The Business Case for Reducing Embodied Carbon

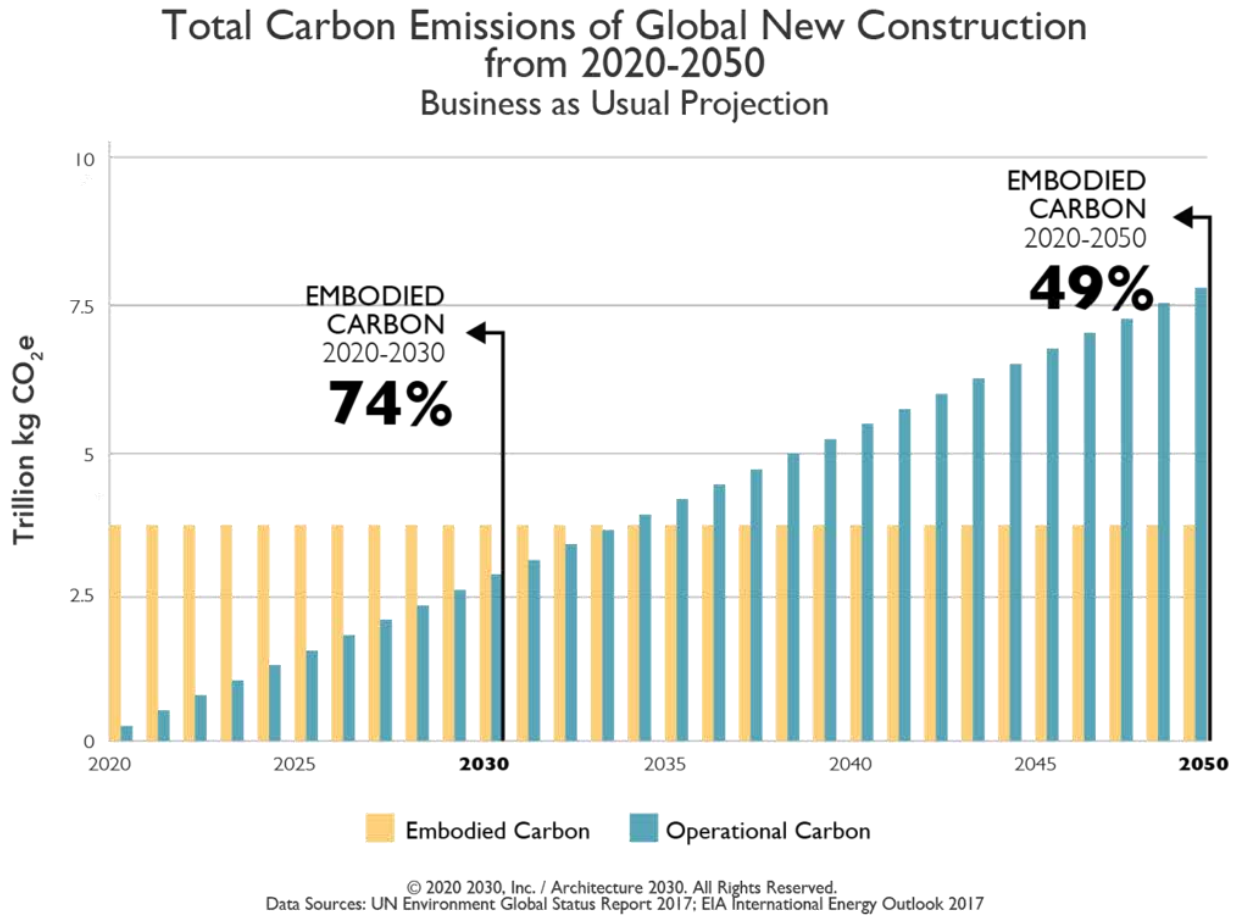
MONIKA HENN, SENIOR MANAGER, ULI GREENPRINT CENTER

OCTOBER 20, 2020

Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.

Introduction

Why Embodied Carbon?



Data Sources: UN Environment Global Status Report 2017; EIA International Energy Outlook 2017

Urban Land Institute Greenprint Reducing Carbon. Building Value.

Regulations are Coming

- Buy Clean California mandates EPDs for materials used in state-funded building projects
- Bay Area Low-Carbon Concrete Codes
- Vancouver's Zero Emissions Buildings policy sets the city on track to reduce embodied carbon by 40% by 2030
- Netherlands Circularity Goal to be 100% circular by 2030

Green Building Certifications and Reporting Structures Increasingly Look at Materials

Green Building Certification Schemes That Look at Embodied Carbon

Certification	Location	Embodied Carbon Specifics
Building Research Establishment Environmental Assessment Method (BREEAM)	Global	Performance of a life cycle assessment (LCA) can provide up to 20 credits. Includes recognition for use of environmental product declarations (EPDs)
Excellence in Design for Greater Efficiencies (EDGE)	Global, emerging markets	Tracks and awards certifications to projects that show reductions in embodied energy
Positive Energy and Carbon Reduction (E+C-)	France	Includes method to track and report embodied carbon performance
Futurebuilt	Norway	Includes method to reduce embodied carbon by 50%, with third-party verification
Green Star—Green Building Council Australia	Australia	Gives credits for the use of LCA, EPDs, and low-carbon materials choices
LEED v4—U.S. Green Building Council	Global	Awards credits for LCA, EPD procurement, and reuse of existing buildings and materials
Living Building Challenge (LBC) version 3.1—InternationalLiving Future Institute (ILFI)	Global	Rewards embodied carbon benchmarking and reduction in the LBC Materials Petal
LBC version 4.0—ILFI	Global	Rewards embodied carbon benchmarking and reduction in the LBC Energy Petal
Zero Carbon—ILFI	Global	Projects must reduce embodied carbon by at least 10% and purchase offsets for the remaining embodied carbon

No Incremental Cost for Lower-Carbon Materials

WEBCOR **Structural Analysis: C40 CLT + Concrete Conceptual Budget**

	QTY	Unit	$/Unit	$
Fountation				
30" Mat	899	CY	$ 425	$ 382,138
36" Mat	196	CY	$ 425	$ 83,319
Columns	28	EA	$ 2,000	$ 56,000
Elevator Pits	1	EA	$ 20,000	$ 20,000
L1				
Concrete Decks (Mild)	12,435	SF	$ 32.5	$ 404,138
Shear Walls	2,750	SF	$ 75	$ 206,250
Columns	30	EA	$ 2,000	$ 60,000
Transfer Beams	1,401	LF	$ 125	$ 175,125
L2				
Concrete Decks (Mild)	12,435	SF	$ 32.5	$ 404,138
Columns	114	EA	$ 2,000	$ 228,000
Shear Walls	2,750	SF	$ 75	$ 206,250
L3, L4, L5, L6, L7				$ -
Shear Walls	11,650	SF	$ 75	$ 873,750
CLT Decks + Columns	56,815	SF	$ 50	$ 2,840,750
Gypcrete	56,815	SF	$ 4.0	$ 227,828
Embeds	81,915	GSF	$ 1.25	$ 102,394
Curbs and Built Up Slabs	81,915	GSF	$ 1.00	$ 81,915
		Total		$ 6,351,994
		SFED		81,915
		$/SFED		$ 77.54

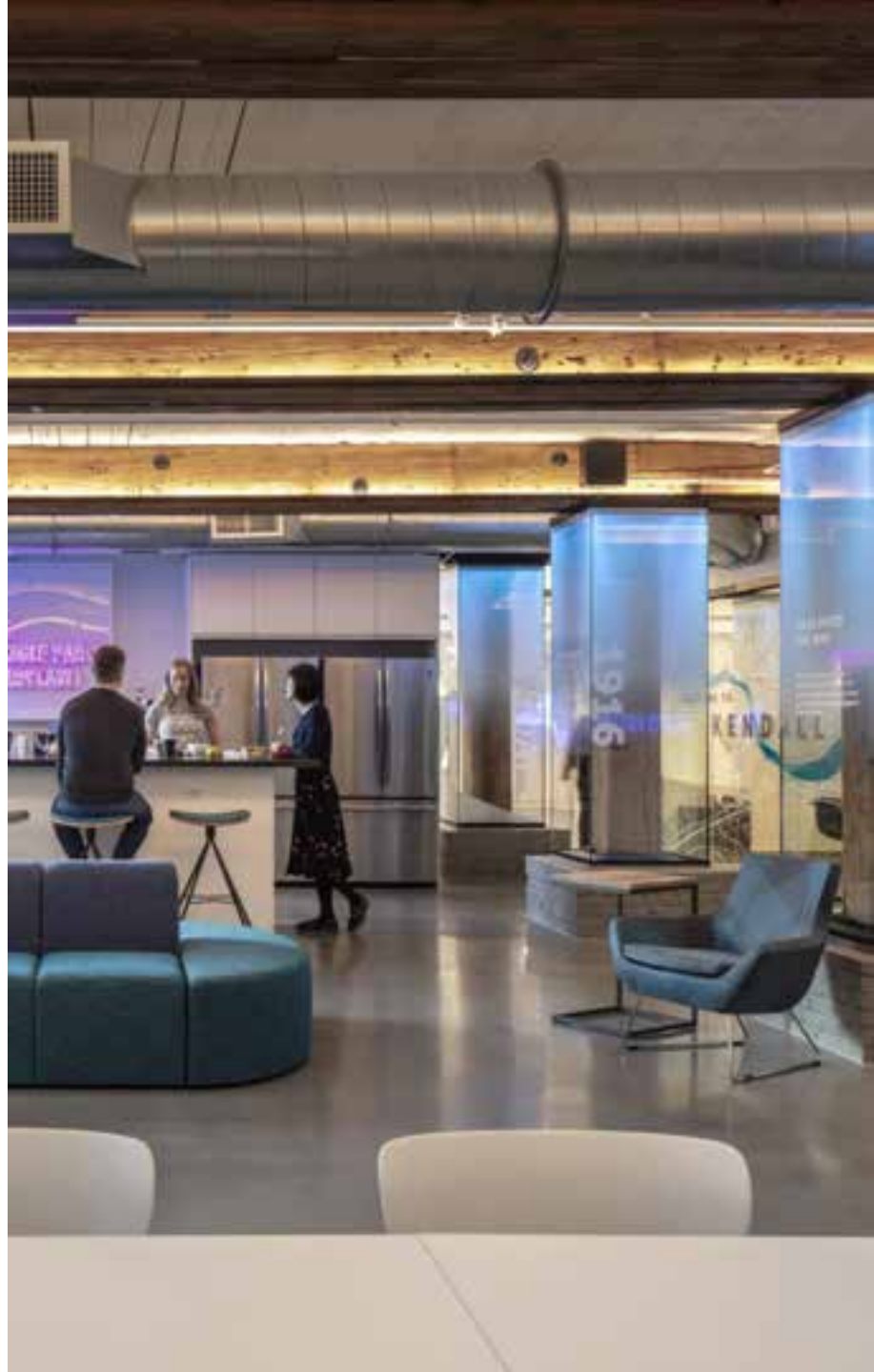
WEBCOR **Structural Analysis: C40 Concrete Conceptual Budget**

	QTY	Unit	$/Unit	$
Fountation				
30" Mat	817	CY	$ 425	$ 347,398
36" Mat	178	CY	$ 425	$ 75,744
Columns	28	EA	$ 2,200	$ 61,600
Elevator Pits	1	EA	$ 20,000	$ 20,000
L1				
Concrete Decks (PT)	12,435	SF	$ 35.0	$ 435,225
Shear Walls	1,375	SF	$ 75	$ 103,125
Columns	30	EA	$ 2,000	$ 60,000
Transfer Beams	1,401	LF	$ 125	$ 175,125
L2				
Concrete Decks (PT)	12,435	SF	$ 35.0	$ 435,225
Columns	114	EA	$ 2,000	$ 228,000
Shear Walls	2,750	SF	$ 75	$ 206,250
L3, L4, L5, L6, L7				$ -
Shear Walls	11,650	SF	$ 75	$ 873,750
Concrete Decks (PT)	56,815	SF	$ 35.0	$ 1,988,525
Columns	456	EA	$ 2,000	$ 912,000
Embeds	81,915	GSF	$ 1.25	$ 102,394
Curbs and Built Up Slabs	81,915	GSF	$ 1.00	$ 81,915
		Total		$ 6,106,276
		SFED		81,915
		$/SFED		$ 74.54

Interest from Communities and Tenants

"Our goals are to get ahead of trends and be a leader, because people who lead on this now will be able to do low carbon much more cost-effectively down the line. And for new projects in cities like San Francisco and Washington, D.C., it's easier to get approval for projects that represent the city's values."

- Andy Bush, Morgan Creek Ventures



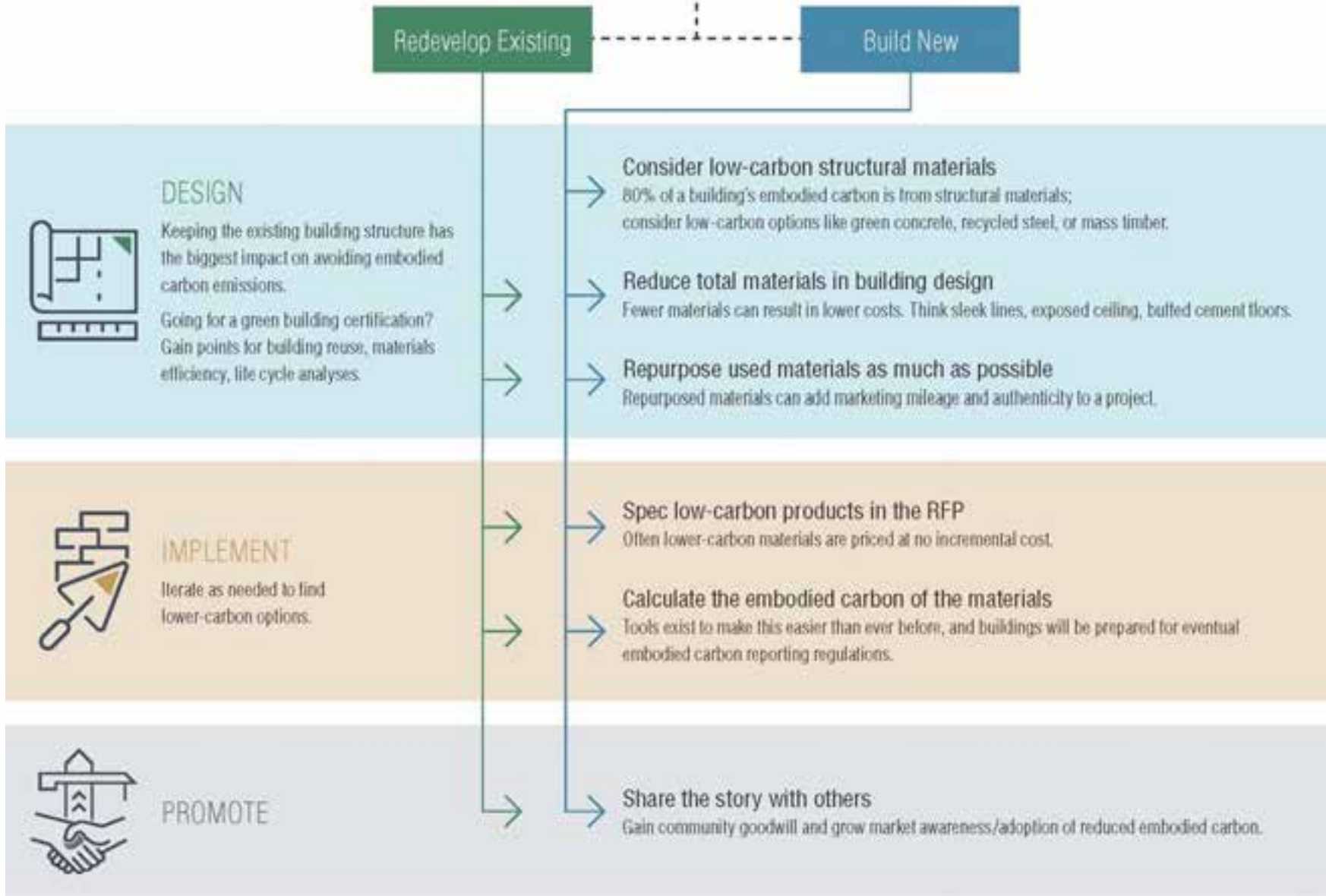
Urban Land Institute Greenprint
Reducing Carbon. Building Value.

Market Challenges

What are the barriers to reducing embodied carbon?

- Market for low-embodied-carbon materials and knowledgeable contractors is still developing
- Limited data for EPDs and LCAs not always available

Simple Pathway for a Developer to Reduce Embodied Carbon



Urban Land Institute Greenprint Reducing Carbon. Building Value.

Project Profiles

Carbon12 – Portland, OR

Kaiser Group and Path Architecture

- 8 story multifamily building completed in 2018
- Constructing with steel core, glulam beams and columns, and CLT floors
  - $2.50/ft^2 more than all concrete in material costs
- Construction timeline cut from 19 weeks to 8 weeks
- Replicating the process estimated to cost 20-25% less
- Avoided 223 metric tons of CO_2e

Urban Land Institute

Circl – Amsterdam, NL

ABN AMRO

- 30,000 ft^2 pavilion completed in 2017
- Incorporated circular principles by reducing material waste and designing for reuse
- Large local Dutch larch CLT beams were used to replace traditional concrete structure
- Leftover wood from beam construction makes up parts of the interior
- Flooring reclaimed hardwood from local buildings

Nishi Building – Canberra, Australia

Molonglo

- Mixed-use development with 233,653 ft^2 of multifamily space and 524,442 ft^2 of commercial space completed in 2014
- Sustainable materials were a priority
  - 25 miles (40 km) of sustainably harvested timber from regional blackbutt gum trees
  - Reclaimed timber—the entryway alone used more than 2,000 pieces of reclaimed timber
- Investments made to indicate value to tenant in hopes of creating happier and more valuable tenants
- Recently sold to office REIT for $256M

"If you plan for it, the economics works out."
- Nikos Kalogeropoulos, Molonglo

Urban Land Institute

uli.org/embodiedcarbon

Monika Henn
Manager, ULI Greenprint Center
monika.henn@uli.org

Urban Land Institute