



CFL MTAP PRESENTATION

*Livable Buckhead and ULI Class of 2024
May 14*





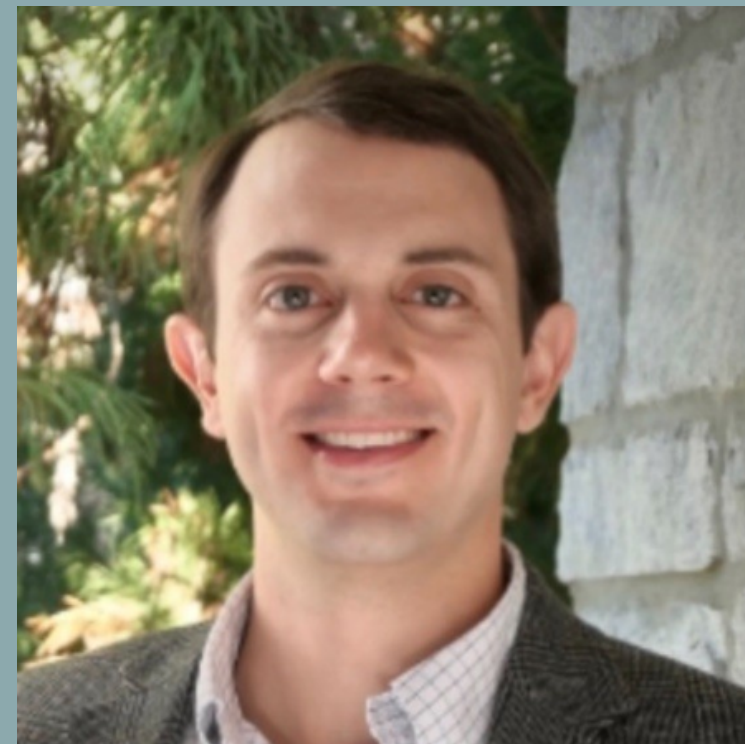
MTAP TEAM



Ramana Koti
Sustainable Design
Leader



Kenneth Igwe
Commercial Real Estate
Lender



Charles Zakem
Kimley-Horn
Civil Engineer



Claire Hansen
RangeWater Real Estate
Director of Development





01.

PROJECT OBJECTIVES AND TIMELINE

Project vision statement, deliverables and where it fits in LB's long term embodied carbon timeline

02.

SURVEY OF THE INDUSTRY

Define key terms and broadly outline the current industry landscape

03.

EMBODIED CARBON CASE STUDY

Explanation of our model and our proxy building

04.

EMBODIED CARBON ALTERNATIVE MATERIALS FOR REDUCTION

Intro to reduction materials, design techniques and their pricing along with policy recommendations

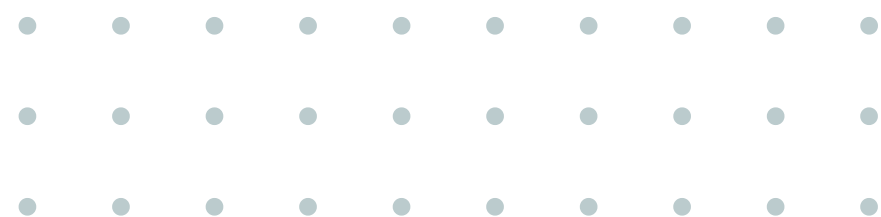


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LCCE: LIFE CYCLE CARBON EMISSION

TWO TYPES:

Embodied Carbon

Operational Carbon

FACTORS OF LCCE:

Material Selection

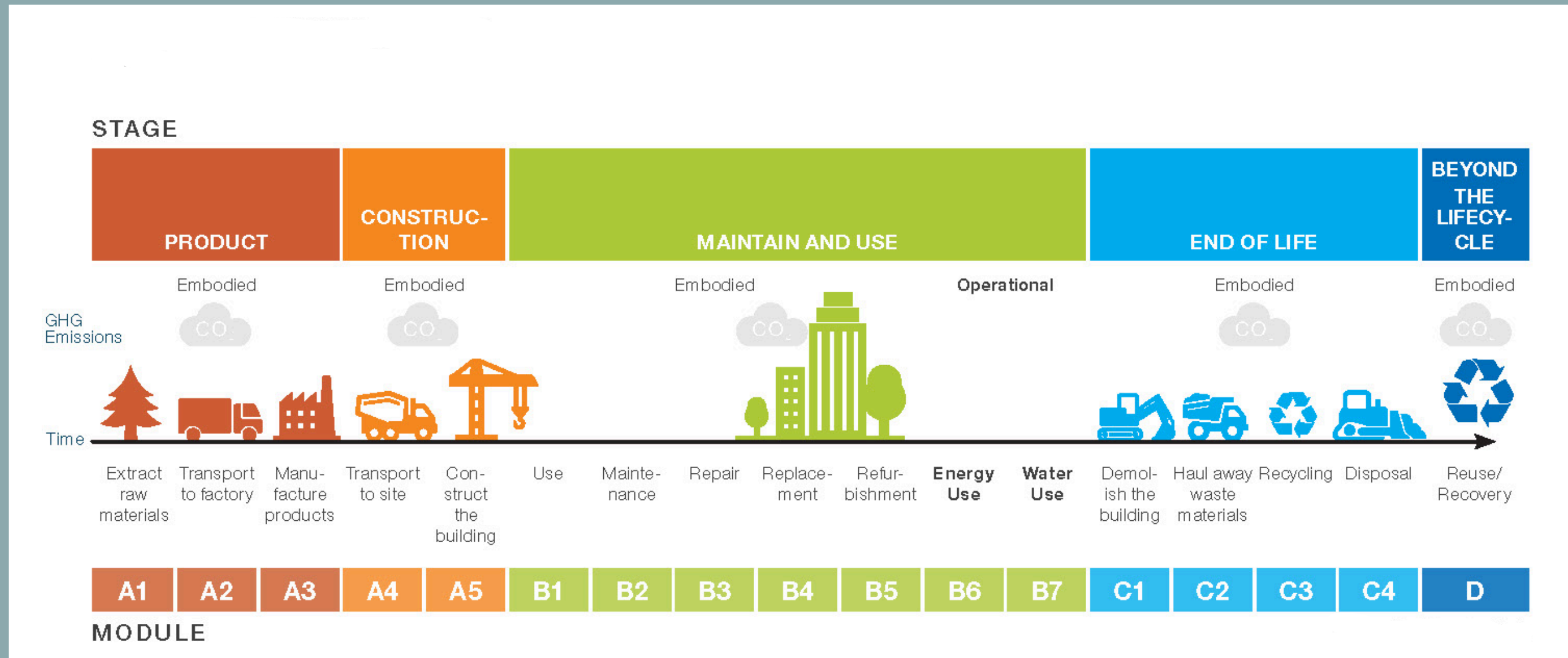
Construction Processes

Energy Use

Maintenance and Renovation

TWO TYPES:

LCA: LIFE CYCLE ASSESSMENT



**EMBODIED CARBON
IN BUILDINGS:
WITHIN AND OUTSIDE
OF LCA'S**

WITHIN LCA

OUTSIDE LCA

**EPD's:
Environmental
Product
Declarations**

STAGES OF AN LCA

- 1) Goal and Scope Definition
- 2) Life Cycle Inventory
- 3) Life Cycle Impact Assessment
- 4) Interpretation

APPLICATION IN DIFFERENT PHASES OF AN LCA

Design Phase

As Designed Phase

As Built Phase

IMPORTANT SOFTWARE TOOLS

One Click LCA
Tally
Athena Impact Estimator
SimaPro

ESTABLISHING A BASELINE

PERFORMANCE TARGETS

Aggressive Target: 40% Reduction starting in 2025 reaching zero or near-zero buildings by 2040

Less Aggressive Target: 10% – 20% reductions by 2030; aim to hit net-zero by 2040/2050

KNOWN WAYS TO ACHIEVE TARGET

Material selection

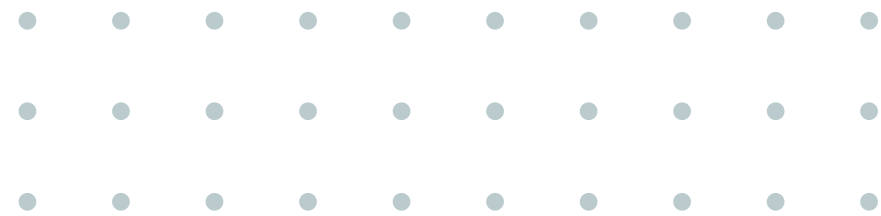
Design optimization

Construction techniques

Reuse existing building materials or components

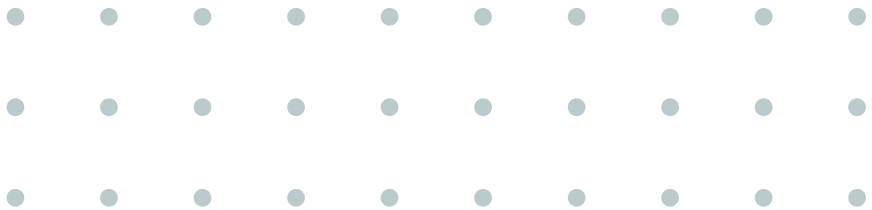
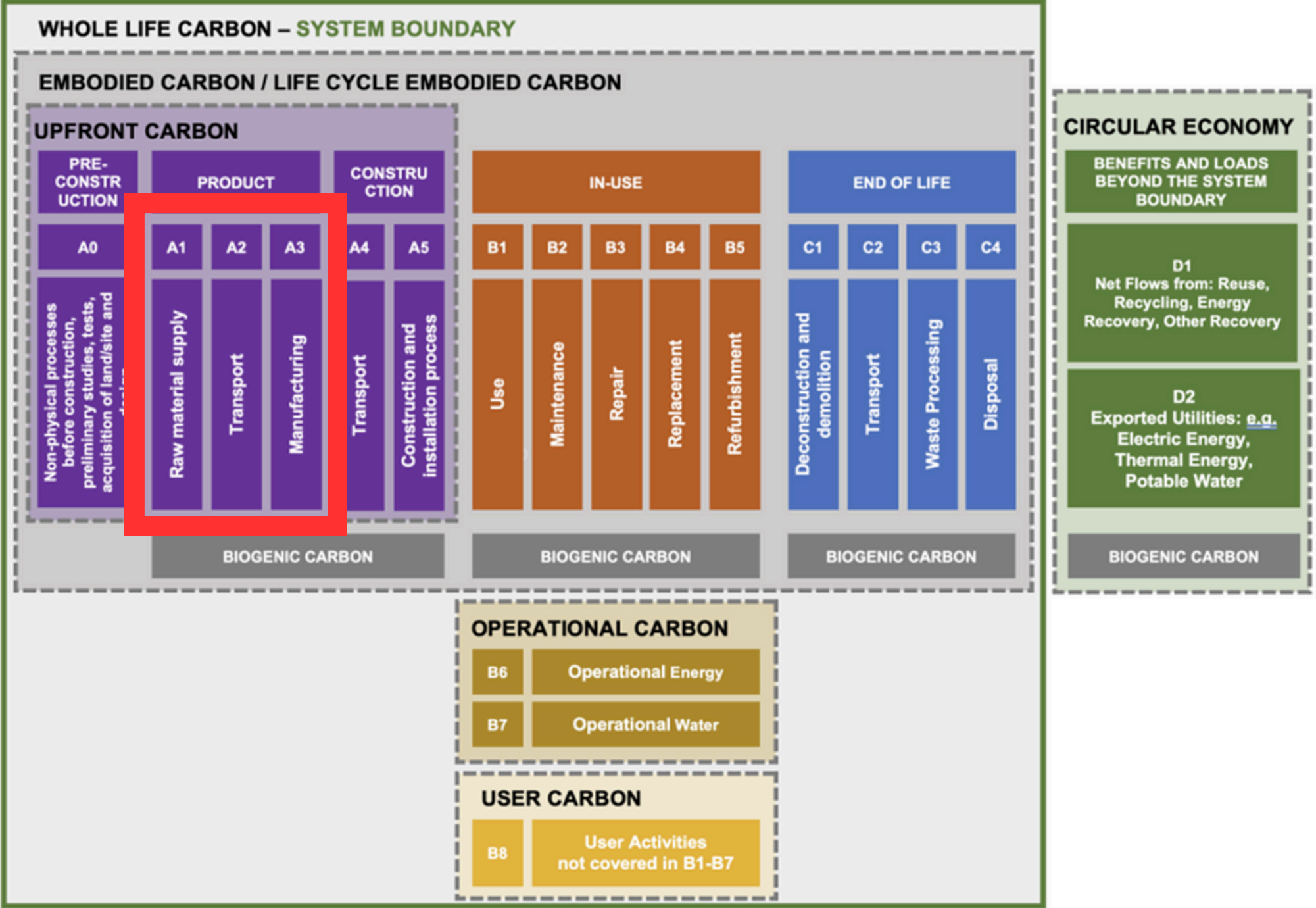
Use lower carbon replacement materials for renovations

Embodied Carbon Case Study and Proxy Building



Embodied Carbon Criteria

Structure
Enclosure



CARBON LEADERSHIP FORUM

Embodied Carbon Reduction Analysis Baseline

373 kgCO₂eq/m² (Baseline Benchmark)

Industry standard practice – 10% better
336 kgCO₂eq/m² (Baseline Benchmark)

70% Structure
20% Enclosure
10% Interiors

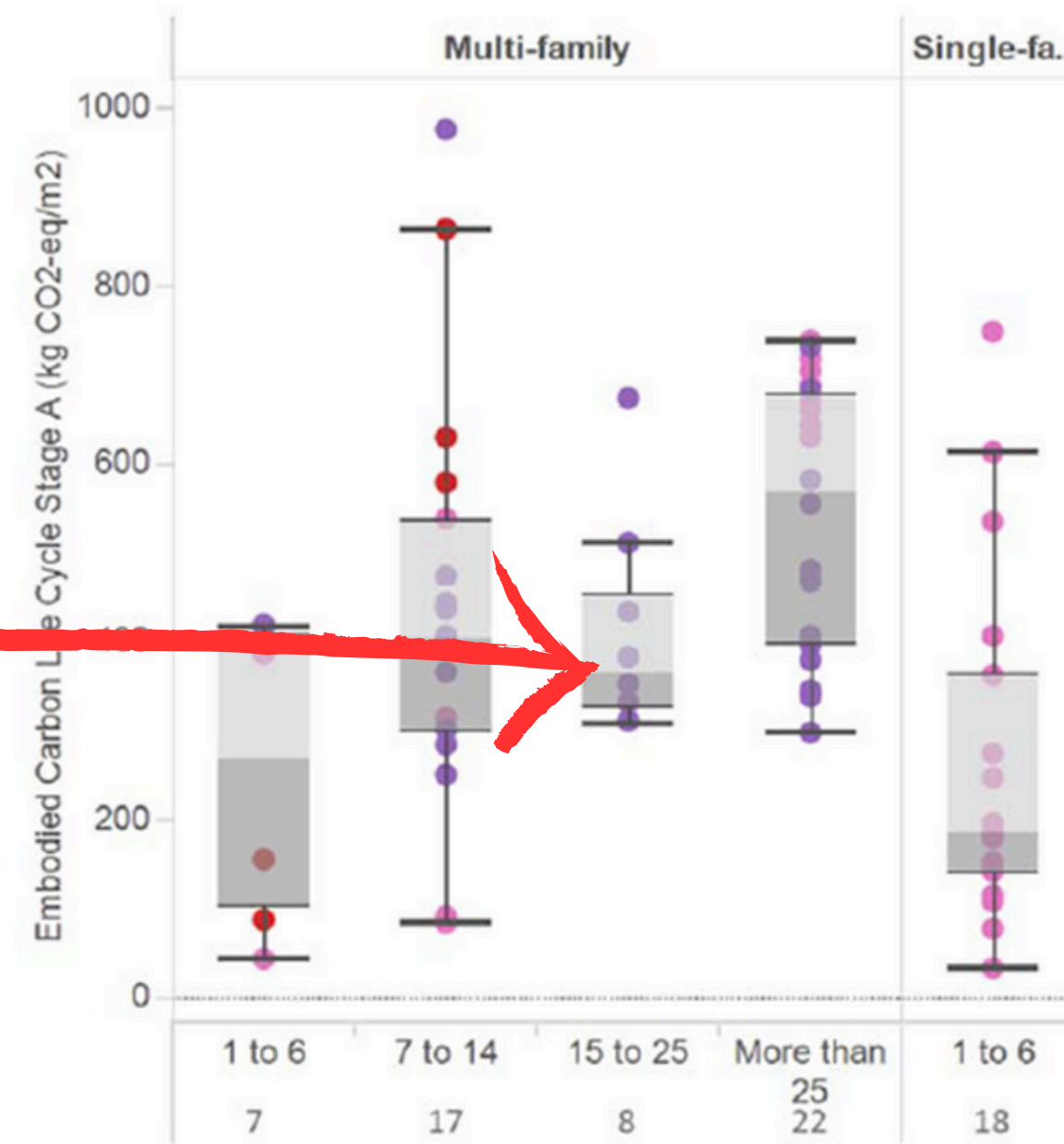
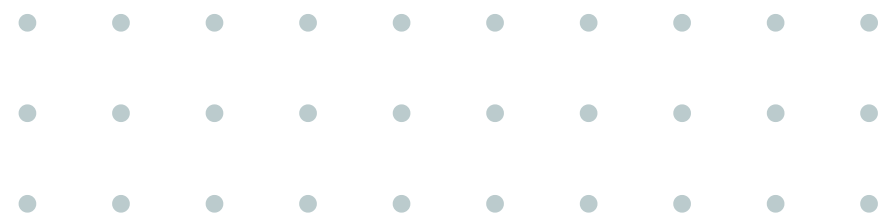
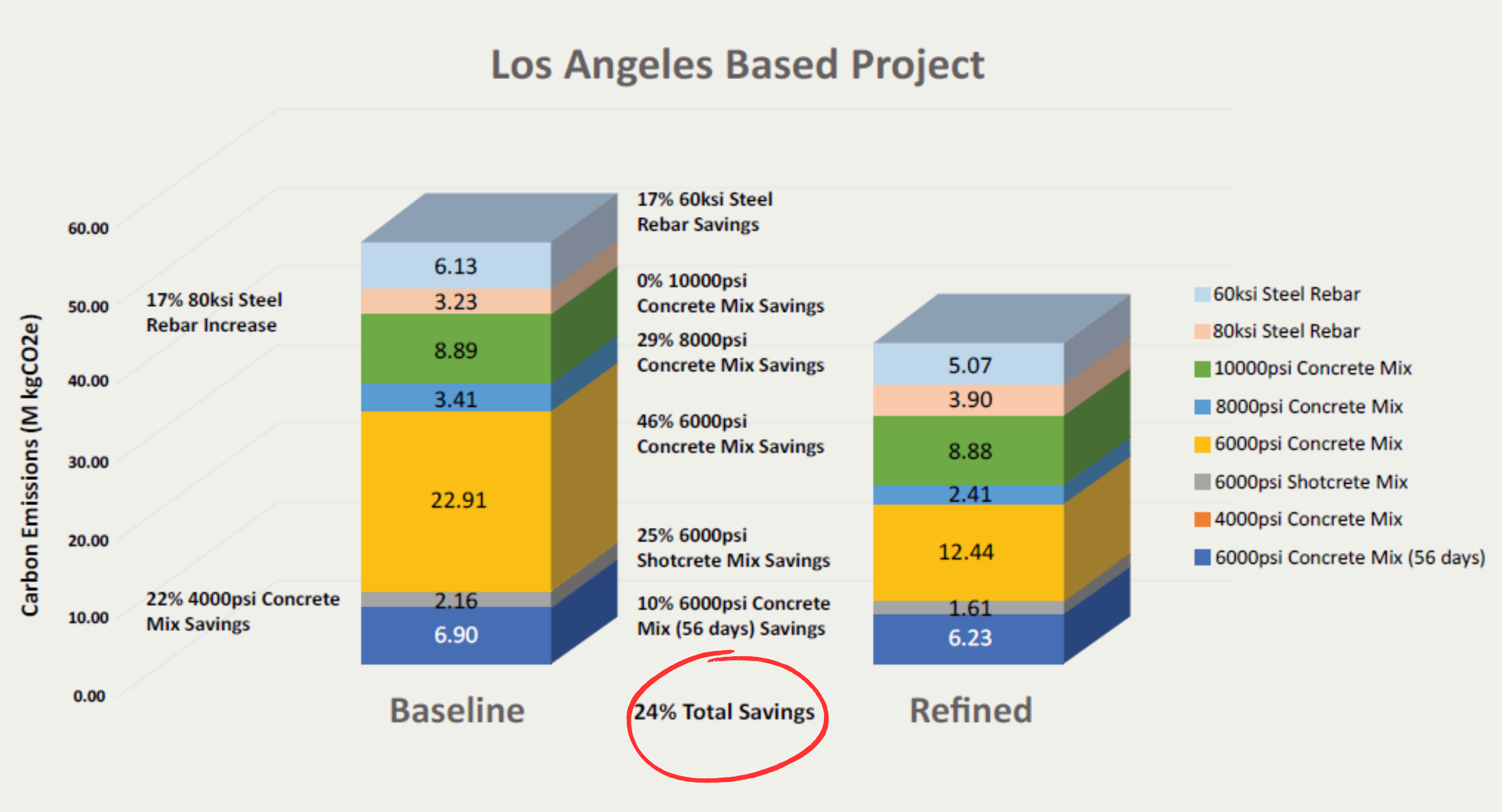


Figure 3: Embodied Carbon per m², of Residential Buildings
(S=Structure, SEI=Structure/Enclosure/Interior, SF=Structure/Foundation, SFE=Structure/Foundation/Enclosure, SFEI=Structure/Foundation/Enclosure/Interiors)

Embodied Carbon Reduction Analysis Baseline



Embodied Carbon Reduction Analysis Baseline

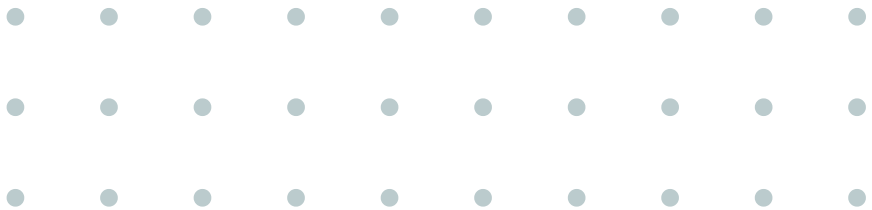
28%

Double Glass									
Materials	PENR [MJ/FU]			PER [MJ/FU]			GWP [kgCO _{2eq} /FU]		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
Aluminum	993.0	2770.4	1724.2	180.6	540.0	297.6	46.5	146.0	105.0
PVC	825.8	2740.0	1542.3	45.2	334.0	133.4	38.6	113.0	68.4
Steel	1396.8	2710.4	2125.0	127.7	310.2	245.6	85.9	152.5	127.3
Wood	699.0	2550.0	1473.0	534	988.8	814.1	31.8	105.0	55.0



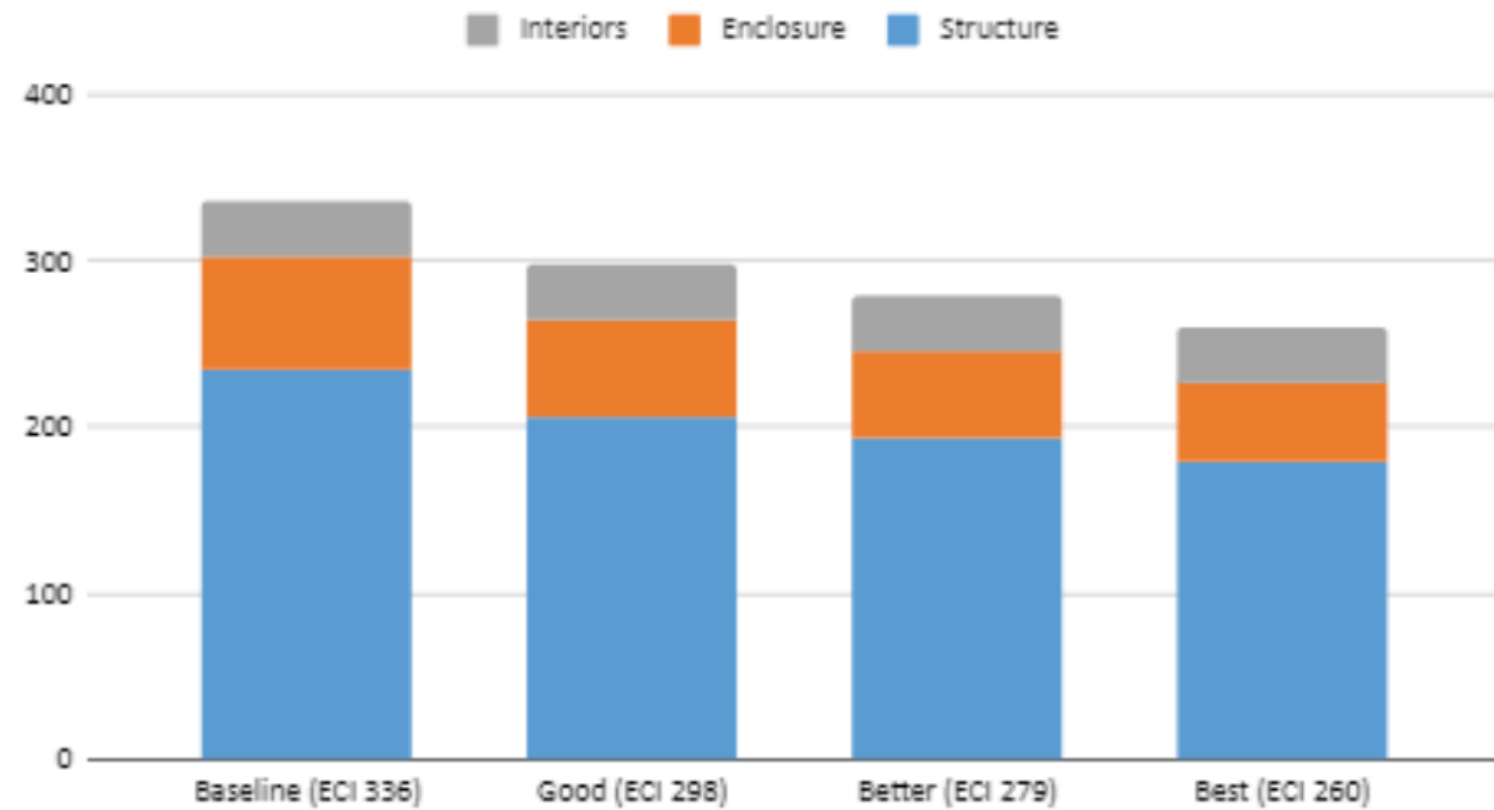
Embodied Carbon Reduction Analysis Baseline

	Baseline	Good	Better	Best
Concrete Embodied Carbon Reduction	0%	12%	18%	24%
Windows Embodied Carbon Reduction	0%	14%	21%	28%



Embodied Carbon Reduction Analysis Baseline

Embodied Carbon Intensity - Baseline vs Improvements



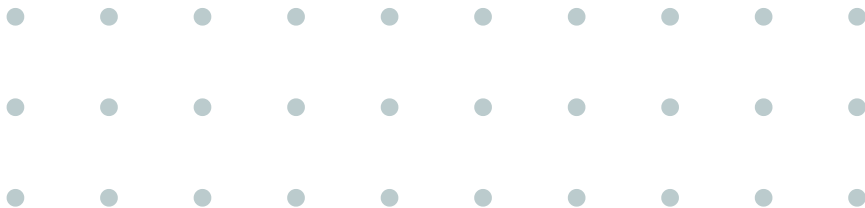
ECI in the figure above stands for Embodied Carbon Intensity in kg CO2e/m2

	Baseline	Good	Better	Best
Structure Embodied Carbon Reduction (70% of the baseline is subject to this)	0%	12%	18%	24%
Windows Embodied Carbon Reduction (20% of the baseline is subject to this)	0%	14%	21%	28%
Combined Reduction Potential (100% of the baseline is subject to this)	0%	11%	17%	22%

Embodied Carbon Reduction Analysis Baseline

LEED:

- Conduct an LCA – 1pt
- 5% reduction – 2pts
- 10% reduction – 3pts
- 20% reduction – 4pts



'The Top 10 Ways to Reduce Concrete's Carbon Footprint' has the following recommendations:

- Communicate carbon reduction goals
- Ensure good quality control assurance
- Optimize concrete design
- Specify innovative cements
- Specify supplementary cementitious materials
- Specify admixtures
- Set targets for carbon footprint
- Don't limit ingredients
- Sequester carbon dioxide in concrete
- Encourage innovation

Their conclusion reads:

"There is no silver bullet to making concrete with zero carbon footprint. It can be done, but not at the volume and cost demanded by today's building owners. For some concretes (sic) on a project, the carbon reduction might be 90%, others closer to 70%, and still others around 30%. All these reductions lead to concrete with a significantly lower footprint than most concrete projects. If you choose to set carbon footprint targets, this will lead to the greatest reduction, but you cannot expect to meet these targets without implementing these top 10 ways to reduce concrete's carbon footprint."

EMBODIED CARBON REDUCTION STRATEGIES

STEEL

Recycled North American
Steel
Efficient Steel Design

**0% PRICE
PREMIUM**

CONCRETE

Supplementary Cement
Materials (SCMs)
Efficient Concrete Design

**0% PRICE
PREMIUM**

INSULATION

Mineral Wool

**5% PRICE
DISCOUNT**

EMBODIED CARBON REDUCTION STRATEGIES

WINDOWS

Reduction of aluminum
double glazing windows

**5%–10% PRICE
PREMIUM**

CURTAIN WALLS

Glulam Mullions
Reduced Curtain Wall
Depth

**5% PRICE
DISCOUNT**



EMBODIED CARBON POLICY

VOLUNTARY LCA PROGRAM
AND NEXT STEPS



EMBODIED CARBON CODE AND PROGRAM TYPES

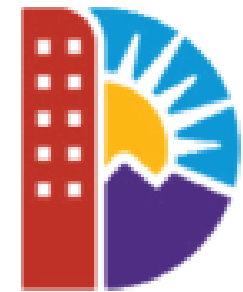
PRESCRIPTIVE

- Typically cap GWP for certain products
- Typically aimed at structure
- Easier to enforce
- May not result in net positive benefit

PERFORMANCE

- Typically LCA-based
- More flexible to market changes
- More accurate
- More costly to perform
- More expertise to enforce

PRESCRIPTIVE EMBODIED CARBON POLICY EXAMPLES



DENVER
THE MILE HIGH CITY

Denver Green Code

Marin County Low Carbon Concrete

Portland Low Carbon Concrete
Program

CALGreen Prescriptive Option

PERFORMANCE EMBODIED CARBON POLICY EXAMPLES



CALGreen Performance Option

LEED v4 Building life-cycle impact
reduction credit

Austin Green Building Program
(voluntary LCA)


POLICY/PROGRAM RECOMMENDATIONS

It starts with **reporting**

Phased approach

Performance-based
criteria for flexibility
and resiliency

Use **LEED**-compliant
standards for
performance
thresholds



1

Voluntary LCA Program
(based on LEED credit standards)

(Similar to Austin Energy Green Building Program)

Required LCA with **incentives** for
high-performance buildings

(LEED Embodied Carbon Credit Standard, 10%
EC reduction similar to CALGreen)



2B



2A

Voluntary LCA with **incentives** for high-
performance buildings

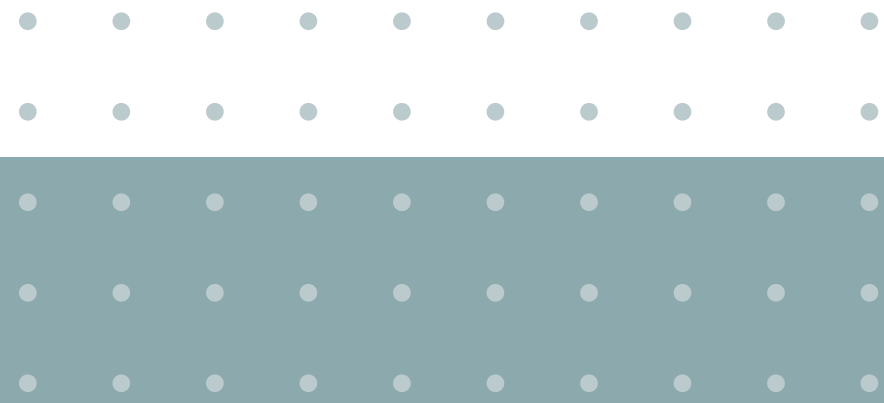
(LEED Embodied Carbon Credit Standard)

Required LCA with **required performance**
for all buildings, **incentives** for highest-
performance buildings

(10% EC reduction required, 20% bonus threshold)



3



THANK YOU

Q&A and Discussion

