

Carbon Leadership Forum

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www.carbonleadershipforum.org



CARBON LEADERSHIP FORUM

Advancing low carbon construction through research, education and outreach

DIAMOND

MITHÜN

STOPWASTE
at home • at work • at school

Carbon Innovations



PLATINUM

ARUP



Interface
Thornton Tomasetti



SKANSKA

GOLD



KIERAN TIMBERLAKE

MAGNUSSON
KLEMENCIC
ASSOCIATES
Structural + Civil Engineers



SIMPSON GUMPERTZ & HEGER

Engineering of Structures
and Building Enclosures



thinkstep



FABRICK

WALTER P MOORE

SILVER

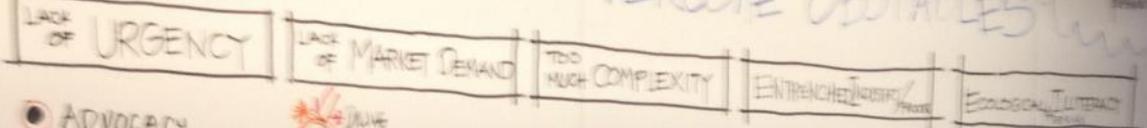
ADRIAN SMITH + GORDON GILL | ARKIN TILT | CARBON CURE | KATERRA | LUND OPSAHL | NATIONAL READY MIXED CONCRETE CO. | NRMCA | SELLEN | SHKS | SIEGEL & STRAIN ARCHITECTS

SUPPORTERS

ARCHITECTURE 2030 | ATHENA SMI | CASBA | C-CHANGE LABS | COALITION TO PRESERVE LA | CORRIM | ECOLOGICAL BUILDING NETWORK | ENDEAVOUR CENTRE | NET ZERO ENERGY COALITION

ACTIONS TO OVERCOME OBSTACLES

SSD INTEREST GROUP
 LEADERS: [unclear]
 MEMBERS: [unclear]



ADVOACACY
 - SHOW UP
 - DRAFT POSITION STATEMENT(S)
 - INCREASE SCIENTIFIC LITERACY (INFO)
 - PR CAMPAIGN (CLE)
 - DRAFT SUPPORTIVE MATERIALS
 - PLAN
 - FUNDING
 - DEPLOYMENT (2019)
 • SOUND BITES

DEMAND CARBON ACCOUNTING

ADVOCATE CLIMATE

DRIVE CITY/STATE LEGISLATION
 - ALLY WITH MP/ML
 - IDENTIFY PROMOTIVE POLICY PRIORS OF CITY/STATE LEVEL
 - GET HIGH RELEVANCE

WORK WITH LOCAL BUSINESSES TO

CONVINCE DECISION MAKERS
 - IDENTIFY DECISION MAKERS
 - FIND GO METRICS
 - CONSERVATION

KEEP ON

LCA SHOW-UP
 - SHOW UP (100%)
 - IDENTIFY TARIFFS (100%)
 - ESTABLISH DIVERSIFIED (100%)
 - EARLY ENGAGE LOCAL (100%)

SIMPLIFY LANGUAGE
 - LCA AND (100%)
 - PLAN LANGUAGE CAMPAIGN (100)
 - GROUND HO-TO (100%)

ESTABLISH A BASELINE SO WE'RE ALL SPEAKING THE SAME LANGUAGE

DESIGN

CONTRACTS

MANUFACTURE

SWAY

CRISIS

ACTIVE



EMBODIED CARBON NETWORK



"TRULY, WHAT A FANTASTIC, TIMELY, IMPORTANT BOOK!"
—DR. GARY H. HUBER, Editor of Sustainable and Green Design

THE NEW CARBON ARCHITECTURE



BUILDING TO COOL THE CLIMATE
BRUCE KING



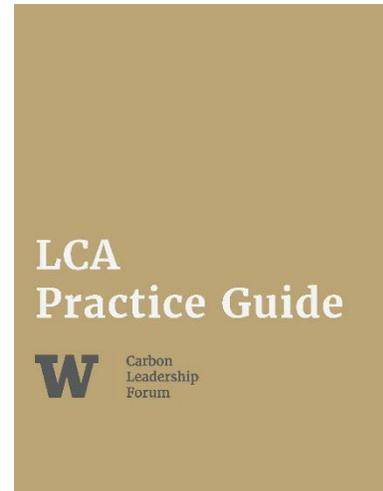
Embodied Carbon Benchmark Study LCA for Low Carbon Construction Part One



CHARLES PAVLOW FUNDATION
SKANSKA

Funded by:
The Charles Pavlow Foundation, Skanska USA, and Oregon Department of Environmental Quality

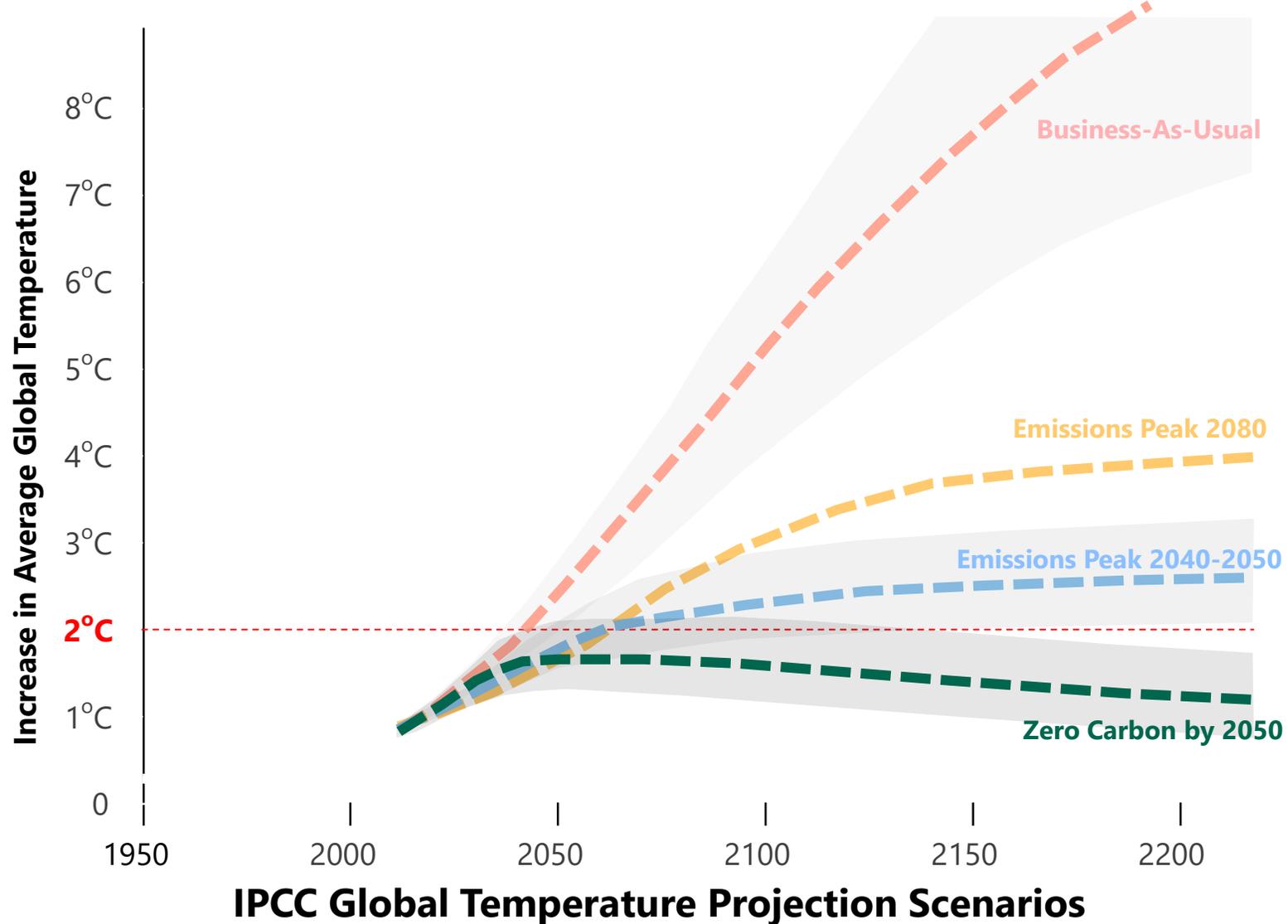
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www.carbonleadershipforum.org/resources/

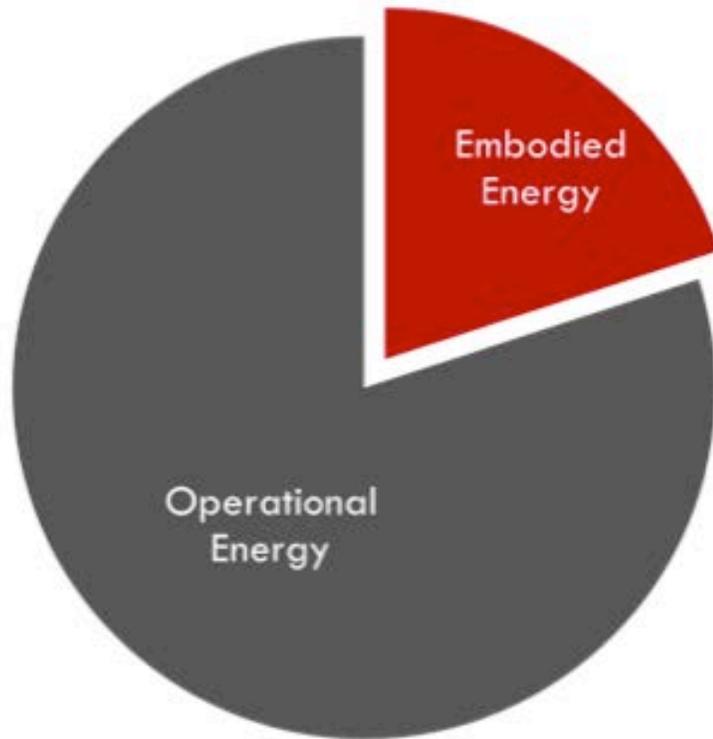
www.embodiedcarbonnetwork.org

Addressing Climate Change is a Time Critical Issue

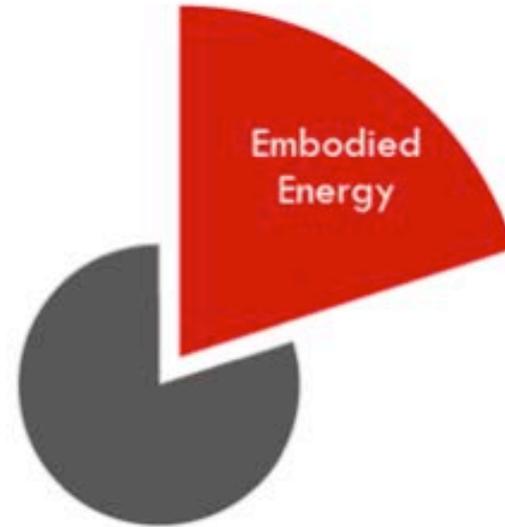


Net Zero = Zero Carbon??

Buildings: Total Lifetime Energy Use



Typical Building



High Performance

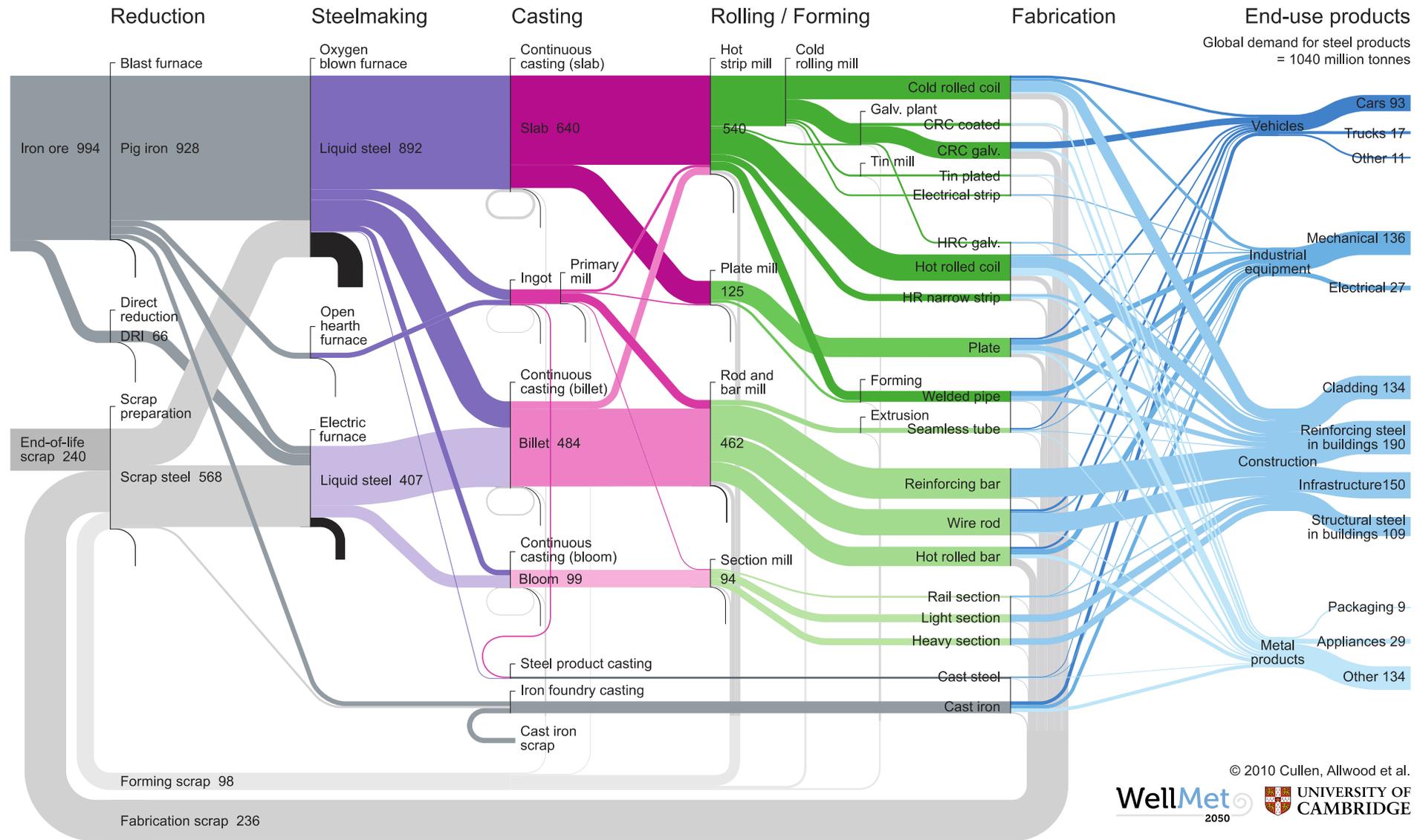
LIFE CYCLE ASSESSMENT/ CARBON ACCOUNTING





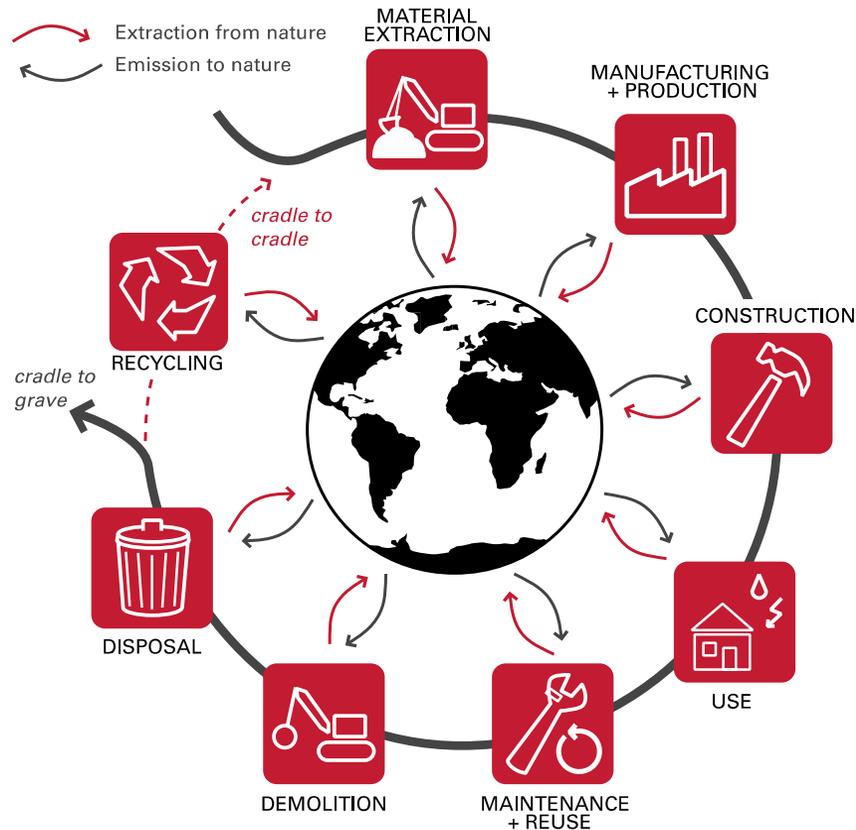
Rebar (Nucor Steel)

EXAMPLE LCA CHALLENGE: UK Steel Material FLOW



LCA **Life Cycle Assessment**

Standardized (ISO) method of tracking/reporting environmental impacts of a product (eg. flooring or building) over the life cycle.



EXTRACTIONS

- Raw materials
- Water
- Coal/Gas

EMISSIONS (soil, water, air)

- Fuel combustion
- Polluted water
- Agricultural run-off
- Chemical reactions

EUTROPHICATION (well nourished)



ACIDIFICATION (Low pH)



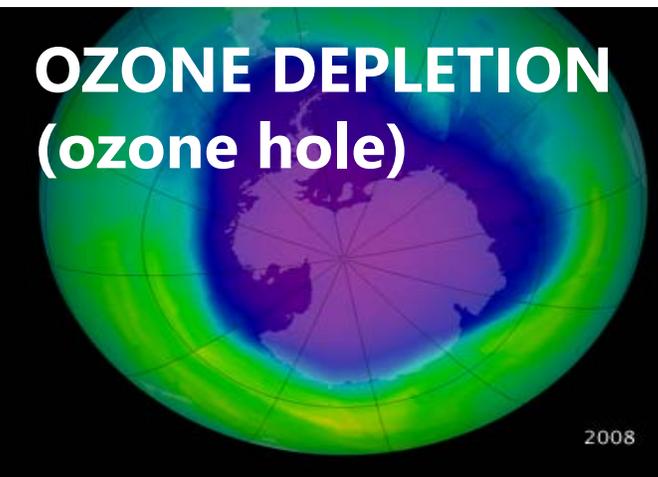
NOT JUST CARBON: OTHER ENVIRONMENTAL IMPACTS



OZONE FORMATION (smog)

**Not covered by Type
LCA**

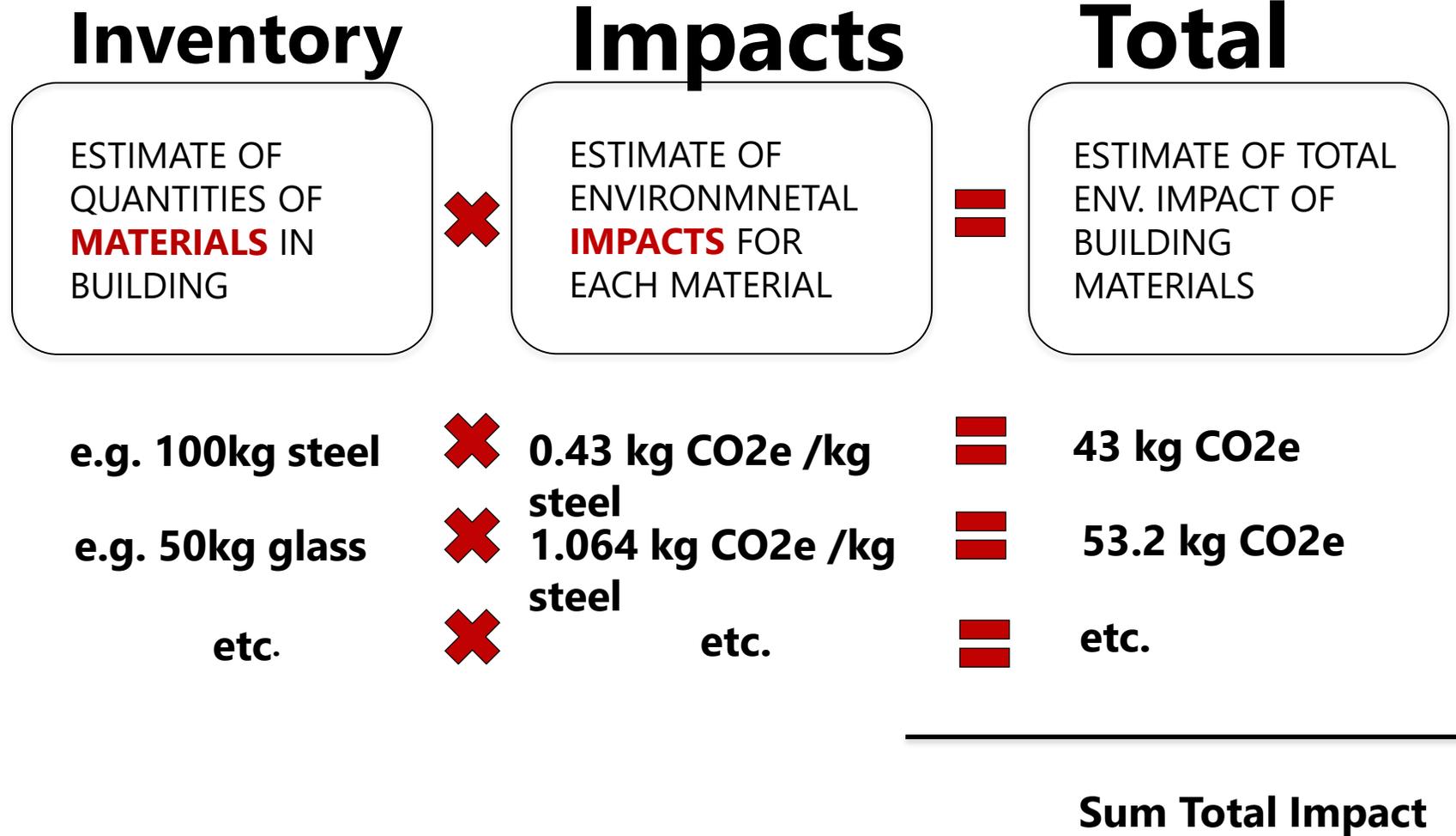
- Land use impacts
- Land use change
- Local impacts
- Habitat disruption
- Water use (developing)
- Human Health Impacts



OZONE DEPLETION (ozone hole)

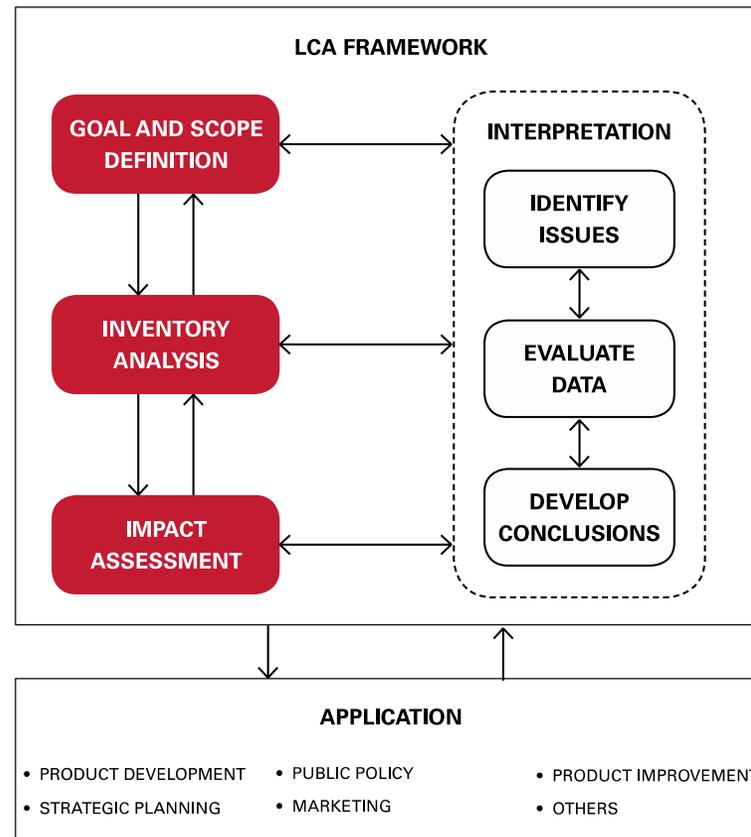
2008

MATERIAL to IMPACTS



LCA Life Cycle Assessment

Standardized (ISO) method of tracking/reporting environmental impacts of a product (eg. flooring or building) over the life cycle.



Goal:

What is the object of study?

Why is this study being performed?

What is the desired outcome?

Who is the audience?

Scope:

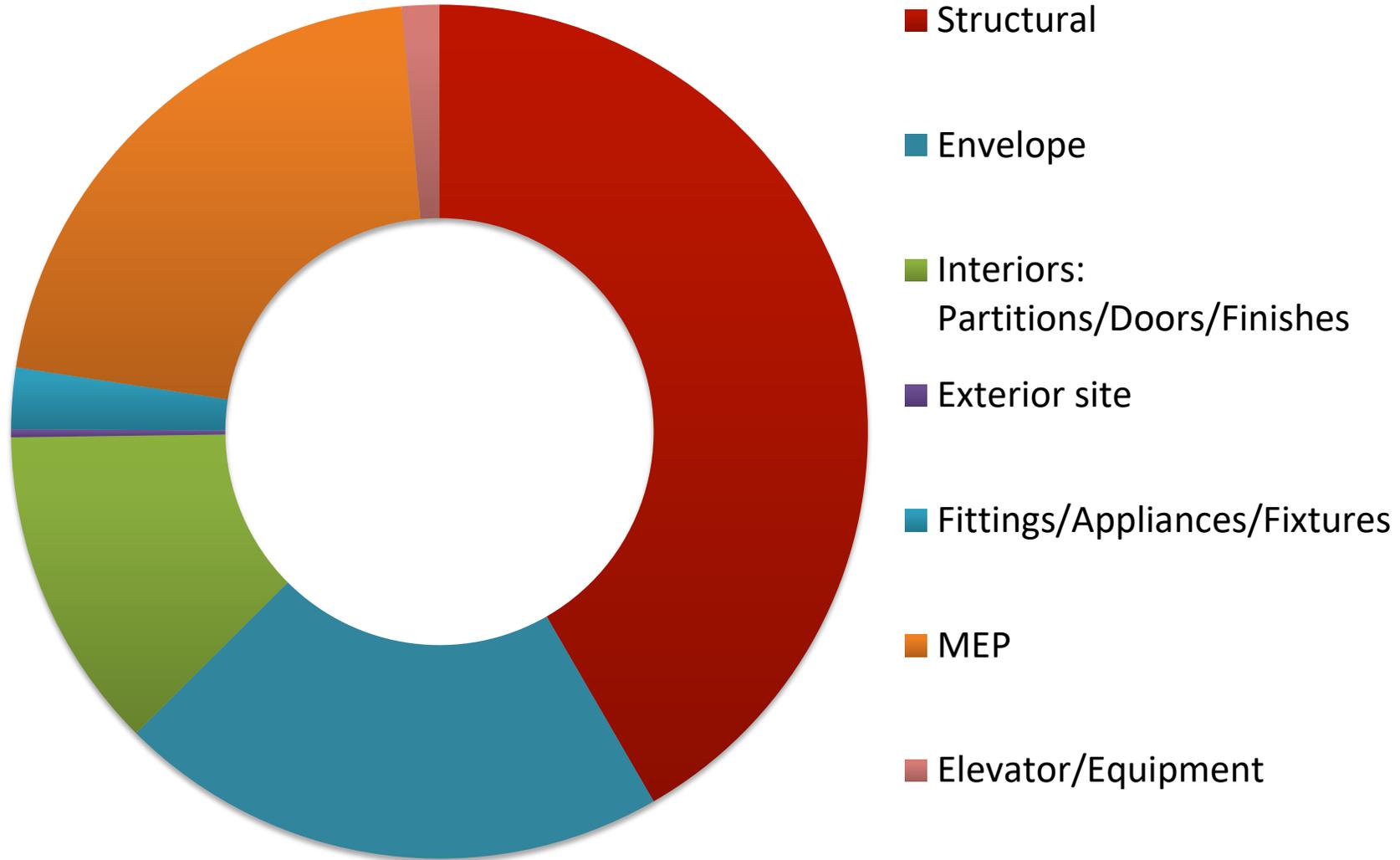
What is included?

What is excluded?

What are the boundaries of study?

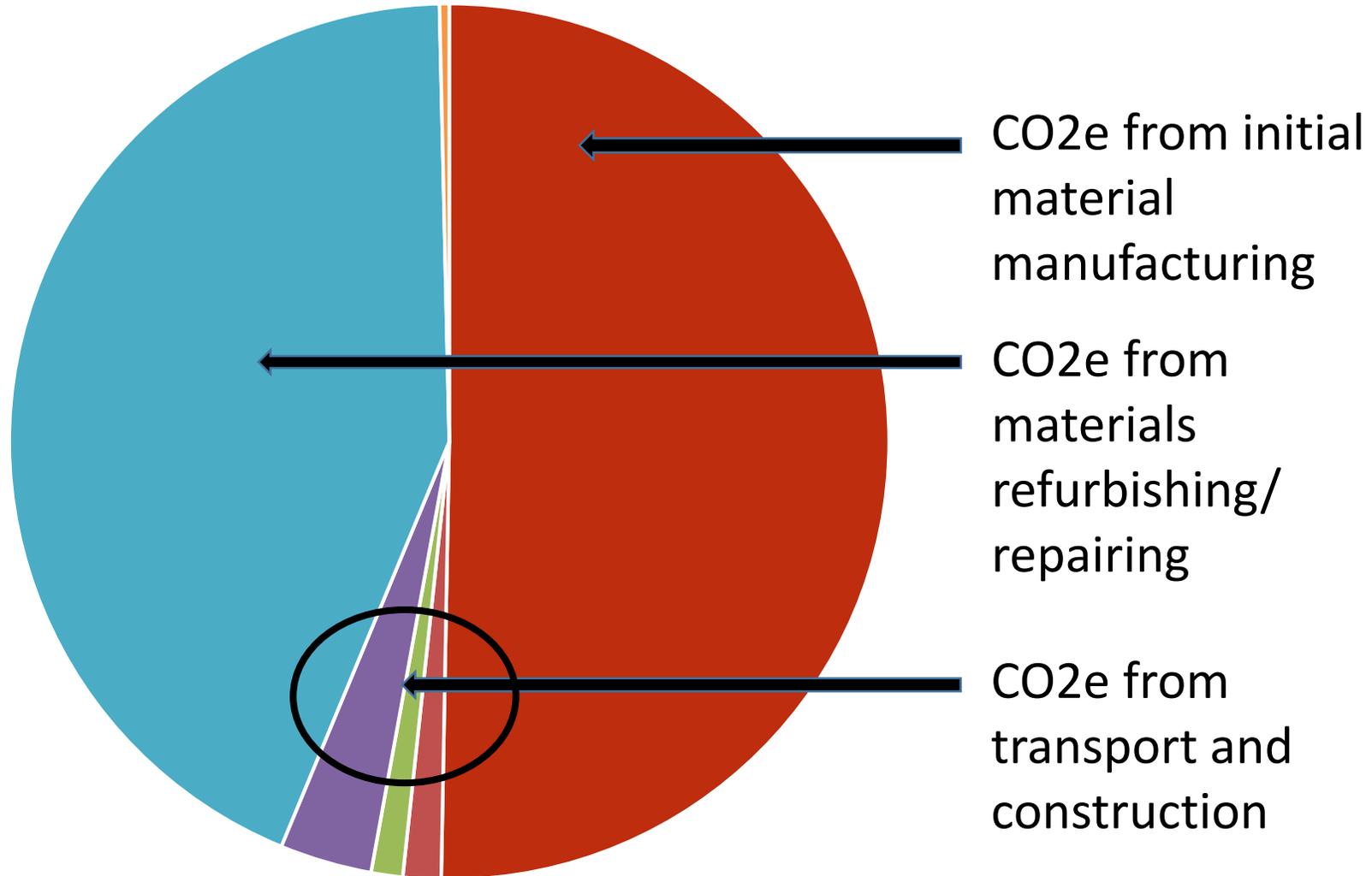
Where is the data coming from?

What impacts will be assessed?



Embodied Carbon Material Breakdown (initial construction)

Embodied CO2e over 100 year life



■ Manufacturing
■ Construction

■ Mfr Transport
■ Use

■ Const Transport
■ End of Life

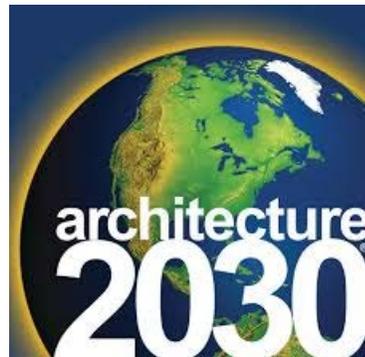
BUILDING INDUSTRY DRIVERS



Points for use of products with EPDs

- Manufacture specific (20 products/5 mfr)
- Industry average (half credit)
- No more than 30% from structure/enclosure

Points for demonstrating whole building improvements



- Architecture 2030 Challenge for Products
- Push to deliver low carbon products by 2030
 - Manufacturer specific
 - Industry average

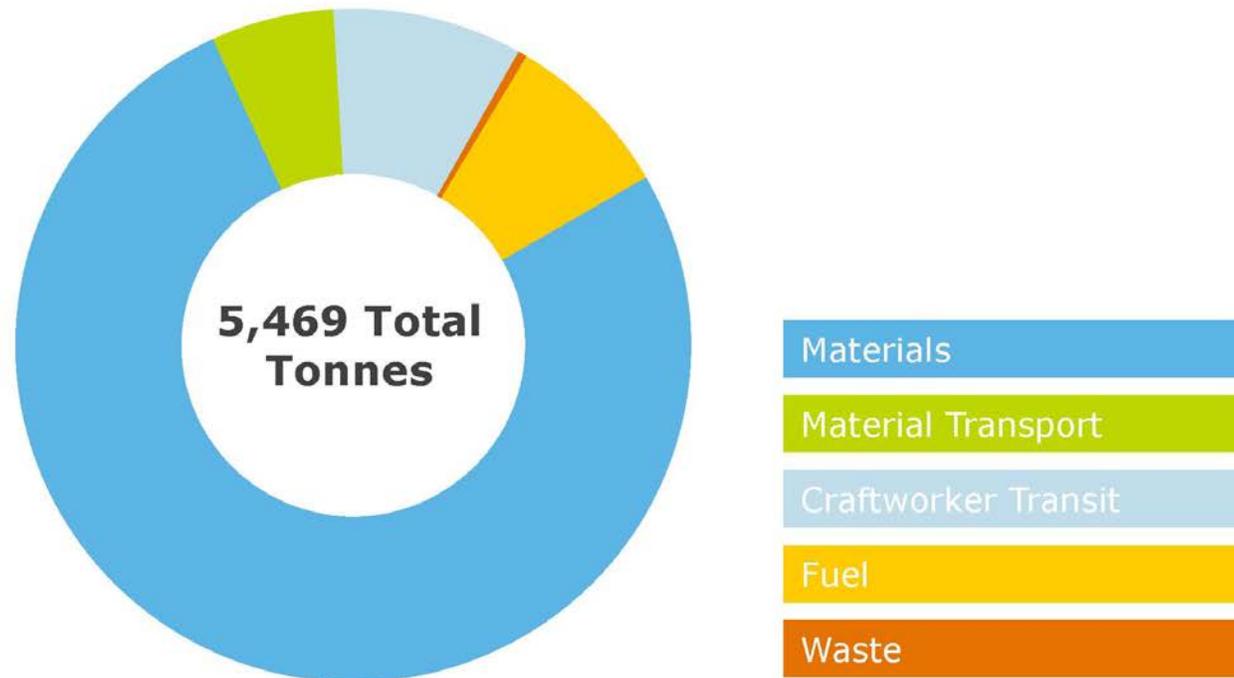


AEC Industry Pushing for Increasing Transparency

- HBD: Health Product Declaration
- Declare: Living Building Challenge Labeling
- Responsible Sourcing Certification in LEED etc.

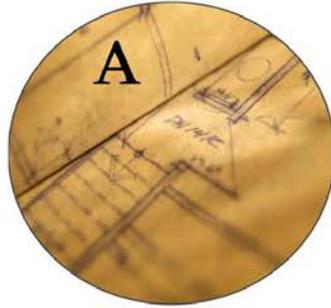
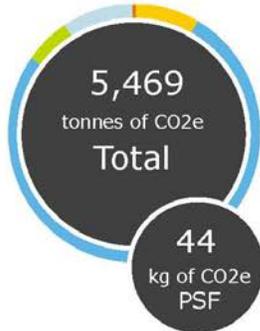
Total Carbon Emissions

The total emissions of CO2 equivalent for the project is made up of emissions due to the manufacture of materials, transport of materials, craftworker transit, fuel usage, and waste transport.



Project A

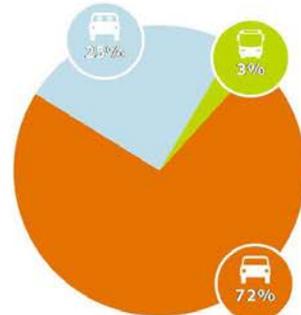
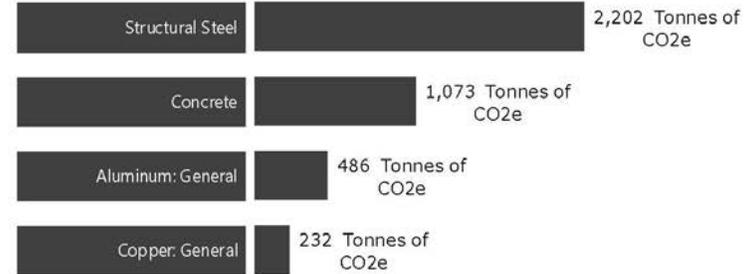
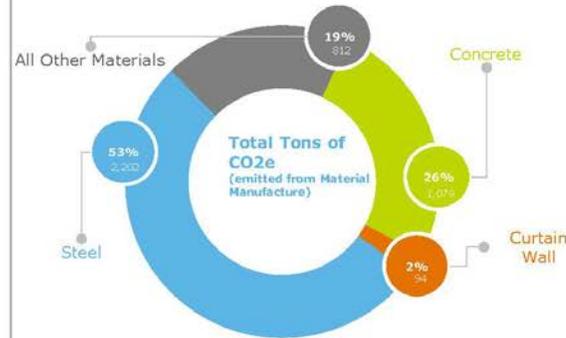
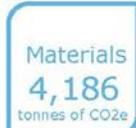
Carbon Tracking
Northeast



RSF: >100,000 SF

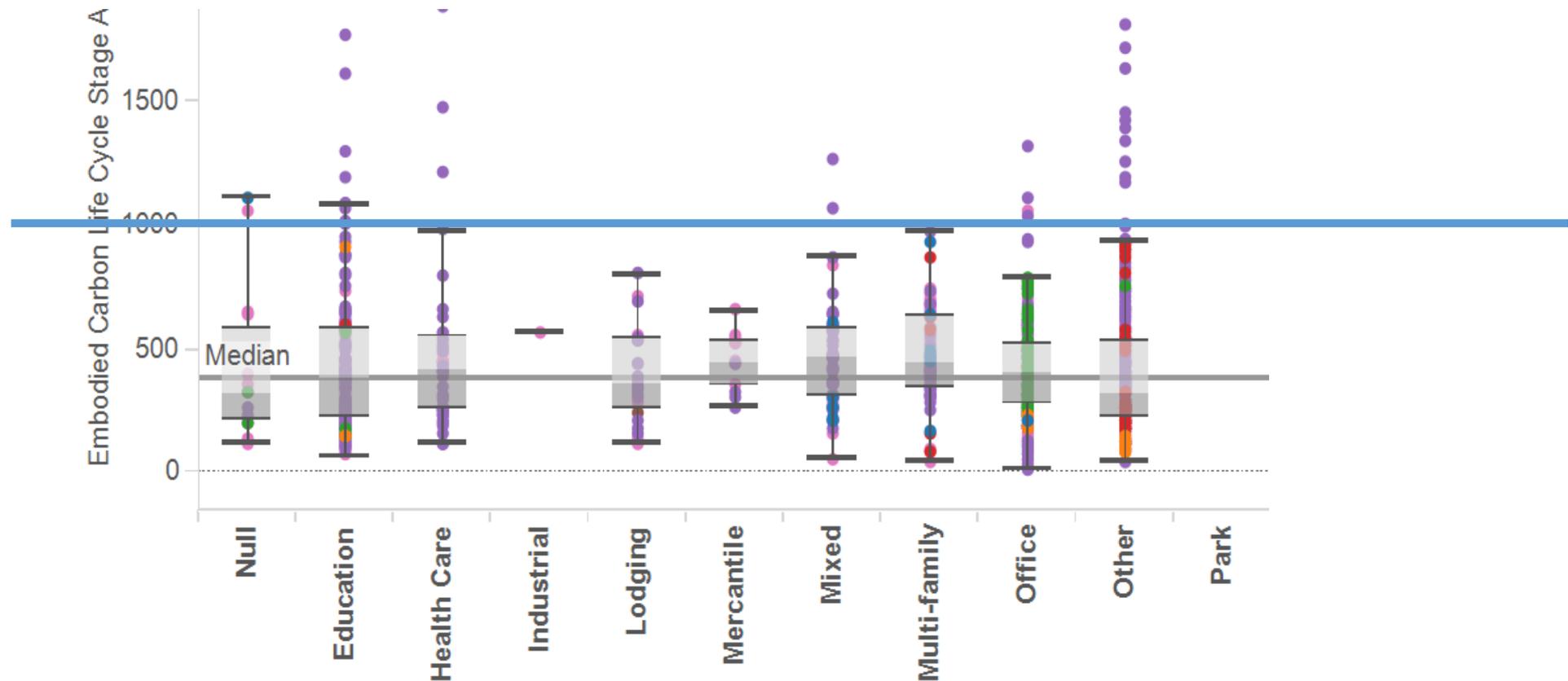
Goal Achieved: **LEED Platinum**

Type: Office/Mixed/Open



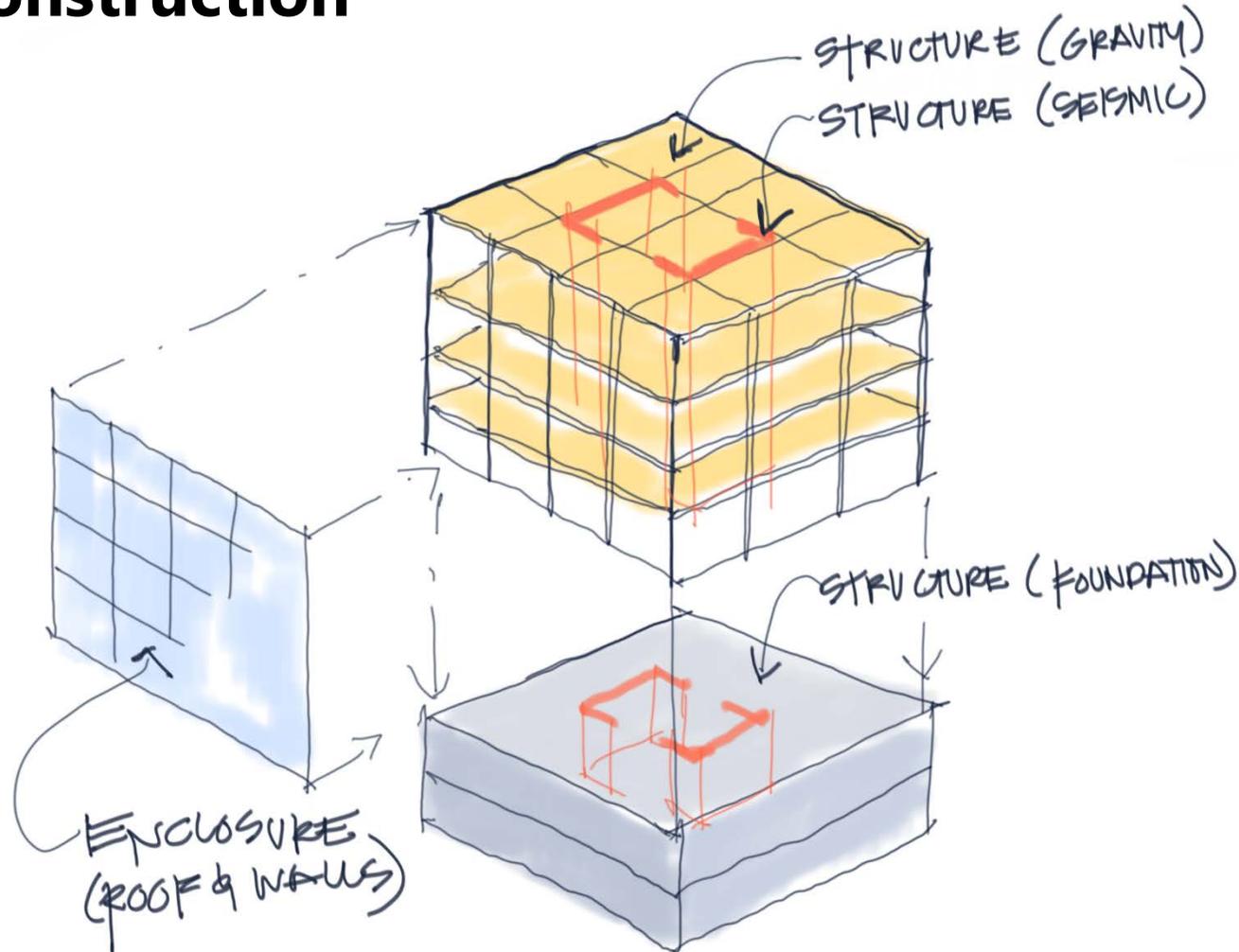
CLF RESEARCH: Embodied Carbon Benchmark

<http://www.carbonleadershipforum.org/data-visualization/>



Typically less than 1,000kgCO₂e/m² and commonly between 200-500 kgCO₂e/m².

CLF RESEARCH: Environmental Impact of Mass Timber Office Construction



Defining a Reference Building

CLF RESEARCH: Environmental Impact of Mass Timber Office Construction

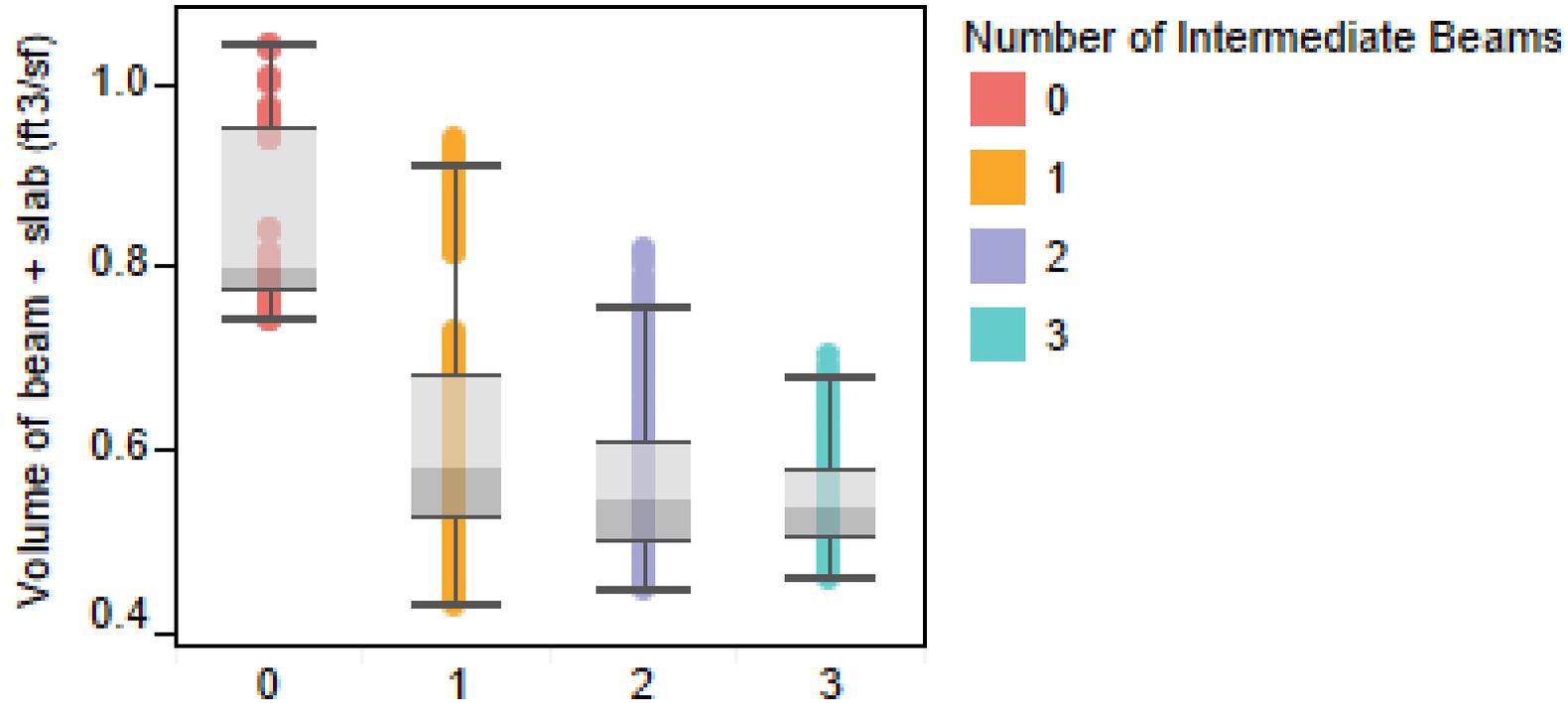


Figure 8. Effect of number of intermediate beams on volume of beam + slab per SF

LCA Practice Guide: Published



- Introduction
- Implementation
 - Five Steps
- Online Resources:
 - Technical Guidance
 - Taxonomy
 - Links to tools etc.
 - Examples

Simonen, **Huang**, Rodriguez
& advisory committee!

LCA Practice Guide: Introduction

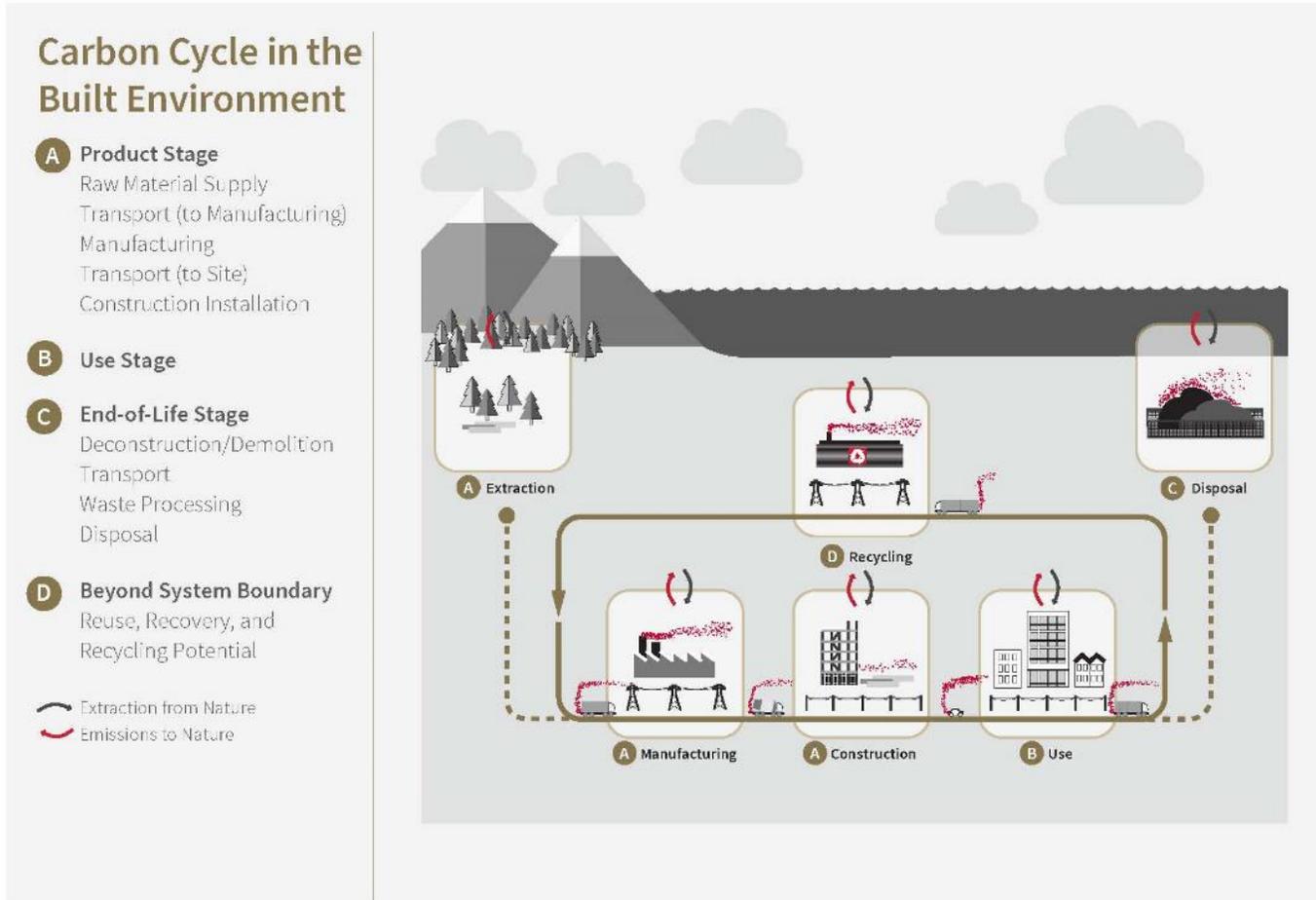


Figure 1. Sources of emissions by life cycle stage (A, B, C, D) of a building based on stage definitions from European Standard (EN) 15978 (credit: Meghan Lewis).

Entry Level Concepts

- How do buildings impact the environment?
- What are emissions and why do they matter?
- How are emissions translated into environmental impacts?
- How is LCA used to evaluate buildings?



EMBODIED CARBON NETWORK

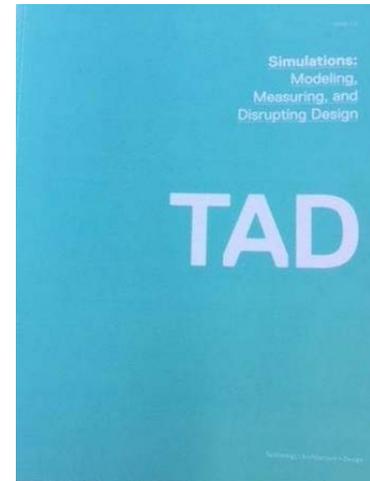


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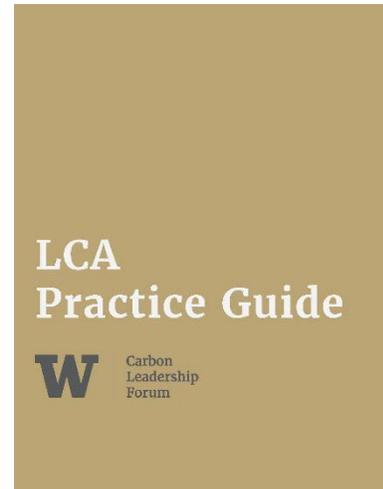


Embodied Carbon Benchmark Study
LCA for Low Carbon Construction
Part One



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www.carbonleadershipforum.org/resources/
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