

2022 New York State ReUse Summit  
Ithaca, NY

**Closing the Loop**  
**Deconstruction, Reuse and Circular Construction**

**Felix Heisel**  
Circular Construction Lab, Department of Architecture, Cornell University



Global material extraction for building construction and operation  
Image: Edward Burtynsky; Source: International Energy Agency and the United Nations Environment Programme (2018)



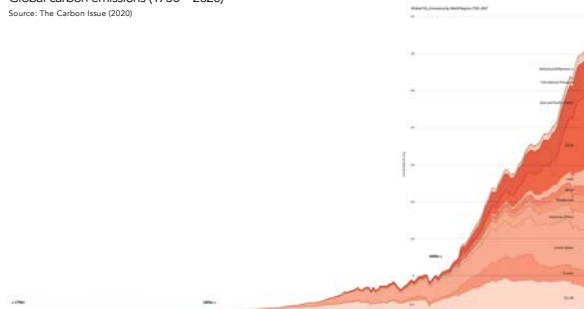
Global waste production from building construction and operation  
Image: Edward Burtynsky; Source: International Energy Agency and the United Nations Environment Programme (2018)



Global carbon emissions from building construction and operation  
Image: Stockfoto; Source: International Energy Agency and the United Nations Environment Programme (2018)



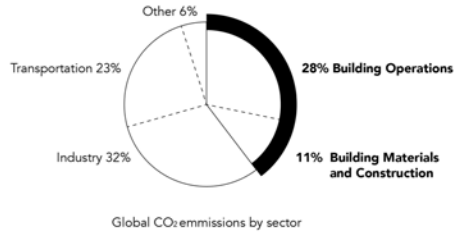
Global carbon emissions (1750 – 2020)  
Source: The Carbon Issue (2020)



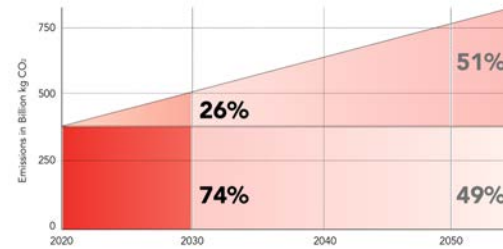
Carbon emission reduction scenarios to reach 1.5 °C Paris Goal  
Source: The Carbon Issue (2020)



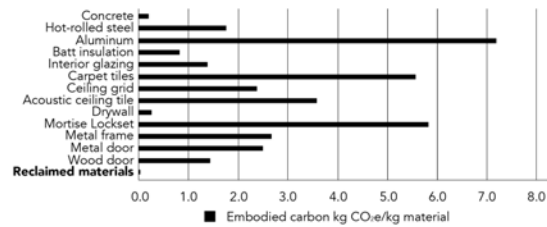
Global carbon emissions from building construction and operation  
Source: The Carbon Issue (2020)



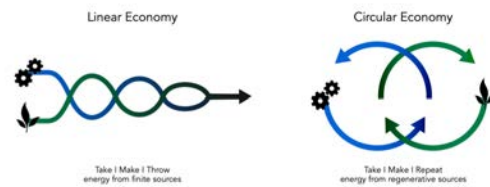
Global carbon emissions from new construction (2020-2050)  
Source: Architecture 2030 (2020)



Embodied carbon of selected building materials  
Source: Doors Unhinged (2020)



From linear resource consumption to circular economy  
Illustration: Felix Heisel based on Arup (2016)

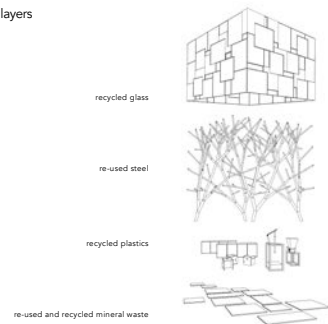


Defining the circular economy  
Source: Ellen MacArthur Foundation (2015)

A circular economy is one that is **restorative and regenerative by design** and aims to keep products, components, and materials at their **highest utility and value at all times**, distinguishing between **technical and biological cycles**.



Re-use and recycling: four material layers  
Illustration: Katna Wiese and Felix Heisel



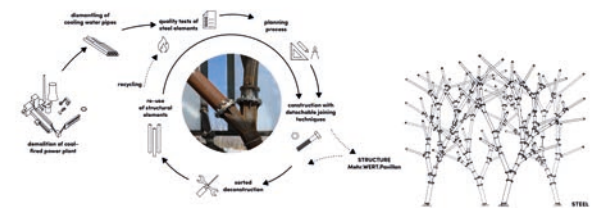
Re-used and recycled mineral waste  
Images: Felix Heisel, Jonathan Preker Copterbrothers



Recycled glass waste  
Image: Zooey Braun



Structure from reused steel  
Illustration: Katharina Blümke



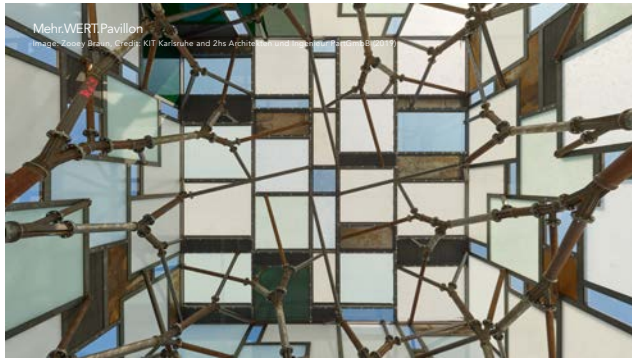
Coal-fired power plant Kneppers  
Image: Hagedorn



Testing samples  
Image: Felix Heisel







Circular Construction Lab, Cornell University  
<http://ccl.aap.cornell.edu>



ABOUT WORK TEAM PUBLICATIONS CONTACT

## CLOSING THE LOOP THROUGH DESIGN AND ENGINEERING

The Circular Construction Lab (CCL) is in the Department of Architecture at Cornell AUP focuses on design research program that advances the paradigm shift from linear material consumption towards a circular economy within an industrialized construction industry. As the intersection of sustainable engineering, material and computer science, as well as economics, the lab investigates new concepts, methods and processes to (1) design and construct buildings as the material inputs for future construction, and (2) activate the potential of the built environment as an urban center for today's construction. CCL understands architecture as part of a regenerative and restorative cycle and sees design as a vehicle that can advance this ambition with excellence in teaching and research. Through close collaborations with academic, industrial, and legislative partners, the lab ensures the relevance of its work and promotes the direct and full-scale implementation of research results towards a more sustainable, low-carbon, circular construction industry.

The Circular Construction Lab is directed by Assistant Professor Felix Hees.

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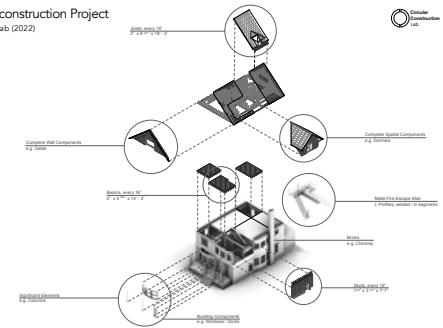


Collegetown Demolitions  
Jason Koski, Cornell University Relations (2022)



Catherine Commons Deconstruction Project  
Jason Koski, Cornell University Relations (2022)





Catherine Commons Deconstruction Project  
Joseph McGranahan, Circular Construction Lab (2022)



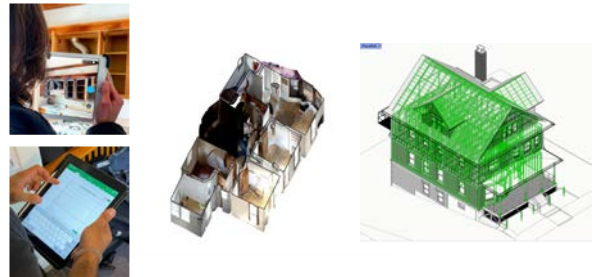
Post-Processing  
Felix Heisel, Circular Construction Lab (2022)



Reselling  
Felix Heisel, Circular Construction Lab (2022)



Salvage and Deconstruction Survey Tool Kit  
Circular Construction Lab (2021)

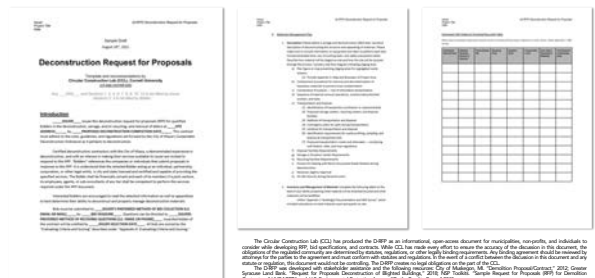


Salvage and Deconstruction Survey Tool Kit  
Circular Construction Lab (2022)

	Surface Area (m2)	Timber (kg)	Bio-Based Insulation (kg)	Plaster (kg)	Embodied Carbon Including Sequestered (kgCO2e)	Total Material Tonnage (US Ton)
Exterior Wall	388.86	2286.53	351.41	3704.74	4123.83	6.99
Interior Wall	388.86	100.20	0.00	7409.48	1132.94	8.28
Floor	199.63	6441.68	0.00	3802.94	9785.96	16.70
Roof	72.41	554.10	475.32	4427.02	2246.70	0.61
Stairs	47.36	491.10	0.00	0.00	644.32	0.54
Total	1329.58	9873.61	826.74	19344.18	17933.75	33.13

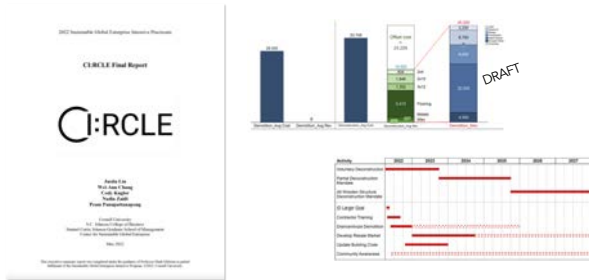


Deconstruction RFP Template  
Circular Construction Lab (2022)





Deconstruction Business Plan Development  
SC Johnson School of Business and Circular Construction Lab (2022)



Circularity, Reuse and Zero Waste Development  
CROWD (2020)



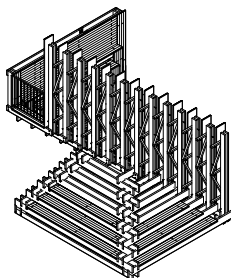
Sustainable Deconstruction Ordinance, City of Ithaca  
CROWD (2022)



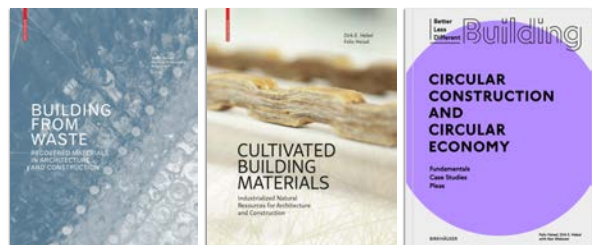
Circulating Matters at the 2022 Cornell Council of the Arts Biennial  
Circular Construction Lab (2022)



Circulating Matters at the 2022 Cornell Council of the Arts Biennial  
Circular Construction Lab (2022)



Building from Waste: Recovered Resources for Architecture and Construction (Birkhäuser, 2014)  
Cultivated Building Materials: Industrialized Resources for Architecture and Construction (Birkhäuser, 2018)  
Circular Construction and Circular Economy: Better Less Different Building (Birkhäuser, 2022)



Thank you!

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