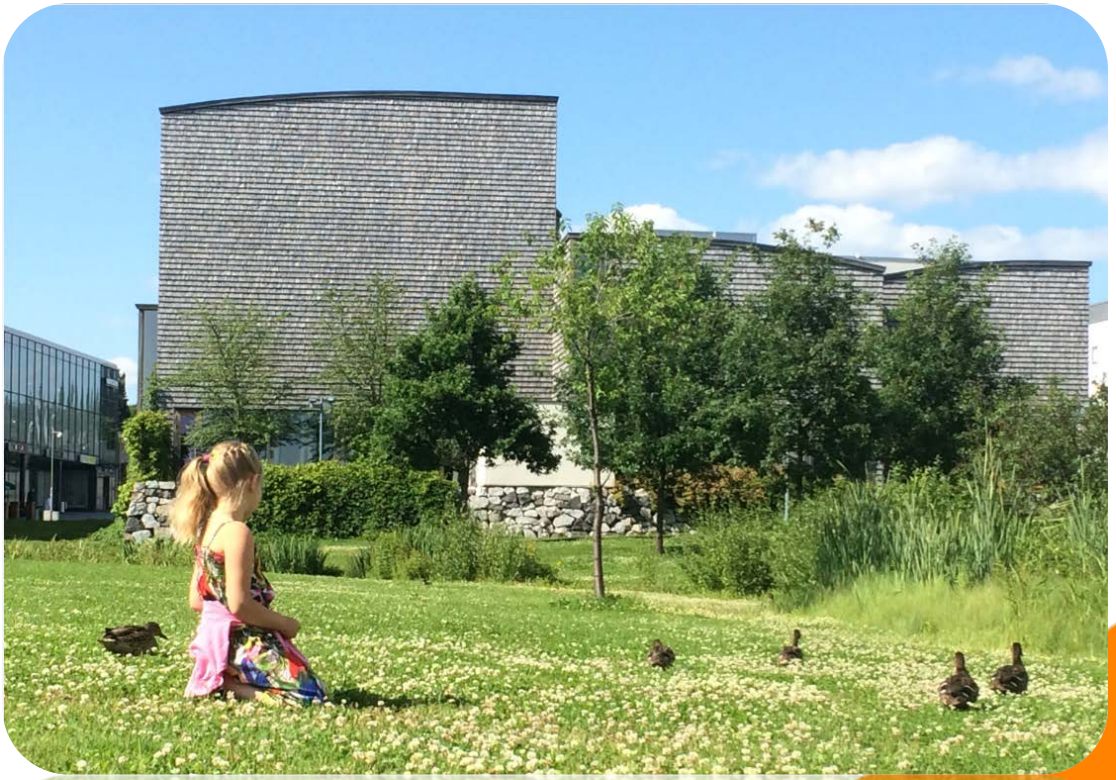
Wood construction in the circular economy



Skog & Trä 2019
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Oslo, Norway

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Circular economy

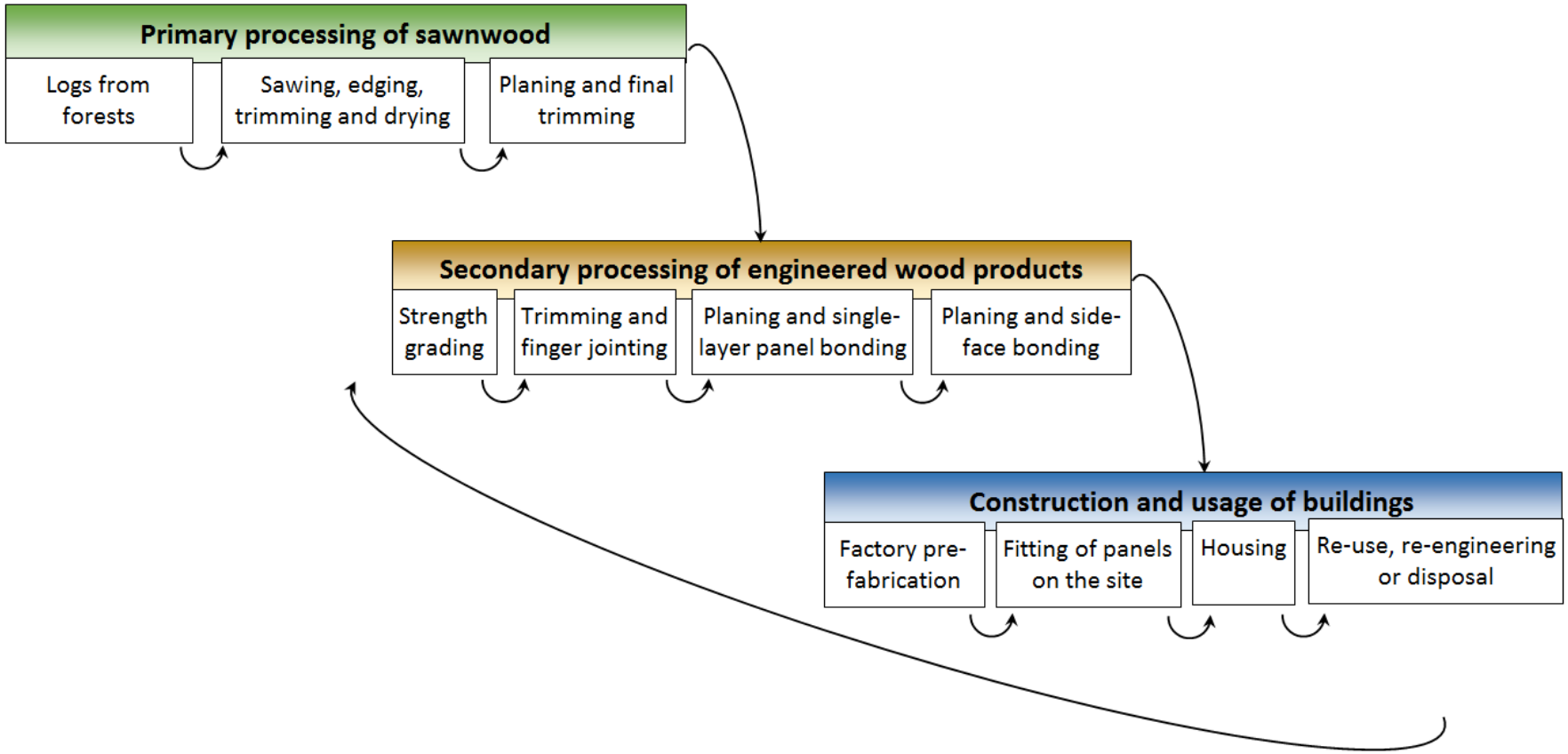
"*In a circular economy, the **value of products and materials is maintained** for as long as possible.*

*Waste and resource use are minimised, and **when a product reaches the end of its life, it is used again** to create further value.*

*This can bring major **economic benefits, contributing to innovation, growth and job creation**.*"

(European Commission)

Building with wood by life-cycle phases – Simplified illustration



Life-cycle sustainability benefits of building with wood

- In the European Union, e.g., construction and usage of buildings is a major contributor of environmental impacts, about
  - 50% of the extracted materials and energy usage, 30 % of water consumption and waste generation
- Industrial wood construction or usage of wood in combination with other materials has multiple environmental competitive advantages over life-cycle of the buildings, e.g., carbon storage, energy efficiency
- Life-cycle benefits achievement requires raw material to be originated from **sustainably managed forests**, efficient usage of side-products, **long life-cycles of buildings** and **efficient recycling**

For climate change mitigation potential, efficient recycling/demolition at the end-of life is critical!

Sources: European Commission, 2014; Dodoo et al. 2014; Santi et al., 2016; Liu et al., 2016; Asrubali et al., 2017; Chiniforus et al., 2018; Gustavsson & Sathre, 2011

Circularity in wood construction – Challenges and opportunities

- In Finland, wood performs well in energy production at the end-of-life phase, but wood recycling is not well developed neither in environmental, nor in economic terms
- In developing circular building models, "recycling the waste" is fundamental abreast with focus on using renewable materials

→ Combination of **bioeconomy** and **circular economy**

- **Systemic development** needed to enhance possibilities for sorting, separation and recovery
- Changes in the business models of building businesses to enhance "**designing for disassembly**" thinking

Sources: Dahlbo et al., (2015); Stephan & Anthanassiadis (2018)

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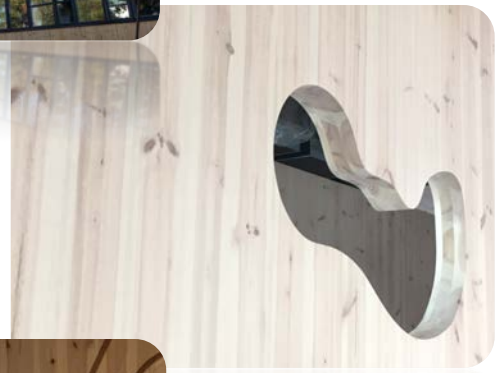
Example – Wasa Innovation Center (opened 30.11.2018)



- Side products of the construction processes are used efficiently and the whole building is designed to be recycled
- Made with local wood – CLT produced in the region, material for CLT from the local non-industrial private forests
- Strong collaboration in business ecosystem – municipality, architects, designers, builders, customer, end-users
- Abreast with resource-efficiency and renewability, architectural design aims to enhance well-being of end-users

...Circularity in wood construction is a multi-dimensional issue with notable business potential for value-chains

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Example – Wooden multi-storey housing business development

- New companies have entered in the Finnish wooden multi-storey building sector
- Increase in interest towards building "housing co-operatives" (i.e., inhabitants own shares in "housing company, typical in the Finnish housing system)
- Usage of wood enables industrialized processes and new type of value chain management

Developing circularity in wooden multi-storey housing construction – Viewpoints of a company **(Project manager A. Erola/SIKLA 20.5.2019)**

- *Utilizing modular elements made of massive wood and connecting elements "smartly"*
- *"Systemic design", i.e., simultaneous consideration of architecture, construction techniques and building service technologies*
- *Routings of building service technologies outside the modular elements*
- *Re-assembly of the wooden multi-storey buildings could be possible*

Example – Potential for multi-dimensional value chain development

DIMENSION	Resource extraction	Production	Consumption	Recycling	Disposal
Environmental	Preventing land-use change and decrease in biodiversity, increasing carbon sinks	Reducing GHG emissions and increased resource and energy efficiency	Decreasing atmospheric and aquatic emissions	Improving product design for easy recycling	Decreasing the amount of waste and increasing the separability of waste
Economic	Enhancing regional development	Developing new products with fewer inputs and/or higher added value	Providing repair systems and/or instructions for repairing/ replacing worn parts	Utilizing secondary raw materials to decrease costs and/or add value	Utilizing waste as a valuable asset to increase efficient use of resources and energy
Social	Fostering local participation and livelihood	Decreasing the usage of chemicals affecting human health	Enhancing the fitness for purpose in use and to meet individual value expectations	Providing information and enhancing recycling and/or product disassembly	Providing information and enhancing disposal and collection of worn products

Sources: Toppinen et al., (2016)

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Thank you!

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