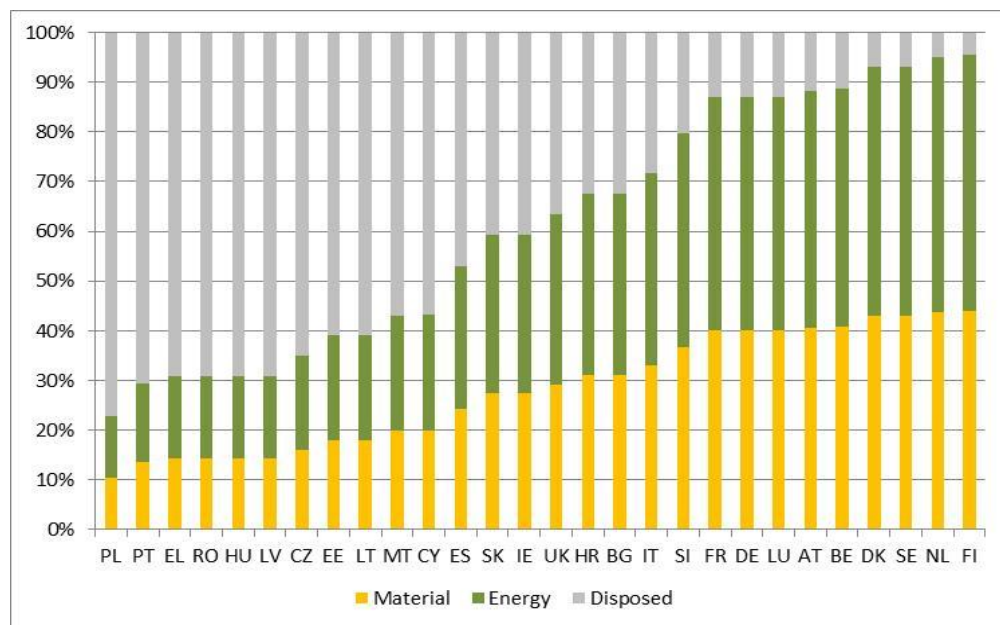
Barriers to the provision of wood (primary)

- Sustainable supply of wood from forests is limited by net annual increment and further **sustainability constraints**
- Cascading depends strongly on the material use of **softwood**; a higher proportion of hardwood forests would decrease the potential of cascading
- **Wood mobilisation** from private forests is rather difficult and expensive because of the large number of owners.
- Logistical challenges need to be met to utilise **wood outside forests** like landscape care wood at reasonable prices.

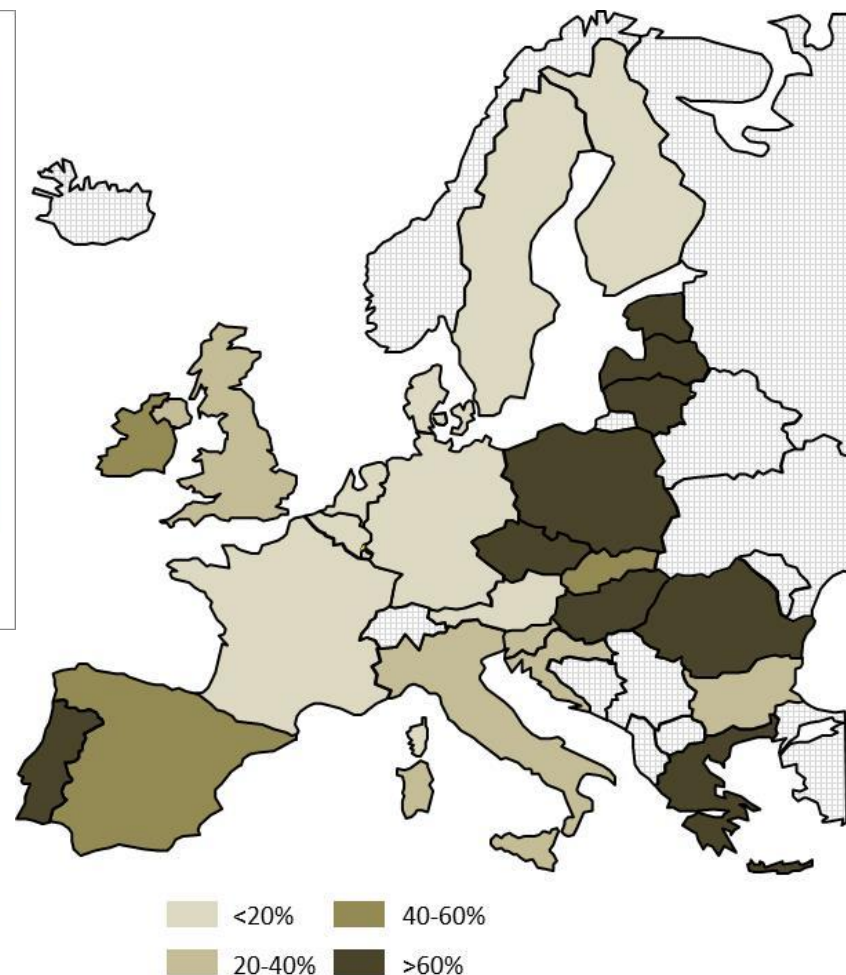
Barriers



Barriers to the provision of wood (recovered)



16,8 M m³ for material
19,5 M m³ for energy
16,0 M m³ disposed



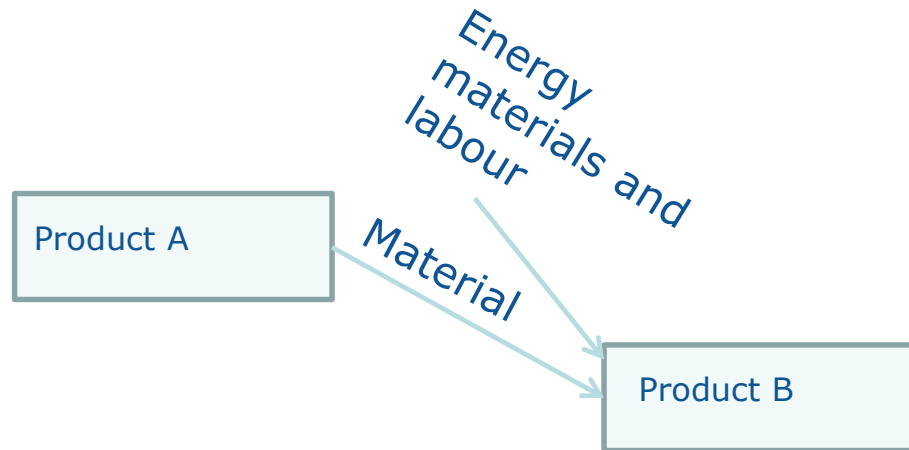
Barriers to the provision of wood (pcw quality)

- Past application of toxic preservatives
- Lack of source separation (e.g. C&D)
- Lack of legislation defining quality of pcw
- Sorting of mixed pcw may be costly and difficult
- Limited applications for pcw

Barriers to utilisation of wood (technical)

- Limited applications for pcw
- Only high quality pcw has wide application possibilities

Barriers to utilisation of wood (market)



General

- Producer A does not participate in the benefits of Producer B
- Producer B has no influence on the activities of producer A
- Dependence on availability of upstream products

Wood specific

- Fresh wood is available at reasonable costs with limited energy expenditure.

Barriers to utilisation of wood (governance)

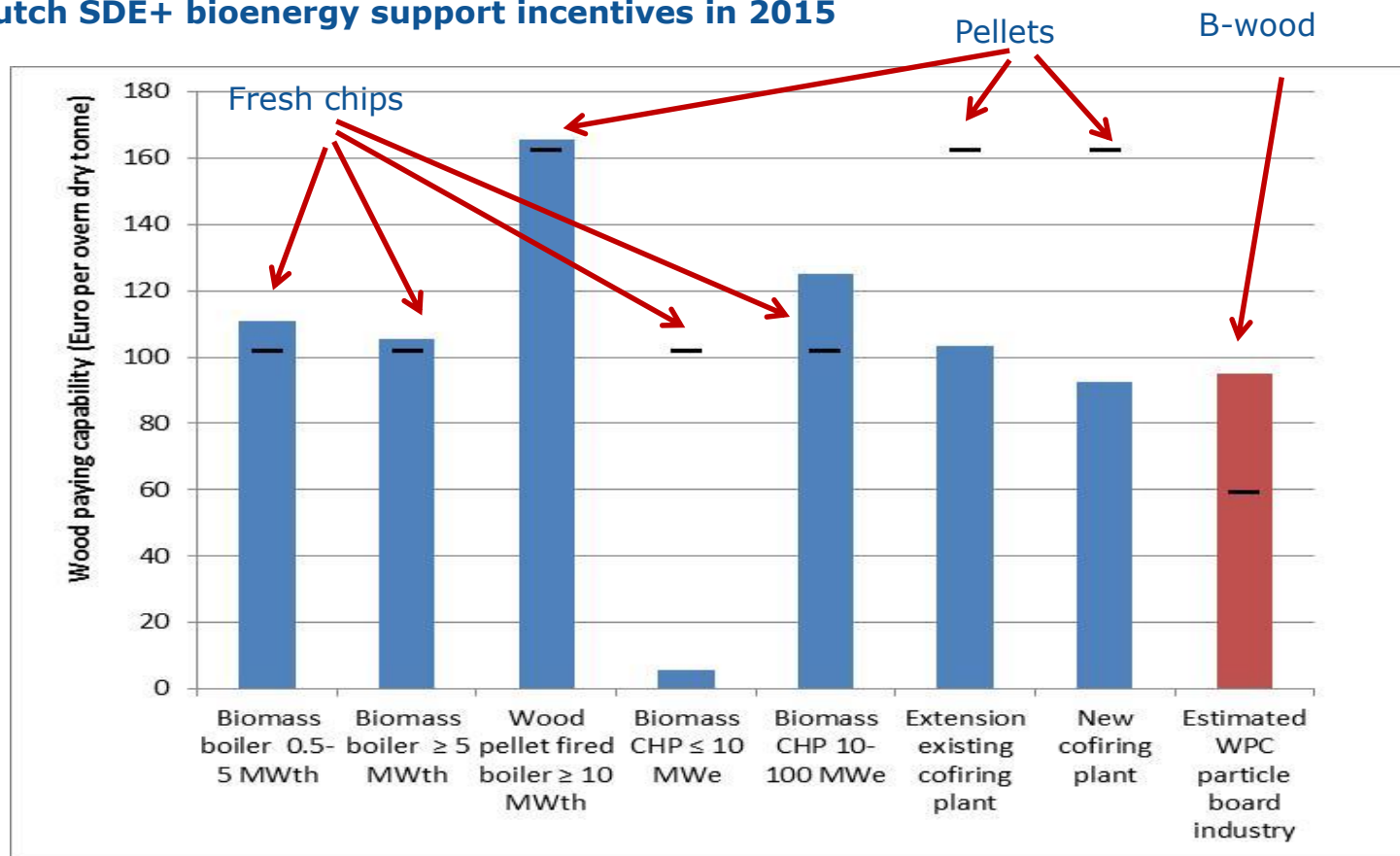
- Lack of integrated approach towards energy and material application of biomass
- Lack of recognition of carbon emission reduction impacts of wooden products
- Lack of recovery targets for waste wood
- Limited attention for source separation of waste wood in Europe
- Strict regulations governing the level of contaminants in particleboard
- Waste status of recovered wood

Barriers to utilisation of wood (governance)

- **Lack of integrated approach towards energy and material application of biomass**

Barriers to utilisation of wood (incentives for bioenergy)

Figure Wood paying capability of bioenergy technologies that applied for Dutch SDE+ bioenergy support incentives in 2015



Barriers to utilisation of wood (incentives for bioenergy)

- Without operational subsidies commercial pellet, chips fired E/CHP bioenergy plants would not be operational.
- If these plants use feedstocks useful for material sectors, (by definition) these **incentivised bioenergy plants cause competition for feedstocks with these material sectors.**
- Actual impact on material sector depends on the design of the subsidy scheme.
- Structural analysis can indicate reduced margins for wood sectors; **direct causal chain between subsidies and reduced production capacities cannot be shown.**

Measures to promote cascading

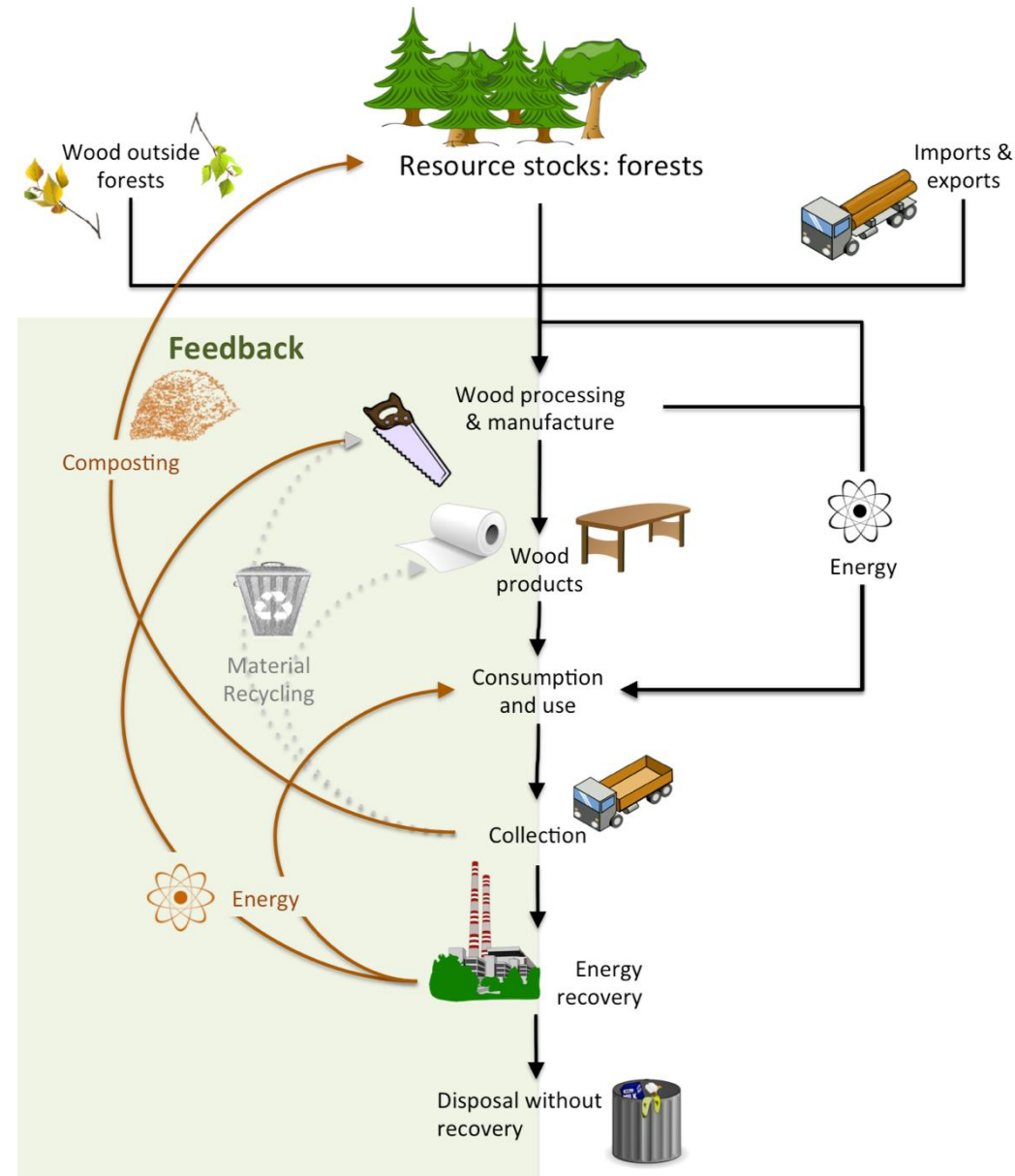


Each barrier often has multiple potential solutions

Barriers and measures act at different points in the wood flow

Wood volumes vary

- 52 Mm³ waste (~36Mm³ recovered)
- 179 Mm³ process residues



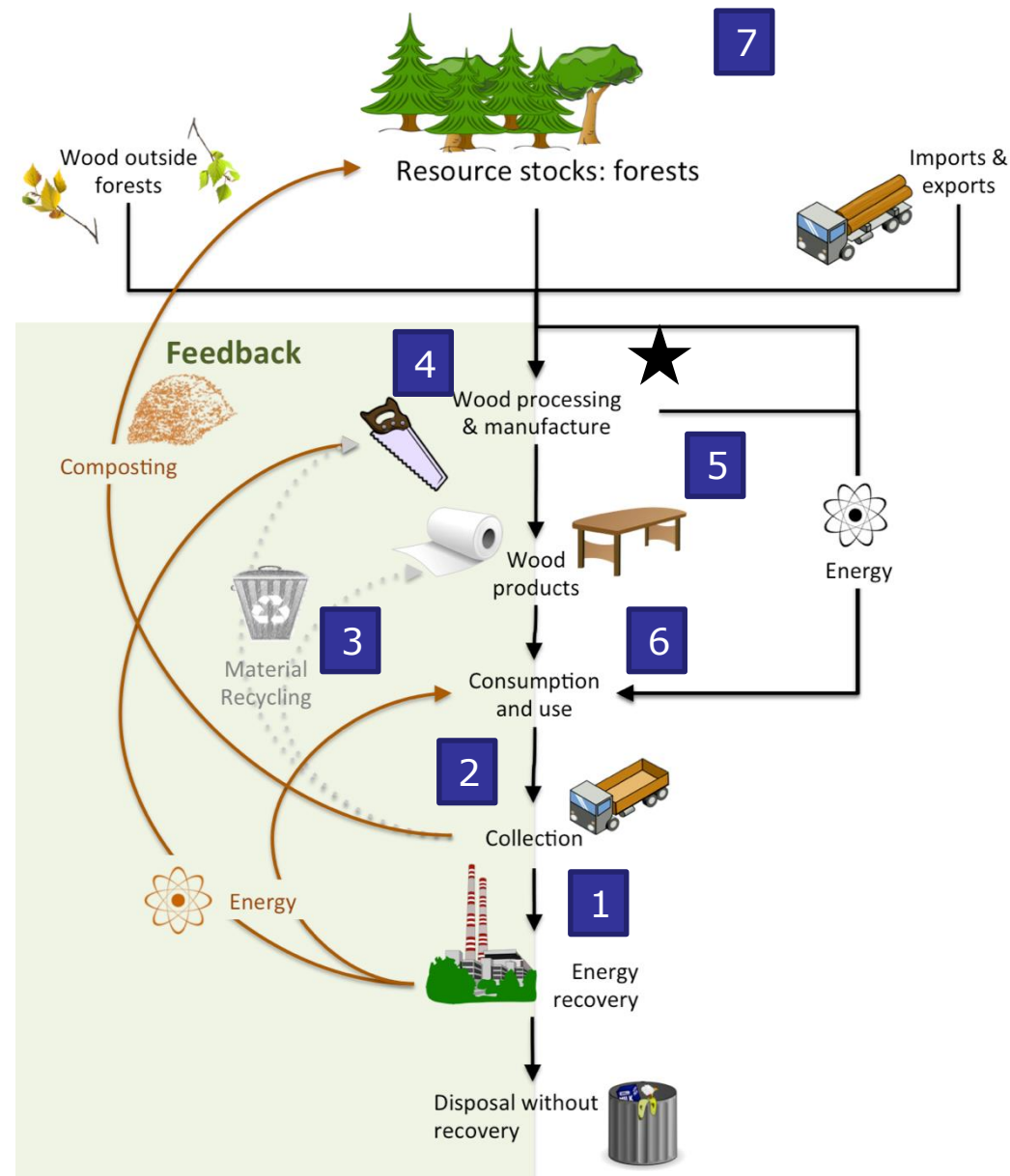
Measures to promote cascading



Key areas of intervention

1. Preventing disposal or burning
2. Enabling collection and separation
3. Promoting recycling of wood/-based products
4. Increasing potential to use recovered wood
5. Improving traceability and labelling
6. Creating new markets (e.g. GPP)
7. General framework conditions

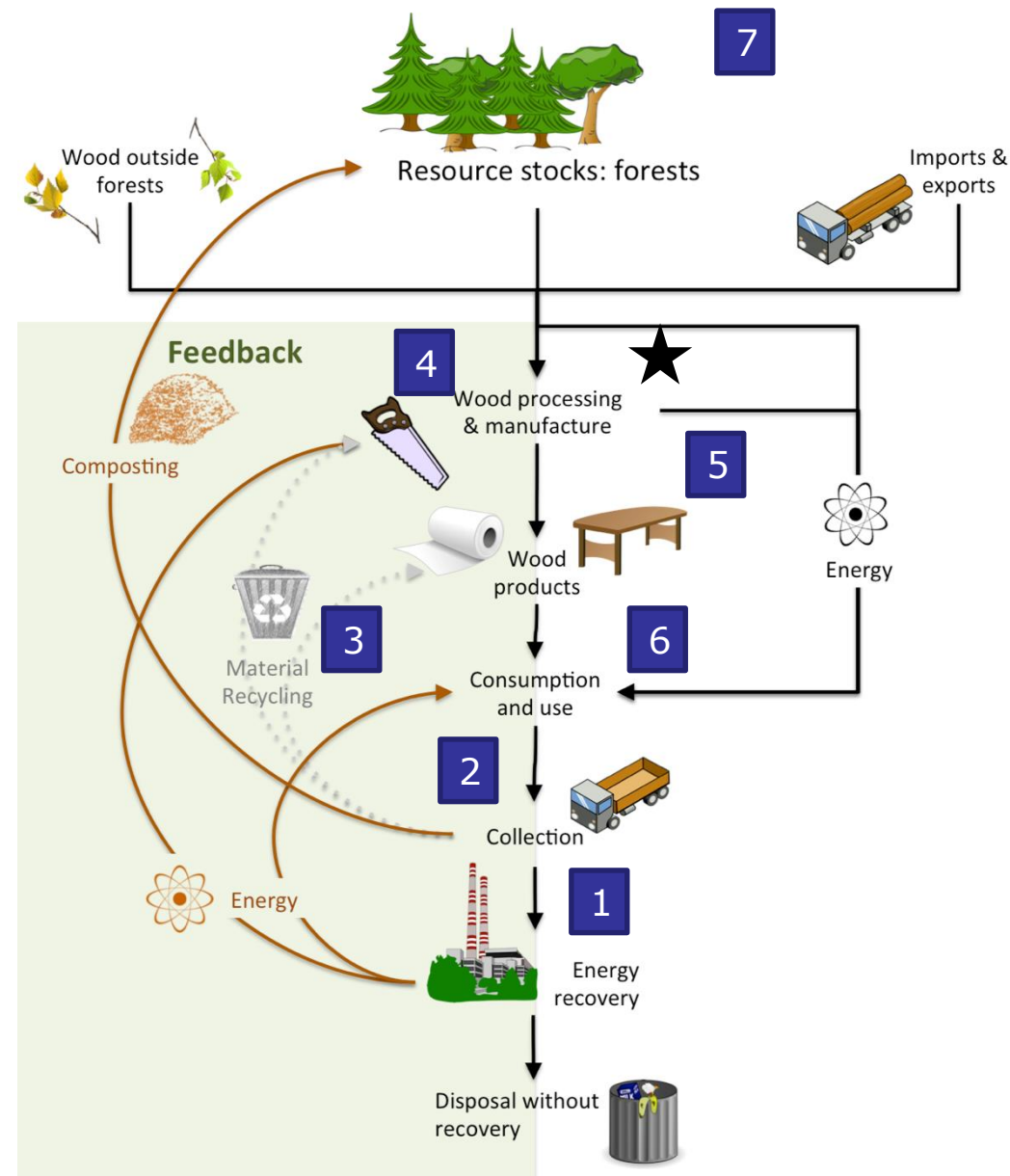
★ - Processing residues



Measures to promote cascading



- Combinations of measures are crucial
- Some measures:
 - rely on others
 - Support others
- Interventions needed at all stages in the wood flow
- Vary with location and context
- All require supporting conditions to be effective



Measures to promote cascading



Key area 1: Preventing disposal or burning

1. **Broader restrictions on the landfilling of waste wood**

Existing measures include restriction on landfilling (bans 13MS) + taxes



(c) National Geographic

2. **Improve balance between material and energy use in policy**

Restrictions on wood fractions qualifying for RED support (e.g. FL & AT [proposed])

Reporting requirements (e.g. Directive 1513/2015)

Voluntary sustainability schemes (e.g. NTA8080)



Measures to promote cascading



Key area 2: Enabling collection and separation

3. **Separate collection from households and industry.**

EPR schemes (e.g. Furniture collection (FR))

Some separate collection but rarely wood

Use of container parks

Bulky waste collection

4. **Standardisation of waste wood classification.**

UK, NL, DE, AT – to guide different end uses

(c) Guardian



PAS 111:2012

Specification for the requirements and test methods for processing waste wood



wrap Working together for a world without waste

BSI

Measures to promote cascading



Key area 2: Enabling collection and separation

5. Improved separation techniques

Limited examples focusing specifically on cascading

Improved *in situ* approaches



6. Design for cascading

Limited examples focusing specifically on cascading

ProZukunft (AT) project

More examples in electronics or other sectors



Measures to promote cascading



Key area 3: Promoting recycling of wood/-based products

7. **Extended Producer Responsibility (EPR) schemes**

EPR schemes (e.g. Furniture collection (FR))

8. **Requirements for recycling of wood or wood containing products**

By type (e.g BE(fl); DE)

By product (e.g. Furniture in FR)



Measures to promote cascading



Key area 4: Increasing the potential to use recovered wood

9. Changes in legal status of certain waste wood fractions

End of waste status - Limited progress for wood at EU level

Austria –to develop EoW for wood

Alternatives to EoW (FL) product standards and use applications



10. Changes in quality standards

MS or industry driven (PAS111; EPF standard)

AT, BE(fl), DE binding legislation

Paper sector EN 643 standard



Measures to promote cascading



Key area 5: Improving traceability and labelling

11. Clear labelling of recovered and cascaded wood

EU Ecolabel for specific products

Nordic ecolabel for façade panels (70% to be recycled)

Other labelling approaches

Triman (FR) denoting recyclable products

Product specific labels – e.g. ERPIS for paper



Measures to promote cascading



Key area 6: Creating new markets

12. Public purchasing preference for recycled wood (containing) products.

Green Public Procurement ~ €2 trillion / 19% of EU GDP

USA BioPreferred programme mandatory federal purchasing of bio-based products



Measures to promote cascading



Key area 7: framework conditons

- **Consumer awareness raising on recycling wood**
- **Establishment of support network**
- **Development of bioeconomy clusters**
- **Investment in research and innovation**
- **Improved reporting and data collection**

Measures to promote cascading



Key area 7: framework conditons

- **Consumer awareness raising on recycling wood**
- **Establishment of support network**
- **Development of bioeconomy clusters**
- **Investment in research and innovation**
- **Improved reporting and data collection**

1. Definition and quantification of cascade

- In this study cascading use is defined as ***"the efficient utilisation of resources by using residues and recycled materials for material use to extend total biomass availability within a given system"***.
- A calculation scheme of cascading use at the market level is introduced using available statistical information and wood flow analysis.
- Provision of wood for further cascading is as important as utilisation of residues and recovered wood.
- Each region and country has specific conditions to provide and utilise residues and recycled materials. The main influencing factors are forest productivity in relation to population, wood industry development and consumption of wood products.

Conclusions



2. Impact of cascading

- Four scenarios (reference, material use, energy use and post-consumer wood) have been analysed for the year 2020 and 2030 to demonstrate the limits and possibilities of cascading use in the wood market.
- Based on relationship between wood volume and employment, added value and carbon content the scope of possible impacts were shown.
- **Increased use of wood for material application enhance a multiplier effect which produces major benefits than energy applications** of wood in terms of employment, production of added value, resource efficiency and lower carbon emissions.

3. Barriers

- **The quality and availability of collected waste wood** is hindered by factors such as contamination, lack of separated collection, lack of harmonised standards and technical barriers
- **Governance barriers** include lack of harmonisation on recycled products, lack of end-of-waste criteria.
- **Market barriers:** benefits for increased cascade on products are not enjoyed by those who would see increased costs; limited markets for cascaded wood and increased consumption of residues and used wood by the bioenergy sector.
- There is generally a **lack of an integrated approach towards energy and material application of biomass**. Energy and material uses of biomass tend to be dealt with separately in policy-making, resulting in a lack of integrated assessments on which to determine the various options for biomass use.

4. Measures for a wider application of cascading use of wood

- The potential to cascade wood takes place within two broad areas within the wood flow, in relation to residues produced in the processing of wood, and in relation to the waste generated following the use or consumption of a wood based product.
- Implementing any of the measures set out in this report in isolation would likely not be sufficient to lead to an increase in cascading use in practice, with a variety of measures needed in any given situation.
- There may need of different measures depending on the local and national context



Thank you!

**European Commission
DG Growth**

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