Funded by the
Erasmus+ Programme
of the European Union

Circular Economy in Wooden Construction

Assoc. Prof. Dr Laura Tupenaite

Vilnius Gediminas Technical University

Funded by the
Erasmus+ Programme
of the European Union

THINKING IN CIRCLES

Source: https://pxhere.com/en/photo/4595

Funded by the
Erasmus+ Programme
of the European Union

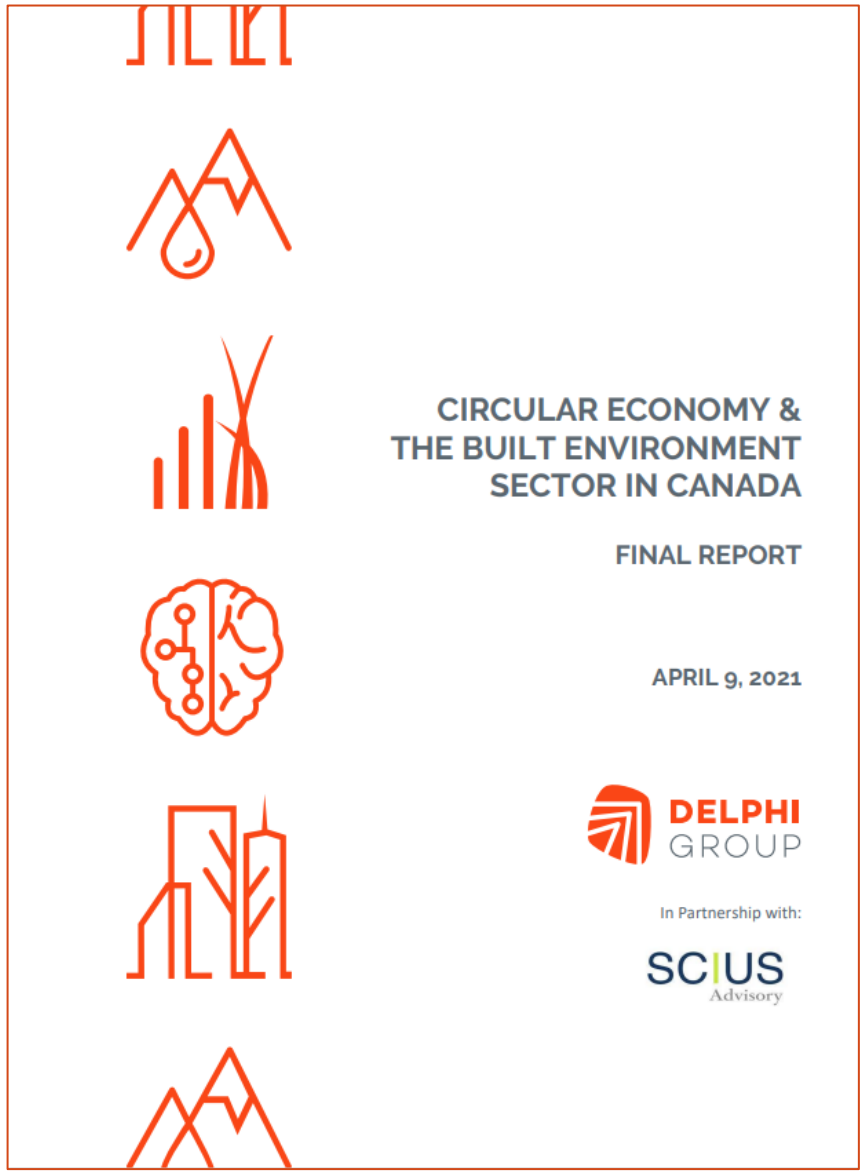
Circular Economy Principles

- Designing out of waste
- Keeping products and materials in use
- Regenerating natural systems

Source: https://bk-bags.com/what-is-circular-economy/

Source: CIOB. CPD: Timber and the circular economy. https://constructionmanagement.co.uk/courses/cpd-timber-and-the-circular-economy/

Funded by the
Erasmus+ Programme
of the European Union

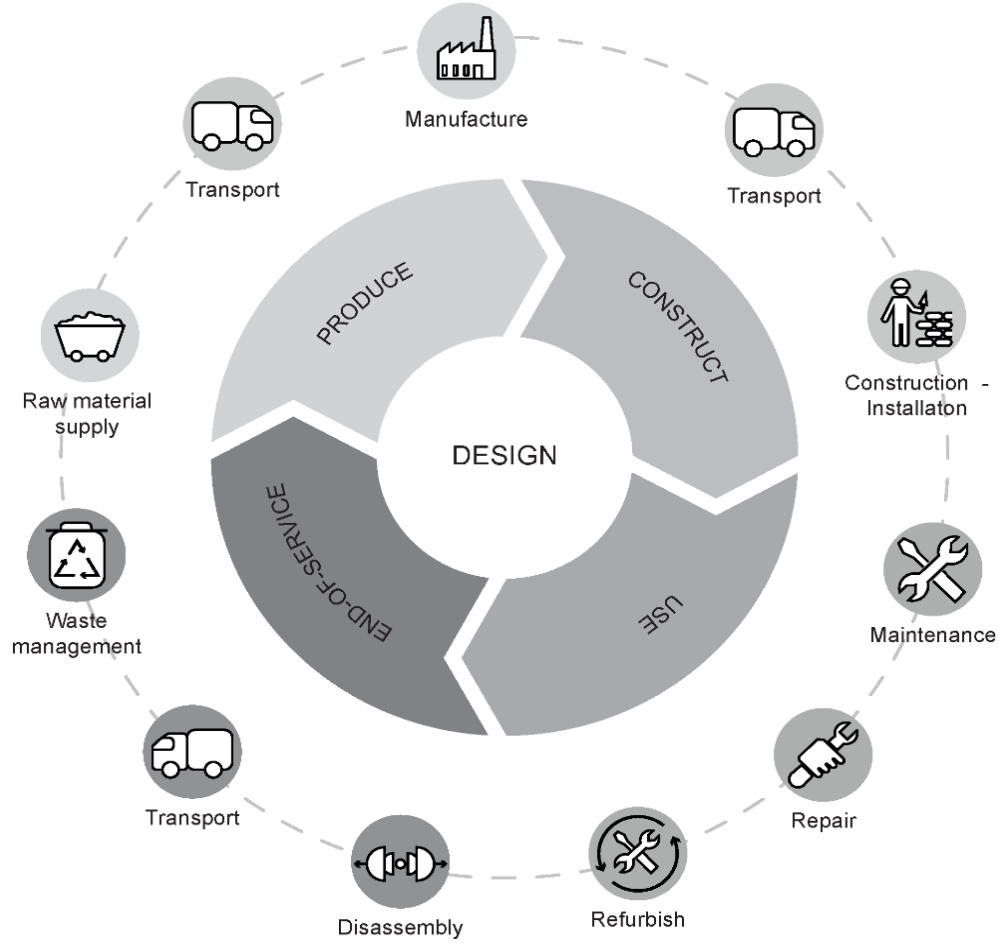


*"Circular economy principles can be applied to the built environment sector, including construction and real estate value chains, to **address current waste issues**, **recapture lost value**, and to realize **new** economic, social, and environmental benefits."*

Source: Delphi Group. (2021). *Circular economy & the build environment sector in Canada*.

Funded by the
Erasmus+ Programme
of the European Union

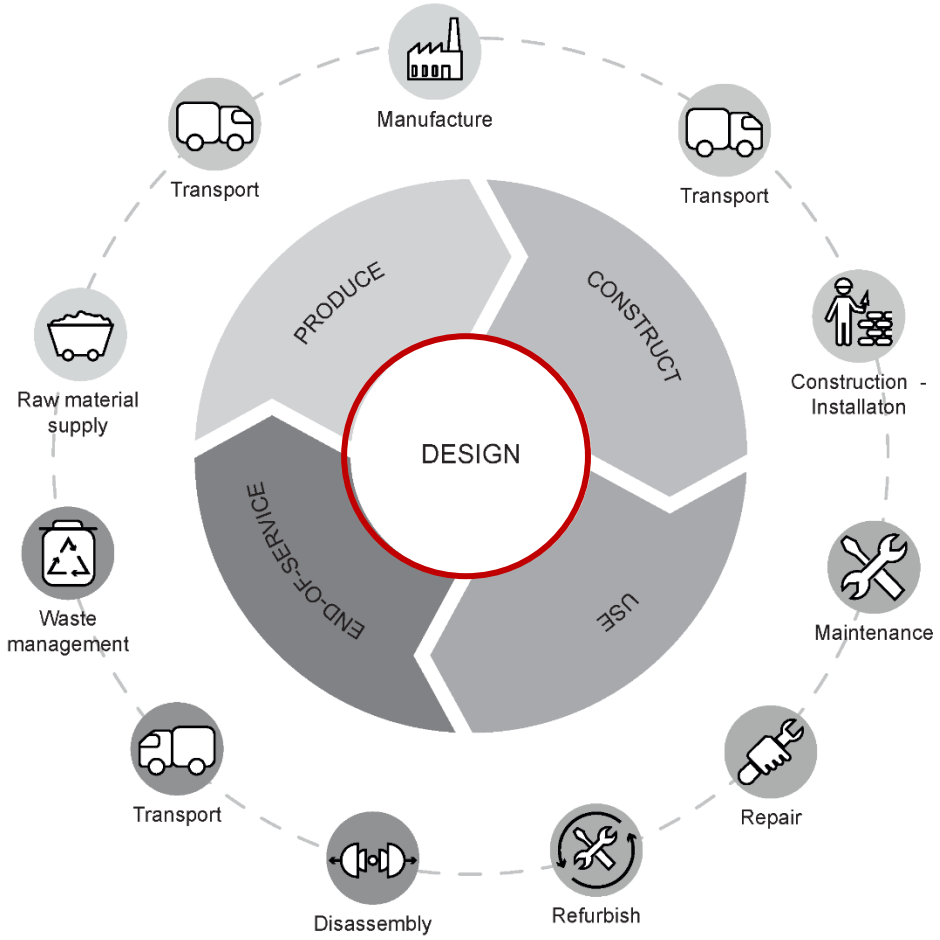
Life Cycle of a Building



Source: TUDelft. *Life cycle of a building*. https://ocw.tudelft.nl/course-readings/3-1-2-life-cycle-of-a-building/

Funded by the
Erasmus+ Programme
of the European Union

Circular Building Design



- Fundamental to the circular built environment is the need to **design well from the beginning!**

Source: Delphi Group. (2021). *Circular economy & the build environment sector in Canada*.

Source: TUDelft. *Life cycle of a building*. https://ocw.tudelft.nl/course-readings/3-1-2-life-cycle-of-a-building/

Funded by the
Erasmus+ Programme
of the European Union

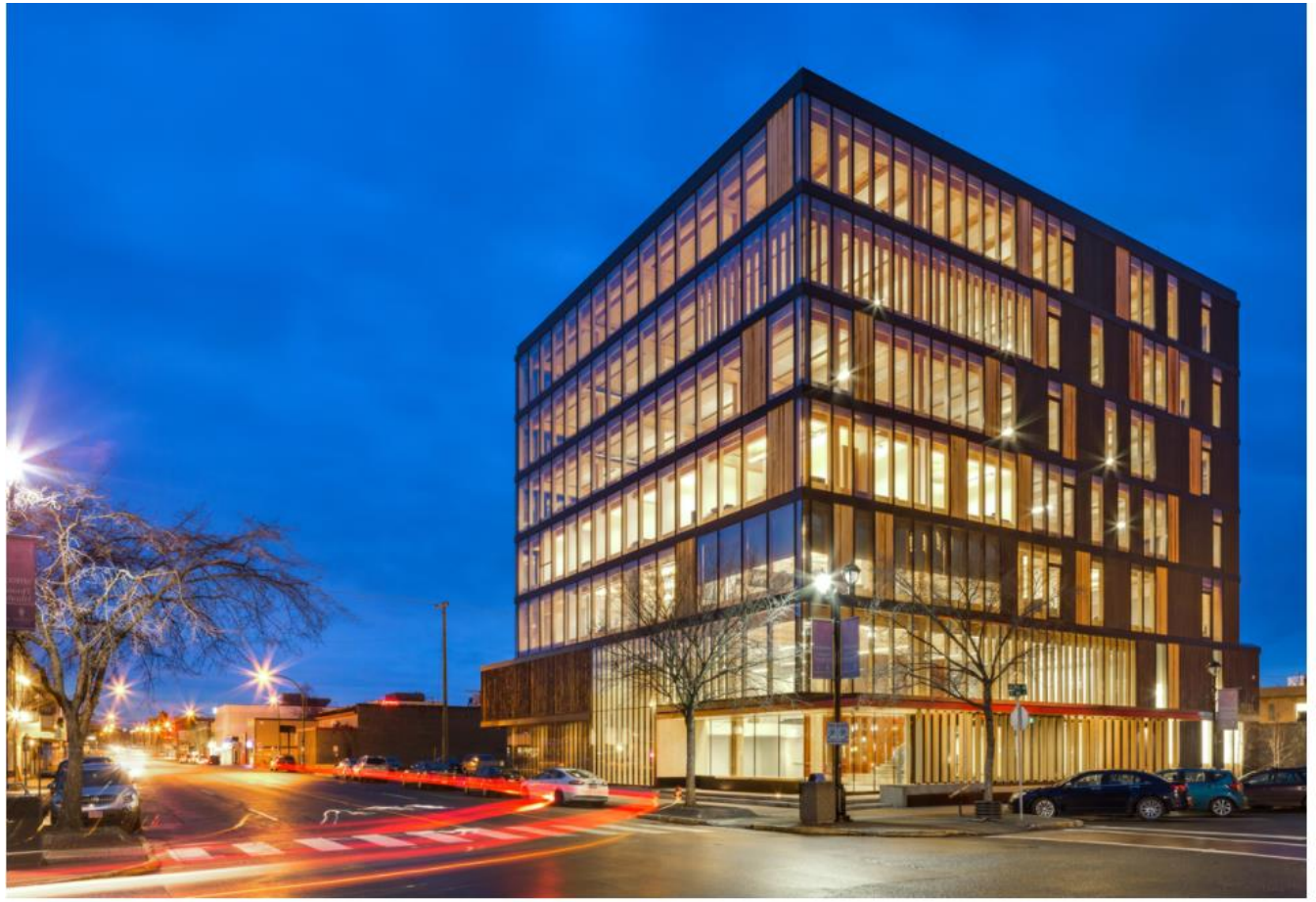
Principles

- Eliminating **waste**, **harmful chemicals**, and **pollution**
- Allowing for **flexible building use**, **adaptive reuse**
- Assurance of **long-term durability**
- Optimization of **material recovery**

Source: Delphi Group. (2021). *Circular economy & the build environment sector in Canada*.

Funded by the
Erasmus+ Programme
of the European Union

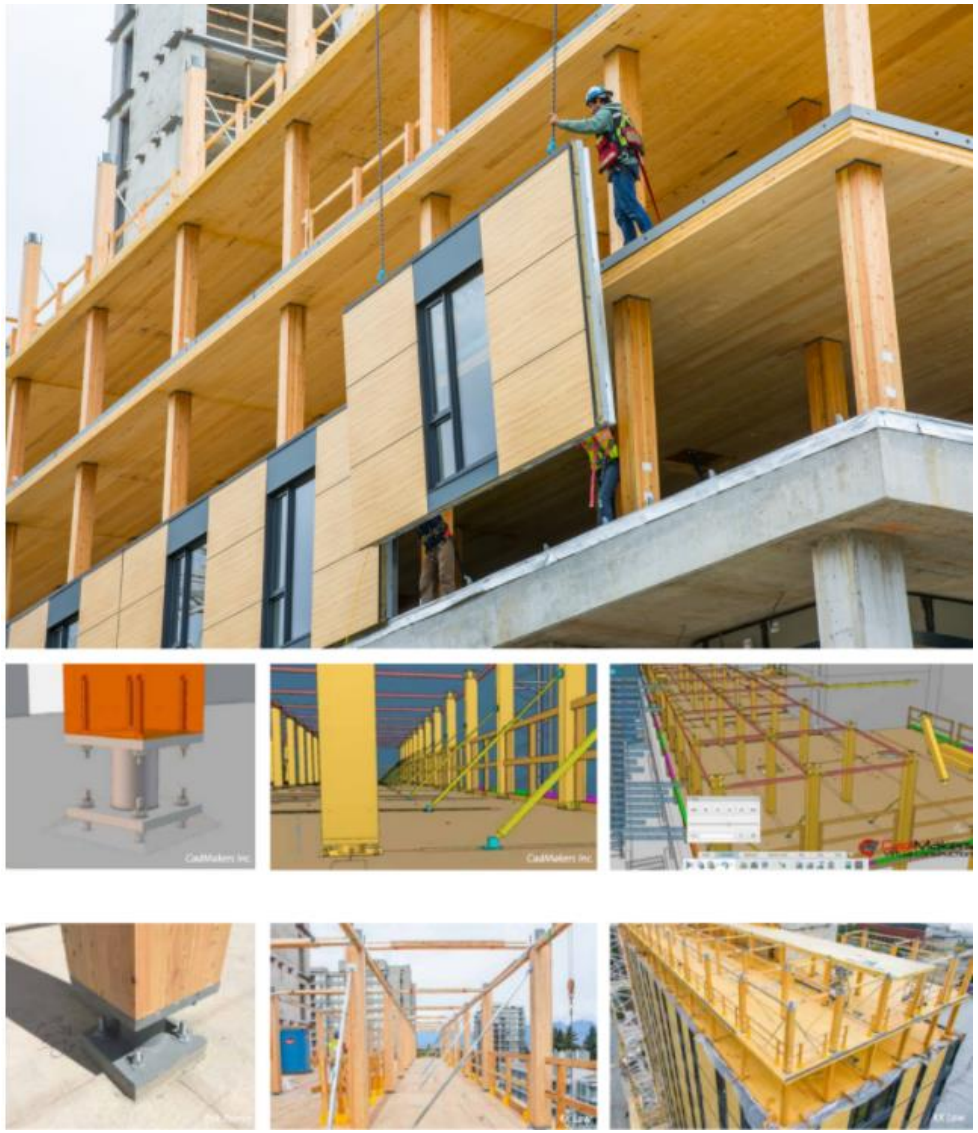
Example



THINKING IN CIRCLES | *The Wood Innovation and Design Centre is designed with a deep focus on repeatable, reusable, prefabricated construction, key principles for a circular economy. The vast majority of the building—including cross-laminated timber (CLT) panels and glue-laminated timber (glulam) columns and beams—can be disassembled at the end of its functional life, and the wood products used in a future structure. | Photo credit: Ema Peter Photography courtesy of MGA | Michael Green Architects*

Source: naturaly:wood. *Coming full circle: wood and the circular economy*. https://www.naturallywood.com/blog/coming-full-circle-wood-circular-economy/

Funded by the
Erasmus+ Programme
of the European Union



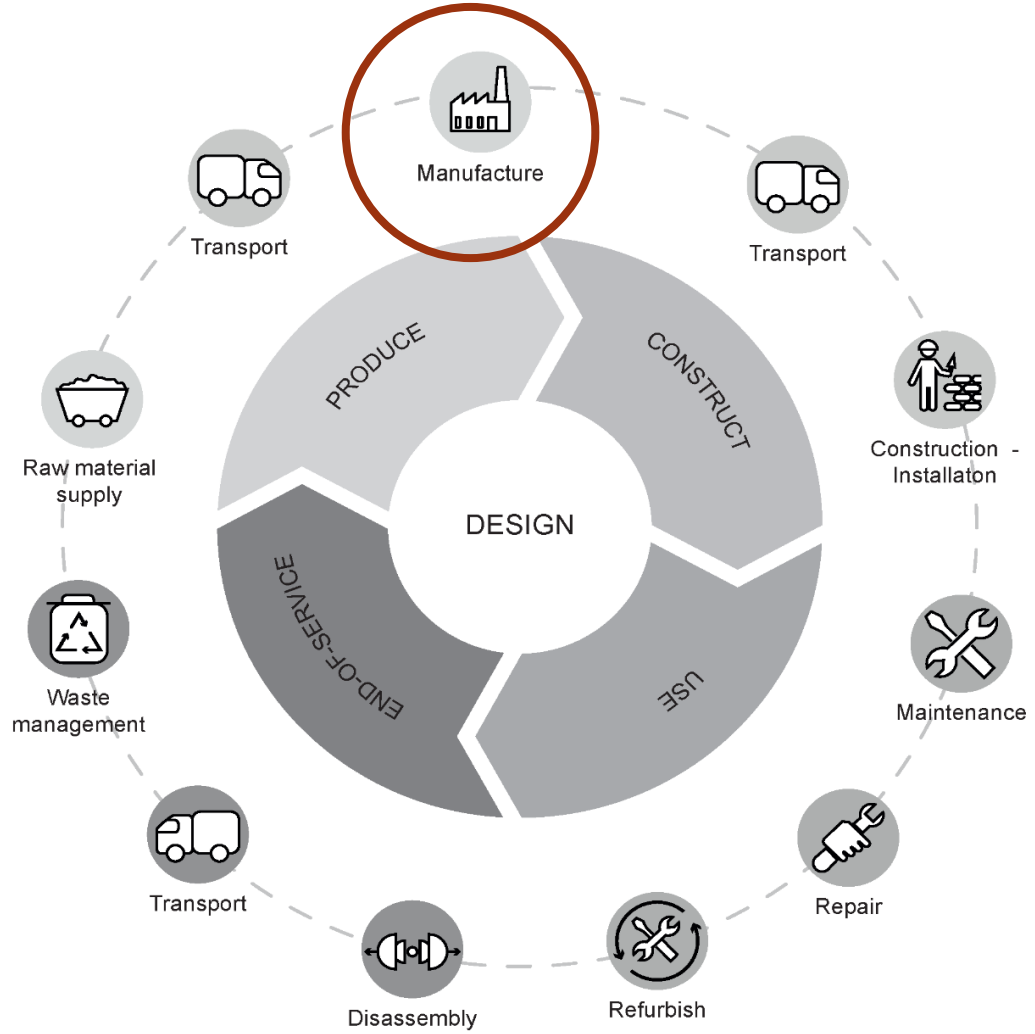
BIM and Virtual Design and Construction (VDC)

- Played a central role in the design of one of the world's tallest wood buildings, Brock Commons Tallwood House.

Source: naturaly:wood. *Coming full circle: wood and the circular economy*. https://www.naturallywood.com/blog/coming-full-circle-wood-circular-economy/

Funded by the
Erasmus+ Programme
of the European Union

Circular Building Materials & Manufacturing



- **Renewable products** (such as timber) and other innovative materials and products with recycled content (such as asphalt, concrete, steel, carpets, window frames, and other products) **support lower-carbon, circular construction.**

Source: Delphi Group. (2021). *Circular economy & the build environment sector in Canada*.

Source: TUDelft. *Life cycle of a building*. https://ocw.tudelft.nl/course-readings/3-1-2-life-cycle-of-a-building/

Funded by the
Erasmus+ Programme
of the European Union

Sustainably Managed Forests

- Wood, that is used for construction must be harvested from sustainably managed forests.
- “The aim of **sustainable forest management (SFM)** is to ensure that forests supply goods and services to meet both present-day and future needs and contribute to the sustainable development of communities” (Food and Agriculture Organization of the United Nations, 2022).

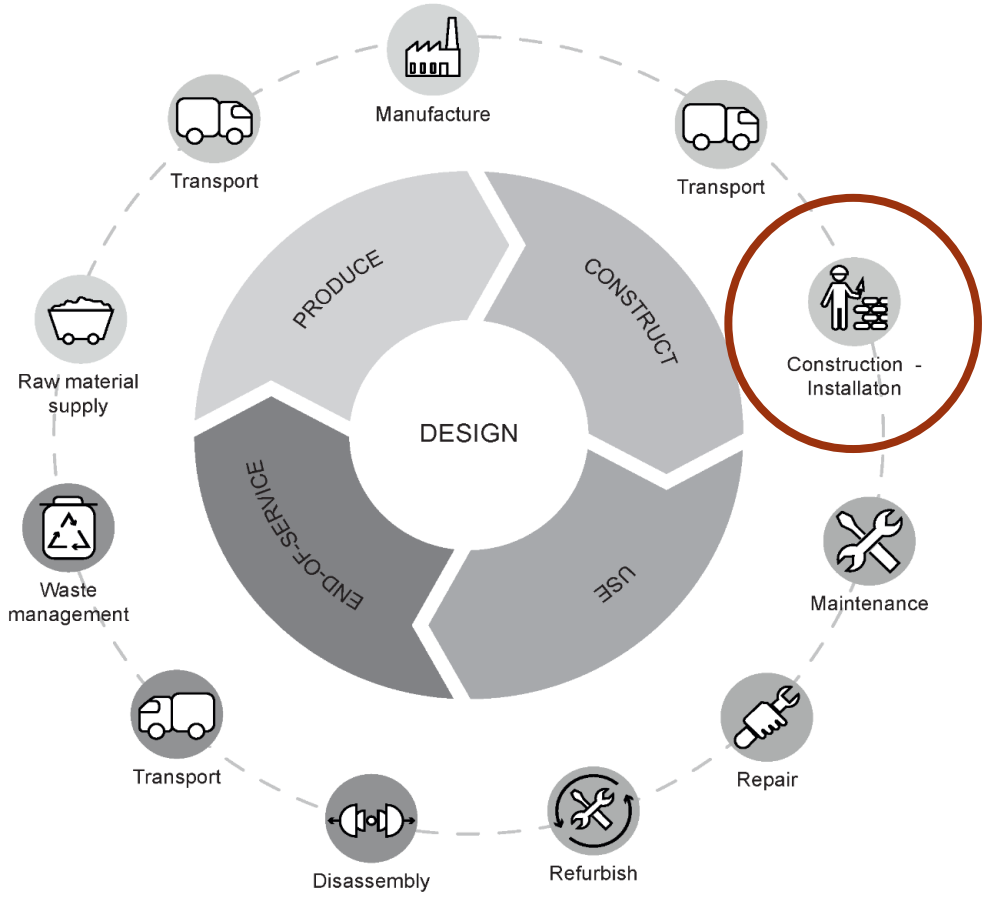
Funded by the
Erasmus+ Programme
of the European Union

- The EU is among the foremost adherents of forest sustainability certification schemes.
- The two international certification schemes are: FSC and PEFC.
- Certification schemes set criteria and principles for sustainable forest management and forest product chain.

Source: Jeffree, M. (Ed.). (2019). *Wood. Building bioeconomy*. CIB.

Funded by the
Erasmus+ Programme
of the European Union

Circular Economy in Construction Stage



- **Waste prevention onsite**
- **Diversion from landfill**
- **Resource management**

Source: Delphi Group. (2021). *Circular economy & the build environment sector in Canada*.

Source: TUDelft. *Life cycle of a building*. https://ocw.tudelft.nl/course-readings/3-1-2-life-cycle-of-a-building/

Funded by the
Erasmus+ Programme
of the European Union

Prefabrication

- Building with wood can help reduce on-site construction waste through **factory-built, computerized prefabrication** which can optimize assembly and streamline on-site erection.

Source: naturaly:wood. *Coming full circle: wood and the circular economy*. https://www.naturallywood.com/blog/coming-full-circle-wood-circular-economy/

Funded by the
Erasmus+ Programme
of the European Union

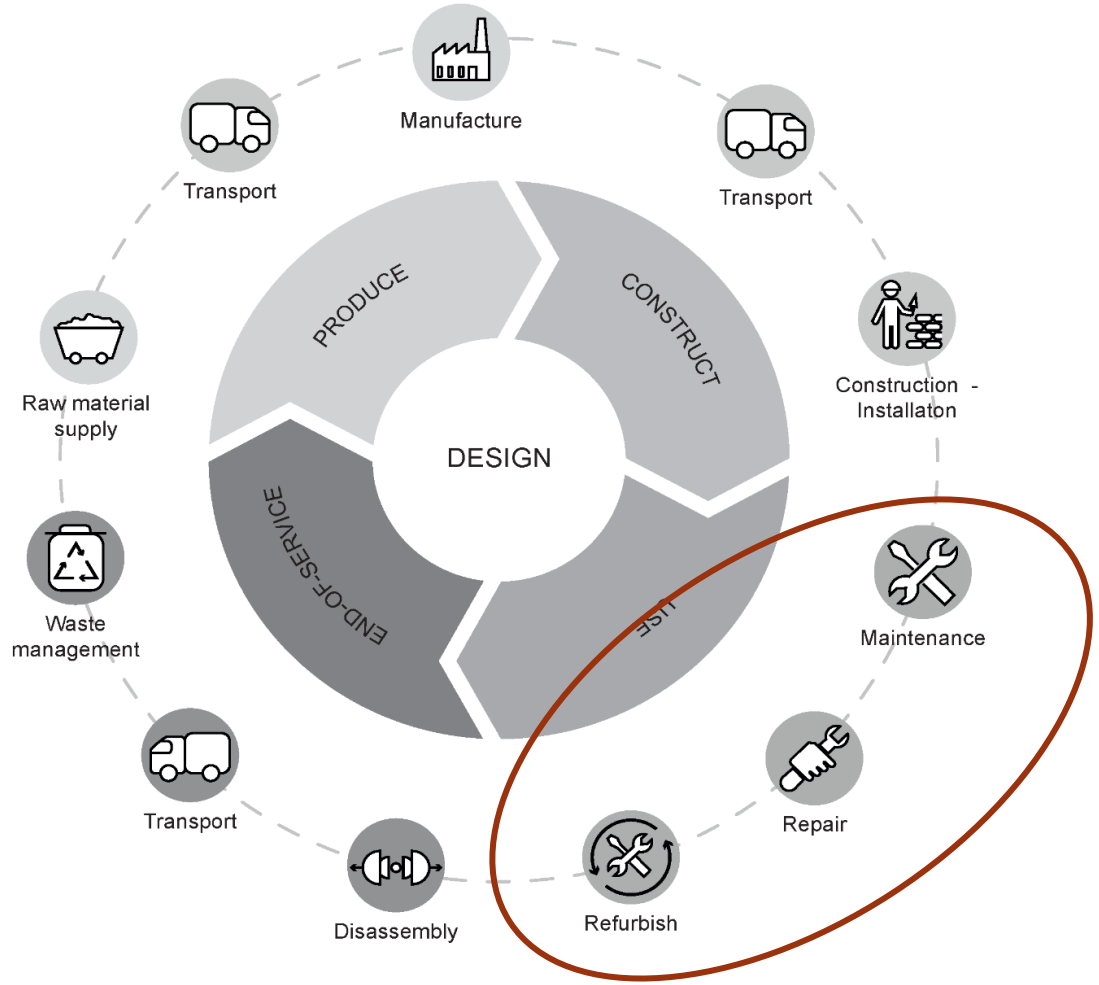
Brock Commons (Canada)

- Brock Commons Tallwood House is an innovative 18 storey tall wood hybrid building at the University of British Columbia (UBC).
- The wood structure was complete **less than 70 days** after the prefabricated components arrived on site, approximately four months faster than a typical project of this size.

Source: Think Wood. Brock Commons Tallwood House. https://www.thinkwood.com/projects/brock-commons-tallwood-house

Funded by the
Erasmus+ Programme
of the European Union

Circular Economy in Use Stage



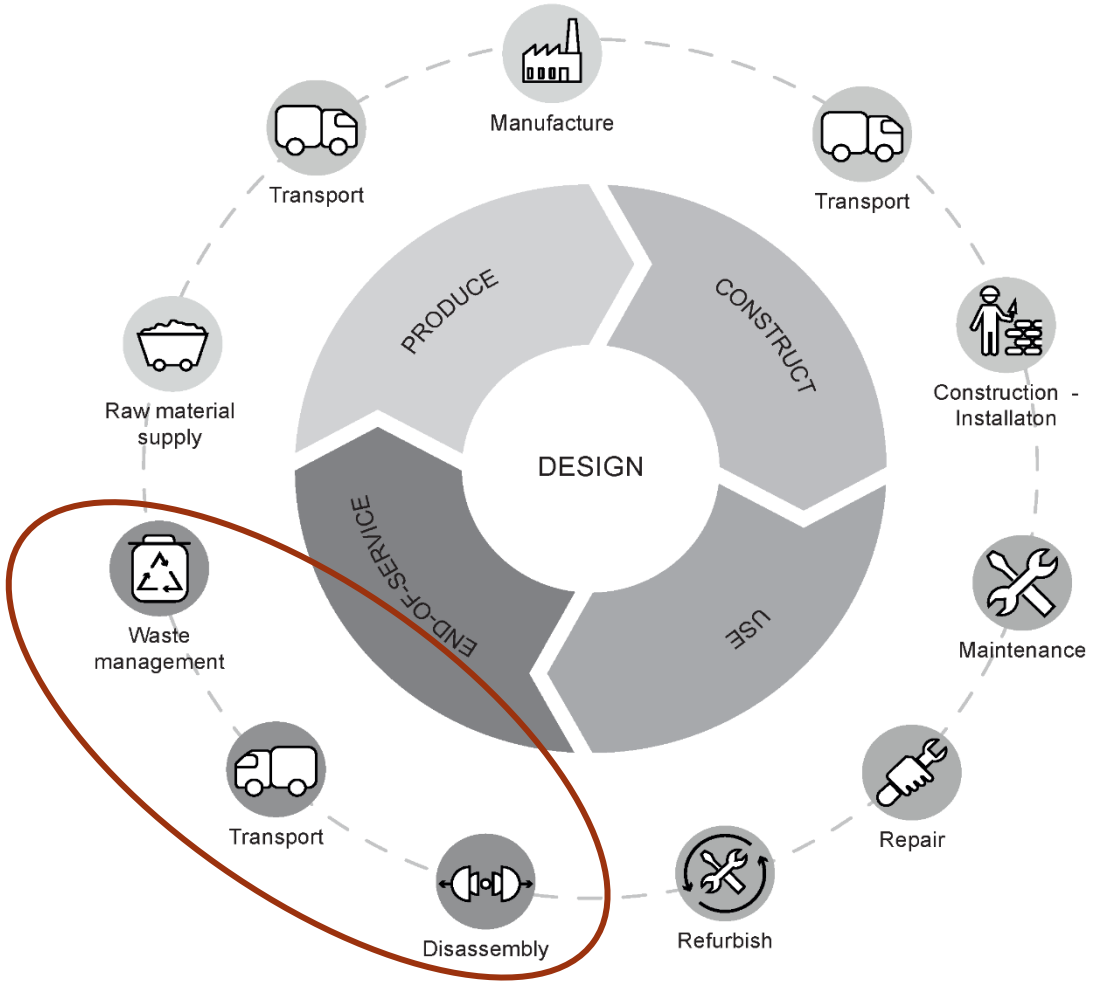
- **Maintenance, renovation, and repair** to ensure durability of a building.

Source: Delphi Group. (2021). *Circular economy & the build environment sector in Canada*.

Source: TUDelft. *Life cycle of a building*. https://ocw.tudelft.nl/course-readings/3-1-2-life-cycle-of-a-building/

Funded by the
Erasmus+ Programme
of the European Union

Deconstruction & Resource Recovery



- Wood is a material well-suited to reuse, whether through the **adaptive reuse** of an existing structure or through **deconstruction and disassembly**.

Source: Delphi Group. (2021). *Circular economy & the build environment sector in Canada*.

Source: TUDelft. *Life cycle of a building*. https://ocw.tudelft.nl/course-readings/3-1-2-life-cycle-of-a-building/

Funded by the
Erasmus+ Programme
of the European Union

Example: Reuse

Vancouver's Mount Pleasant neighborhood (Canada)

Source: naturaly:wood. *Coming full circle: wood and the circular economy*. https://www.naturallywood.com/blog/coming-full-circle-wood-circular-economy/

Funded by the
Erasmus+ Programme
of the European Union

Example: Deconstruction

Corporate Leadership in DfD/A: Case Study on MEC

Mountain Equipment Coop (MEC) has four buildings across Canada that showcase circular building practices and building material stewardship. The first two are the Ottawa and Winnipeg buildings, both of which were built to C2000 standards at the time. C2000 was the predecessor of LEED and other building performance metrics, the buildings being classed the 1st and 2nd ever C2000 certified in Canada.

The **Ottawa building** is recognized for a model for DfD/A. The original 40-year old building was carefully dismantled with the intention of reusing as much material as possible, utilizing the disassembly-friendly original construction components. As a result, roughly 75% of those materials were re-incorporated into the new building, including 50% of the timber, and the majority of the steel building frame. Key participants in this project were Derek Badger, who went on to author "The Residential Deconstruction Manual" for the CHMC, and Linda Chapman Architecture.

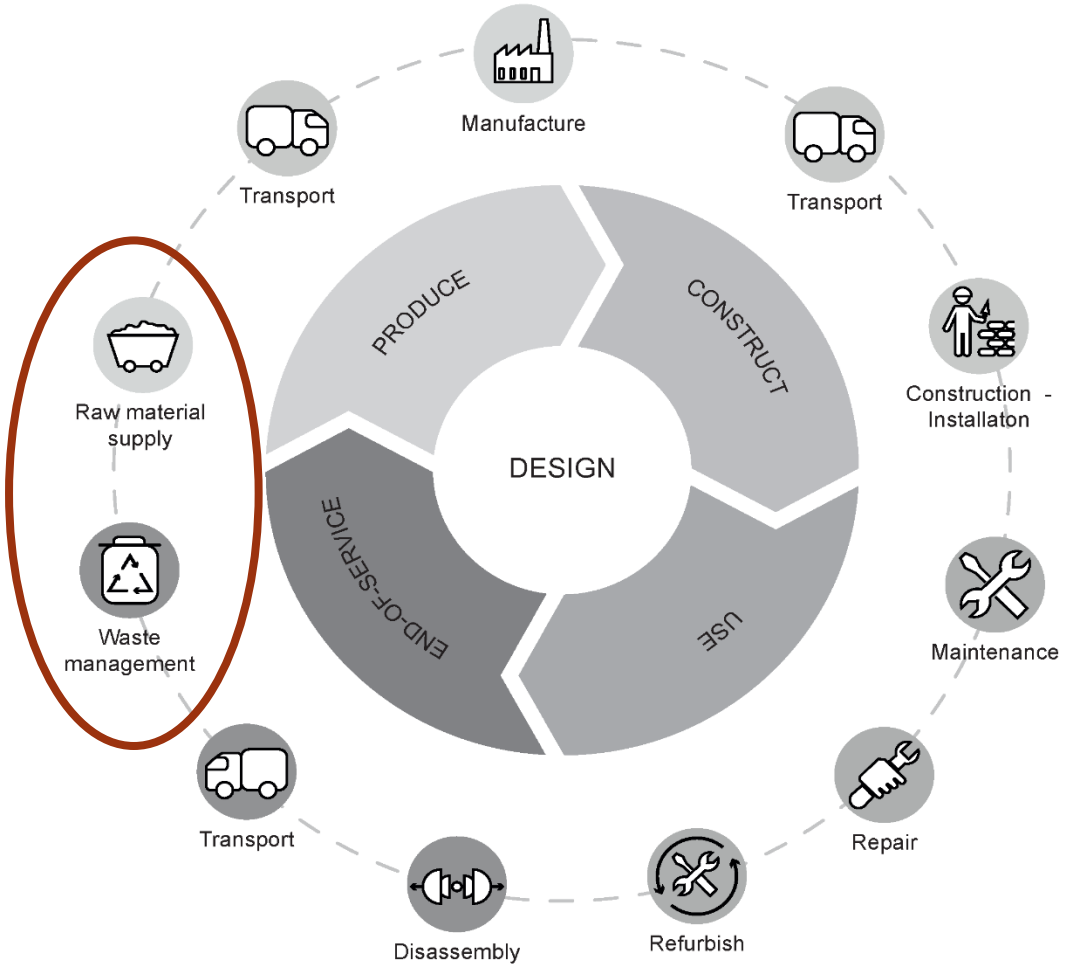
An important aspect of this project was the preservation of heritage features of the building, a 60's era two-storey grocery store with curbside character contributing to the area's heritage and aesthetic. Critics of the project implicated MEC as adding to the 'gentrifi-cation' of the area, preserving heritage elements that much more important. **See Appendix B for full case study.**

Source: https://www.mec.ca/en/explore/green-buildings

Source: Delphi Group. (2021). *Circular economy & the build environment sector in Canada*.

Funded by the
Erasmus+ Programme
of the European Union

Reverse Logistics



- Reverse logistics is a key tenet of the circular economy that enables **products materials to be recycled, sorted, processed, reused, and remanufactured**.

Source: Delphi Group. (2021). *Circular economy & the build environment sector in Canada*.

Source: TUDelft. *Life cycle of a building*. https://ocw.tudelft.nl/course-readings/3-1-2-life-cycle-of-a-building/

Funded by the
Erasmus+ Programme
of the European Union

"Although less than 1% of 'waste' timber ends up in landfill, it is estimated that only 19% was recycled into other products, such as insulation or panel boards."

- The TRADA Wood Information Sheet Recovering and Minimising Waste Wood (based on data from the Environment Agency and the Wood Recycling Association) found that, although less than 1% of 'waste' timber ends up in landfill, it is estimated that only 19% was recycled into other products, such as insulation or panel boards, with a further 11% used for animal bedding and surfaces. This leaves 69% that is directly or indirectly used as a biofuel for energy production.

Funded by the
Erasmus+ Programme
of the European Union

Recycling

Recycled timber structure and cladding

- Reusing and reclaiming timber gives many environmental benefits from reduction of greenhouse gas emissions and global warming to reducing environmental and carbon footprints.
- Untreated timber is the most economical and best timber for the environment to recycle and reuse.

Funded by the
Erasmus+ Programme
of the European Union

THANK YOU FOR YOUR ATTENTION!