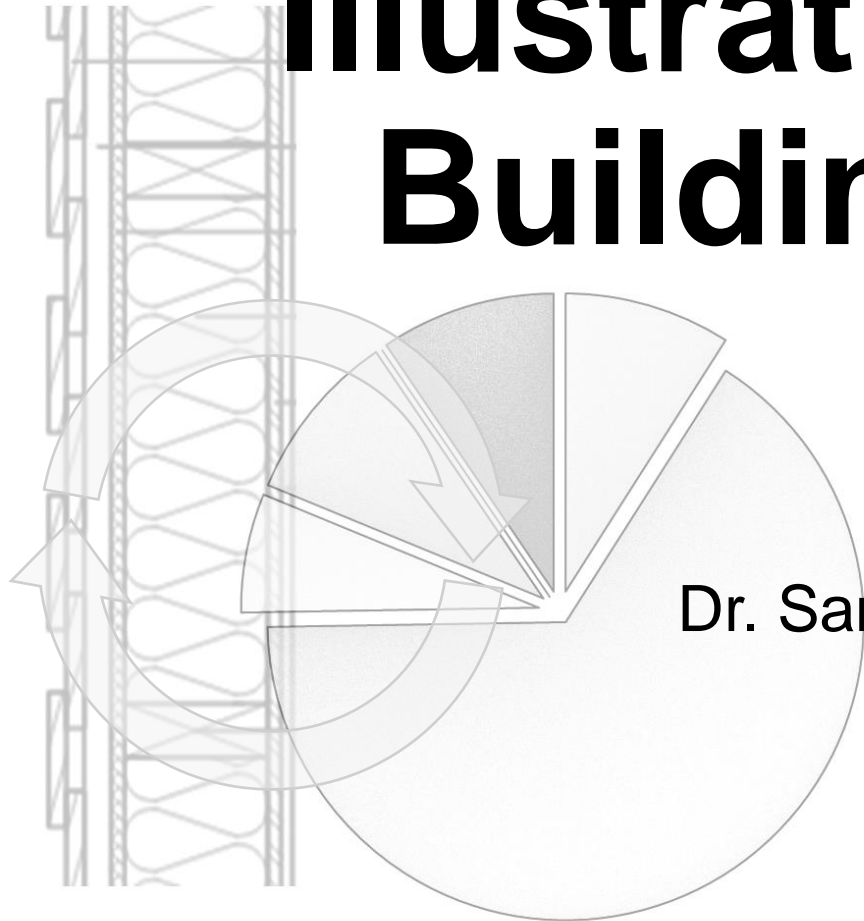


Illustrating Circularity of Building Components



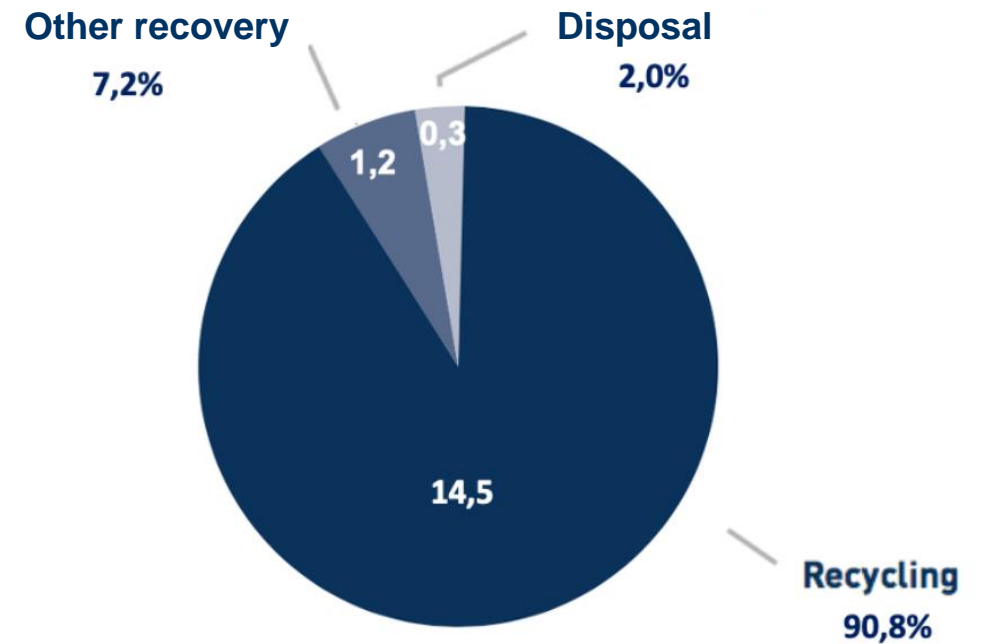
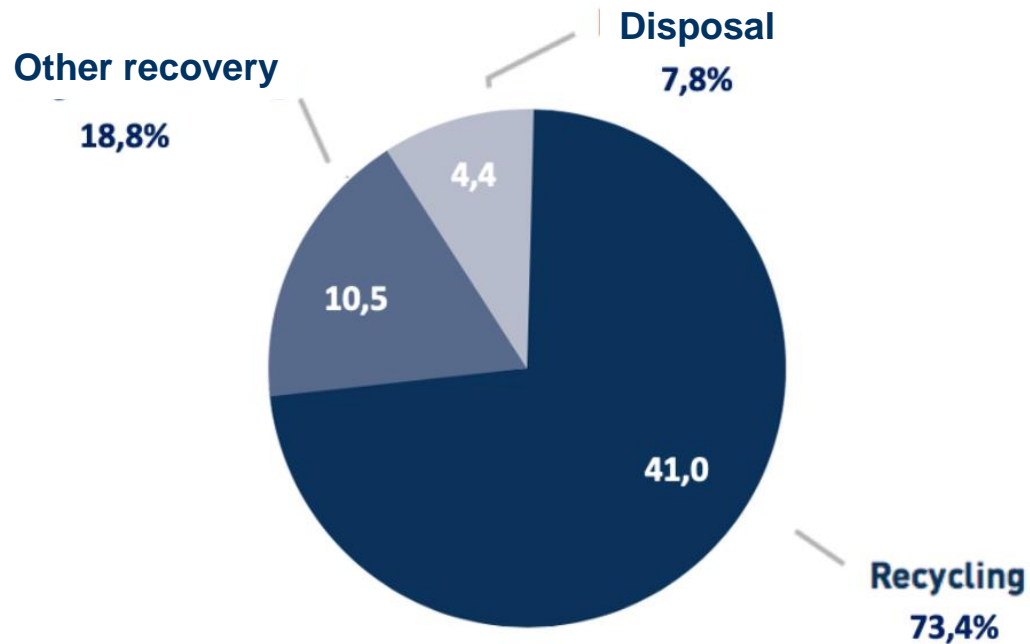
Dr. Samuel Ebert and Max Hartmann

1. Problem of Circularity
2. Recovery | Recycling
3. Differentiating recycling
4. Example for quantifiable Method
5. Results

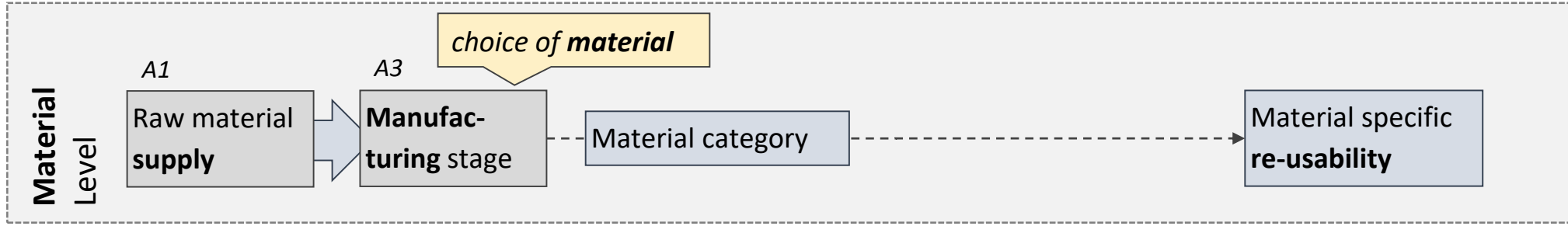
1. Problem of circularity

Average residue of construction debris (in mio. t)
Amount per year: 5.9 mio. t

Average residue of road debris (in mio. t)
Amount per year: 16.0 mio. t



2. Recovery | Recycling



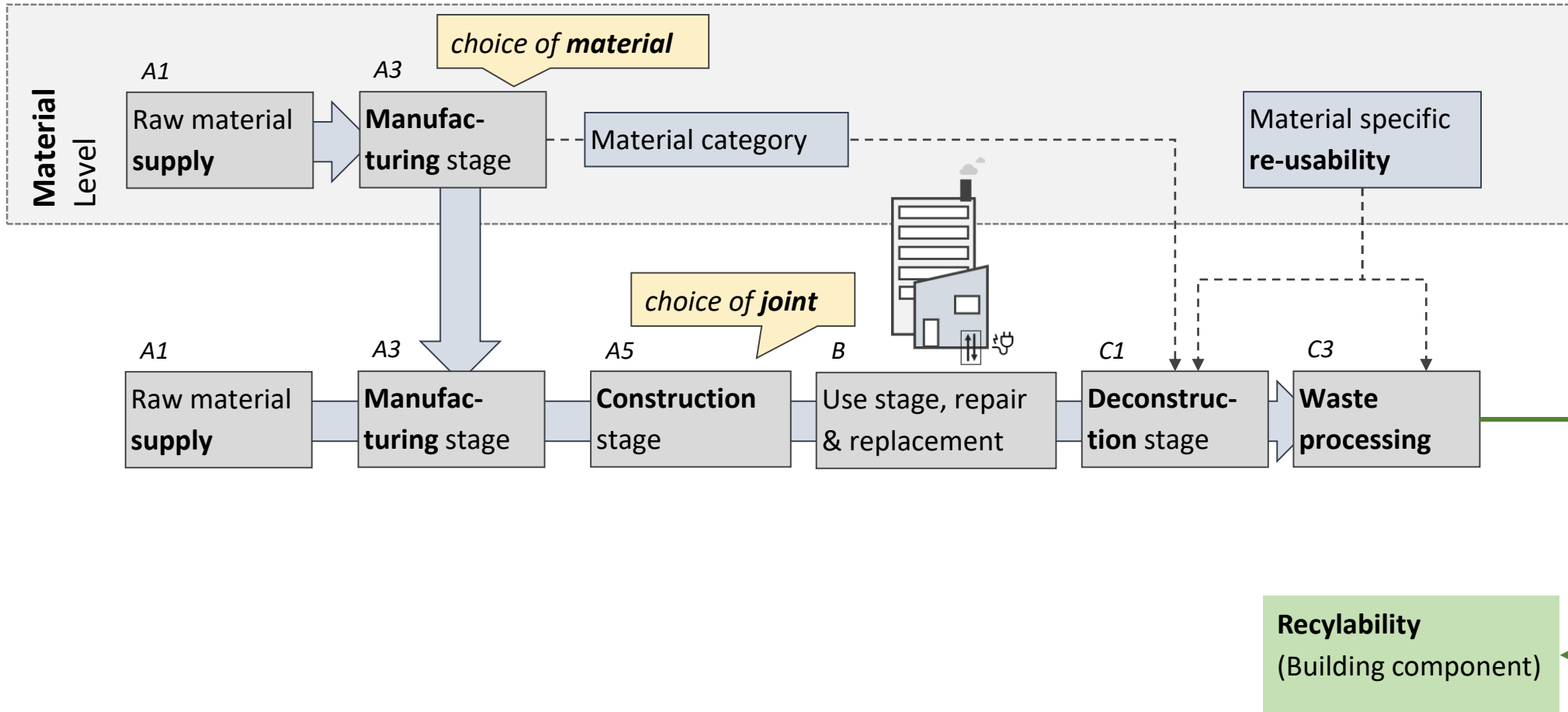
?

Recyclability
(Building component)

No complete coverage of RC capability by building materials.

Goal: *Maximise resource use while reducing and avoiding impacts.*

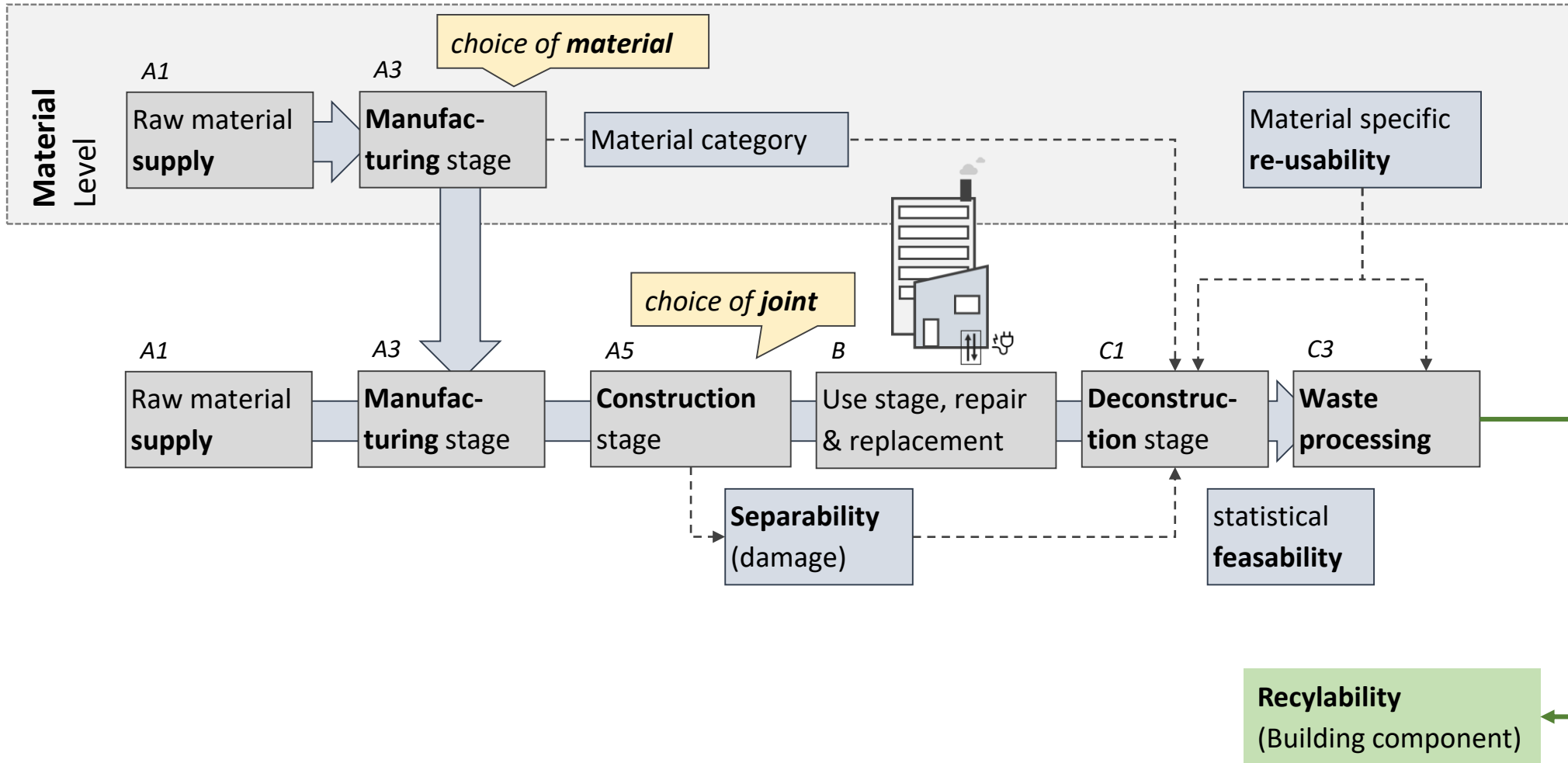
2. Recovery | Recycling



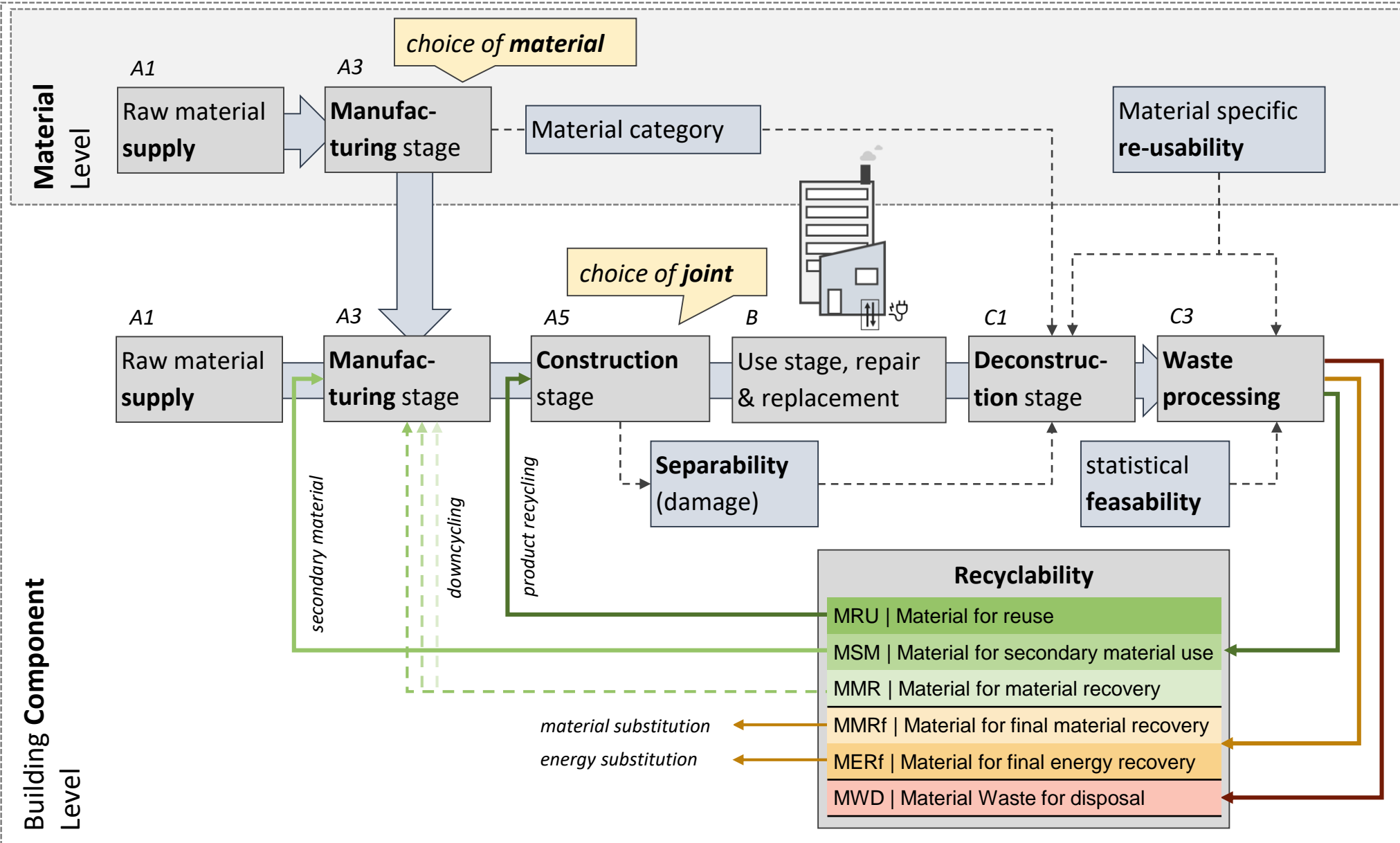
Which materials are chosen?
How are they joined?

Indicator: Use of raw materials in consistent cycles.

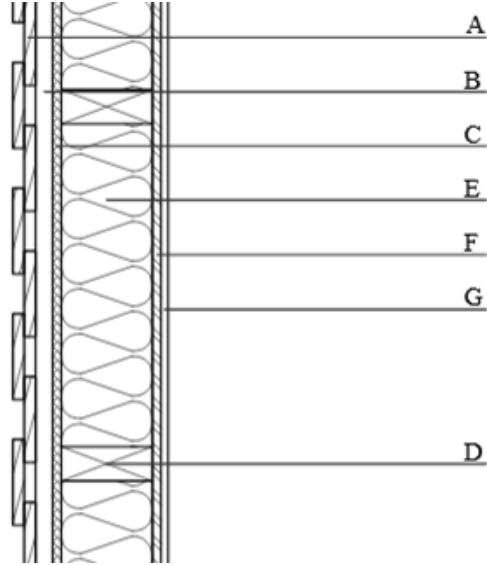
2. Recovery | Recycling



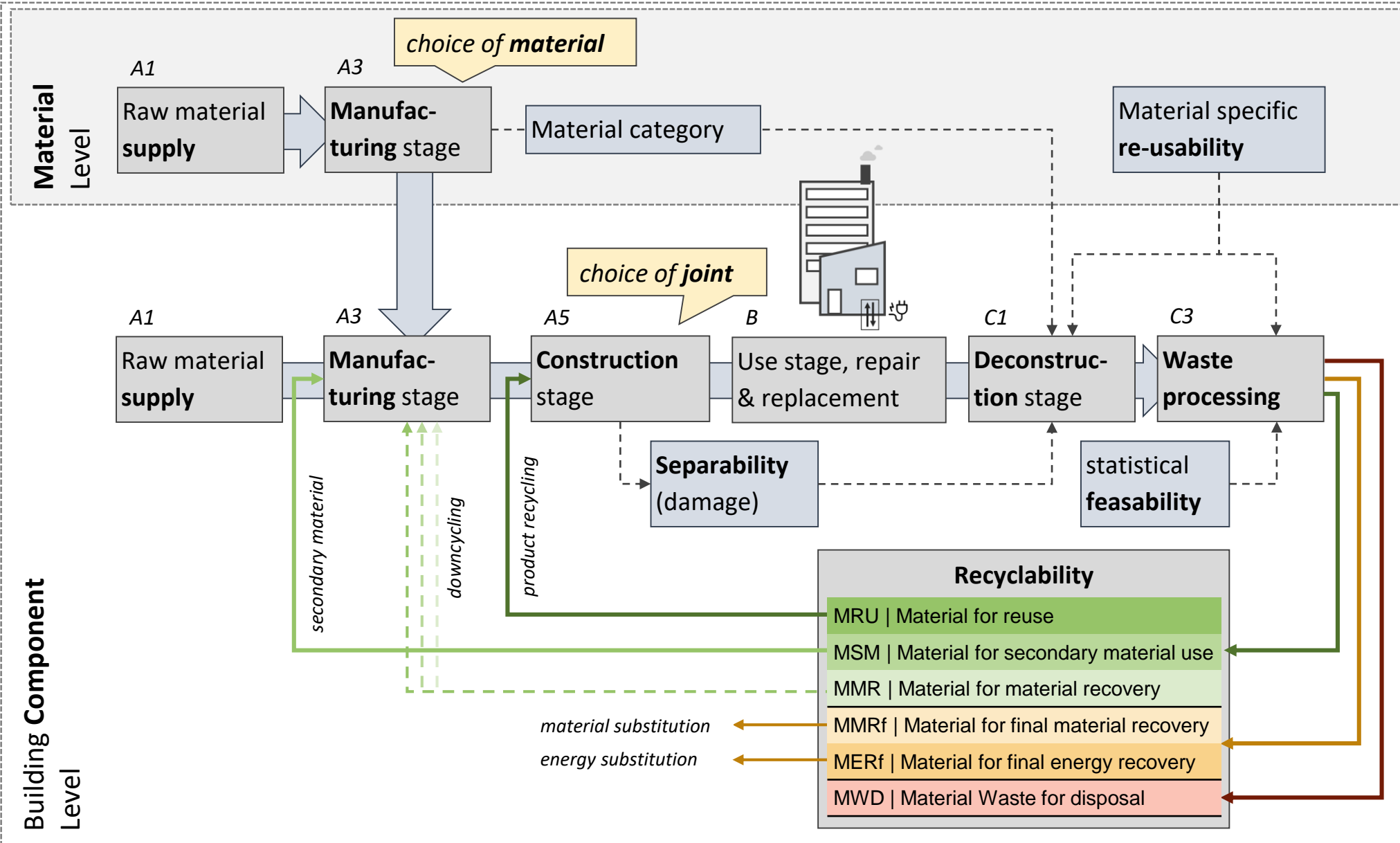
3. Differentiating recycling



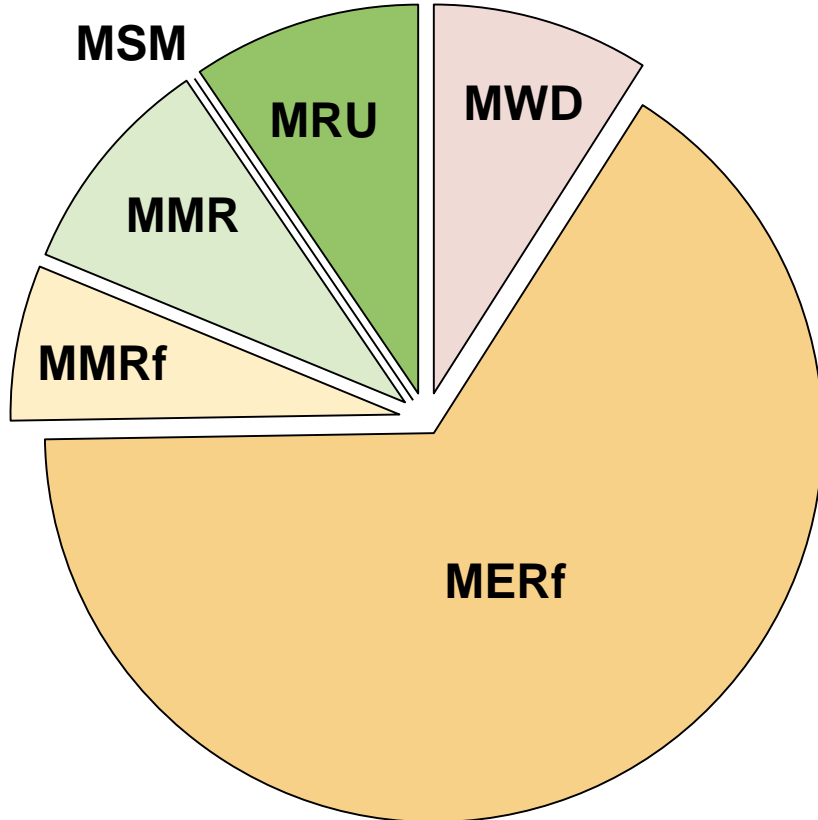
4. Example for quantifiable Method

Timber Frame Construction (EW-TF)	
	<p>A 24 mm timber cladding</p> <p>B 30 mm timber battens (w/d = 50/30, e = 625 mm)</p> <p>C 15 mm MDF board</p> <p>D 200 mm construction timber (w/d = 60/200, e = 625 mm)</p> <p>E 200 mm mineral wool insul.</p> <p>F 15 mm OSB</p> <p>G 15 mm gypsum fibre board</p>
U-value: 0.21 W/m ² K	
Thickness: 299.0 mm	
Mass: 61.4 kg/m ²	
Mass (incl. B4): 74.3 kg/m ² (+20.8 %)	

4. Example for quantifiable Method



4. Results of the Recyclability Model



MRU Material for reuse	7.1 kg/m ² (9.5 %)
MSM Material for secondary material use	0.0 kg/m ² (0.0 %)
MMR Material for material recovery	6.9 kg/m ² (9.3 %)
MMRf Material for final material recovery	4.8 kg/m ² (6.5 %)
MERf Material for final energy recovery	48.8 kg/m ² (65.8 %)
MWD Material Waste for disposal	6.7 kg/m ² (9.0 %)

5. Results

- Necessity of differentiating Recycling categories to identify the quality of possible circularity
- importance to consider joints of the component layers and the process of disassembling or deconstruction regarding destruction and separability
- Quantifiable and transparent results for the material output flows, which can be implemented in resource documentation