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Embodied Carbon 101

Friday, April 12 | 11:00am

AGENDA

1. Learning Objectives
2. About Foresight Management
3. Why Embodied Carbon
4. Common Challenges
5. Successful Processes
6. Tools + Resources
7. Case Studies
8. Q+A

Learning Objective 01:

Explain the difference between embodied and operational carbon.

Learning Objective 02:

Articulate why embodied carbon is critical in the path towards decarbonization and the Architecture 2030 interim targets for reduction.

Learning Objective 03:

Enumerate which tools can help design teams lower the embodied carbon of buildings and when to use them in the design process.

Learning Objective 04:

Understand common challenges to lowering the embodied carbon of buildings and how to overcome them.

A little about Foresight.

A little about Foresight. We exist to…

1. Champion energy management
2. Accelerate sustainability
3. Increase profitability

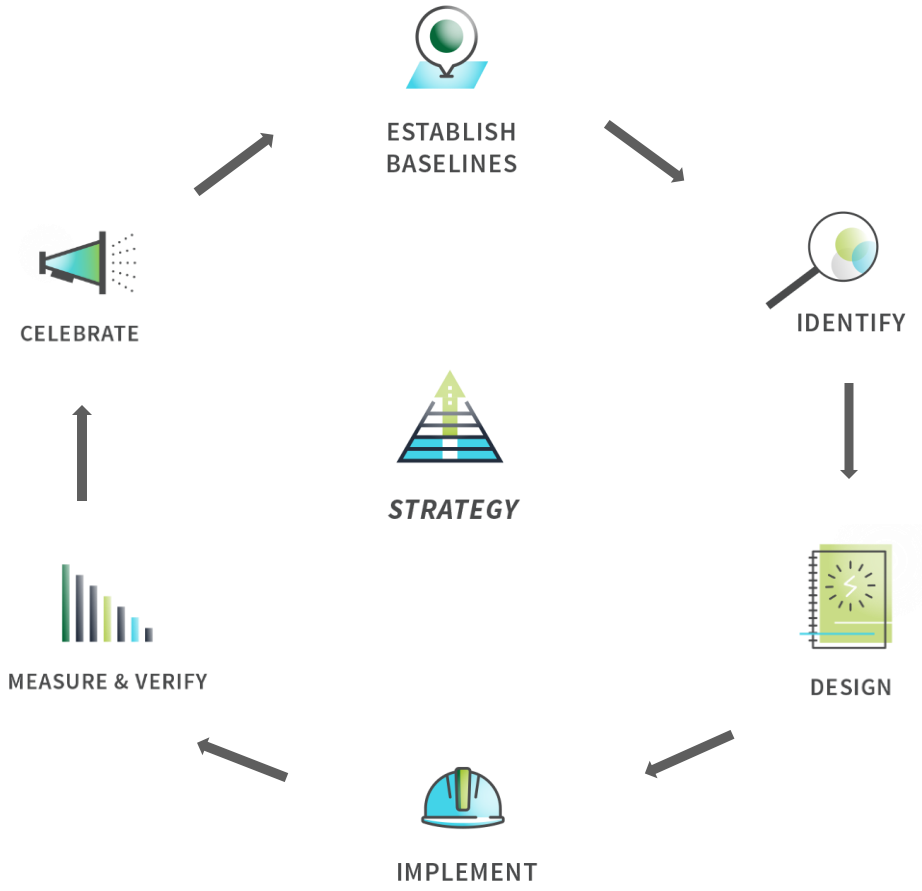
…for our clients

Our Process

Centered around and in support of the corporate strategy, sustainability can and should be pursued with continuous improvement in mind.

Sustainability is a journey, not a destination, and should be approached and addressed with the long-term in mind.

Our services are designed to meet your company wherever it's at along the path to energy excellence and a sustainable future.



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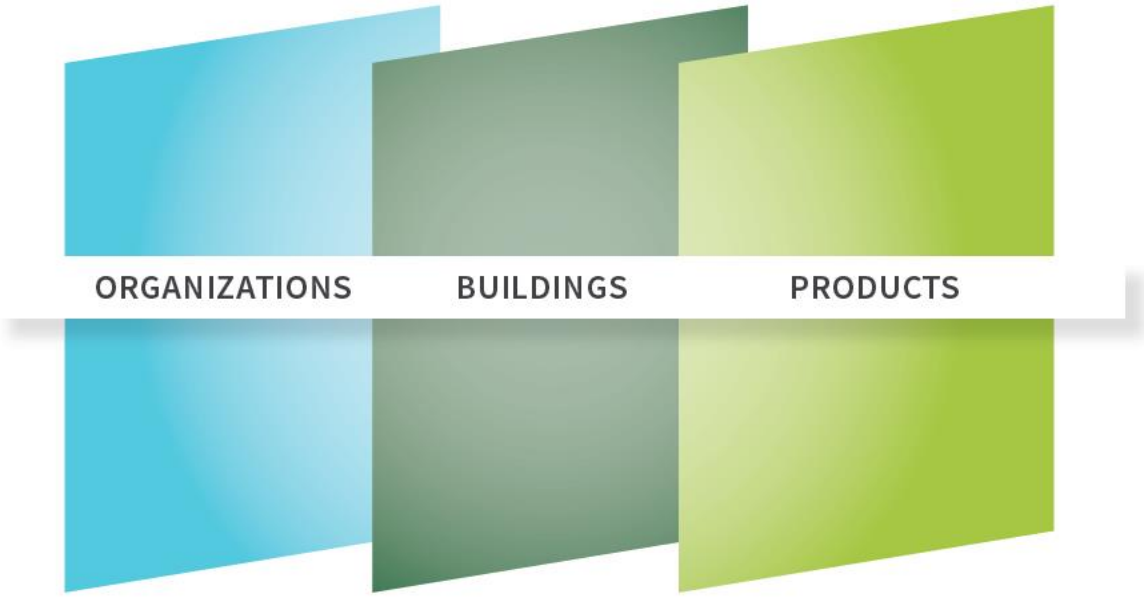
Areas of Impact



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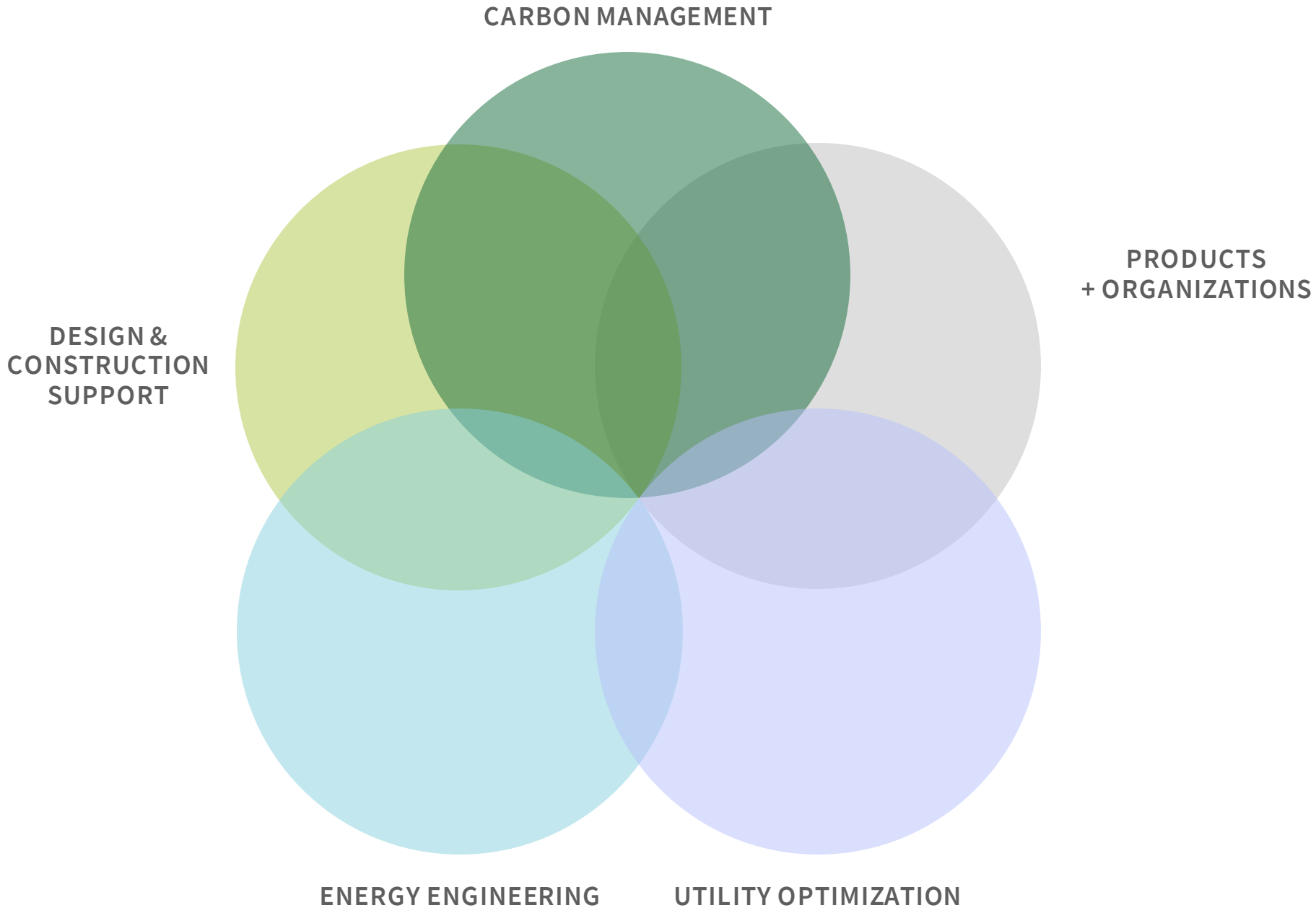
CARBON MANAGEMENT
DESIGN &
CONSTRUCTION
SUPPORT
PRODUCTS
+ ORGANIZATIONS
ENERGY ENGINEERING
UTILITY OPTIMIZATION

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Our Team

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Our Collaborators + Partners

Perrigo

Erhardt CONSTRUCTION

intertek

UrbanWorks 25

Pioneer CONSTRUCTION

CBRE

SMITHGROUP

HNI

TowerPinkster
Architecture · Engineering · Interiors

MillerKnoll

progressive ae

WOLVERINE BUILDING GROUP

BRINSHORE

meijer

PURE ARCHITECTS

MMA

VENEKLASEN CONSTRUCTION

PK PK COMPANIES

fishbeck

WOLVERINE worldwide

HAWORTH

HOBBS + BLACK ARCHITECTS

TSP Architecture Engineering Planning

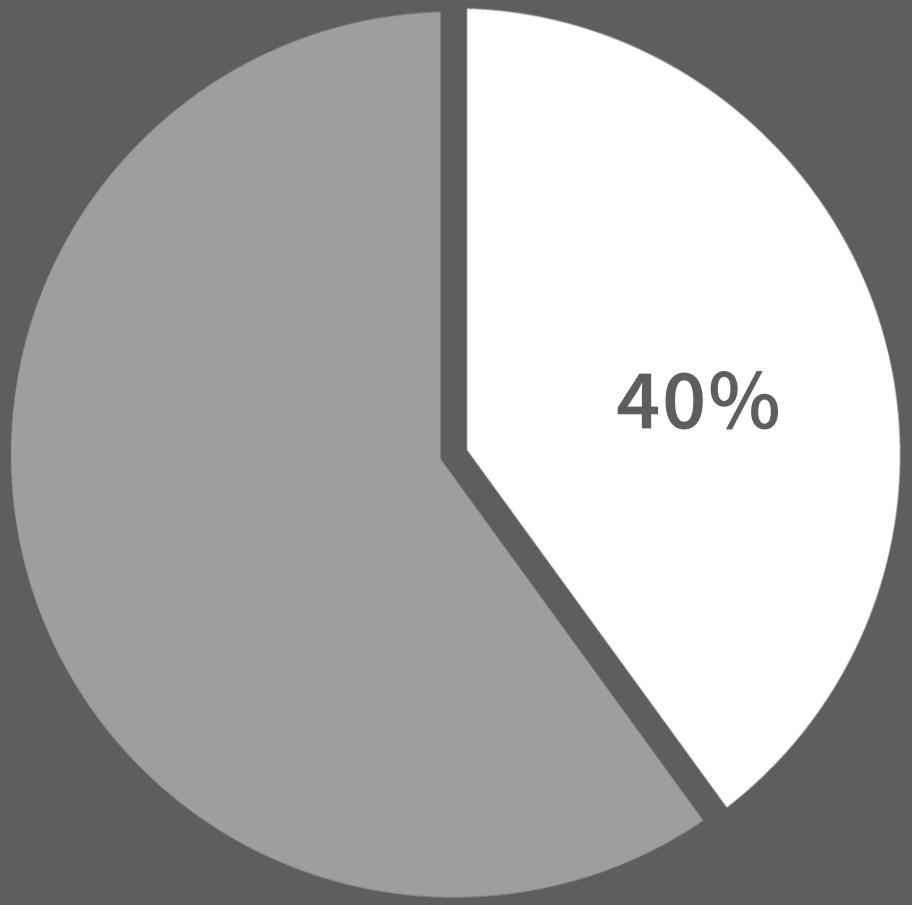
AIA

cote AIA / Committee on the Environment

J.S.VIG CONSTRUCTION
projectgreen

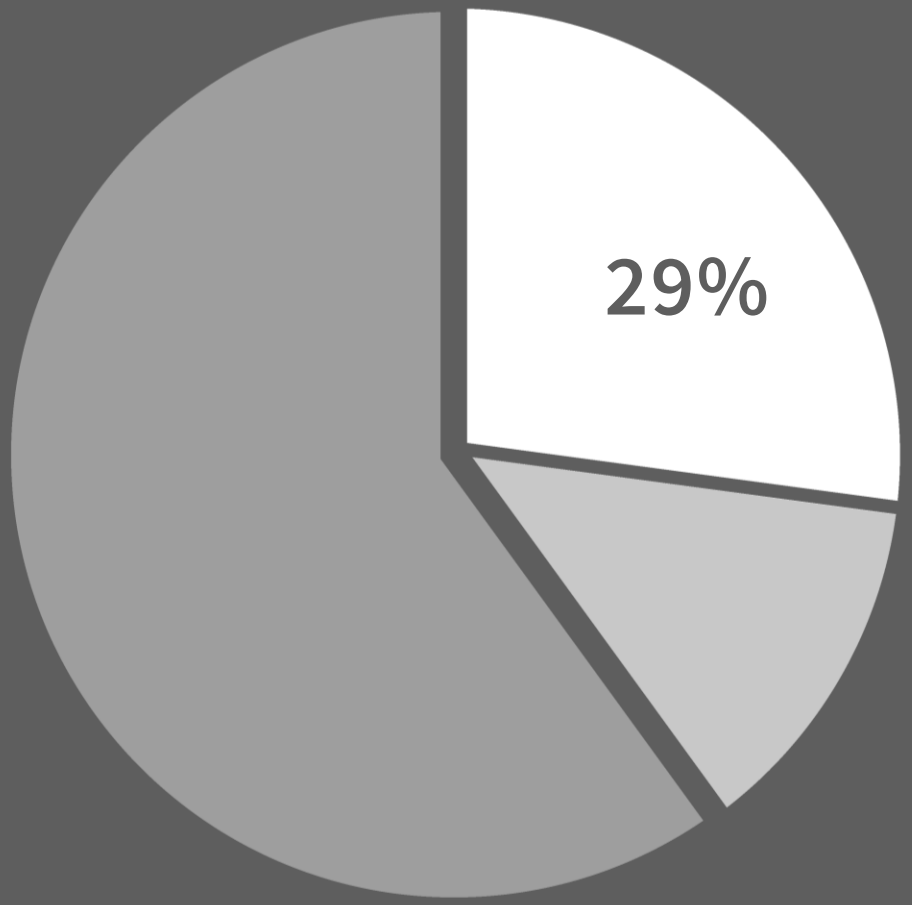
Why Embodied Carbon?

Why Embodied Carbon?



40% of global GHG emissions are associated with buildings.

Why Embodied Carbon?



72% of that 40% (29% of the total) is associated with **OPERATIONAL** carbon.


72% of that 40% (29% of the total) is associated with **OPERATIONAL** carbon.


MOUNTAINS and CARPET

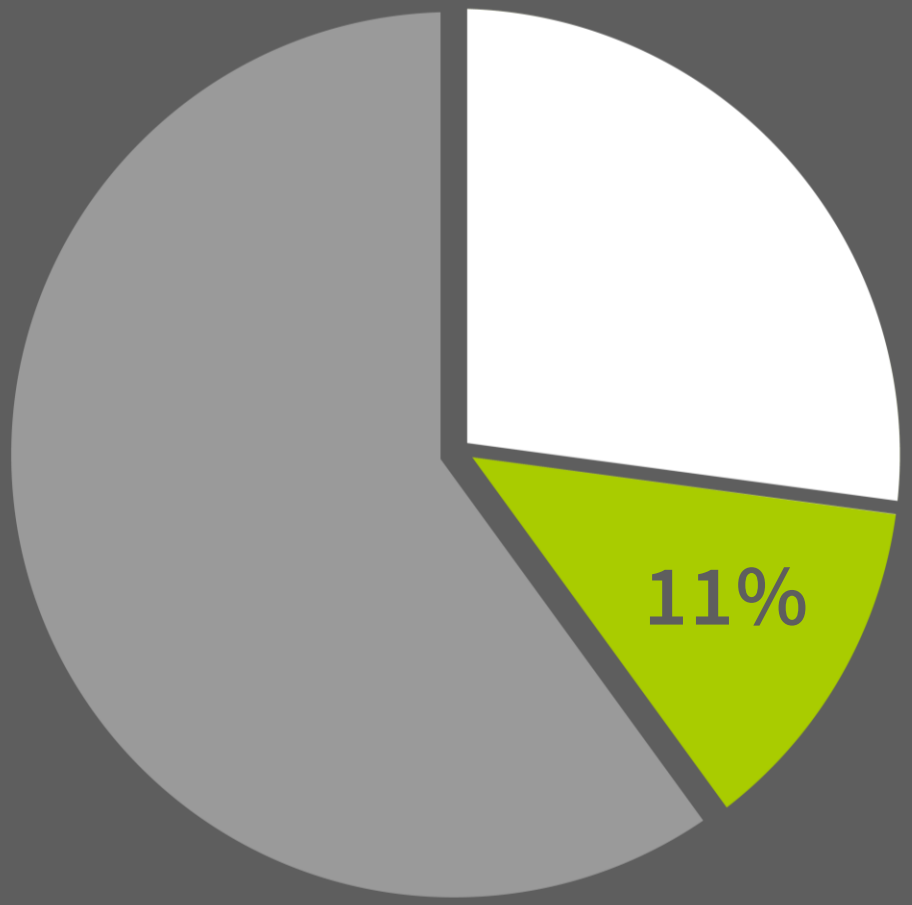

MOUNTAINS = buildings over 50,000sf


MOUNTAINS account for 5%
of all *buildings.*


MOUNTAINS account for
50% of all *energy use.*

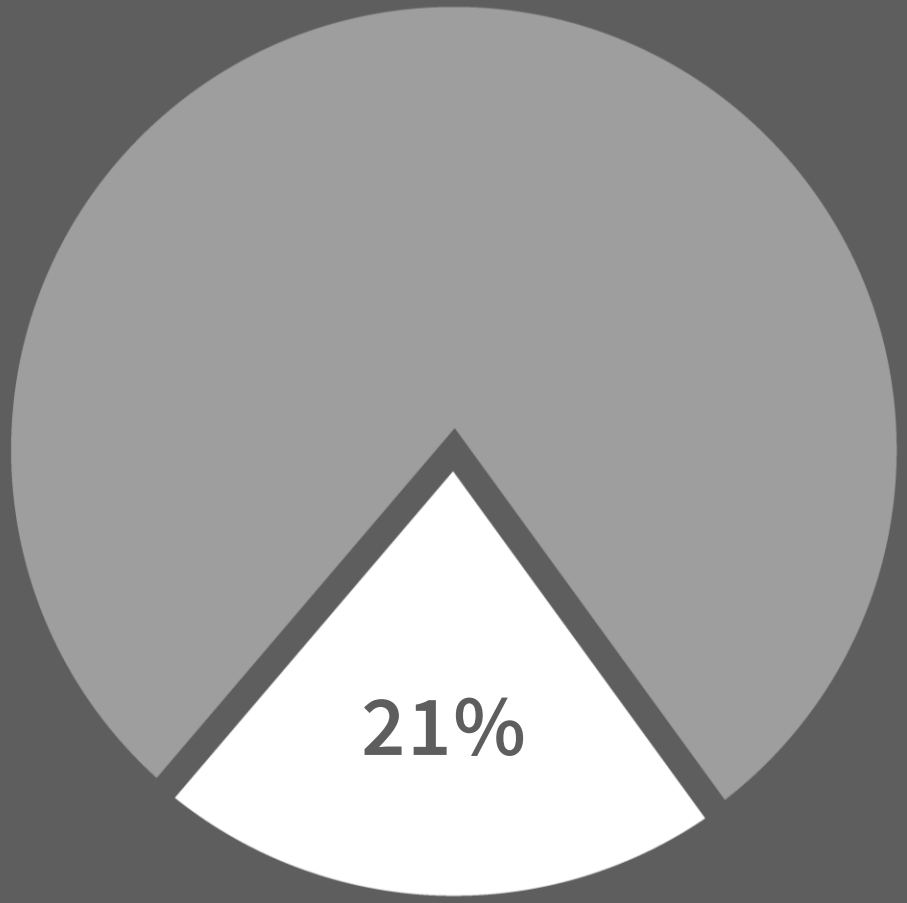

MOUNTAINS and **CARPET:**
Retrofit existing buildings!

Why Embodied Carbon?



28% of that 40% (11% of the total) is associated with **EMBODIED** carbon.

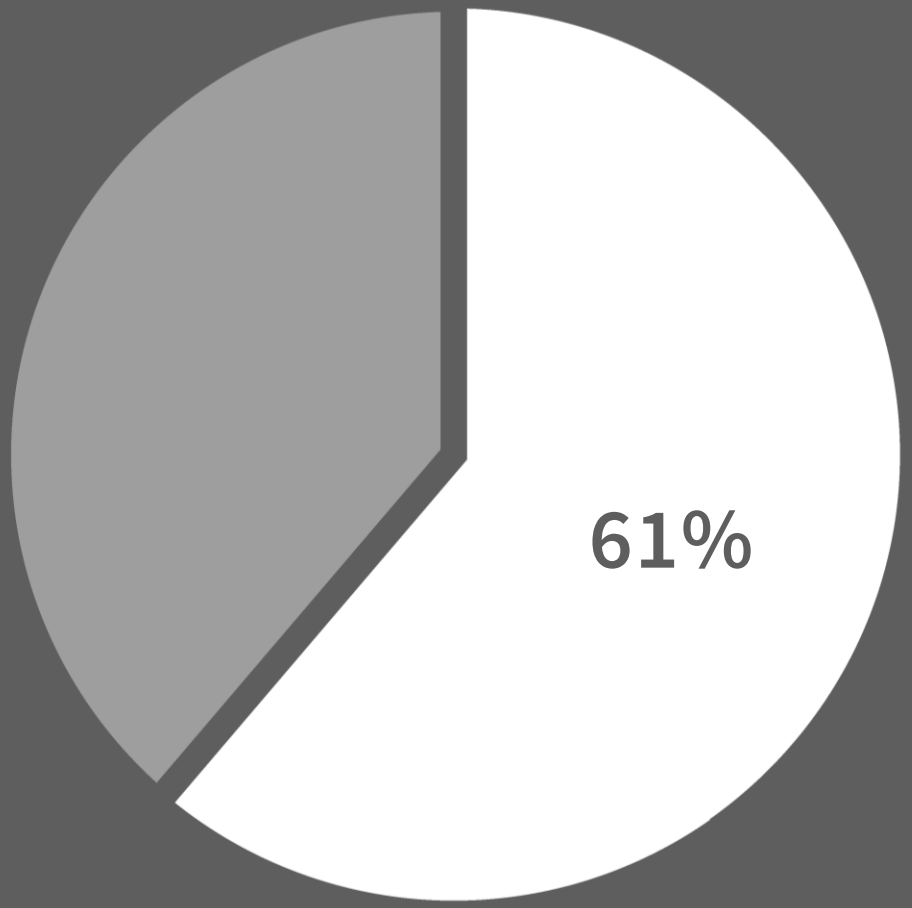
Why Embodied Carbon?



21% of global GHG emissions are associated with **TRANSPORTATION**.

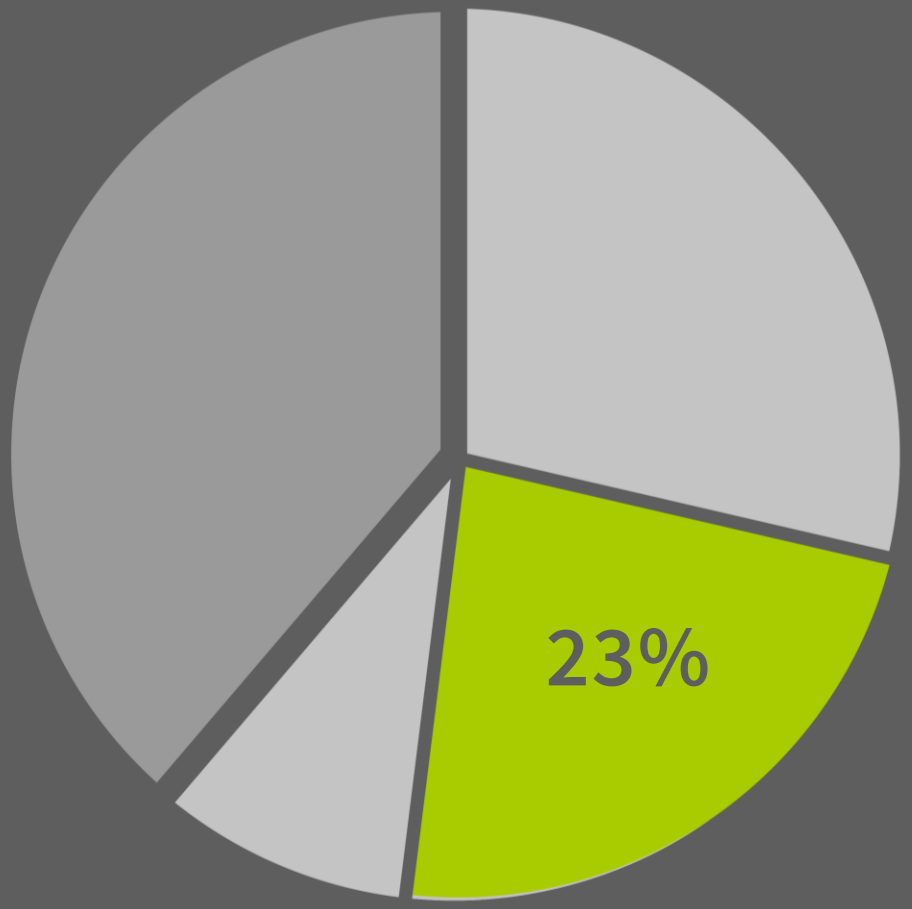
(which is essentially how we move people and things between buildings)

Why Embodied Carbon?



61% of global GHG emissions are determined by how we design buildings and where we place them in relation to one another.

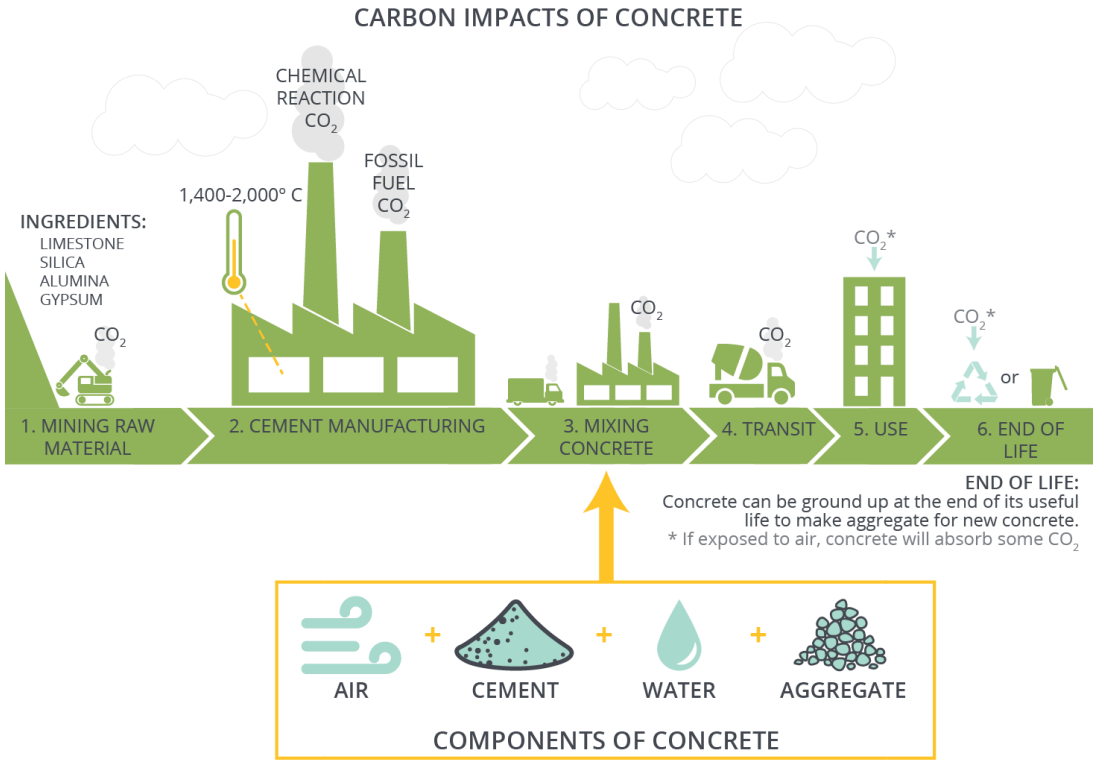
Why Embodied Carbon?

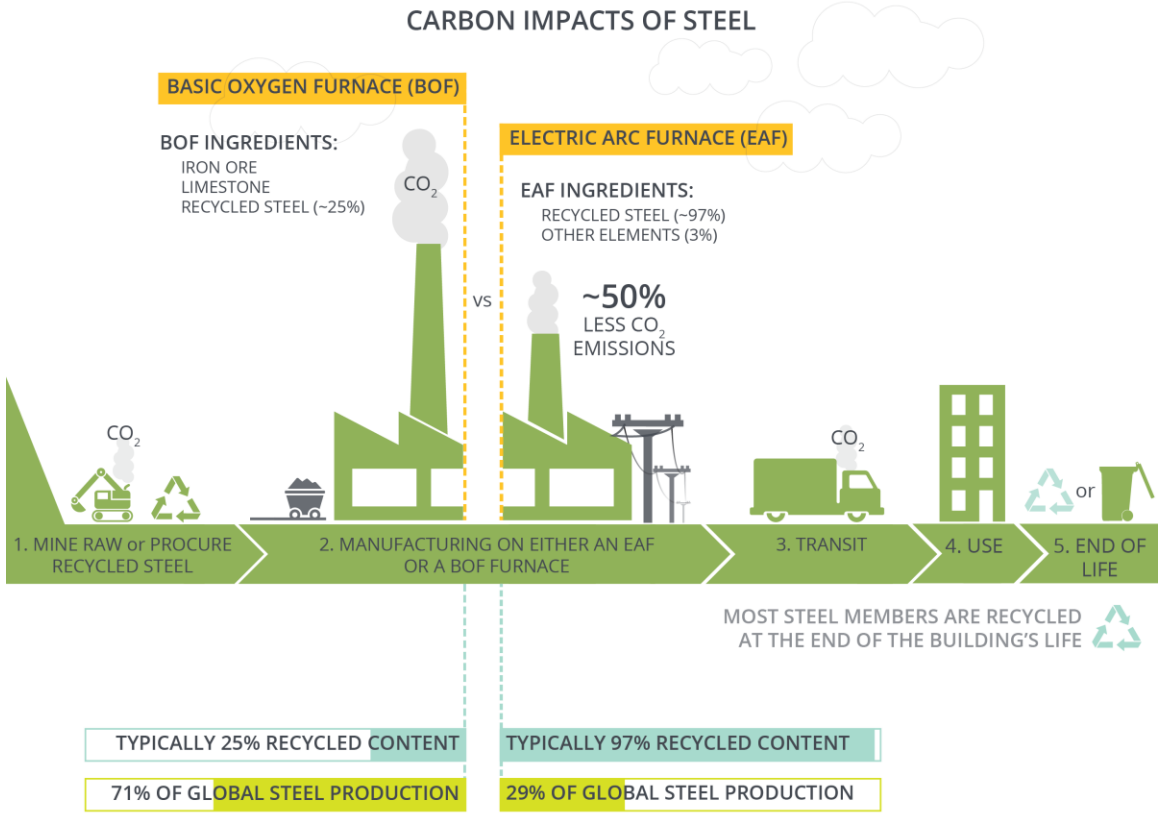


More than 1/3 of that (23% of the total) is associated with just three materials:

concrete (11%)
metal (10%)
aluminum (2%)

Why Embodied Carbon?





CARBON SMART MATERIALS PALETTE™

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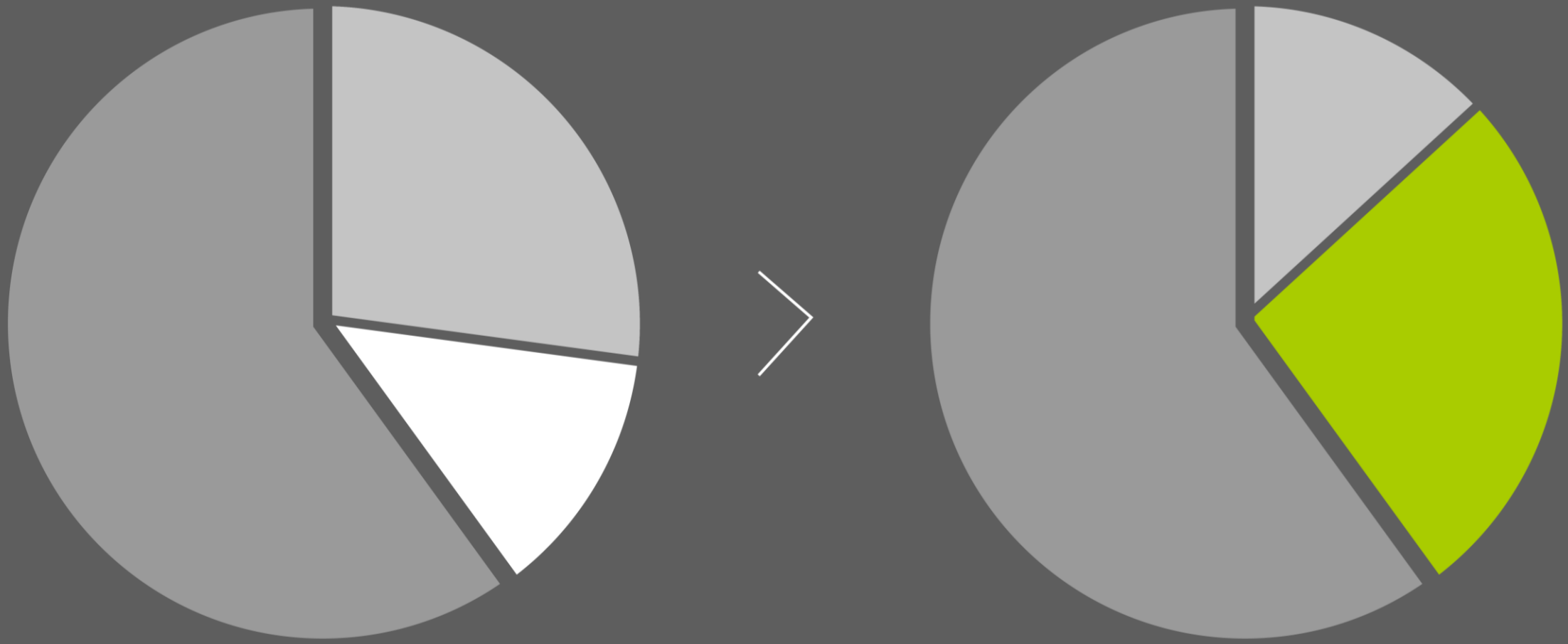
Why Embodied Carbon?



Historic Building Stock.

Buildings between now and 2030.

Common Challenges

Challenge 01:

How much carbon is embodied in this product?

LIFE-CYCLE ASSESSMENT

- Life-cycle assessment (LCA) is a technique to assess environmental impacts associated with all the stages of a product's life from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling.
- LCAs are time consuming, costly to compile, and the vast majority of products in the market are still lacking the necessary rigorous documentation to demonstrate a valid assessment.
- LEED (and other ratings systems) acknowledges products that have an existing EPD (Environmental Product Declaration) created from information gathered in an LCA.

LCA + EPDs

products

vs.

WBLCA

buildings

ecomedes SPOT UL Declare.

tally One Click LCA EC3 CARE Tool

Embodied Carbon

FIGURE 1
Life cycle stages for building products.
Based on EN 15978:2011 and ISO 21930:2017

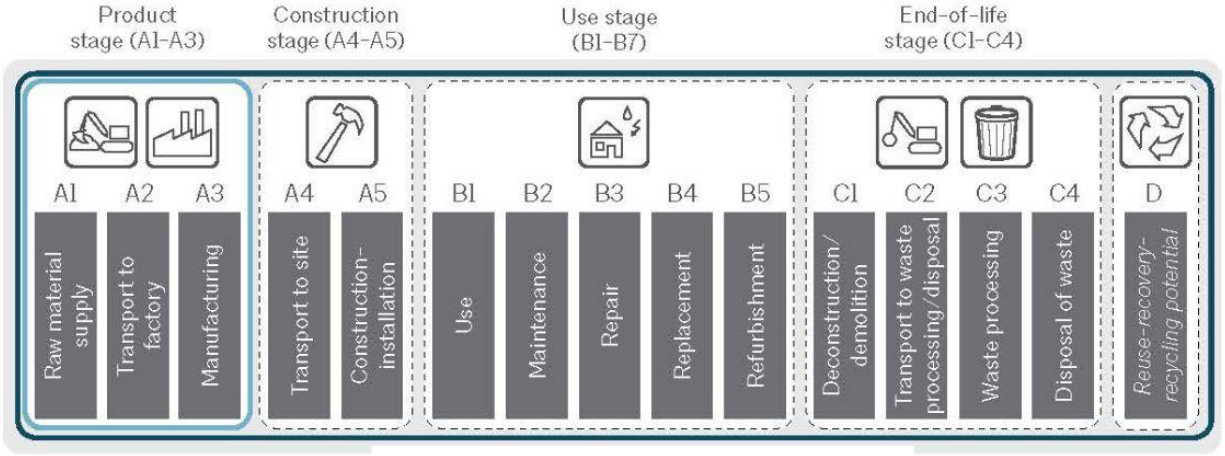


Image: AIA-CLF-Embodied-Carbon-Toolkit-for-Architects_Part2-V2

Embodied Carbon + Operational Carbon

FIGURE 1
Life cycle stages for building products.
Based on EN 15978:2011 and ISO 21930:2017

***Operational carbon stages that are typically excluded from life cycle assessments focused on embodied carbon**

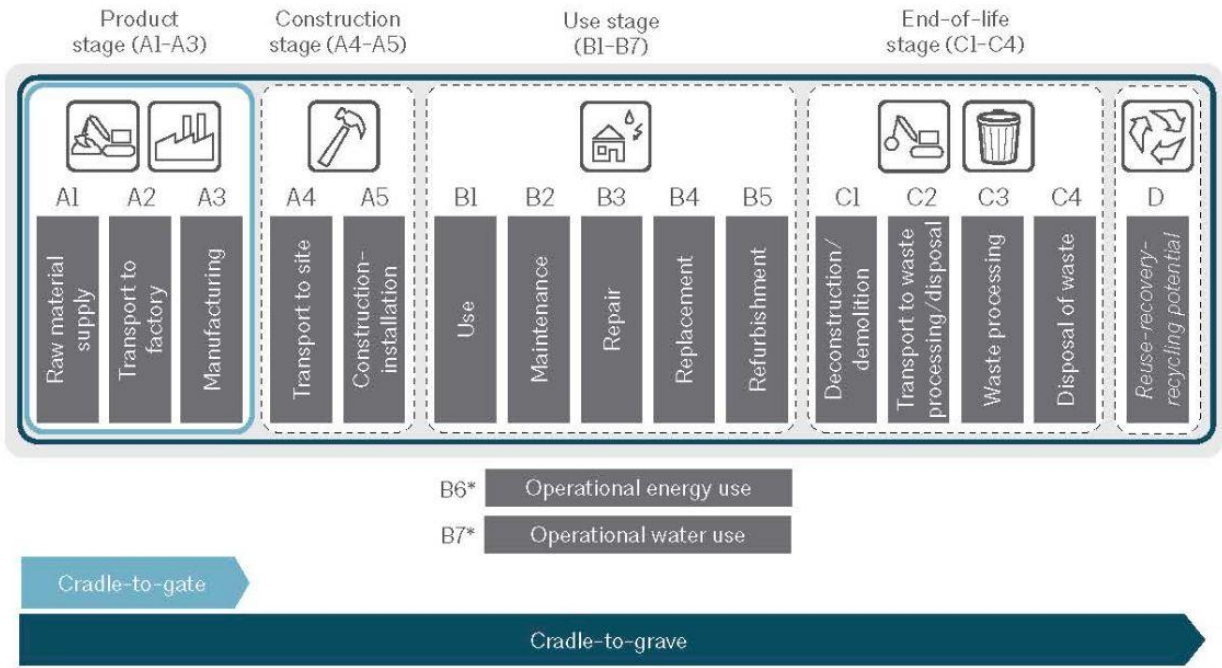


Image: AIA-CLF-Embodied-Carbon-Toolkit-for-Architects_Part2-V2

Challenge 02:

Where (and when) to start?

Challenge 02: WHEN

> "When just one percent of a project's up front costs are spent… up to **SEVENTY PERCENT** of its life cycle impacts are already be determined."
>
> —Joe Romm, Founding Editor of Climate Progress

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Challenge 02: WHEN

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Challenge 02: WHEN

1%

determines

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THE BALANCING ACT

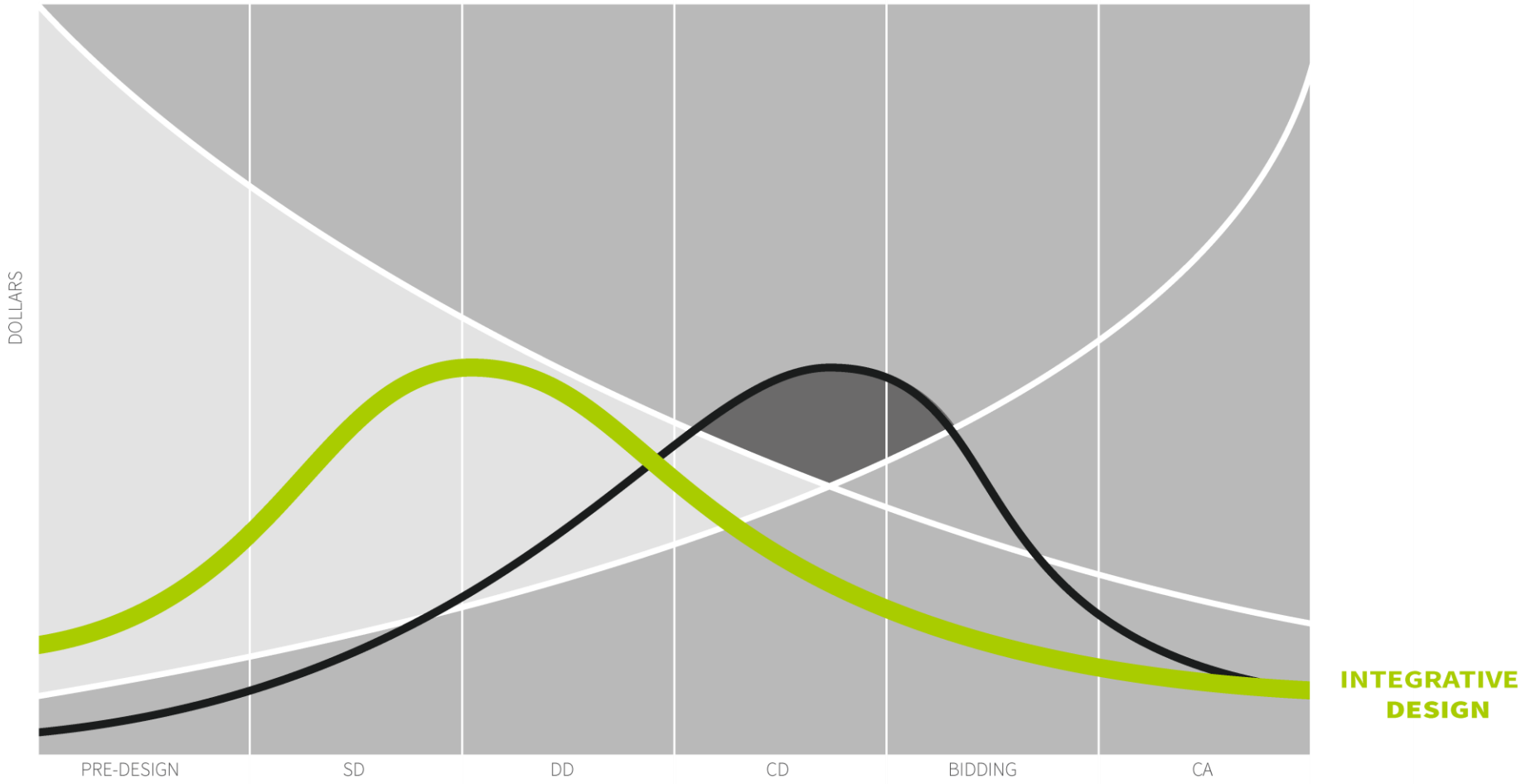
Structure

Interiors

Envelope

Mechanical

Challenge 02: WHEN



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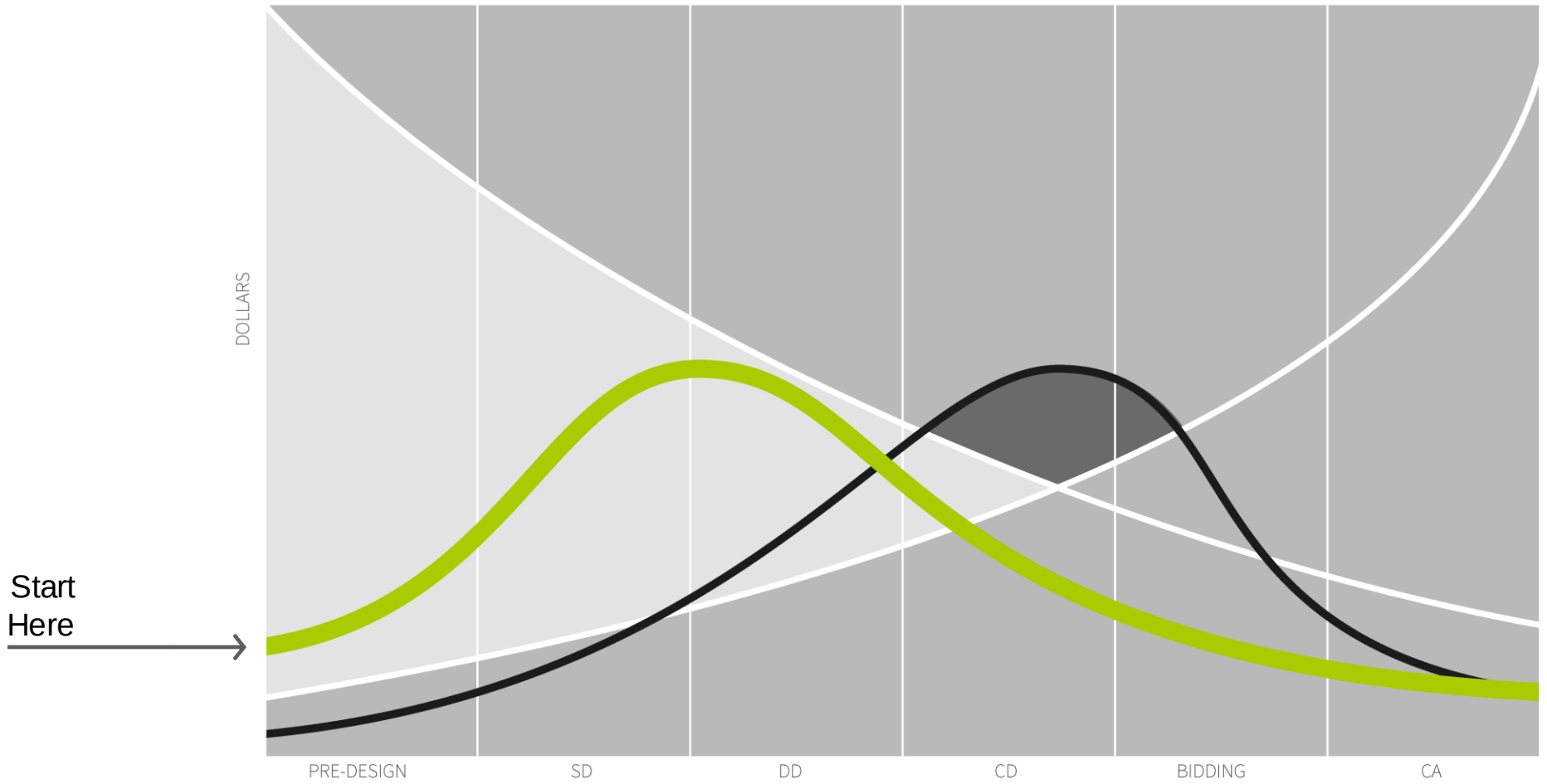
Challenge 02: WHEN



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THE BALANCING ACT

Structure

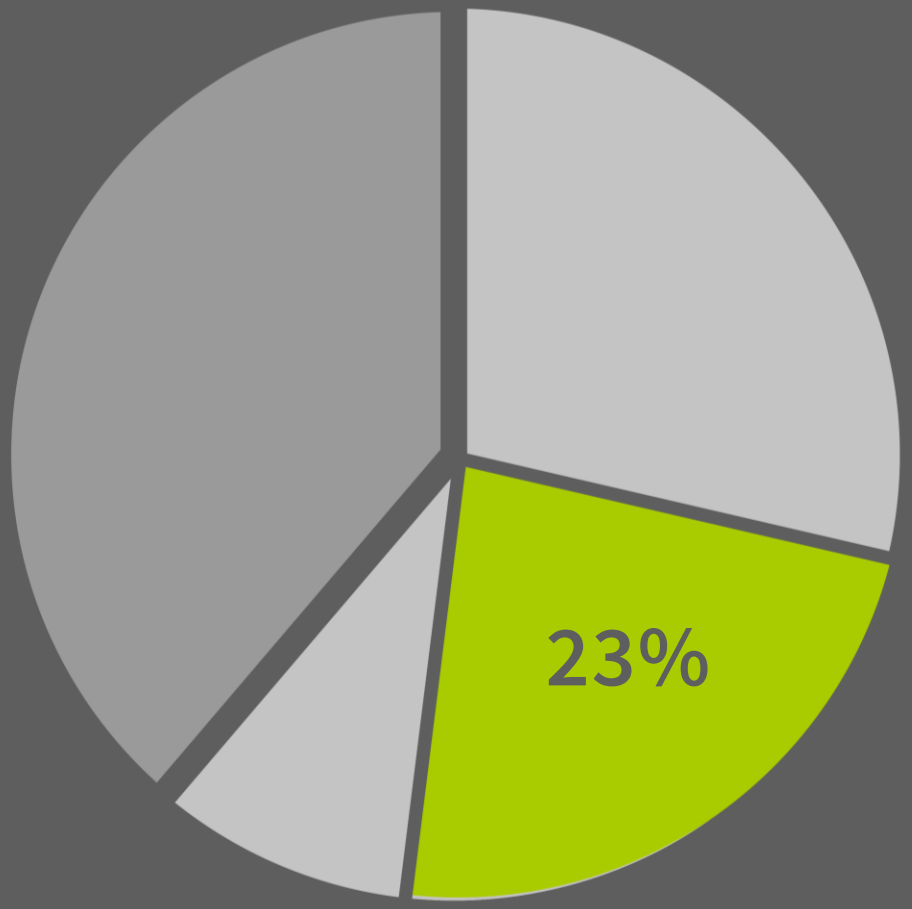
Interiors

Envelope

How do we make decisions for big impact within the ***existing constraints****?*

Mechanical

Challenge 02: WHERE



concrete (11%)
metal (10%)
aluminum (2%)

THE BALANCING ACT

Structure

- Load Capacity
- Floor Slab/System and Bay Sizing
- Shear Elements

Mechanical

- VRF
- Chilled Water
- Water Source Heat Pump

THE BALANCING ACT

Interiors

- Ceiling - Floor to Floor and Drop
- Partitions & Compartmentalization

Mechanical

- VRF
- Chilled Water
- Water Source Heat Pump

THE BALANCING ACT

Envelope

- Thermal Performance
- Airtightness
- Pentetrations

Mechanical

- VRF
- Chilled Water
- Water Source Heat Pump

THE BALANCING ACT

Structure

Interiors

Envelope

How do we make decisions for big impact within the ***existing constraints****?*

Mechanical

THE COST:
EMBODIED CARBON

Structure 

Interiors 

Envelope 

What do all the changes ***cost*** *us?*

THE COST:
EMBODIED CARBON

Structure 

Interiors 

Envelope 

What do all the changes ***cost*** *us?*

 Mechanical

THE BALANCING ACT

Structure

Interiors

Envelope

*How big is the **benefit**?*
*How much **energy** do we **save**?*

Mechanical

AIA

ChatGPT

1. Lack of knowledge and expertise
2. Cost implications
3. Changing design priorities
4. Complex supply chains
5. Limited availability of data

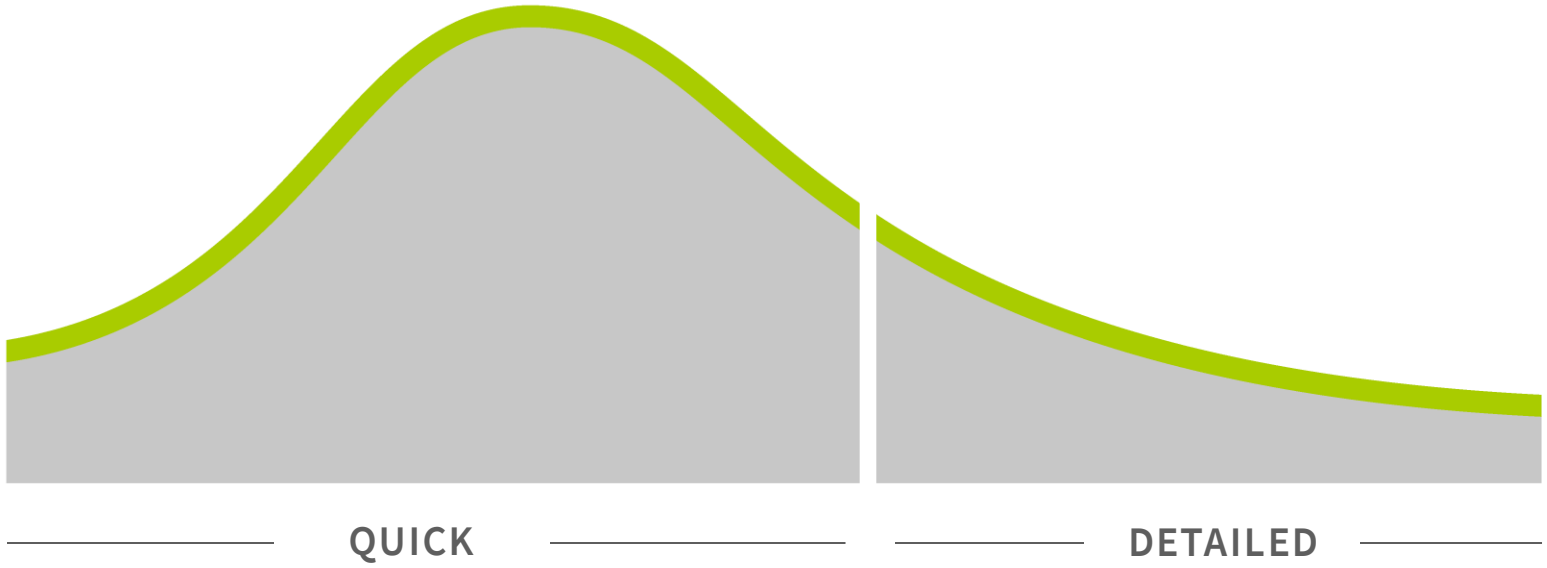
Foresight Management

Where (and when) does one start?

How much embodied carbon is in this product?

Successful Processes

Successful Process:



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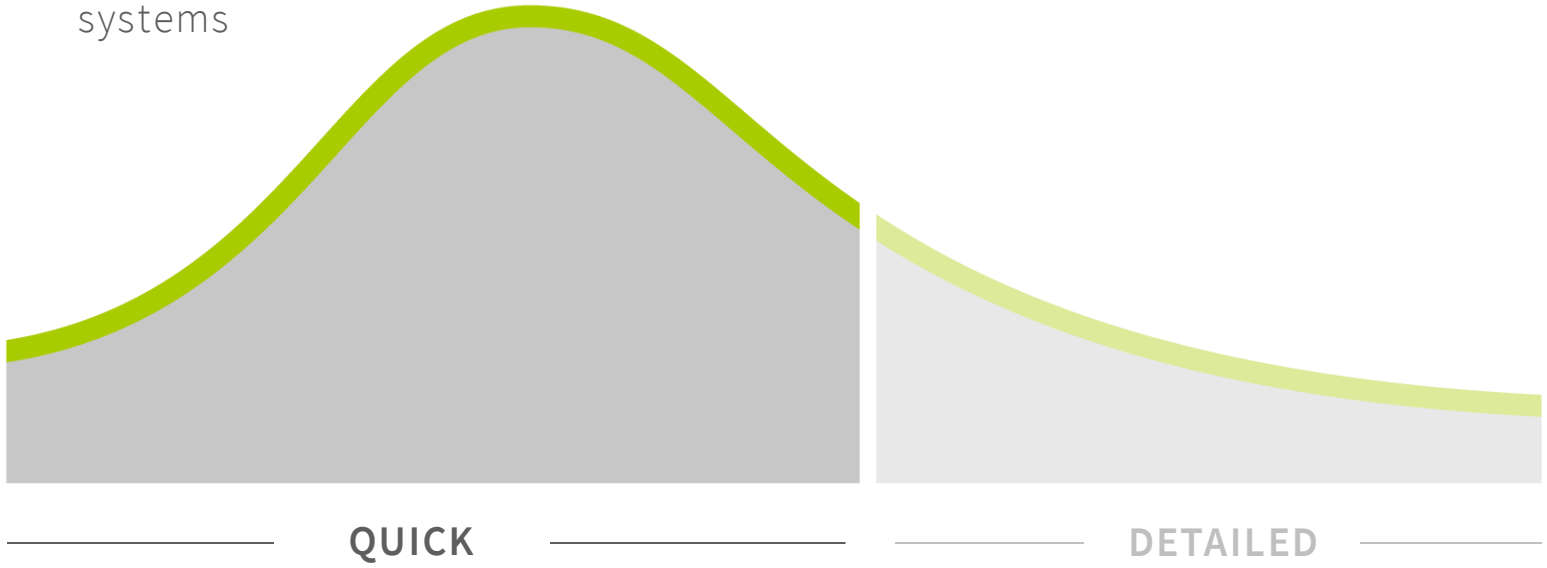
Successful Process:

1. Build only what is necessary
2. Set targets + pick your tool
3. Establish Baseline
4. Integrate Embodied Carbon into decision making criteria.
5. Focus on structural + envelope systems



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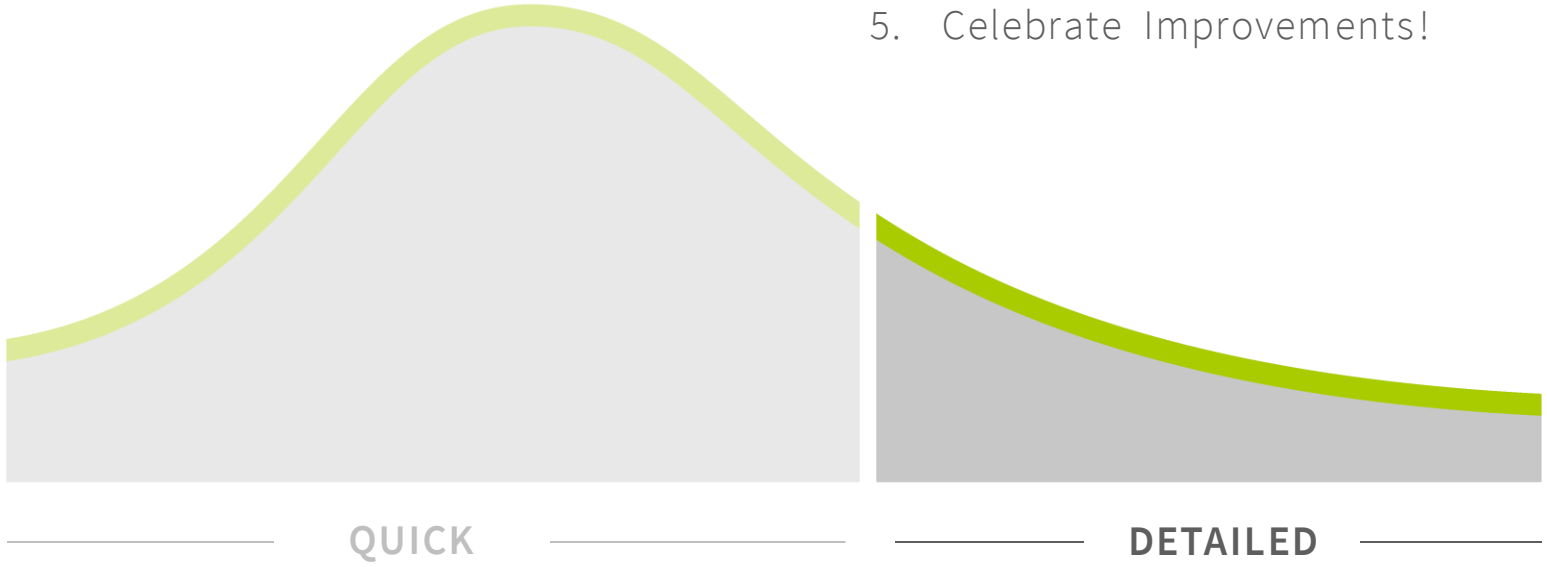
Successful Process:

1. Evaluate salvage/reuse materials
2. Focus on materials + systems with the biggest impact
3. Utilize product LCAs and EPDs to evaluate lower-carbon alternatives
4. Monitor + track process at key milestones
5. Celebrate Improvements!



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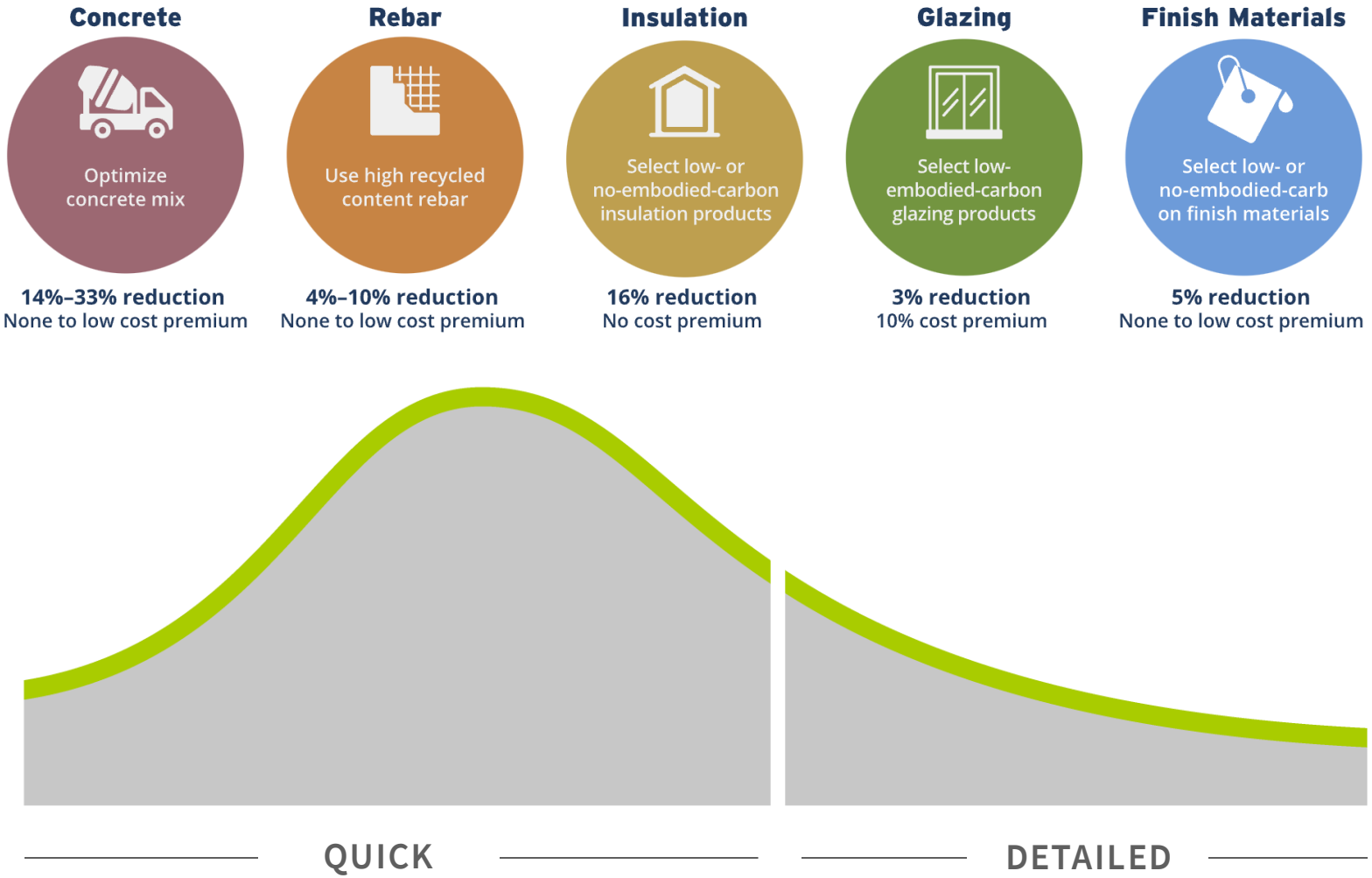
Successful Process:



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Tools + Resources

Tools:

PROs	Popular Real-time Easy comparisons Comprehensive database	Quick-and-easy inputs Interoperability Highly customizable International, most comprehensive database	Comprehensive database Open Source Free Bridges the gap from design to construction	Step-by-step guidance Developed by architects for architects. Designed specifically for existing buildings.
CONs	Limited inputs, reporting + output formats. Limited to Revit.	International, can be complex and time-consuming to use Limited reporting + output formats.	Can be complex and time-consuming to use Limited output formats. Does not integrate with other design tools.	Designed specifically for existing buildings. Limited material catalog. Limited Outputs.

Resources:

	ecomedes	SPOT® | UL	Declare.
EPDs	x	x	
HPDs	x	x	
Cradle-to-Cradle	x	x	
GreenGuard	x	x	
FSC	x	x	
VOCs	x	x	
LEED	x		
WELL	x		
LBC	x		x
Red List			x

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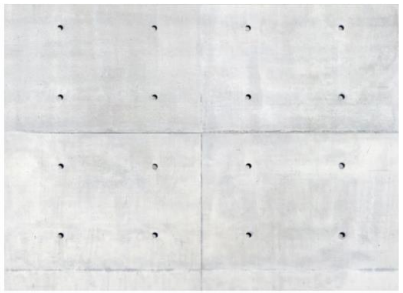
Resources:

CARBON SMART MATERIALS PALETTE™

HIGH-IMPACT MATERIALS

Predominant building materials with high-impact potential for emissions reductions



CONCRETE

STEEL

WOOD

INSULATION

CARPET

GYPSUM BOARD

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Resources:

CARBON SMART
MATERIALS PALETTE™

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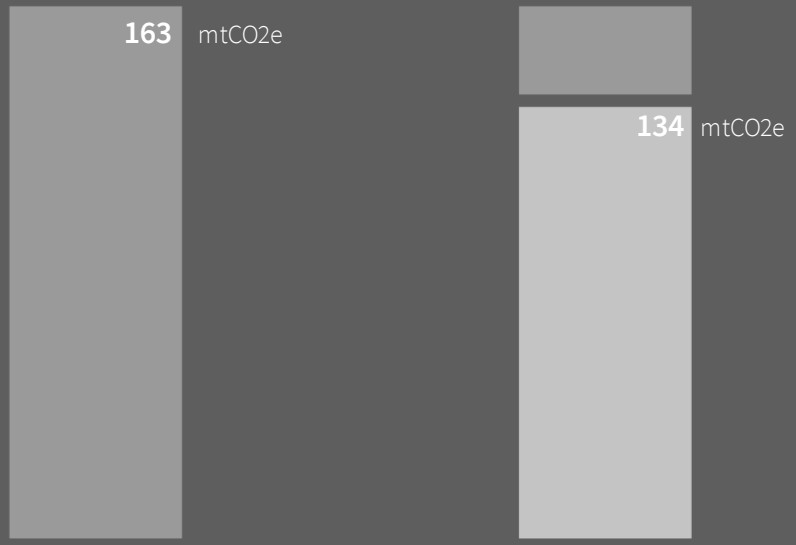
Case Studies

CASE STUDY

00:
baseline

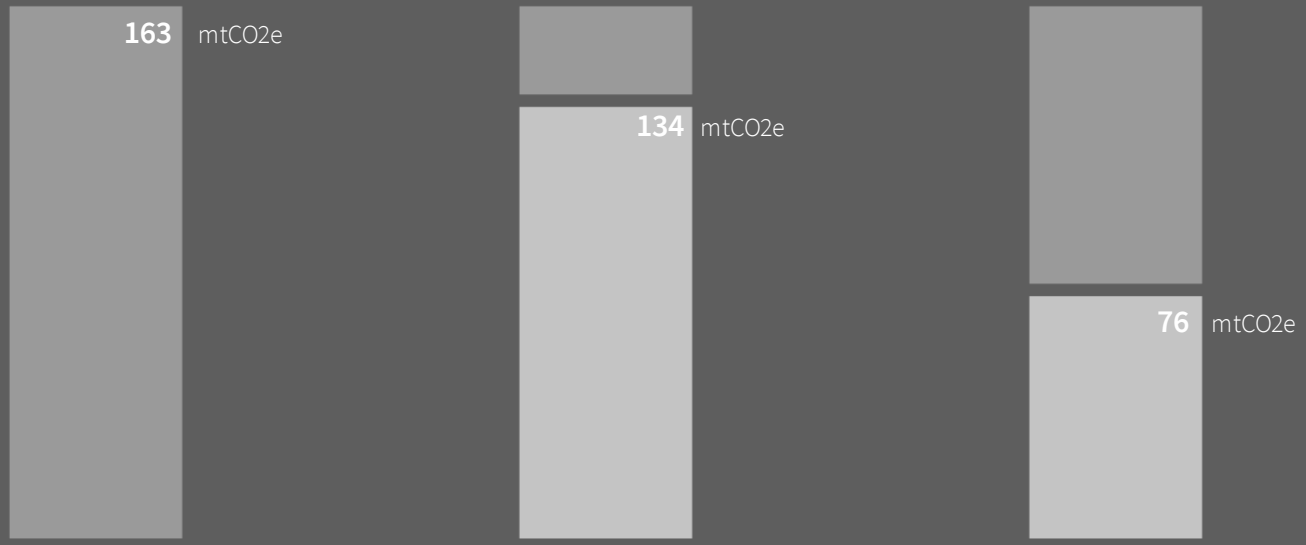
CASE STUDY



00:
baseline

01:
area
reduction

CASE STUDY

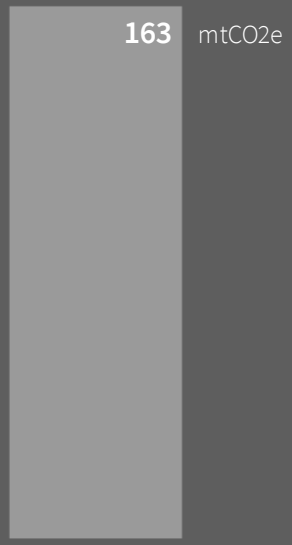


00:
baseline

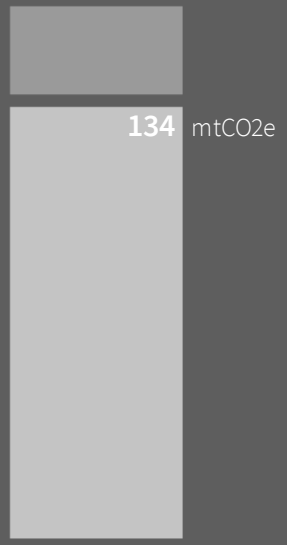
01:
area
reduction

02:
minimize
concrete
+ steel

CASE STUDY



00:
baseline



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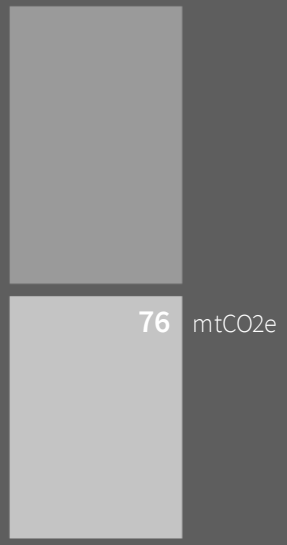
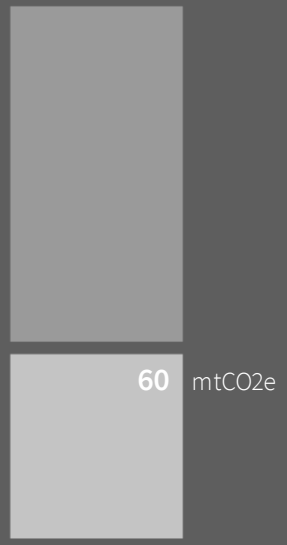
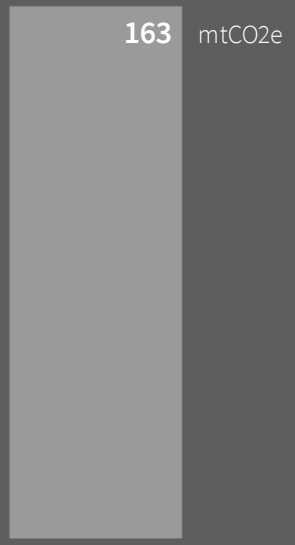


02:
minimize
concrete
+ steel



03:
salvaged
materials

CASE STUDY



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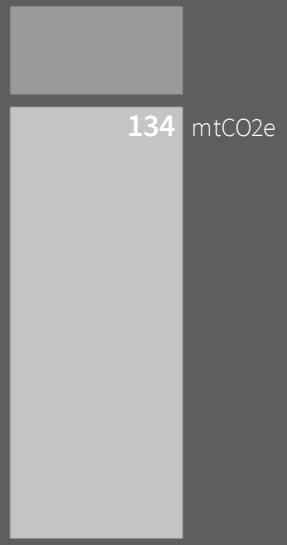
baseline



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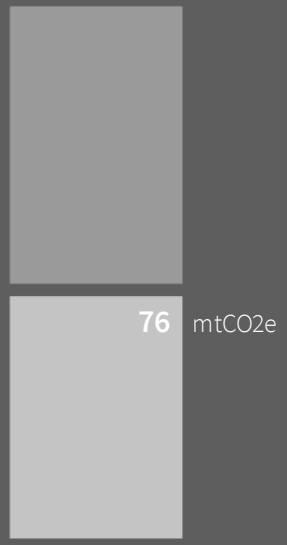

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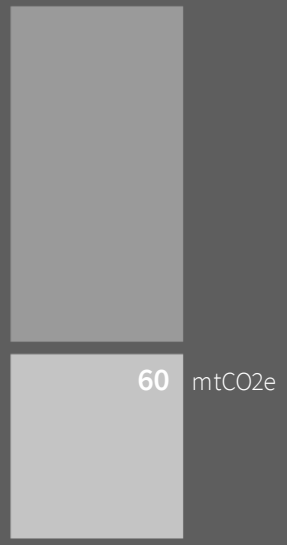

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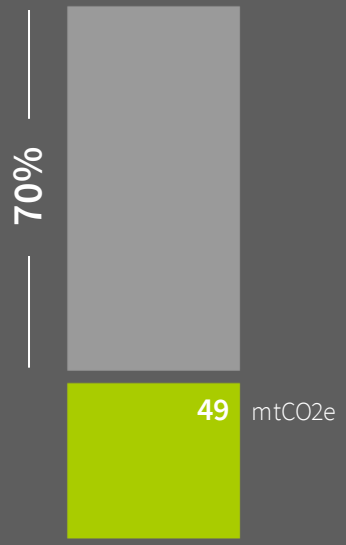

04:
low-carbon
alternatives

Q & A

Ready to talk or learn more?

EMAIL

hello@fsmgmt.co

VISIT

fsmgmt.co