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Environmental and
Energy Study Institute

Materials will be available at:

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CONGRESSIONAL BRIEFING

Building Materials: From Production to Reuse

Briefing Series: Reduce and Reuse

**How to Cut Greenhouse Gas Emissions of Building
Materials, Plastics, and Food**

Wednesday, December 08, 2021

About EESI...



NON-PROFIT

Founded in 1984 by a bipartisan Congressional caucus as an independent (i.e., not federally-funded) non-profit organization



NON-PARTISAN

Source of non-partisan information on environmental, energy, and climate policies



DIRECT ASSISTANCE

In addition to a full portfolio of federal policy work, EESI provides direct assistance to utilities to develop “on-bill financing” programs



SUSTAINABLE SOCIETIES

Focused on win-win solutions to make our energy, buildings, and transportation sectors sustainable, resilient, and more equitable

Polycymaker Education

Briefings and Webcasts



Live, in-person and online public briefings, archived webcasts, and written summaries

Climate Change Solutions



Bi-weekly newsletter with everything policymakers and concerned citizens need to know, including a legislation and hearings tracker

Fact Sheets and Issue Briefs



Timely, objective coverage of environmental, clean energy, and climate change topics

Social Media (@EESIOnline)



Active engagement on Twitter, Facebook, LinkedIn, and YouTube



Other Relevant 2021 Briefings



April 20, 2021

[Rethinking Reduce, Reuse, and Recycle: Policies and Programs to Address Waste](#)

eesi.org/042021waste



February 26, 2021

[Congressional Climate Camp #2: Federal Policies for High Emitting Sectors](#)

eesi.org/022621camp

Rethinking Reduce, Reuse, and Recycle: Policies and Programs to Address Waste

April 20, 2021



Contact

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Materials

04_20_2021 Full Slide Deck

Congressional Climate Camp #2: Federal Policies for High Emitting Sectors

Briefing Series: Congressional Climate Camps

February 26, 2021



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Full Slide Deck for Congressional Climate Camp #2: Federal Policies for High Emitting Sectors

“Reduce and Reuse” Briefing Series

5

-  **December 08** **Building Materials: From Production to Reuse**
-  **December 09** **The Climate Consequences of Plastics**
-  **December 10** **Reducing Emissions by Reducing Food Waste**

Sign up for the Full Series: <https://www.eesi.org/1221waste>

Building Materials

Impacts and Opportunities

EESI

Jordan Palmeri

Oregon Department of Environmental Quality

12/8/21

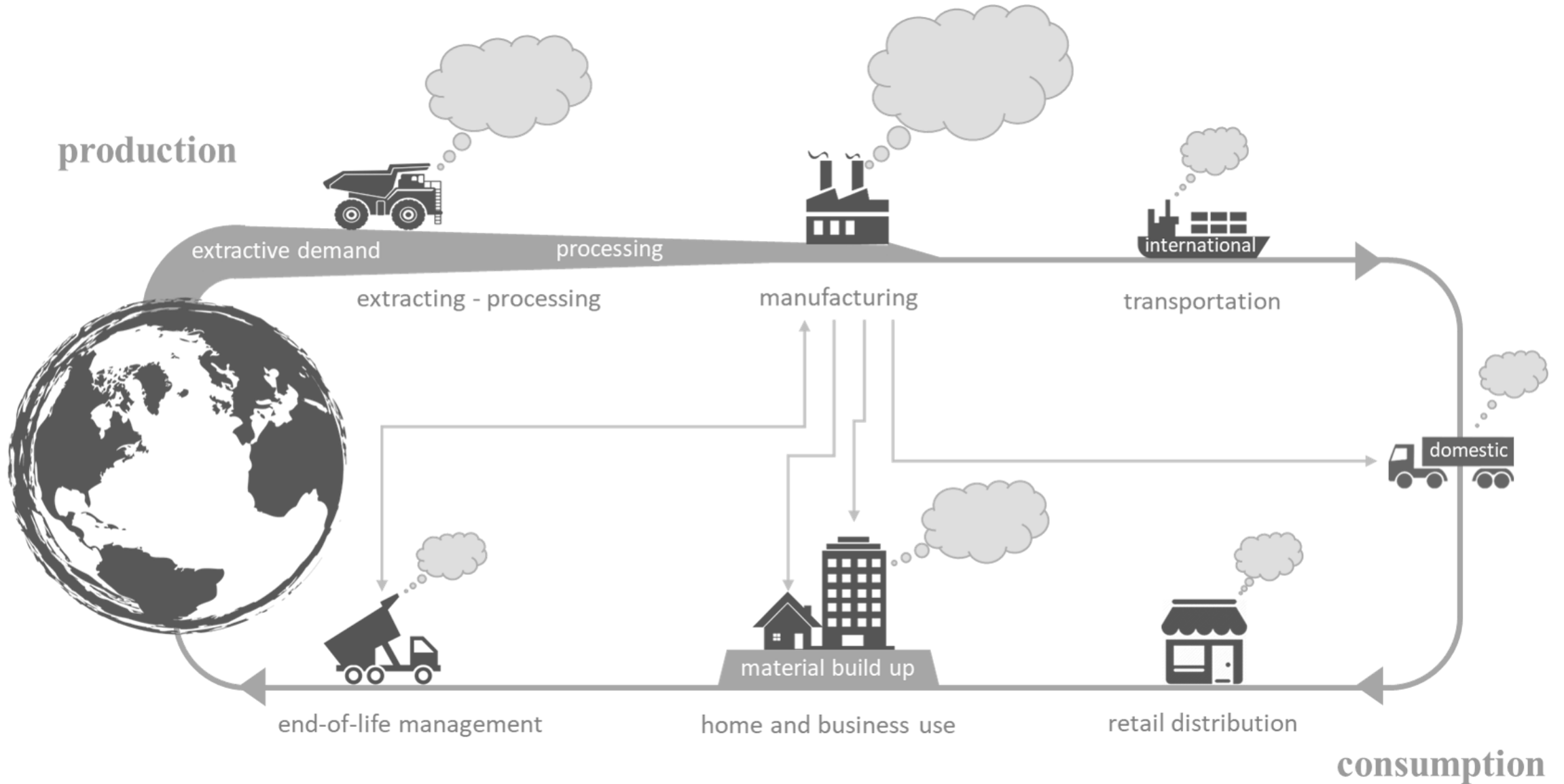
Outline

1. Carbon impacts of building materials
2. Short term – carbon reduction opportunities
3. Long term – moving towards circular building material sector

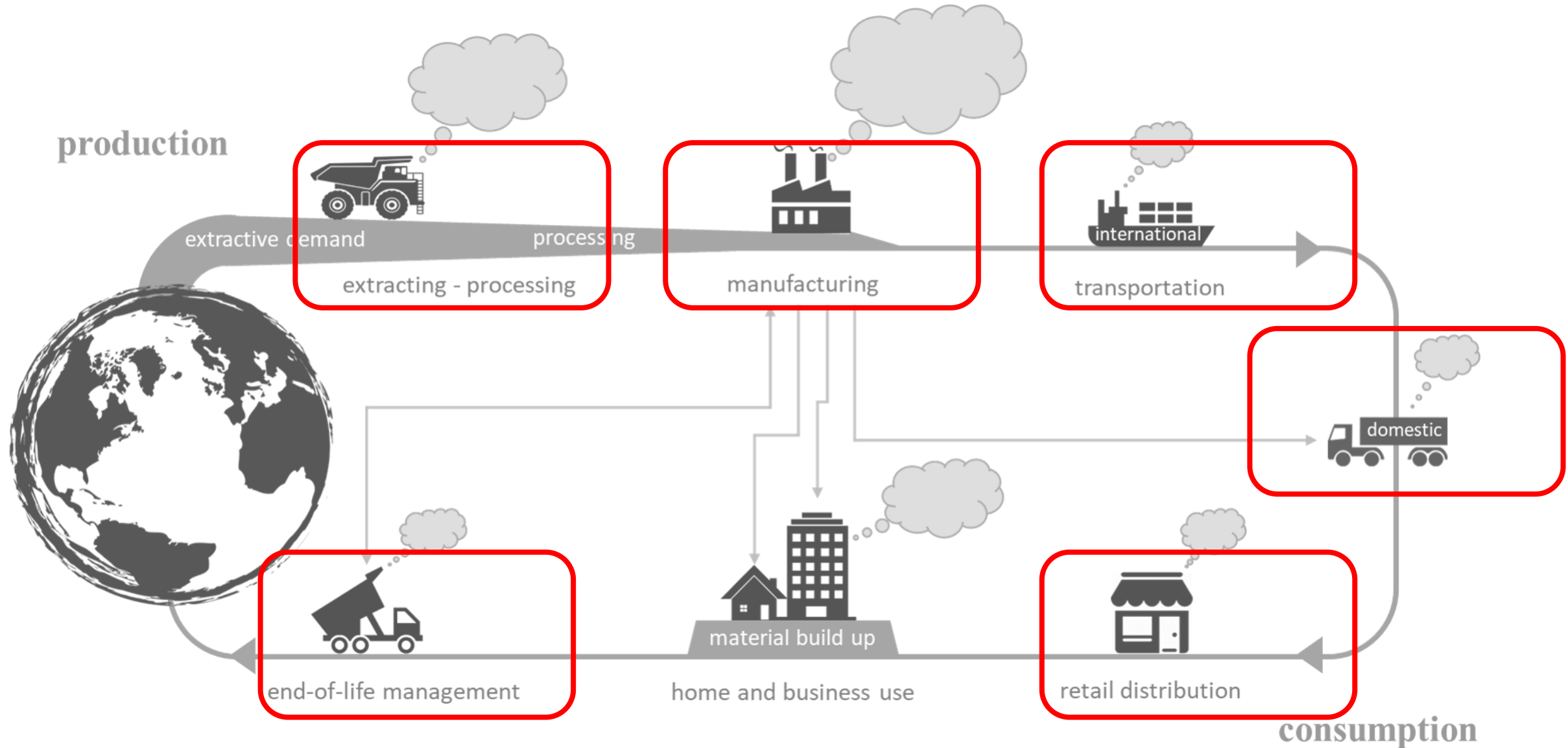


Carbon impacts of building materials

Product lifecycle

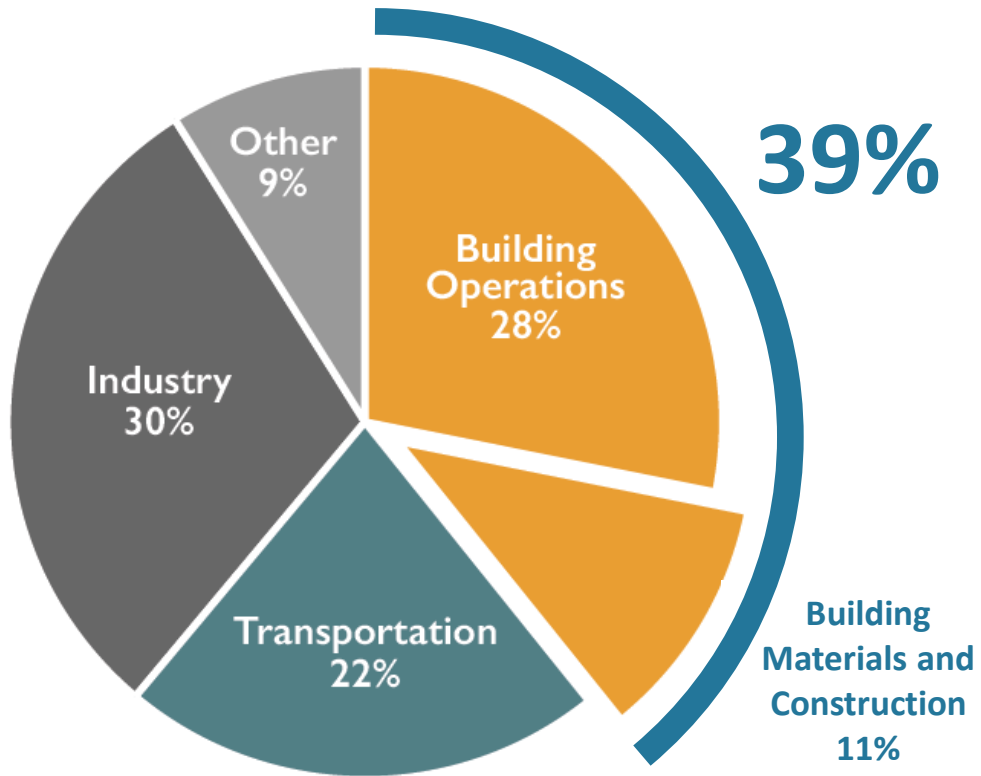


Product lifecycle – embodied carbon focus areas

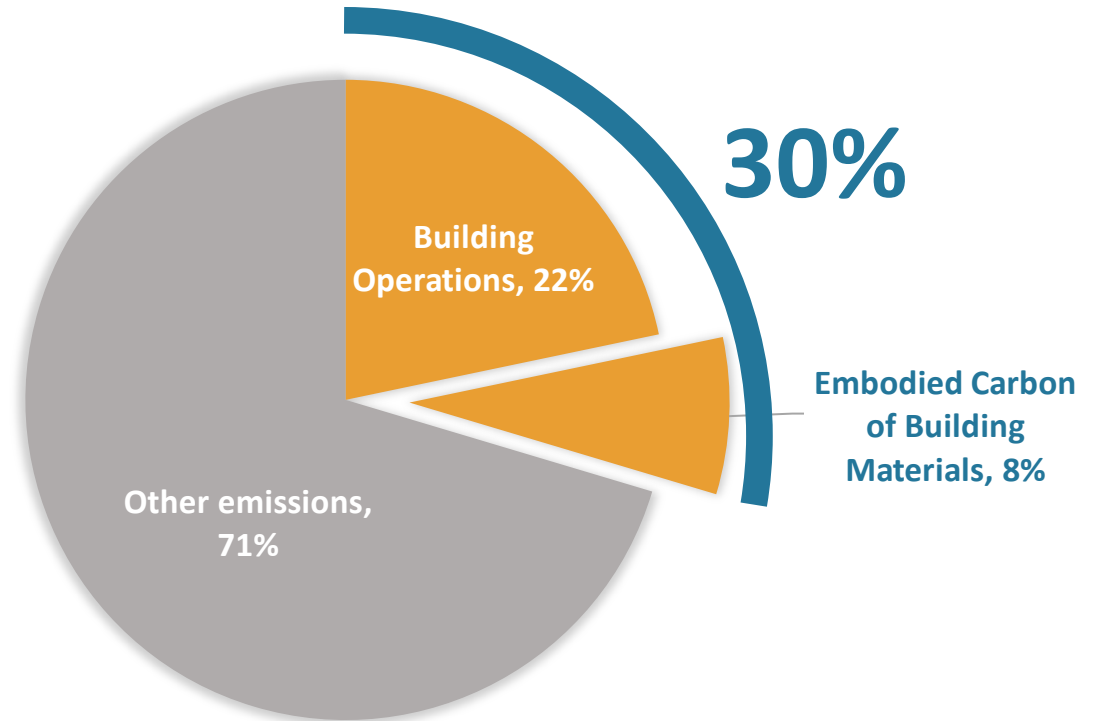


CO2 emissions

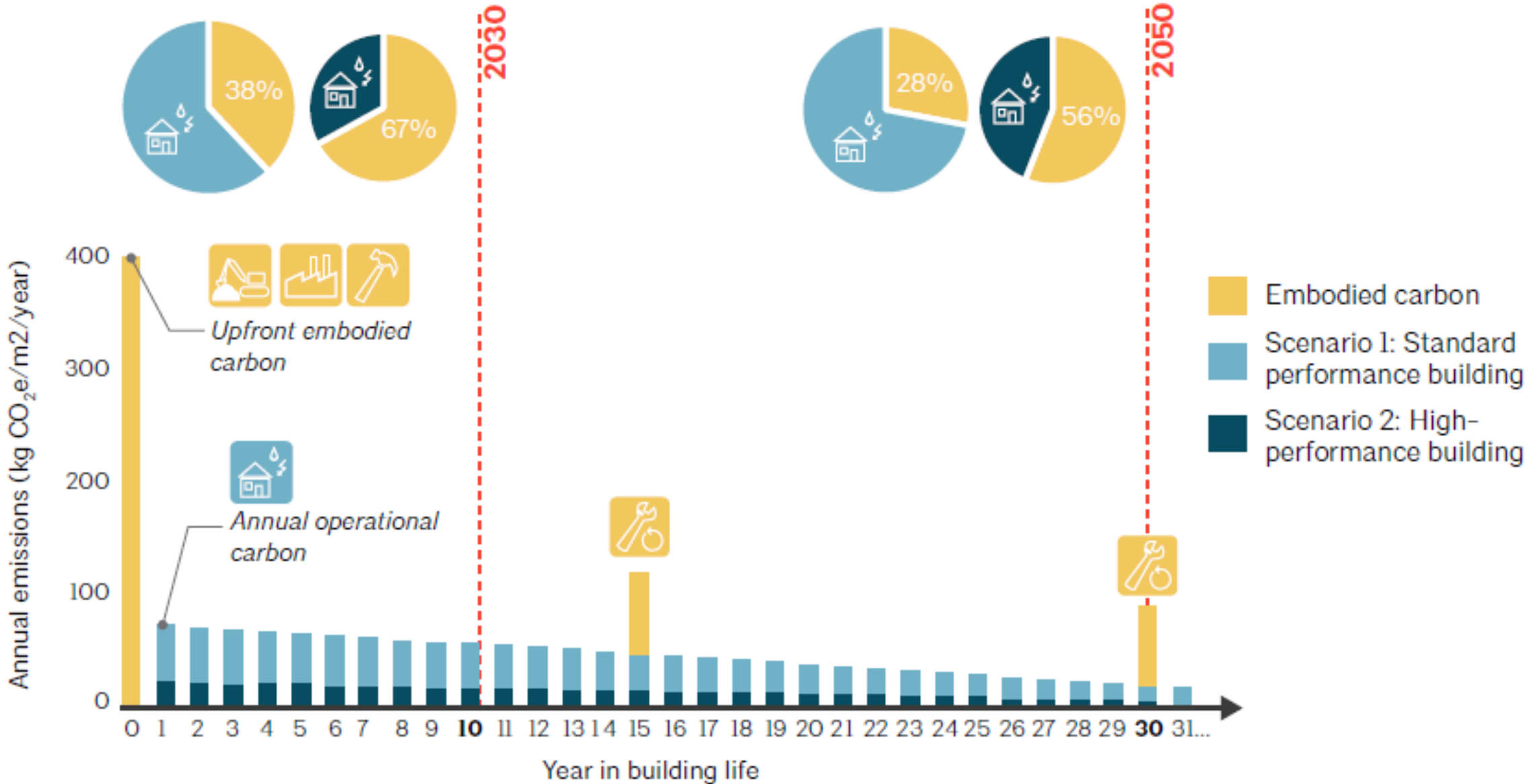
Global



Oregon consumption-based



Embodied vs. Operational Carbon



Source: AIA / CLF Embodied Carbon Toolkit

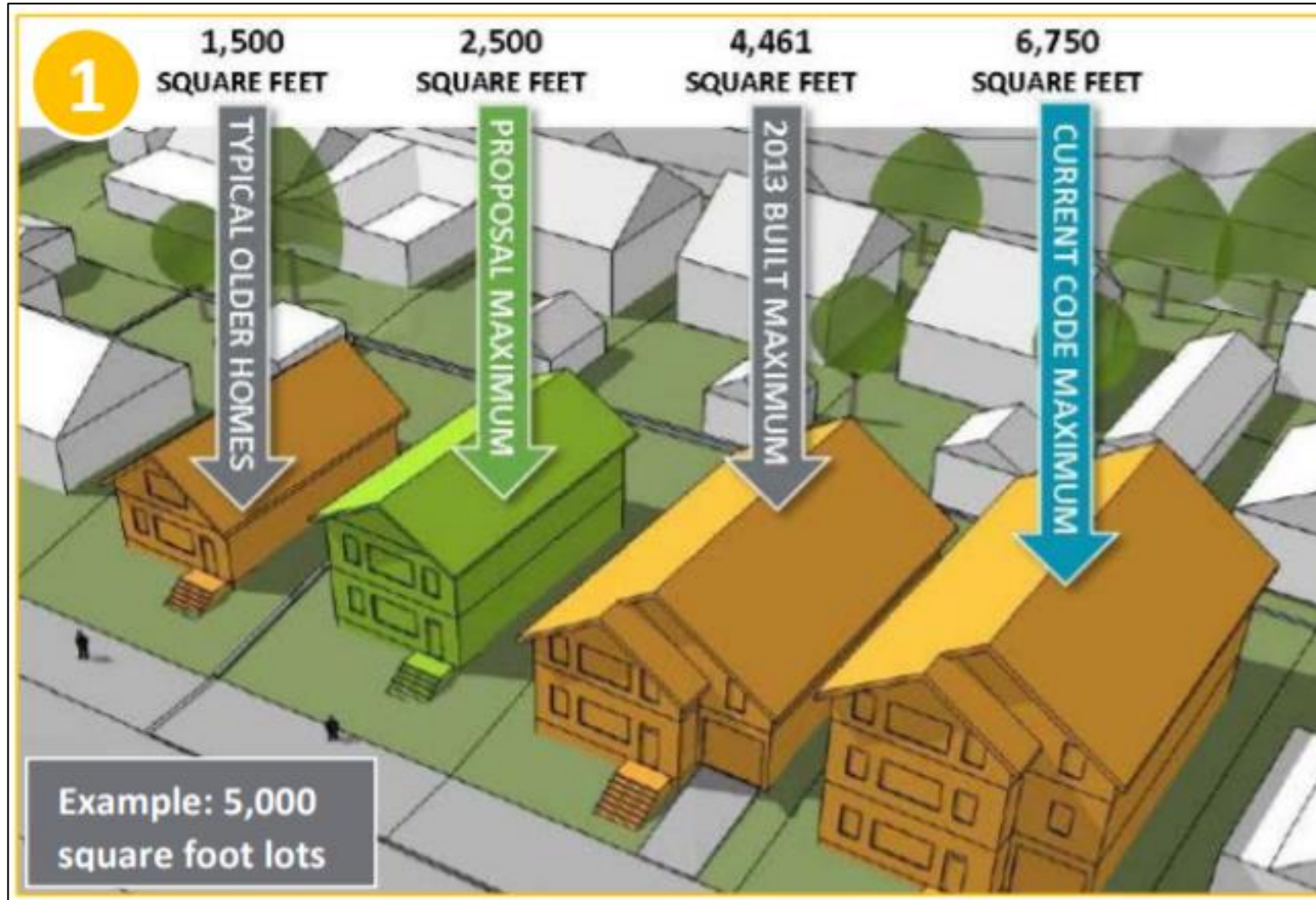
Strategies to reduce embodied carbon

- Build less
- Reuse existing buildings
- Build smaller
 - occupancy matters
- Reuse materials
- Optimize building
 - whole building LCA
- Optimize materials
 - EPDs
 - other certifications
- Minimize waste
- Recover waste



Reduction strategies – short term

City of Portland - Zoning Code



Vancouver, BC – whole building LCA requirement

Policy

- Requires reporting of embodied emissions for all rezoned buildings
- Equivalent annual embodied emissions values must be reported alongside operational emissions in kgCO₂e/m²/year
- Data collected by city to understand scale of embodied emissions



City of Portland – Deconstruction requirement



Environmental Product Declarations (EPDs) for public purchasing

BUY 
CLEAN



Other State Efforts:

- Oregon
- New York
- Washington
- Minnesota

Federal Efforts:

- Buy clean Procurement Requirements

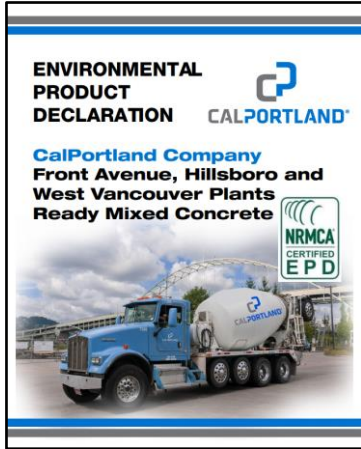
What is an Environmental Product Declarations (EPD)?

- Disclosure label that reports the environmental impacts of products
- Typically include impacts of raw material extraction, transportation, and manufacturing
- Third party certified against ISO standards

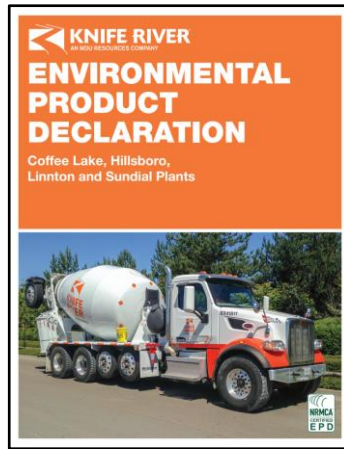
ENVIRONMENTAL IMPACTS	
Declared Product: Mix 45SS420A • Bend Plant Exterior SOG Compressive strength: 4000 PSI at 28 days	
Declared Unit: 1 m ³ of concrete	
Global Warming Potential (kg CO₂-eq)	387
Ozone Depletion Potential (kg CFC-11-eq)	9.8E-6
Acidification Potential (kg SO₂-eq)	2.42
Eutrophication Potential (kg N-eq)	0.47
Photochemical Ozone Creation Potential (kg O₃-eq)	58.0
Abiotic Depletion, non-fossil (kg Sb-eq)	1.2E-6
Abiotic Depletion, fossil (MJ)	1,229
Total Waste Disposed (kg)	2.76
Consumption of Freshwater (m³)	2.89
Product Components: natural aggregate (ASTM C33), Portland cement (ASTM C150), batch water (ASTM C1602), slag cement (ASTM C989), admixture (ASTM C260)	

Additional detail and impacts are reported on page three of this EPD

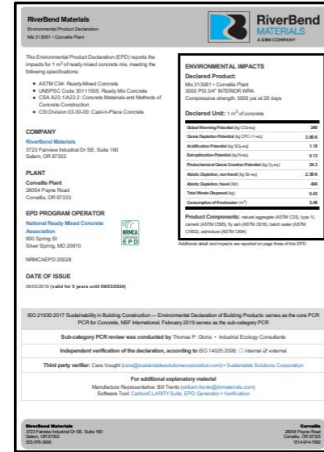
Oregon Concrete EPDs



CalPortland



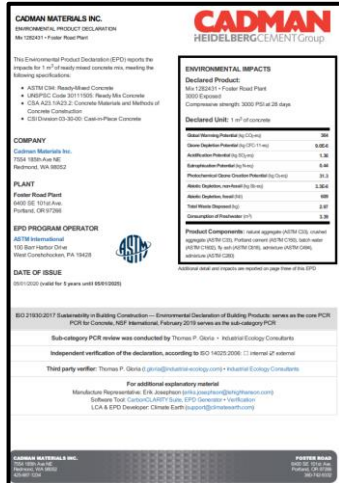
Knife River



RiverBend



Hooker Creek



Cadman



Wilsonville

Program stats:

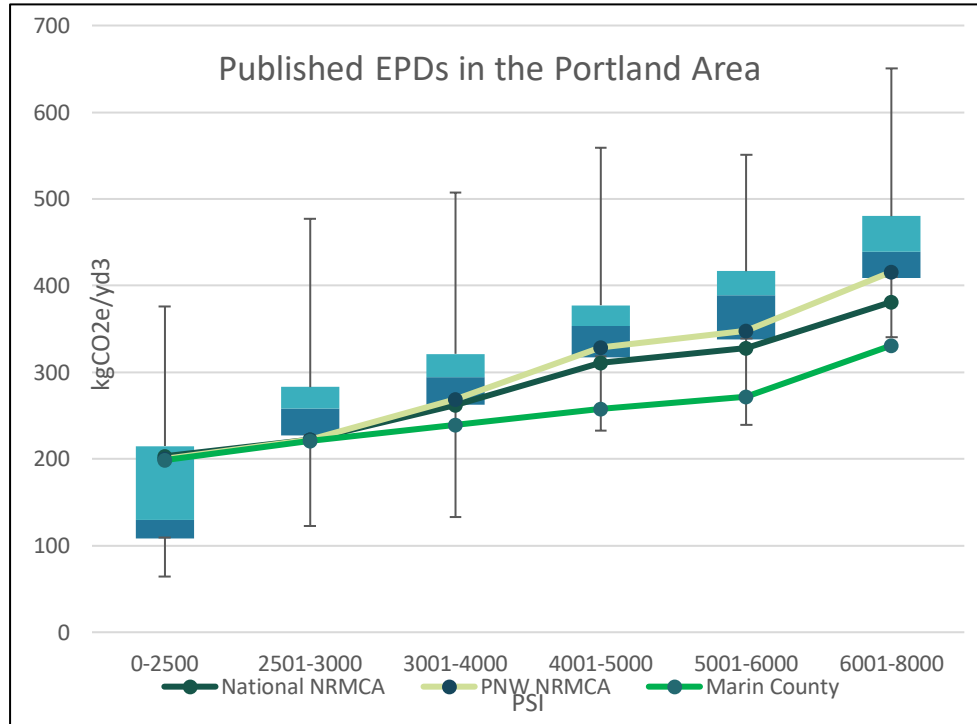
- 10 companies
- 21 central batch plants
- 4 mobile mix plants
- Over 1500 EPDs produced

City of Portland Concrete Procurement Policy



- Jan 1, 2020
 - EPDs required on all City projects
- Jan 1, 2022
 - City publishes GWP threshold
- ~ June 1, 2022
 - All EPDs must be below threshold

Concrete – policy + pilots



2020 Low Carbon Concrete Sidewalk Pilot

This case study provides information on the City of Portland's first round of low-carbon concrete pilot projects, featuring sidewalk ramps within the City's Bureau of Transportation.

October 2020



Additional City of Portland Pilot Projects



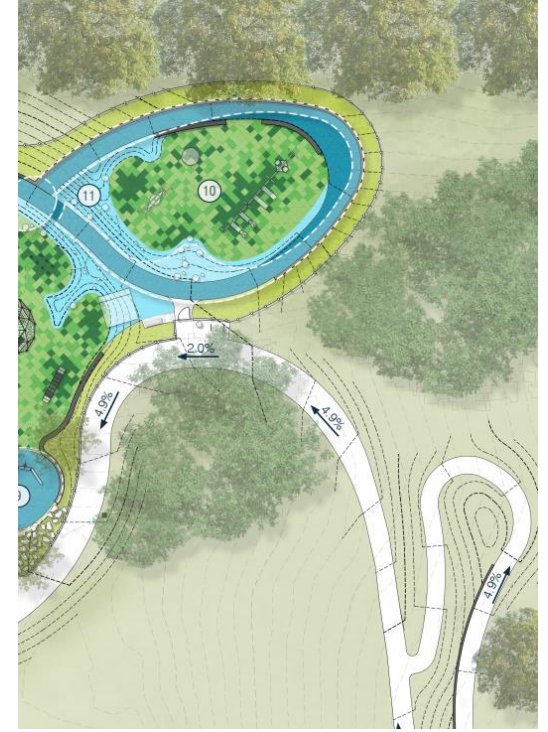
Traffic signal
pole footing



Driveways



Pavement and
ADA ramps



Stormwater +
Playground

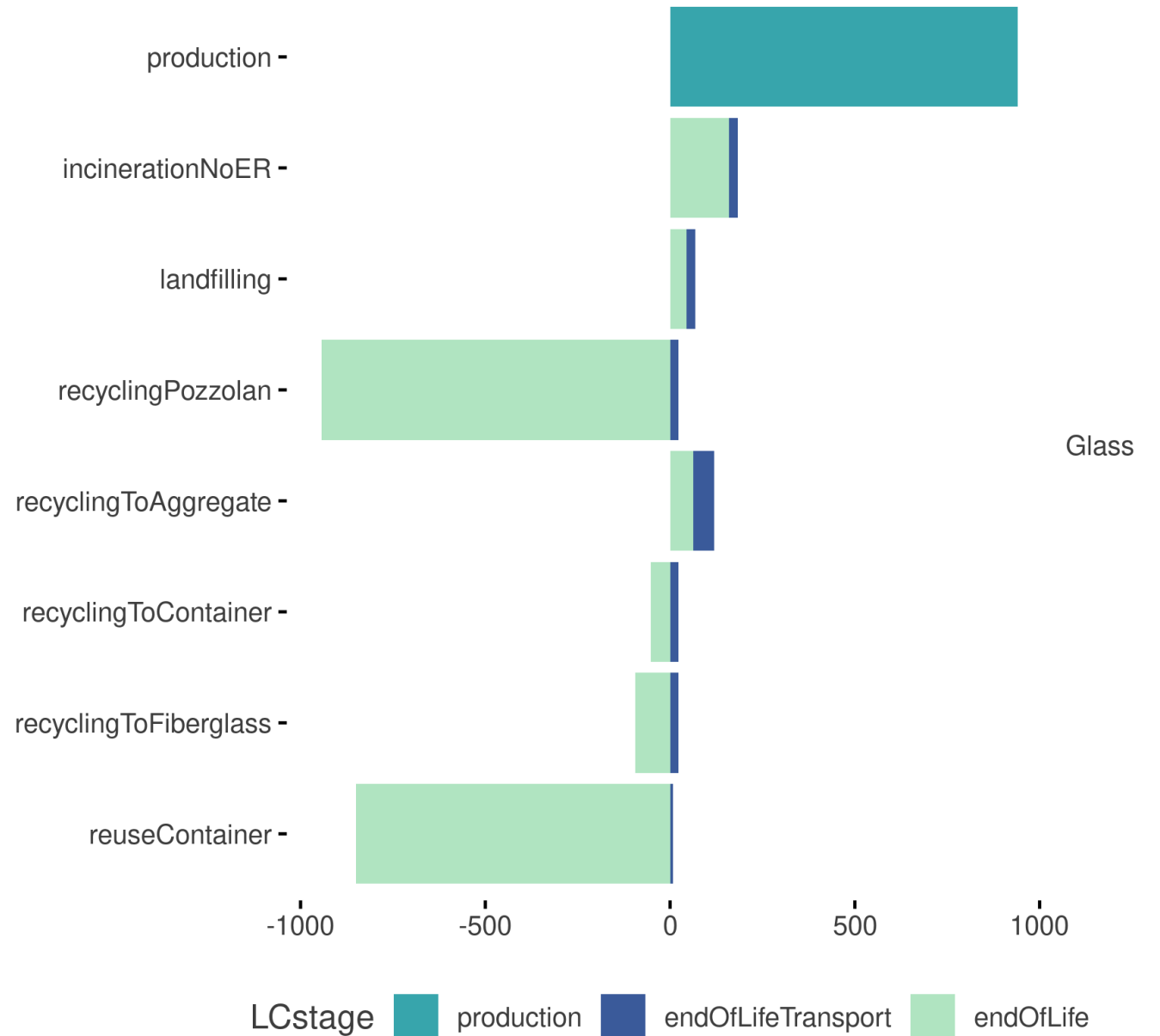
Marin County, California - Building Code

Table 19.07.050 Cement and Embodied Carbon Limit Pathways

	Cement limits for use with any compliance method 19.07.050.2 through 19.07.050.5	Embodied Carbon limits for use with any compliance method 19.07.050.2 through 19.07.050.5
Minimum specified compressive strength f_c , psi (1)	Maximum ordinary Portland cement content, lbs/yd ³ (2)	Maximum embodied carbon kg CO _{2e} /m ³ , per EPD
up to 2500	362	260
3000	410	289
4000	456	313
5000	503	338
6000	531	356
7000	594	394
7001 and higher	657	433
up to 3000 light weight	512	578
4000 light weight	571	626
5000 light weight	629	675
Notes		
(1) For concrete strengths between the stated values, use linear interpolation to determine cement and/or embodied carbon limits.		
(2) Portland cement of any type per ASTM C150.		

Long term – moving towards circular building material sector

GWP 20 impacts per ton of waste (kg CO2 eq.)



materials management

conserving resources · protecting the environment · living well

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503-229-6766

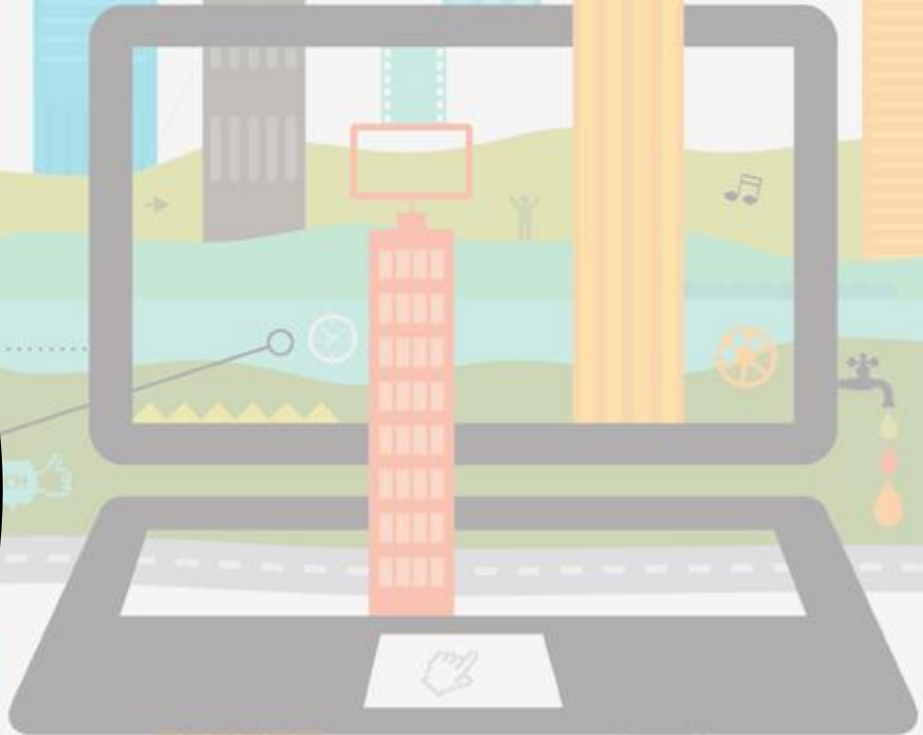
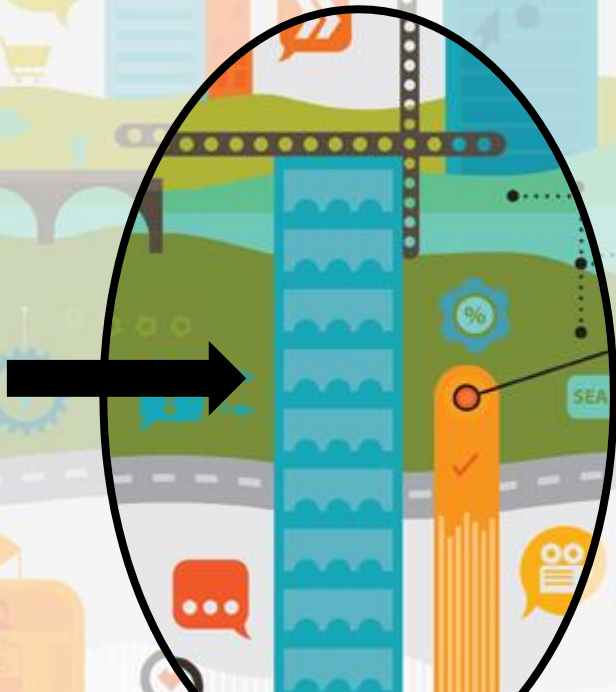
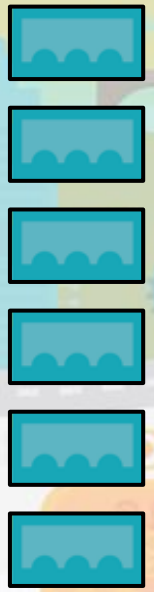
Enabling the Circular Economy in the Built Environment

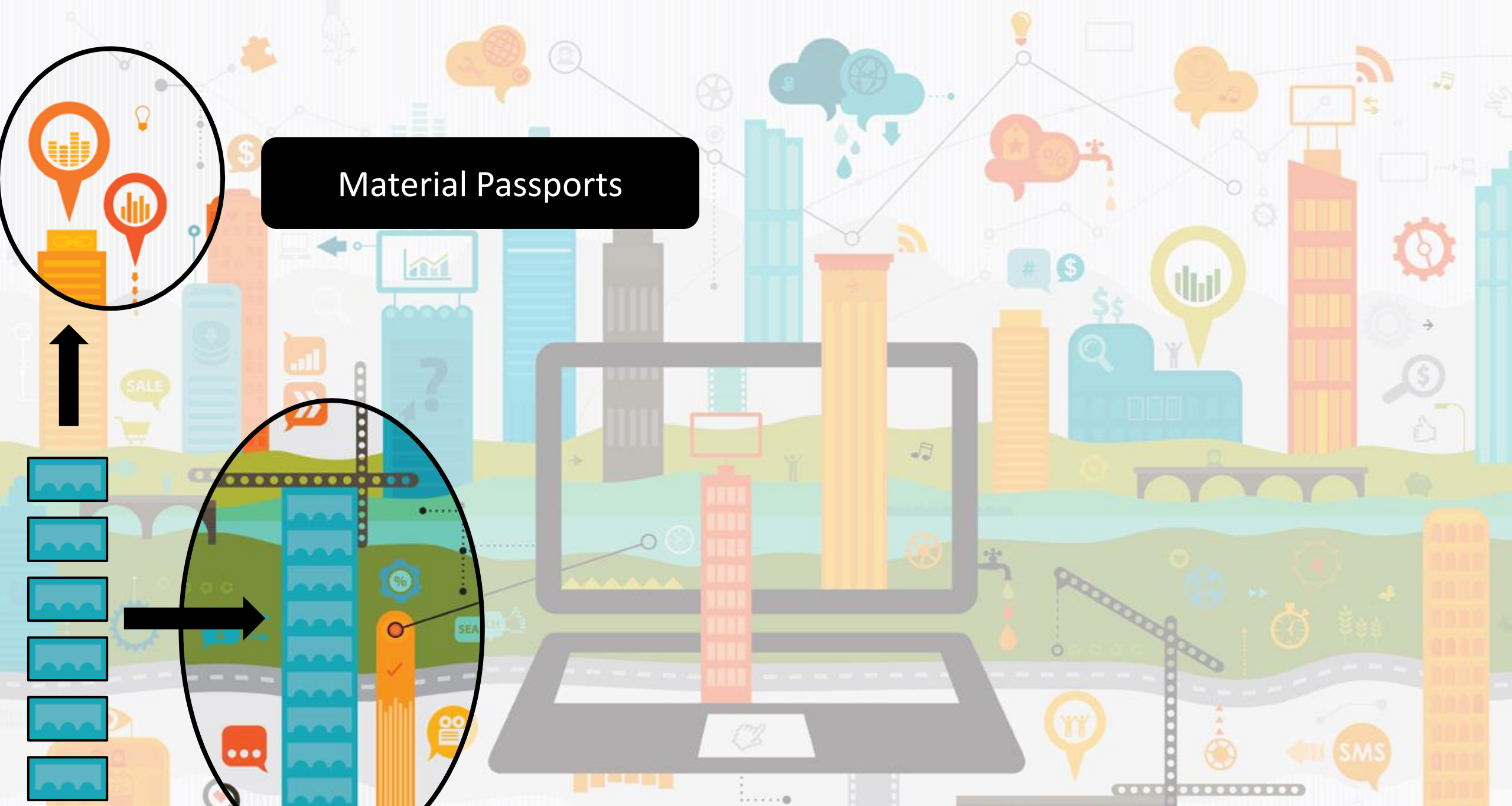
The role of policymakers

How does a **circular built environment** look like?



Design for Deconstruction

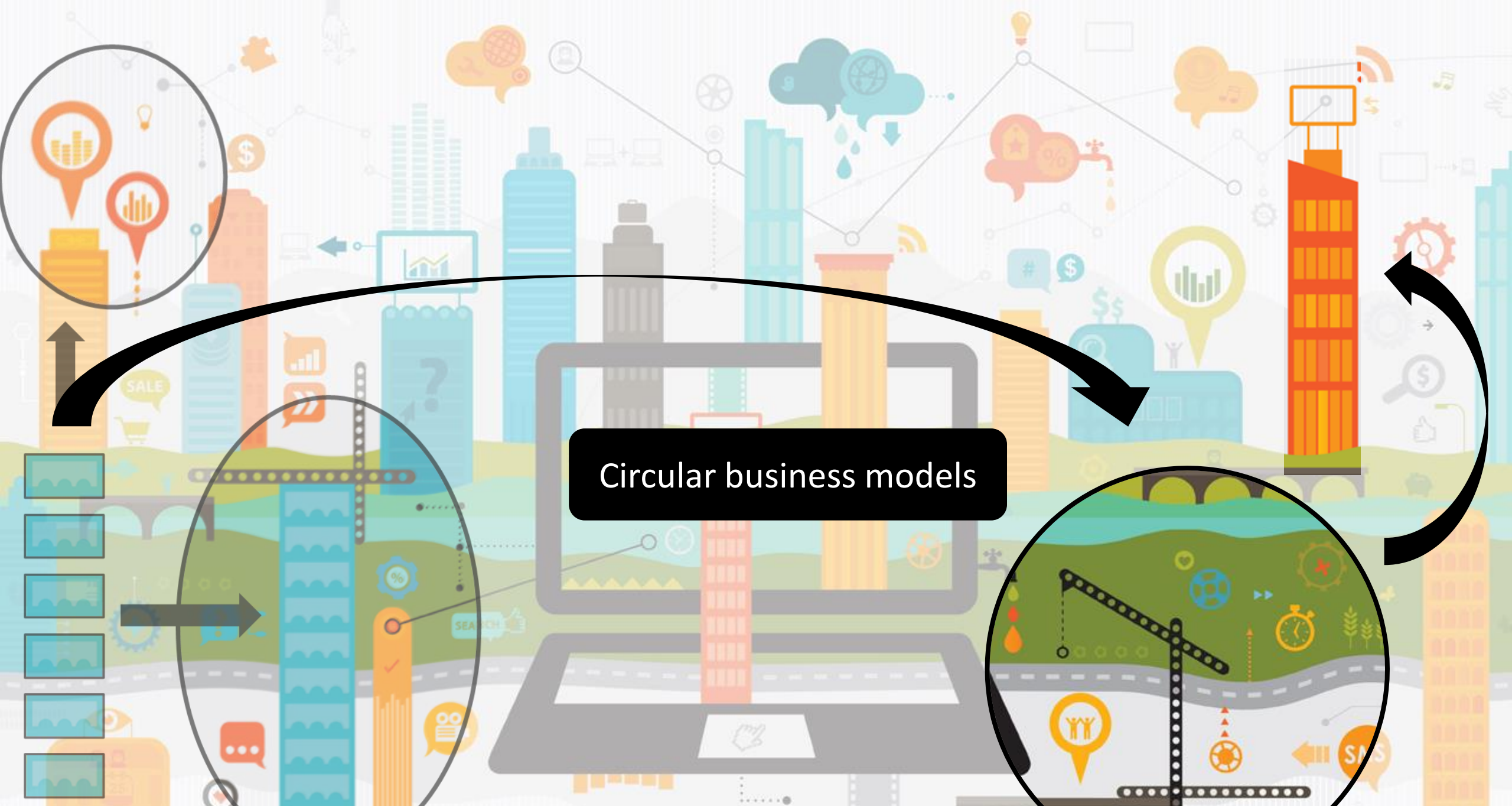




Material Passports

Urban mining





Circular business models

How can **policymakers** enable the circular economy in the built environment?

Creating national and regional **circular economy action plans** to guide states and cities in their own programs and regulations



Brussels, 11.3.2020
COM(2020) 98 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

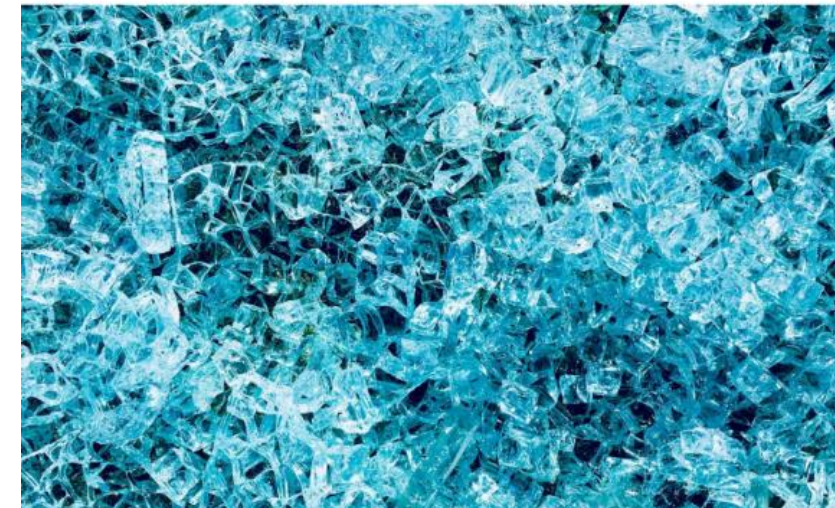
A new Circular Economy Action Plan
For a cleaner and more competitive Europe



Australia's National
Science Agency

NATIONAL Circular economy roadmap for plastics, glass, paper and tyres

Pathways for unlocking future growth opportunities for Australia
JANUARY 2021



Creating educational campaigns to raise public and stakeholders' awareness about the circular economy



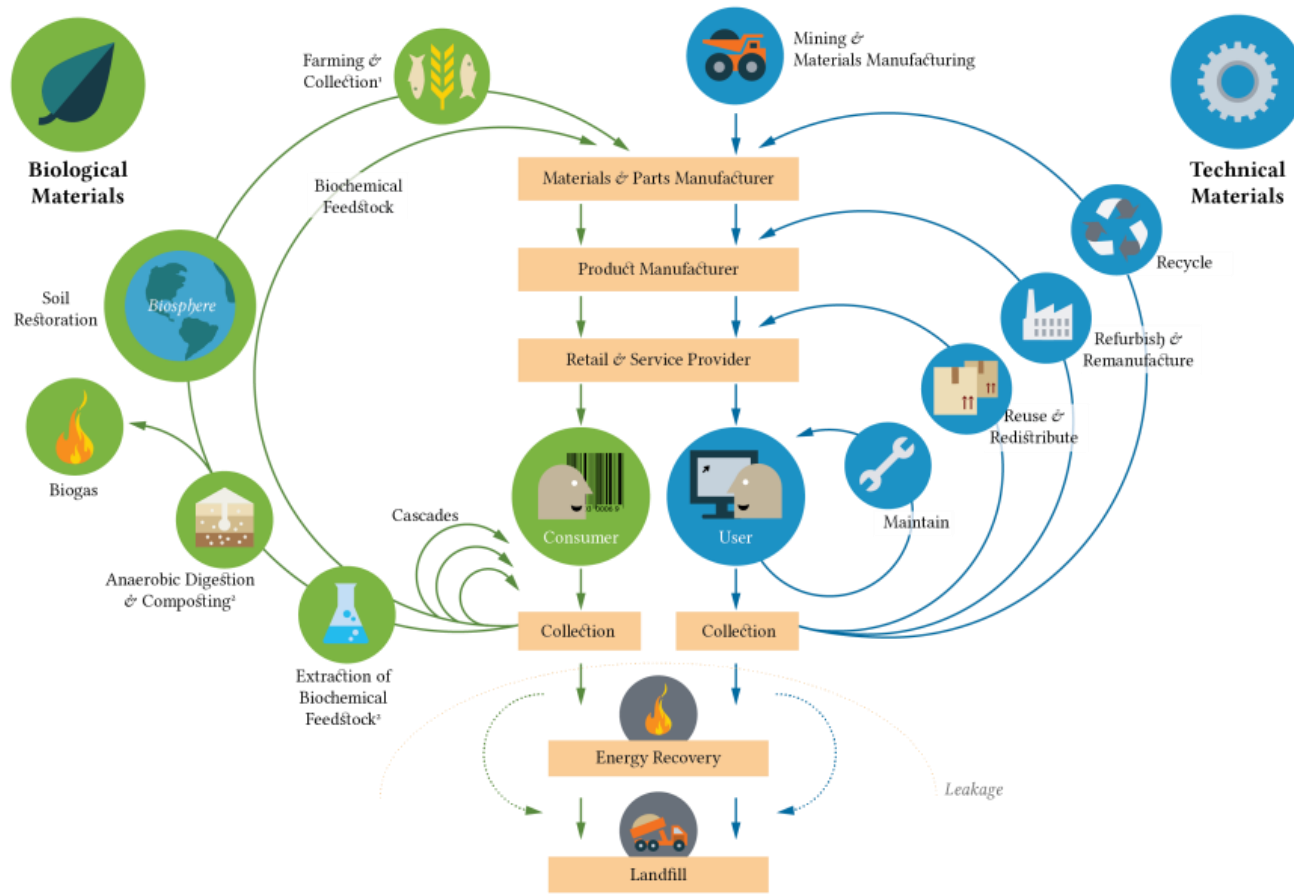
Circular economy educational campaigns in Italian schools.

Source: <https://circulareconomy.europa.eu/>

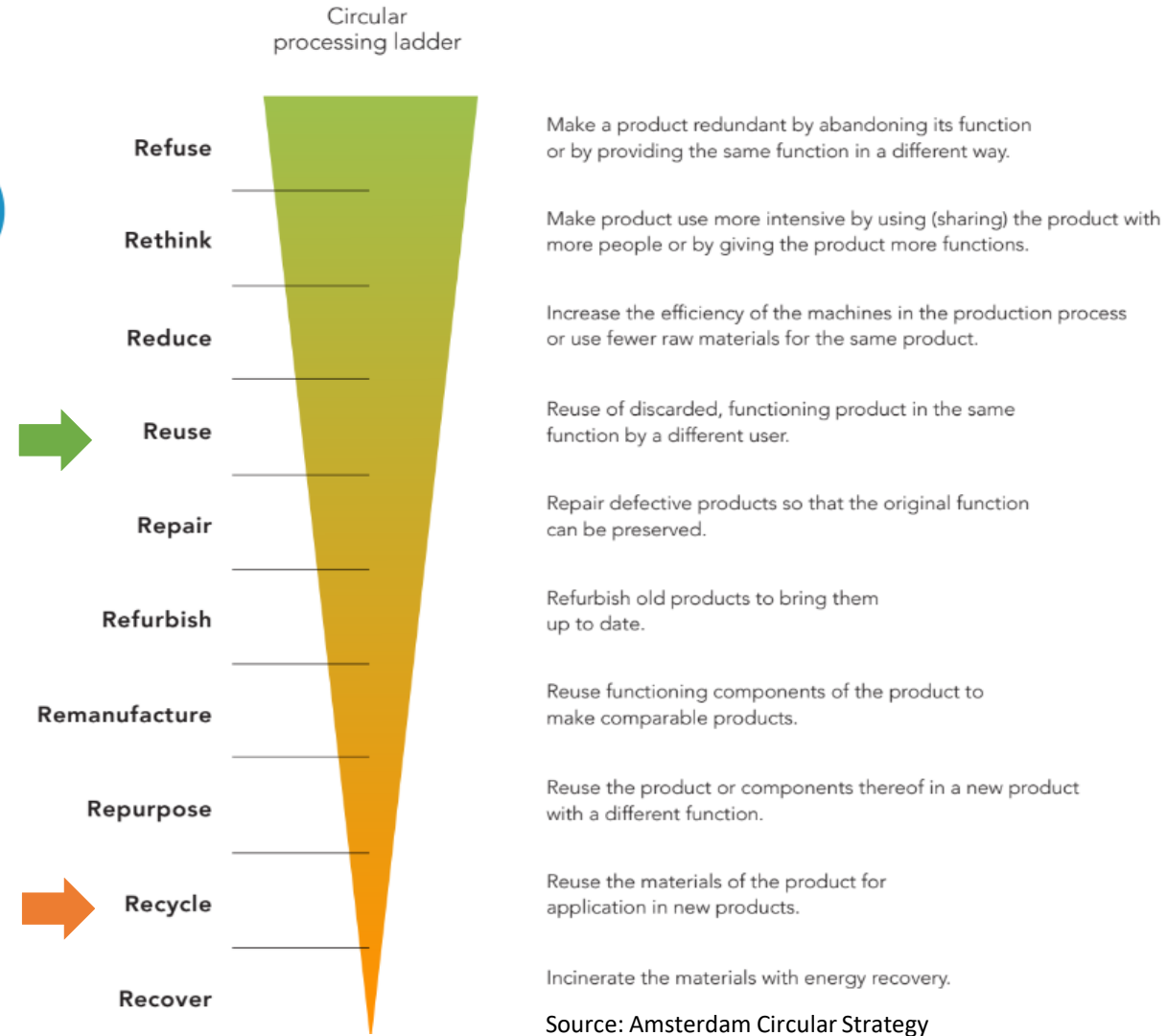


Circular economy illustration to educate stakeholders. Source: <https://www.cisco.com/>

Creating landfill diversion targets and zero waste policies that differentiate between reuse and recycling



Source: Ellen MacArthur Foundation



Incorporating circular economy principles into public procurement

CIRCULAR PROCUREMENT MODELS

1. System level

- Product service system
- Public Private Partnership
- Cooperation with other organisations on sharing and reuse
- Rent/lease
- Supplier take-back systems including reuse, recycling, refurbishment and remanufacturing

2. Supplier Level

- Supplier take-back system
- Design to disassembly
- Reparability of standard products
- External reuse/ sale of products
- Internal reuse of products

3. Product

- Materials in the product can be identified
- Products can be disassembled after use
- Recyclable materials
- Resource efficiency and Total Cost of Ownership
- Recycled materials

(Source: SPP Regions Best Practice Report)

Source: Public Procurement for a Circular Economy (European Commission)



Incorporating circular economy principles into public procurement

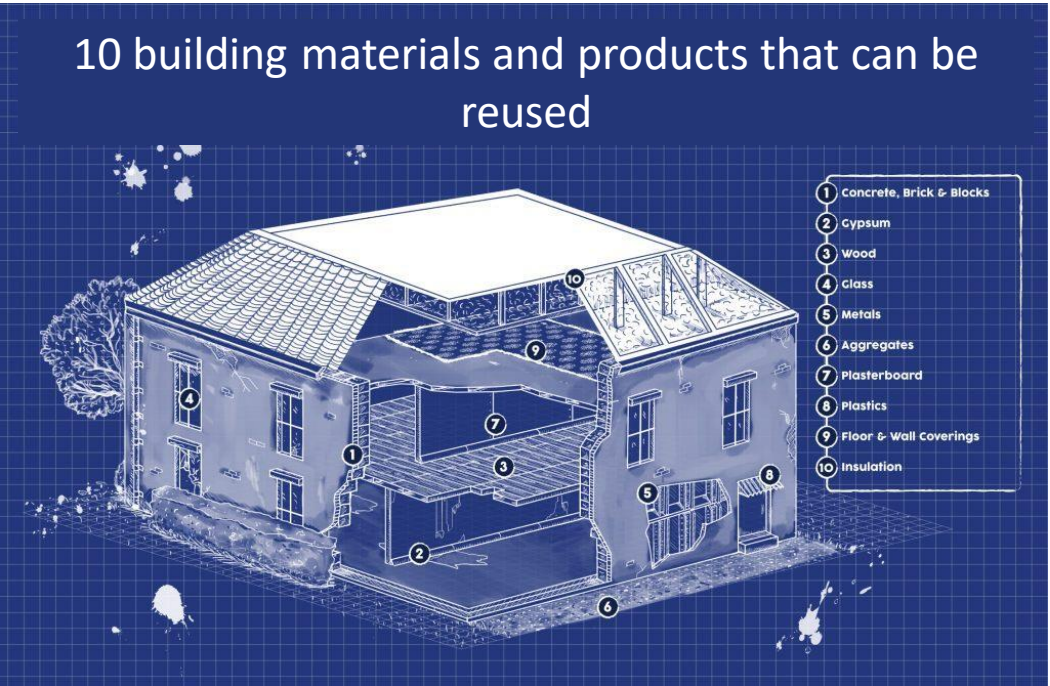
A circular road



Source: Amsterdam Circular Strategy



Establishing **targets** for salvaged components in new construction



10 building materials and products that can be reused. Source: ArchDaily

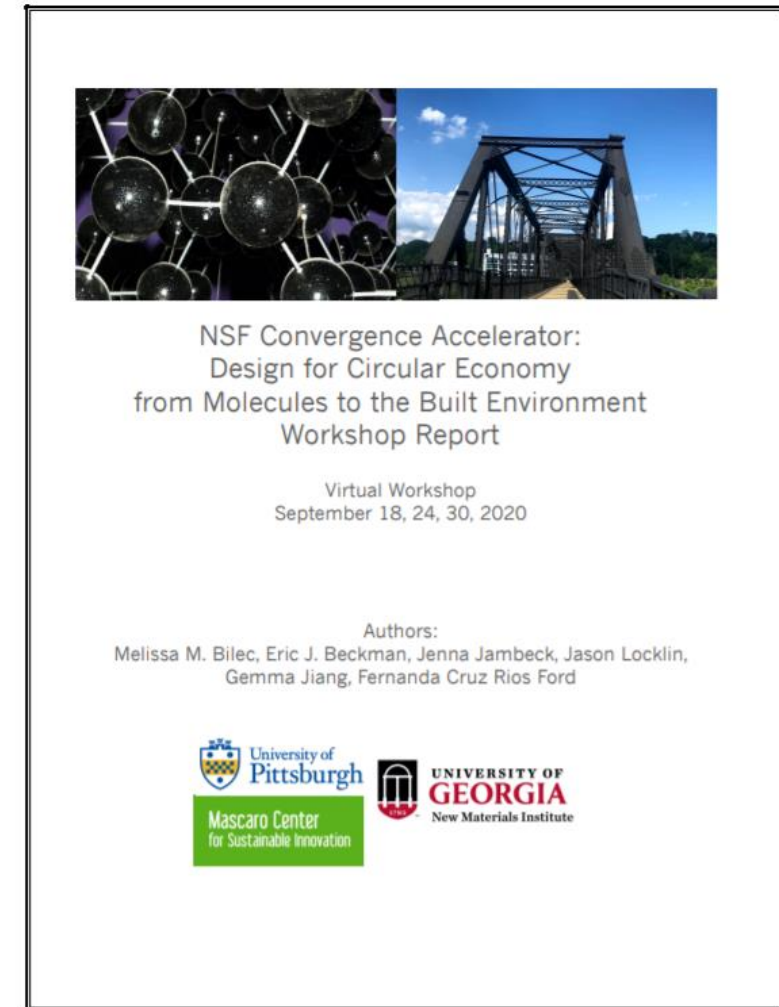


Resource Rows building in Copenhagen, Denmark. Source: ArchDaily



Allocating federal funding to **research and development** initiatives focused on circular economy

- Improving current **environmental assessment methodologies** to better address closed-loop systems
- Innovative **biobased materials**
- Innovative technologies to **disassemble** buildings
- **Material passports** technology
- Technologies and processes for **testing salvaged materials**
- Development of **metrics and indicators**
- Circular economy **pilot projects**
- Mapping **material flows and building components stocks**



Source: <https://beta.nsf.gov/>

Allocating federal funding for **research and development** initiatives focused on circular economy



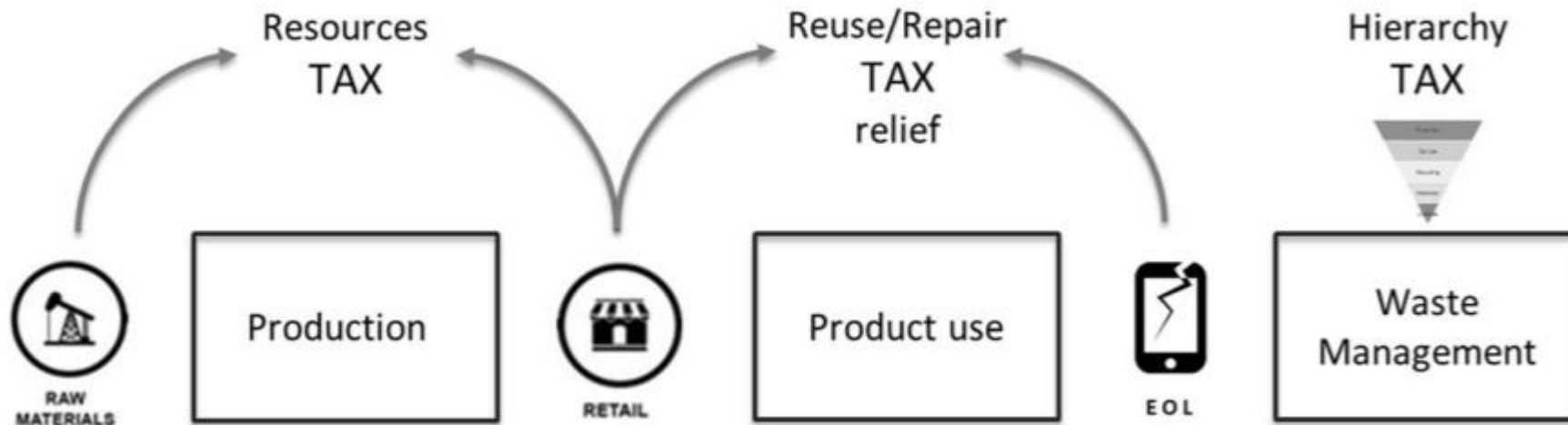
Current estimated material stock for the City of Melbourne, for selected materials.
From Stephan, A. & Athanassiadis, A. (2017). Quantifying and mapping embodied environmental requirements of urban building stocks. *Building and Environment*, 114, p. 187-202.

Promoting a **construction regulation reform** to incorporate circular economy strategies and eliminate burdens to material reuse



Source: <https://archinect.com/>

Creating **fiscal incentives** for circular economy



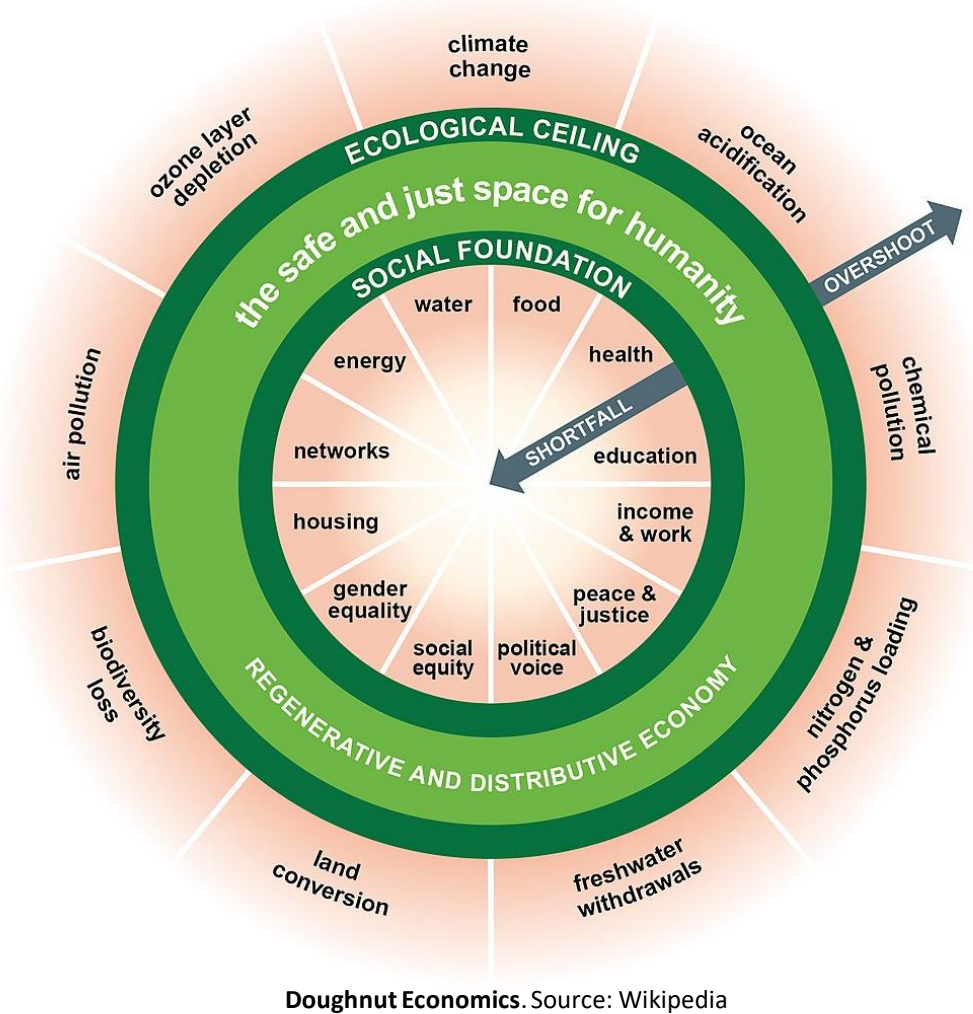
Circular economy taxation framework

From Milios, L. (2021). Towards a Circular Economy Taxation Framework: Expectations and Challenges of Implementation. Circular Economy and Sustainability (1), p. 477-498.

Other examples:

- Creating **subsidies** for companies engaging in circular economy practices
- Raising taxes on **new construction**
- Creating tax relief for building **adaptive reuse**
- Creating polluter-pays taxes for building's **embodied energy**

A final word: economies are for the people



Source: NewDream.org

Thank you!

fernanda.cr.ford@gmail.com



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