De-Concrete

Eco-efficient Construction and demolition practices

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DeConcrete: Eco-Efficient Arctic Technologies Cooperation (KO 4068/24303324) 2019-2022

AIM

Research institutions and construction business companies will test and apply the best environmental and efficient demolition technologies.

After demolition construction wastes will be recycled and reused for building new roads and other constructions.

TASKS

- To conduct comparative studies on guidelines and practices of buildings demolition
- To organize demolition process (including labs experiments, testing and workshops)
- To organize separation and concrete waste processing
- To define concrete recycling areas and waste management strategy
- To promote ripple effects of the project in construction businesses development

Kolarctic CBC
EU FINLAND NORWAY RUSSIA SWEDEN

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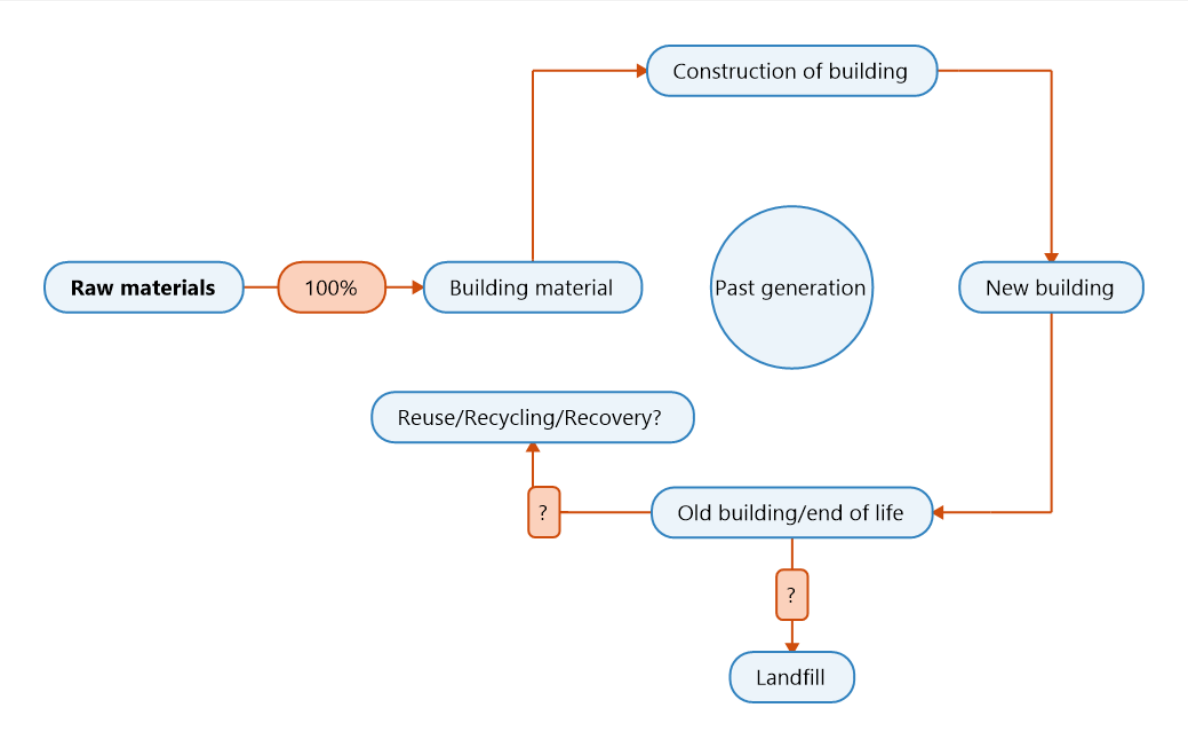
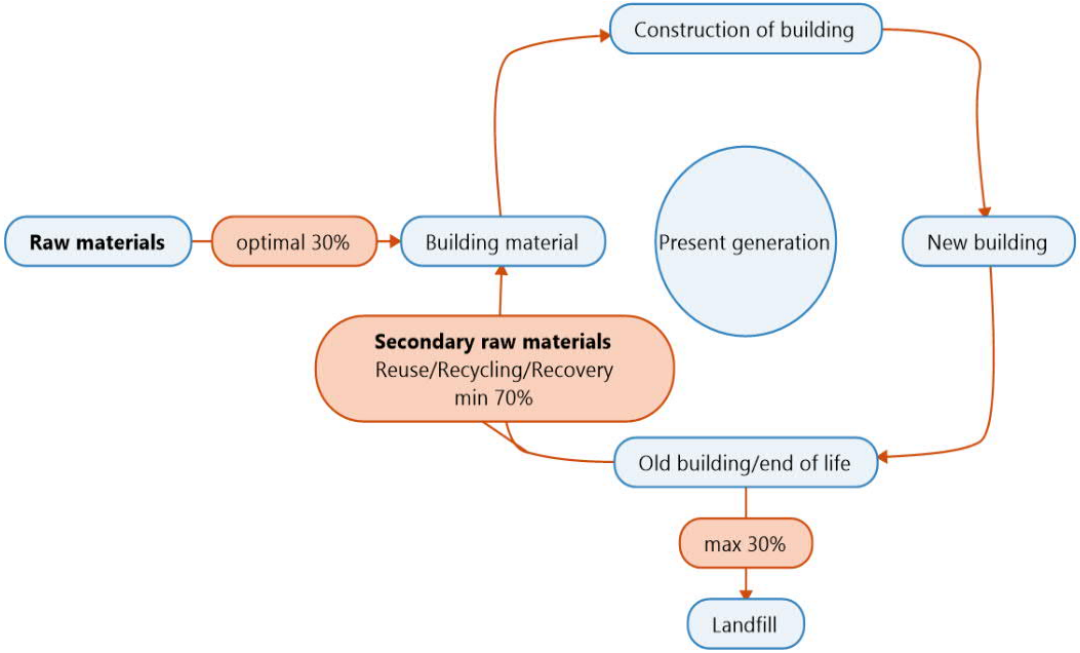
Past generation



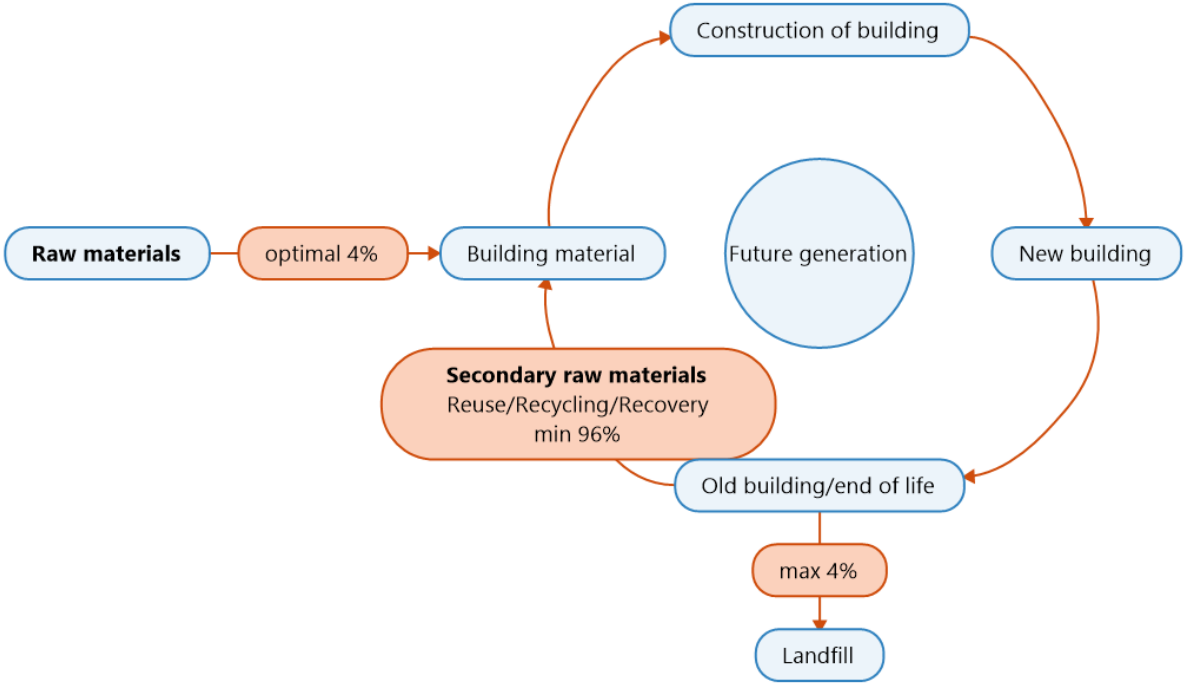
- Available only raw materials
- First buildings
- Start of material life

Present generation



- Globally, it is estimated that about 35% CDW is landfilled
- EU produced 374 million tonnes (33% of total waste) of CDW excl. excavation soil in 2016
- EU set a target of recover minimally 70% by weight of all non-hazardous CDW by 2020 in the EU Waste Framework Directive (2008/98/EC)

Future generation



- European Environmental Agency estimates that 96% of all mineral (inert) material from CDW can be recycled
- Whether future generation able to keep present material flow?

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What needs to be done?

Tools to support uptake

- Change of legislation
- Increase of fee for not sustainable handling of waste material
- Charges for wrong material treatment/disposal
- Requirements on SRM integration in new structures (BREEAM, LEED)

Response of industry

- Adaptation of new practices/stop the activity due to lack of competence after legislation change
- Change of habits to avoid high fees/disposal to nature
- Avoid wrong handling/do it smarter and invisibly
- Promis but do not deliver/the wrong method of utilisation due to lack of knowledge

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Additional challenges in Kolarctic program area

- Large distances (area 1.9 mil. km^2)
- Harsh arctic climate
- Sparsely populated (population 5.1 mil.)

→ Need for cross-border collaboration in order to accelerate good practice uptake

Europe: area 10.2 mil. km^2
population 745,2 mil.

DECONCRETE FOCUS AREAS

1. Increasing the recycling by improving the demolition practices
2. Reusing the demolition objects
3. Methods to improve the usage in quality and quantity
4. Ripple effects of the project findings

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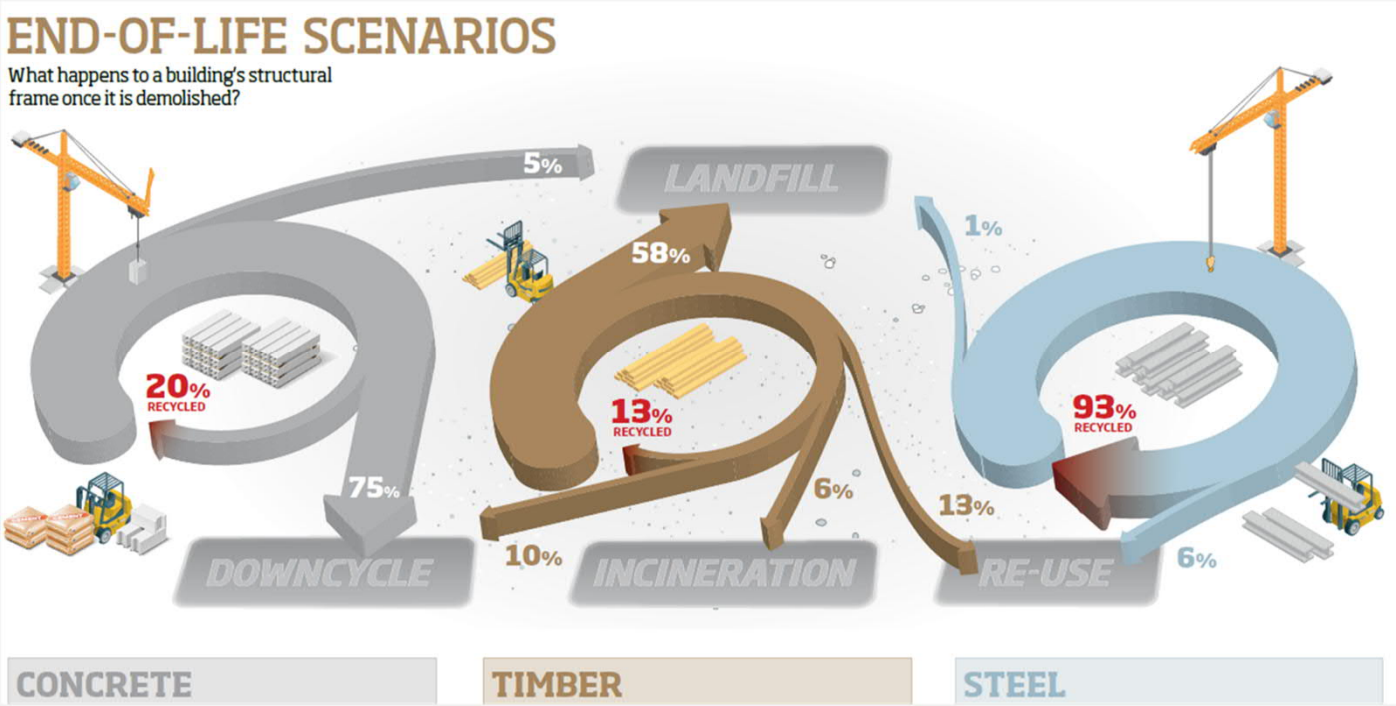
1.Increasing the recycling by improving the demolition practices
End-of-life scenarios

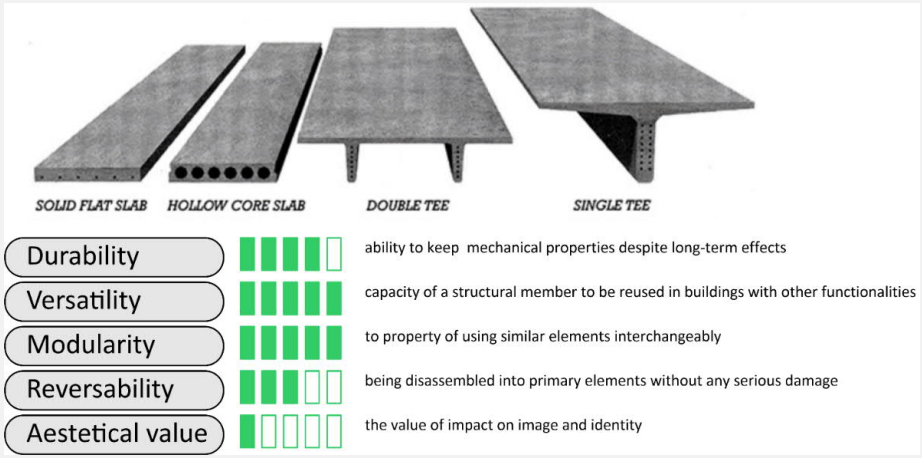


End-of-life scenarios for concrete, timber and steel materials

[*SteelConstruction.info. Recycling and reuse. 2020*]

1.Increasing the recycling by improving the demolition practices
Re-birth certificate -

- Issued for each element and integrated within global BIM
- Several layers of information
  - **Layer 1** (durability concerns)
  - **Layer 2** (in-depth knowledge)
  - **Layer 3** (performance at element level)

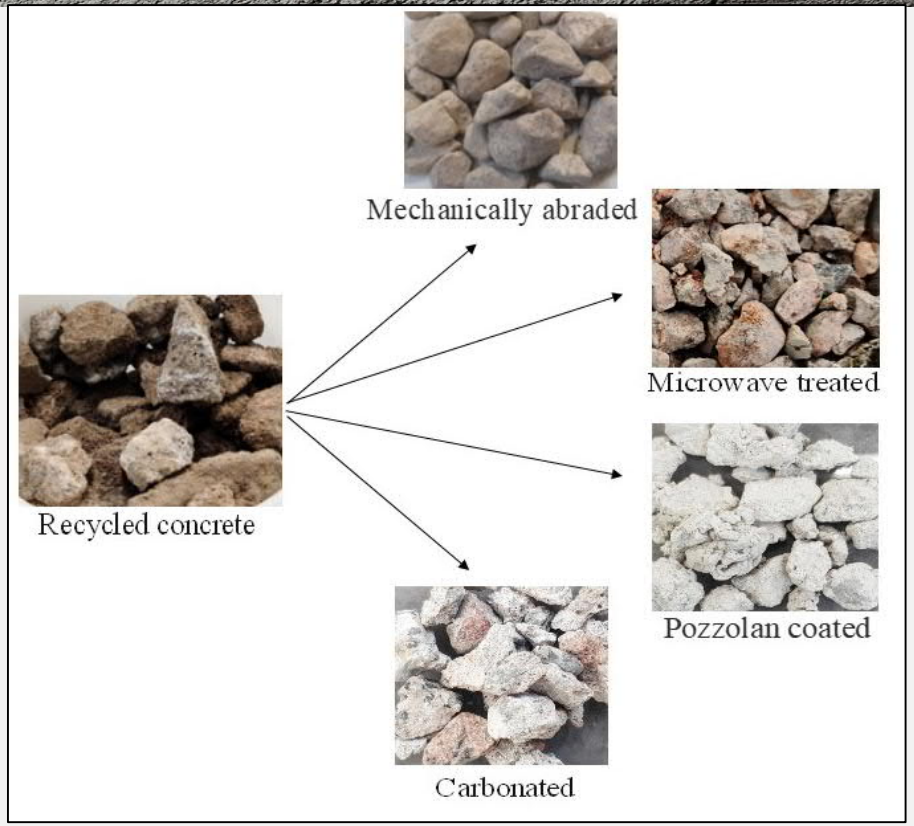


2. Reusing the demolition objects
Demolished concrete

- Recycled concrete: coarse (>4.75 mm) and fine fraction (<4.75 mm)

3. Methods to improve the usage in quality and quantity
Treatment methods

- Mechanical abrasion
- Microwave treatment
- Pozzolan coating
- Carbonation



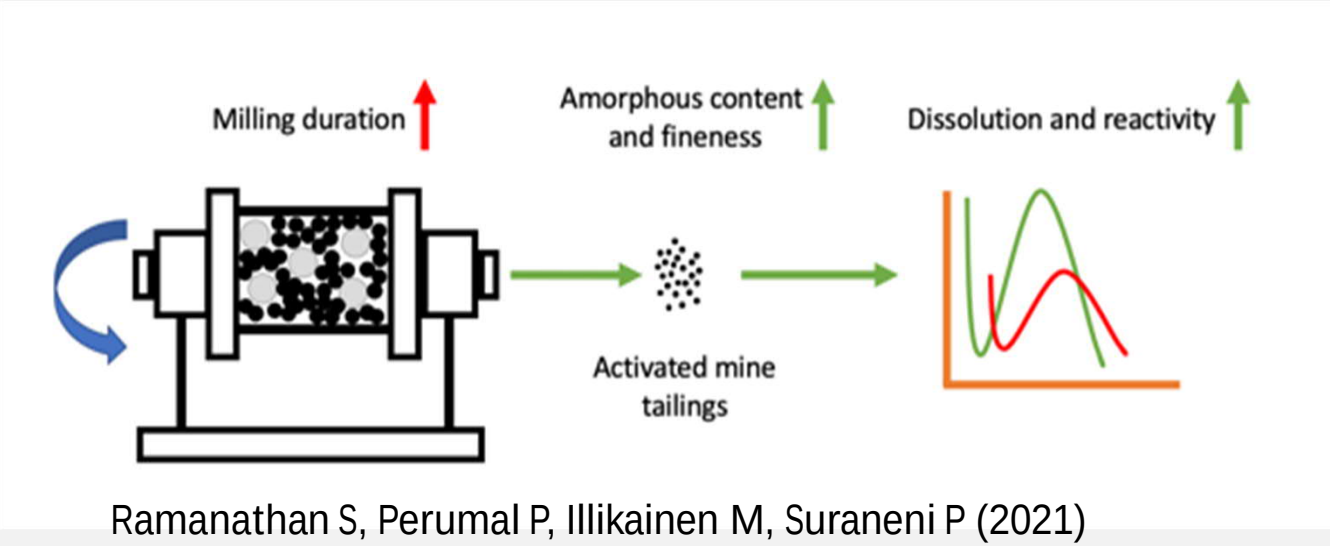
Perumal, P., & Omran, M. (2021). Sustainable Treatment Methods for Recycled Concrete. In *Concrete Beton* (Issue July, pp. 16–19). Cement & Concrete, SA.

Concrete fines and What can we do with it?

- Recycled concrete: coarse (>4.75 mm) and fine fraction (<4.75 mm)
  - Aggregate and sand replacement
- <75 µm, paste fractions! not acceptable as fine aggregate
  - Issue with dust
  - High contamination possibilities
  - Transportation is a problem

High Value application for fines

- Supplementary cementitious materials (SCMs)
  - Mechanochemical activation
  - Thermal treatment



Ramanathan S, Perumal P, Illikainen M, Suraneni P (2021) Mechanically activated mine tailings for use as supplementary cementitious materials. RILEM Tech Lett 6:61–69.

High volume application for fines

- Granulation of waste concrete powder for artificial aggregates!
- Low temperature curing methods, for example carbonation is a promising method together with granulation
  - Additional carbon capturing and storage!!!!

Fine concrete powder

Eirich high-shear granulator

Granulated concrete powder

4. Ripple effects

- Conducted workshops in Oulu (Finland) and Bodo (Norway)
- Dissemination in national/ international events
- Pitches in business gatherings
- New Interrag NPA project with consortium partners starting soon!
  - Low Carbon Concrete for Arctic Climate with Excellent Sustainability and Durability

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Thank you!!! Questions?!!!

2019, Arkhangelsk, Russia

2022, Bodø, Norway

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