Accelerating Circular Economy Transitions for a Sustainable Built Environment

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Impacts of the Built Environment

- 40% of global raw materials demand. (EPA 2018)
- >75% of construction waste ends up in landfills. (EPA 2018)
- 37% of global CO2 emissions. (Ellen MacArthur Foundation 2019)
- 10% of which are attributed to embodied carbon.
Linear vs. Circular Economy (CE)

Adopted from: What Design Can Do (WDCD) - 2021
CE & the Built Environment

- In 2020, only 8.6% of the consumed raw materials made it back to the economy (Circularity Gap 2020).

- Circularity gap of > 90%

- Built Environment: High Growth – High Waste?
CE Transitions: Scales and Directions

 Owners
- Reconsider?
- Owner requirements
- Certifications metrics

 Macro:
- Urban Stocks

 Meso:
- Project-level

 Micro:
- Firms

 A/E Firms
- Low impact design
- Design for adaptability
- Performance Specs

 Suppliers
- Material Passports & EPDs
- Sell and buy back
- Product as service

 Contractors
- Procurement
- Prefabrication
- Product Passports & EPDs
- Performance contracting

 Background

 Research Need

 Goal

 Research Focus

 Contributions
CE Transitions: Scales and Directions

Top-Down (Command & Control)
- Legislations
- Incentives
- Awareness

Bottom-Up (Market Model)
- BMs
- Technologies
- Materials

Background
Research Need
Goal
Research Focus
Contributions
Accelerate CE transitions in the construction sector through a systems-based approach, accounting for:

- Scales and directions of change.
- The uniqueness of the construction industry, the diversity of its stakeholders.
Construction Stakeholder-specific CE Transition Strategies

CE in Green Building Certifications

CE & Sustainability

Policy & Complex Systems

Modeling and Simulation of CE Transitions

Construction Engineering & Management

Construction Procurement and Contracting for the CE

Top-Down / Bottom-Up

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Contributions
“For investors and construction clients, adopting the circular economy means an improved return on investment, while also contributing to achieving carbon emissions targets.” — Ellen MacArthur Foundation, 2021

“Adopting circular economy principles could significantly enhance global construction industry productivity, saving at least US$100bn a year.” — World Economic Forum, 2016