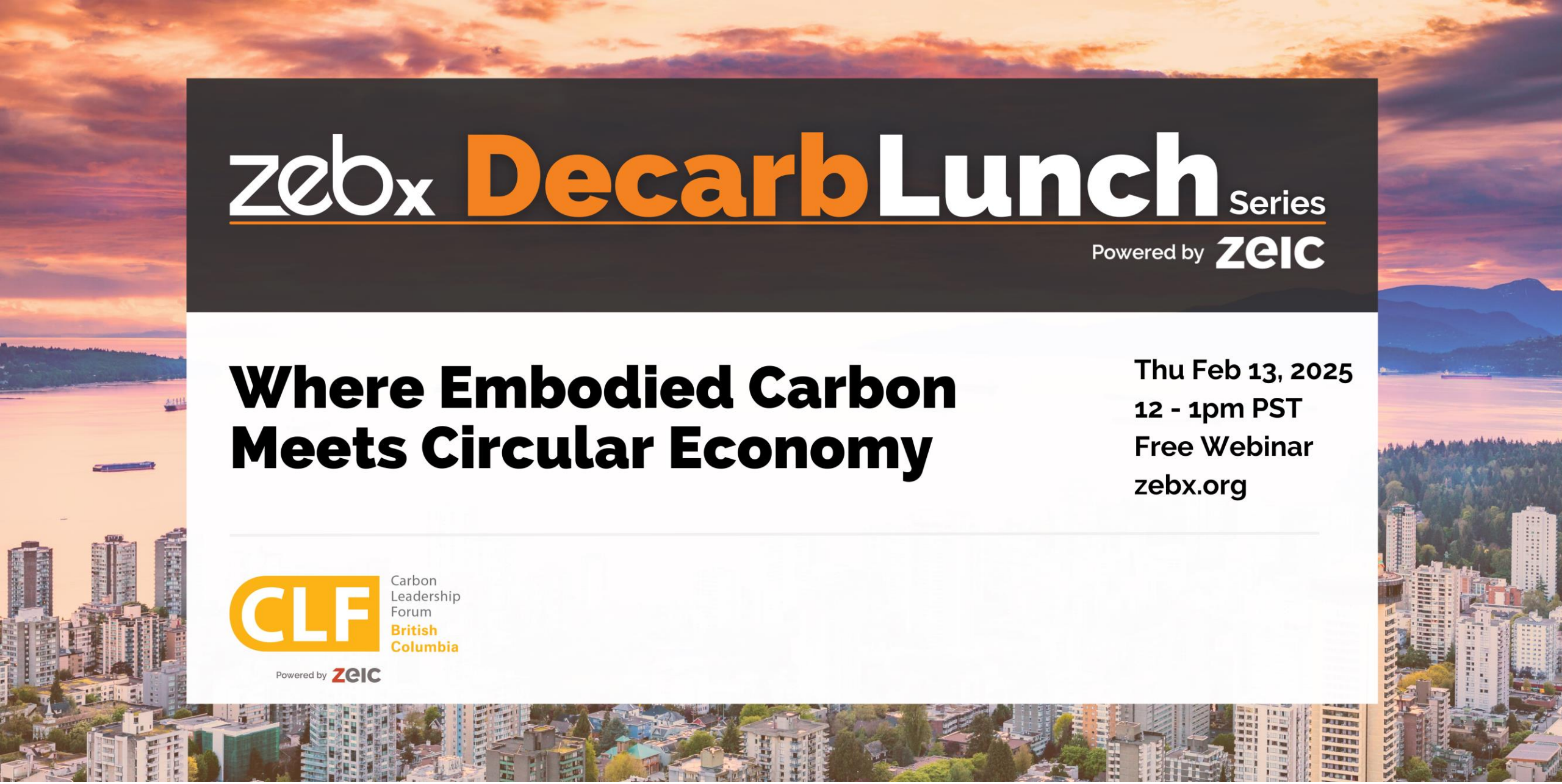

zebx DecarbLunch Series

Powered by zeic

Where Embodied Carbon Meets Circular Economy

Thu Feb 13, 2025
12 - 1pm PST
Free Webinar
zebx.org

CLF Carbon Leadership Forum British Columbia
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North Family FOUNDATION

CITY OF VANCOUVER

1995
2025

30 COAST

WASTE MANAGEMENT ASSOCIATION

Our Vision

To be a leading industry resource for developing best practices in waste management and reduction.

Our Mission

To foster environmental leadership and best practices by providing a forum for discussion, education, and networking for the waste management industry in British Columbia.

221

Organizational members

+ 25 Students

1161

Individual active members

from those organizations.

3600+

Industry-wide

mailing list

CLF Carbon Leadership Forum British Columbia

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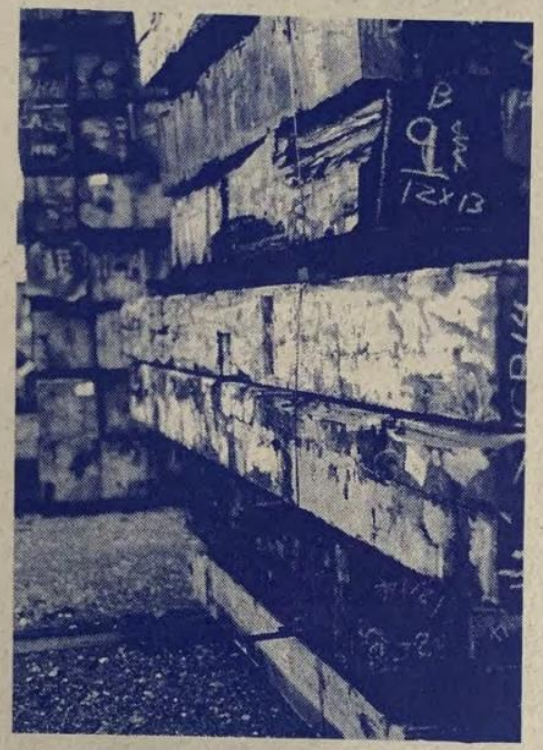
CWMA news

spring 1999

Coast Waste Management Association

INSIDE



Recovered timbers at the new DEMXX site in Parksville

Do Used Building Materials Measure Up?

Only good for making a composter or dog house? Think again. Welcome to a quickly growing business in BC: deconstruction and sales of recovered materials.

Deconstruction means removing valuable and useable fixtures and building materials before or instead of demolition. As tipping fees and environmental values

Thrift S… Hit the …

A cooperative of… Victoria thrift stor… ting together to re… able and other sal…

The project, called *Boo…* salvage high grade disc… provide job training in t…

Thrift stores involved… St. Vincent de Paul, Goo… Women in Need and Pen… nity Services. These or… working on *Bookends* w… Economic Development … (CEDCO) under the nam… Circle Co-op."

Salvage Circle will re… tonnes per month of use… contract with Regent R… will be sorted based on… will have their bindings… the pages sorted by pap… sale back to Regent. The…

Developing a Deconstruction Strategy for BC

Thomas Mueller

In May 1998, the B.C. Ministry of the Environment organized a symposium to explore how demolition waste could be managed in a more environmentally appropriate manner. Currently, many buildings are demolished without proper removal of hazardous or banned materials and without significant salvage and recycling of demolition materials.

The symposium attempted to address these issues by exploring "deconstruction" as a possible strategy for achieving both the proper management of hazardous materials and the maximum diversion of building materials from disposal.

A total of 62 demolition contractors, municipal engineers, permitting staff and regional, provincial and federal government representatives attended the symposium to identify barriers to deconstruction and find solutions for developing a provincial strategy. The following key barriers were identified, including:

- a lack of awareness of the potential economic, environmental and social benefits of deconstruction,
- existing regulations which may not permit the reuse of building materials,
- inconsistent regulations governing the handling and management of hazardous materials,
- a lack of consideration in the permitting and development process for the time required for deconstruction,
- a lack of markets for salvaged materials.

The symposium attendees showed strong support for deconstruction and recommended a number of solutions for developing a provincial strategy. The Deconstruction/Demolition Planning Committee has reviewed the recommendations and is now actively pursuing the following initiatives:

- the expansion of membership on the Plannin… Committee to include representatives from al… relevant sectors,
- the organization of up to five regional symposia by June 1999 to discuss the implementation of recommended solutions with affected stakeholder groups,
- the completion of a discussion paper (based on the Symposium summary report) to be used as a resource material at the regional symposia, and
- the development of an industry association to represent the interests of decons-truction firms in BC.

A discussion paper is now available for upcoming 1999 symposia across the Province On Vancouver Island, (Nanaimo), the symposium is on April 21. The Lower Mainland date i… April 26.

For more information please contact Brian Grant, B.C. Environment at 250 356 9834, email: grant@epdiv1.env.gov.bc.ca or Thomas Mueller, GVRD at 604 436 6818, email: tmueller@gvrd.bc.ca

Carbon Leadership Forum British Columbia

Powered by ZEIC

Where embodied carbon meets circular economy

Stephanie Dalo, P.Eng

Thursday, Feb 13th, 2025

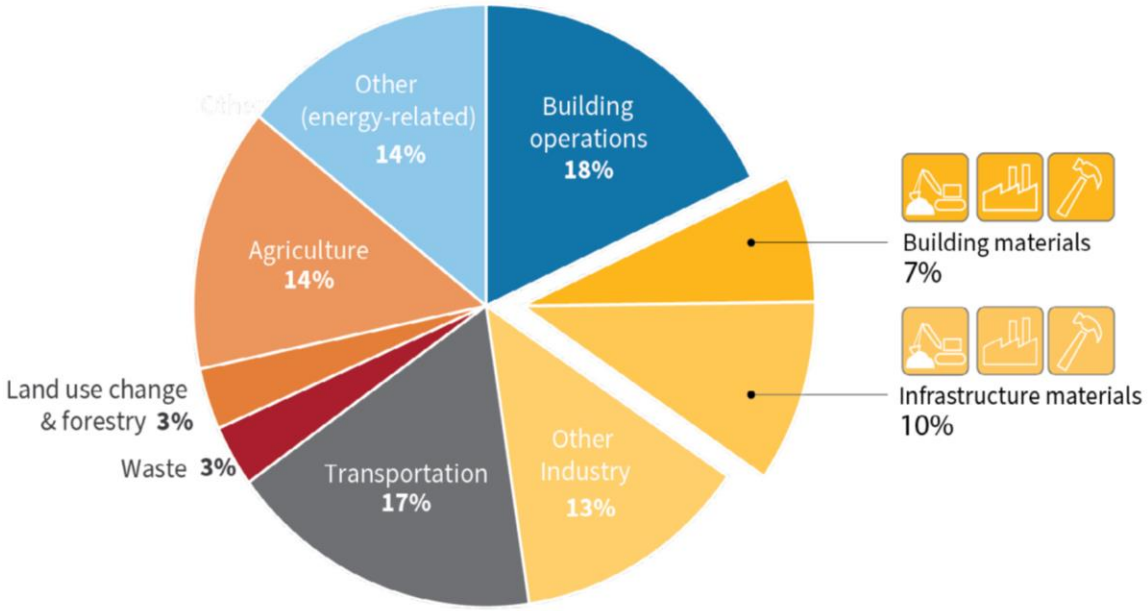
Land Acknowledgement

- Introduction – The current climate
- Pt.1 - Where Embodied Carbon and Circularity Meet
- Pt.2 - Net Zero by 2050: Creating the most with 25 yrs to go
- Pt.3 - Rethinking Carbon Offsets

CITIES ARE THE LARGEST PLACE-BASED SOURCE OF GHG EMISSIONS

Embodied carbon is significant

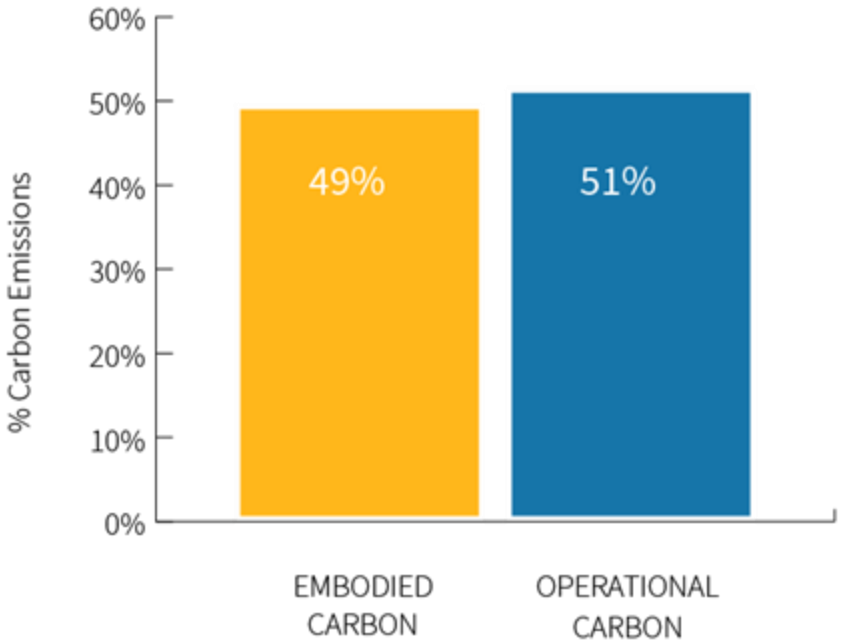
Global Greenhouse Gas Emissions Breakdown by Sector 2019



Data sources: World Greenhouse Gas Emissions: 2019, World Resources Institute (WRI), 2022 & IEA 2023). Energy Technology Perspectives 2023

Total Carbon Emissions of Global New Construction from 2020-2050

Business as Usual Projection



Upfront Carbon

The majority of building product embodied emissions occur up front

Breakdown of product life-cycle, not including building operational emissions

50%-85%
PRODUCT STAGE
(A1-A3)

3%-10%
CONSTRUCTION
(A4-A5)

6%-22%
USE
(B1-B5)

1%-15%
END OF LIFE
(C1-C4)

Source: Driving Action on Embodied Carbon in Buildings, RMI & USGBC, September 2023

Tools & Strategies to Reduce Embodied Carbon

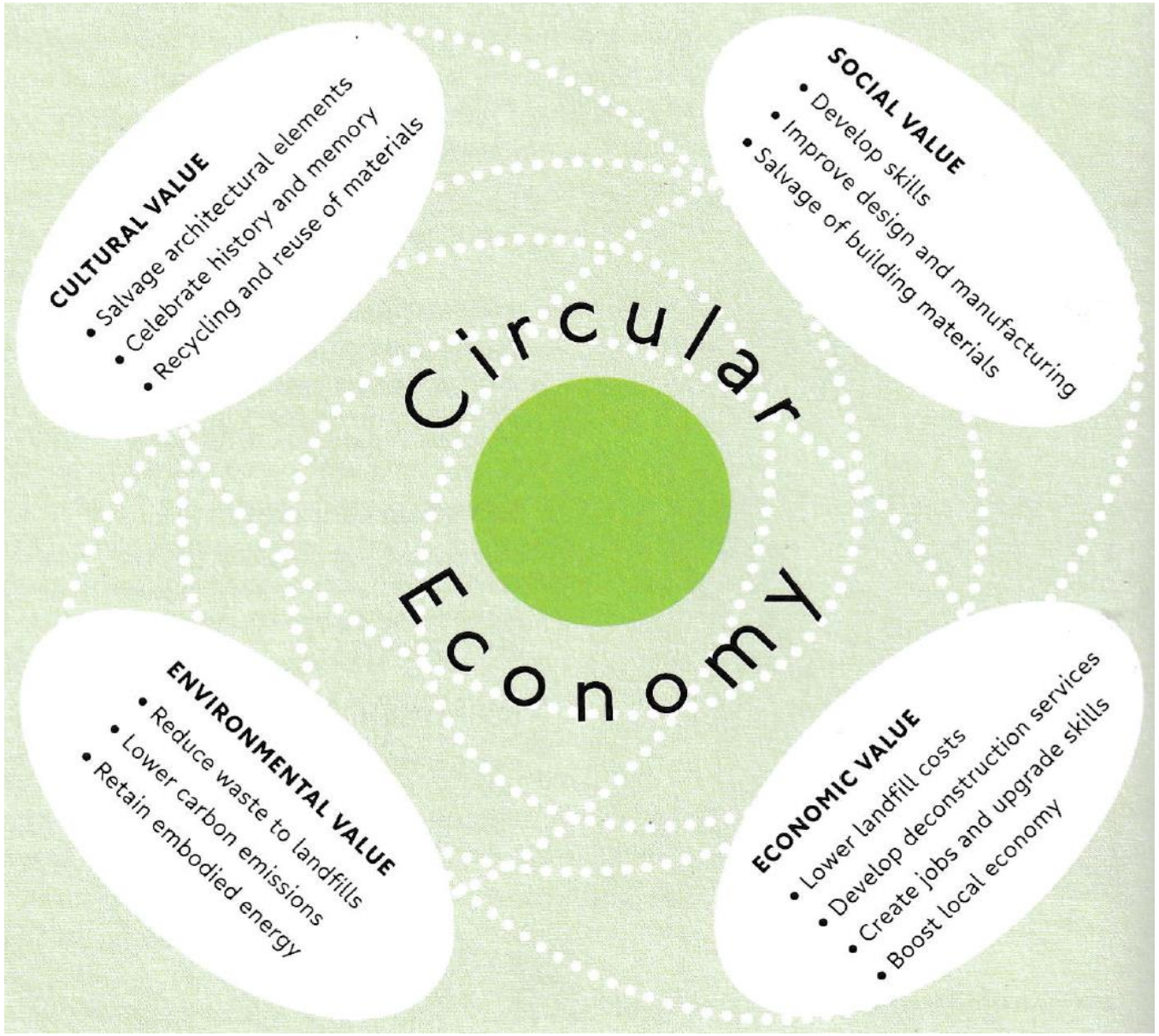
1. BUILD LESS, REUSE MORE
2. DESIGN LIGHTER AND SMARTER
3. USE LOW-CARBON ALTERNATIVES
4. PROCURE LOW(ER) CARBON PRODUCTS

Source: Carbon Leadership Forum, Embodied Carbon 101, June 2024

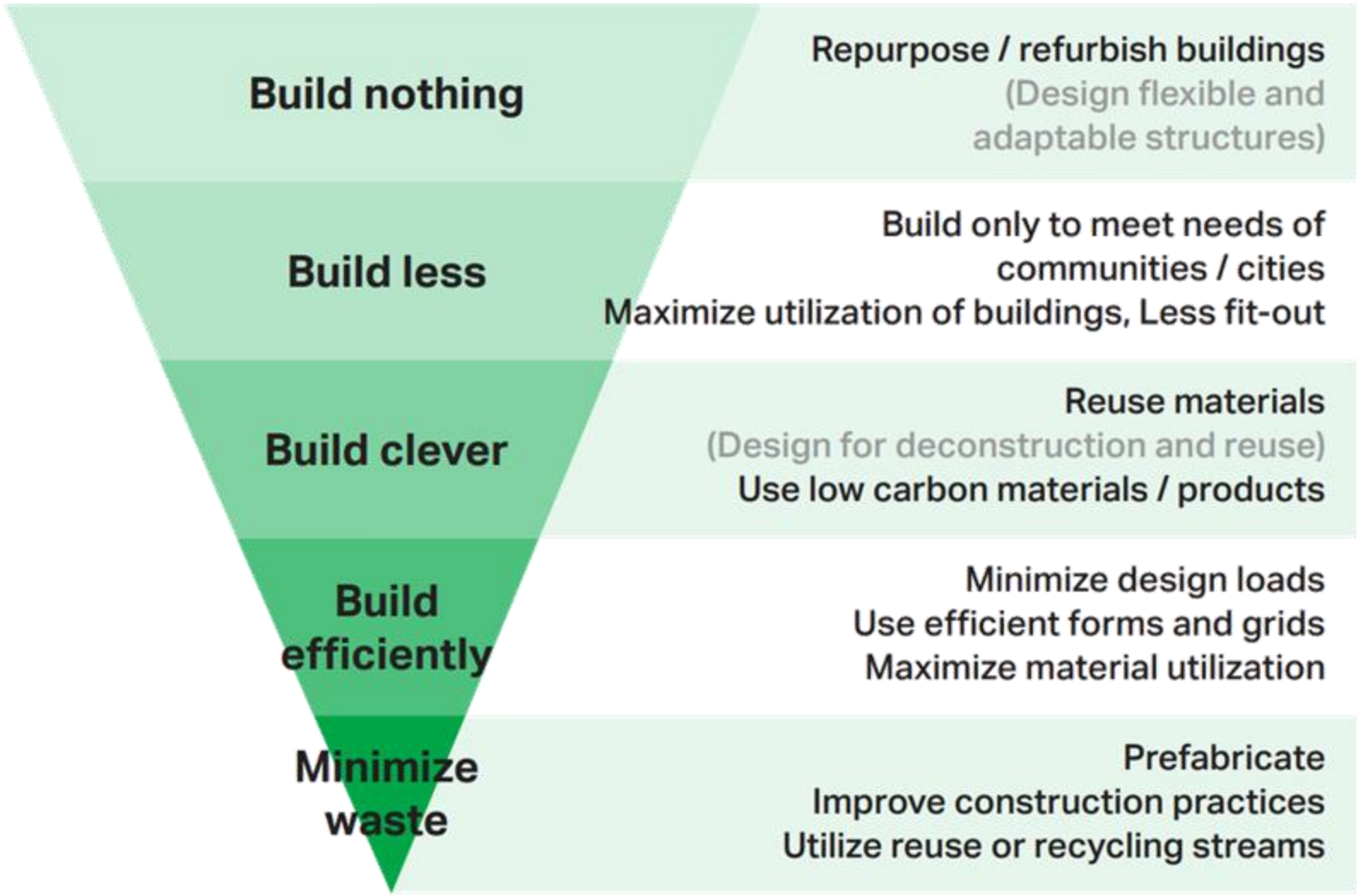
The built environment in Canada is one of the largest consumers of raw materials and energy and is also the largest contributor to the waste stream by weight.

3.4 million tonnes of construction materials are sent to landfill annually representing an estimated 1.8 million tonnes of embodied carbon

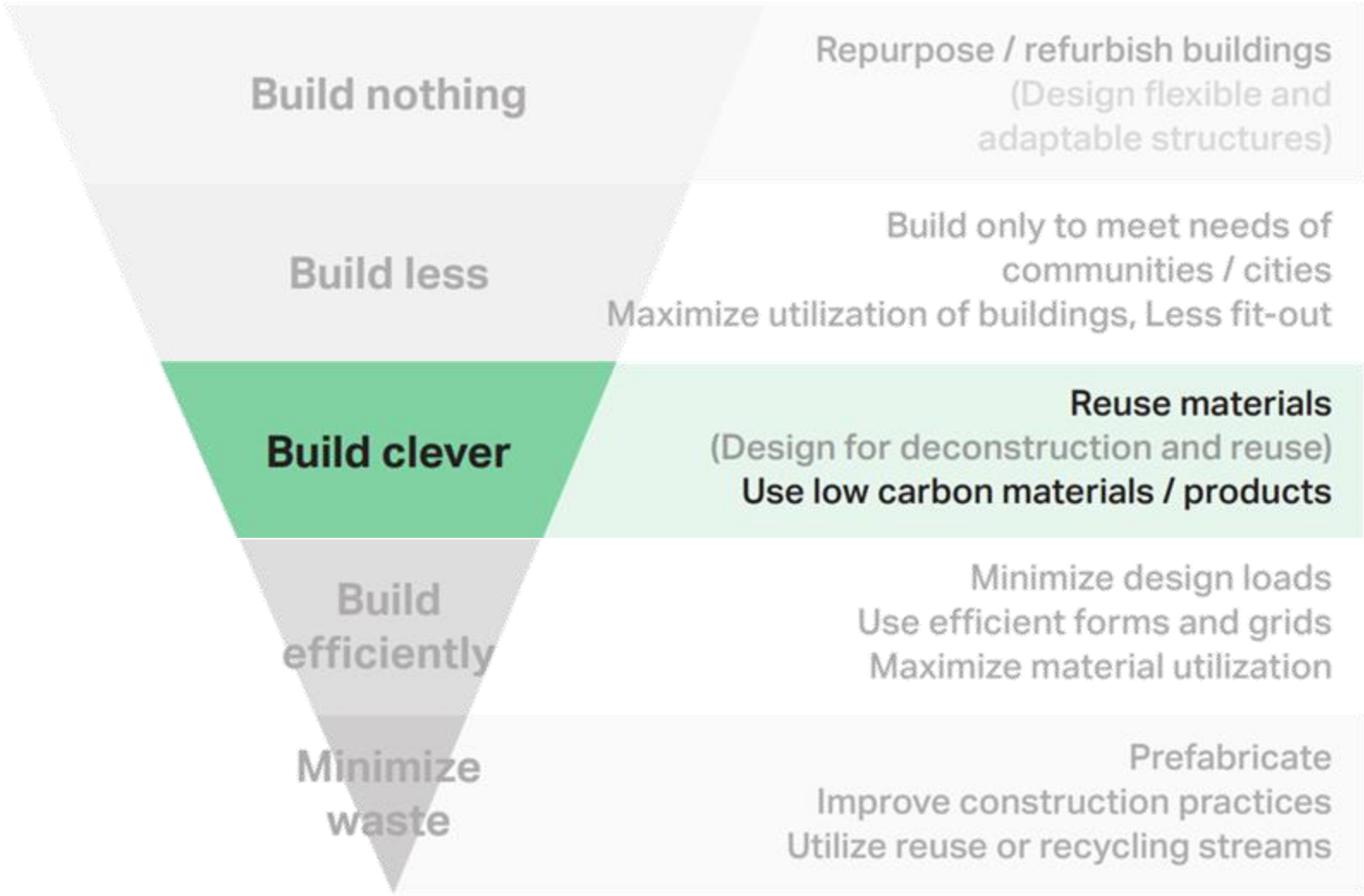
Related benefits of achieving a circular economy in the building and construction sector….



Source: Building Better.Less.Different – Circular Construction and Circular Economy, Heisel F.,et al., 2022

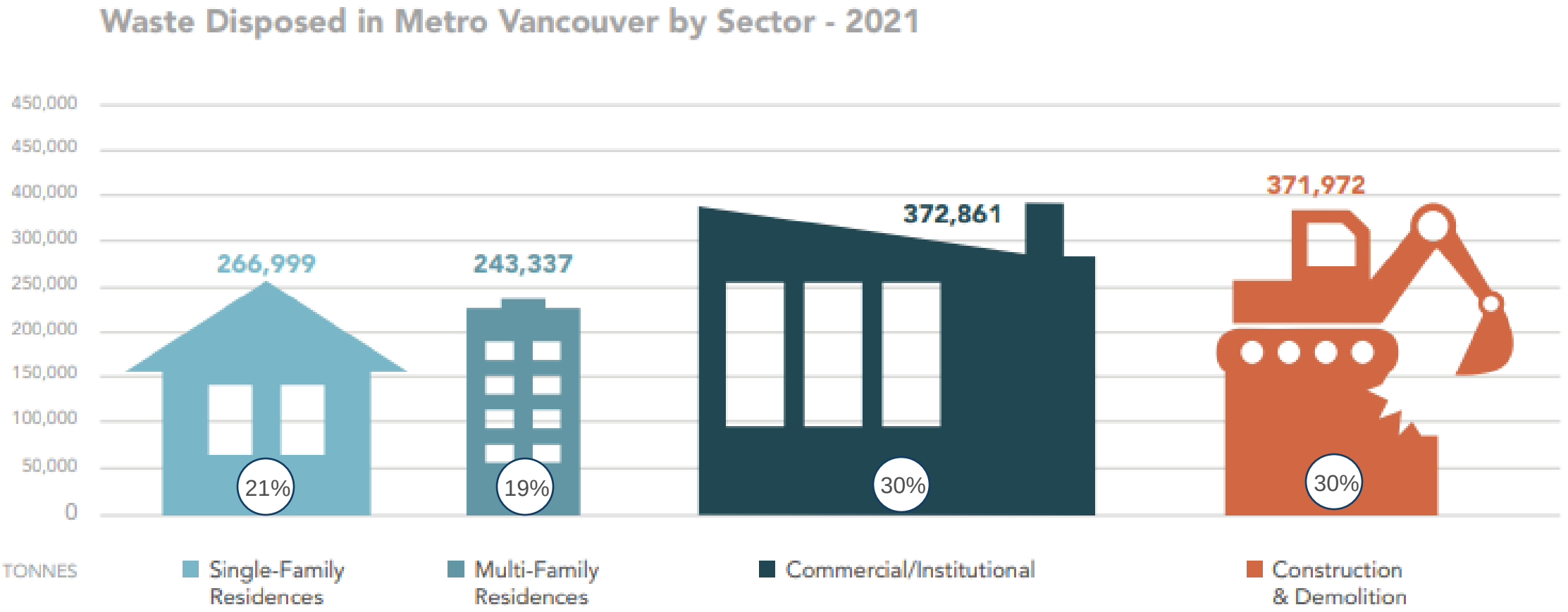


Source: World Business Council for Sustainable Development, 2021



Source: World Business Council for Sustainable Development, 2021

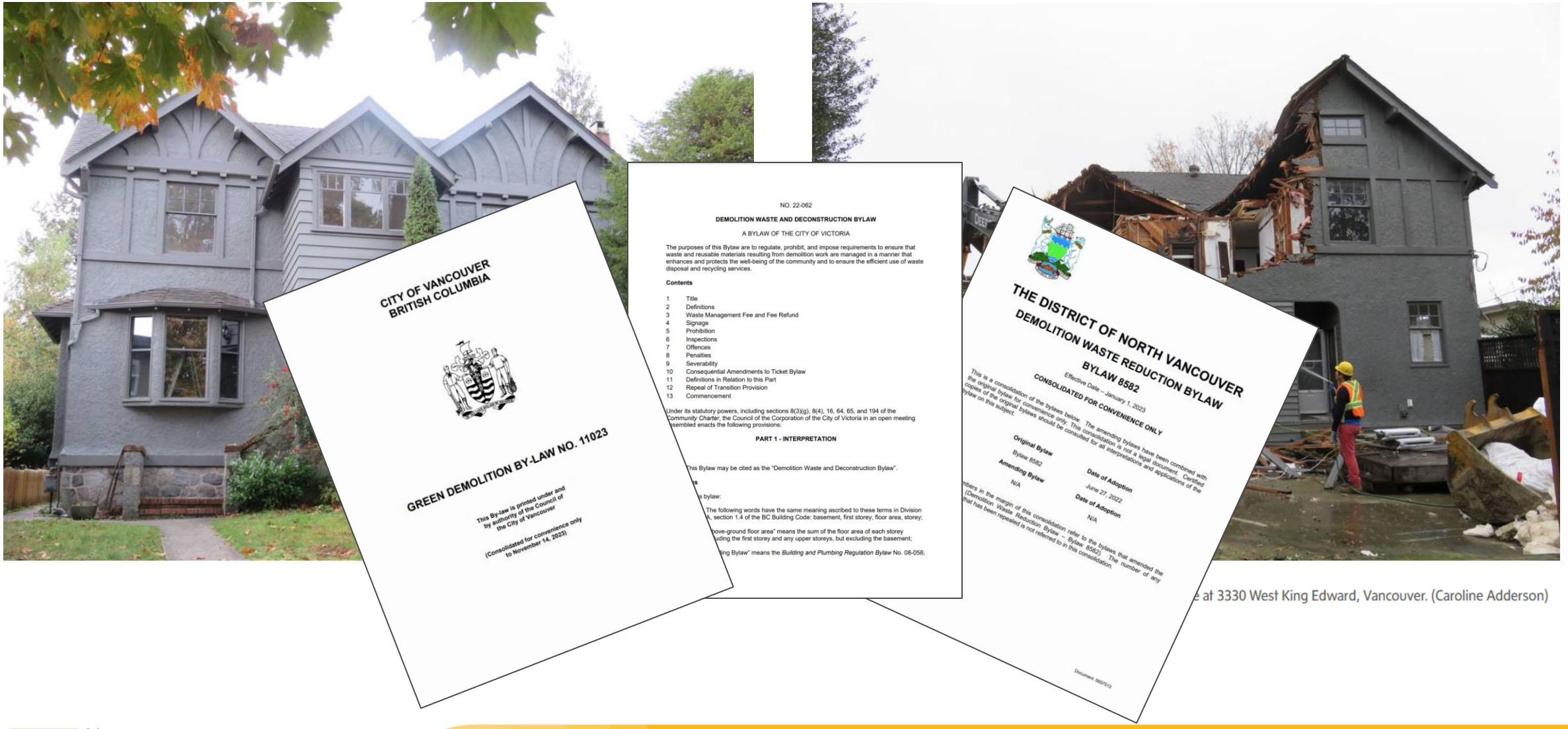
The situation….



Source: Blueprint for Change, Lighthouse, 2023

Source: Lighthouse & Unbuilders, The Opportunities and Challenges of Deconstruction, ZEBx, CLF BC 2023

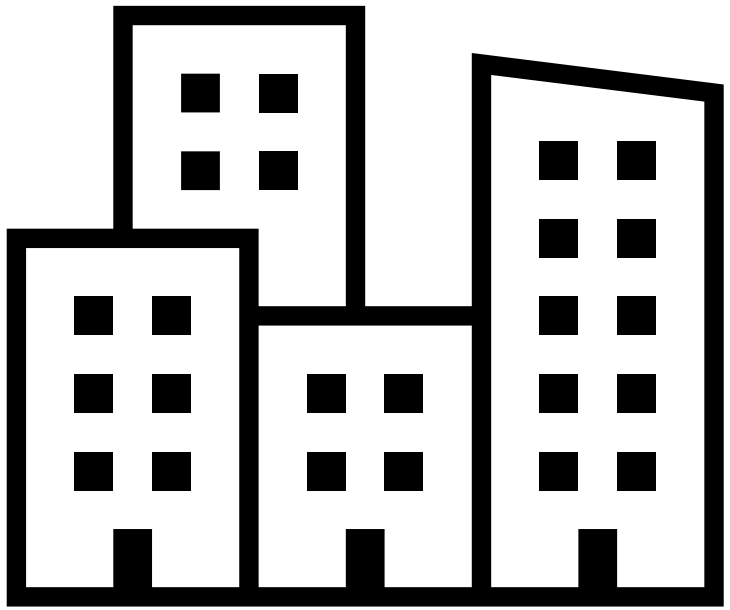
Part 9 Buildings



e at 3330 West King Edward, Vancouver. (Caroline Adderson)

Embodied Carbon Requirements

In VBBL 2025



All new Part 3 buildings
except small projects ≤ 1,800 m²

from an
Absolute Benchmark
400 kg CO_2/m²
(10% reduction: 360 kg CO_2/m)

OR

from a
Baseline
(functionally equivalent)

Industry Leadership Credits

Up to 5% optional credit of 10% required reduction

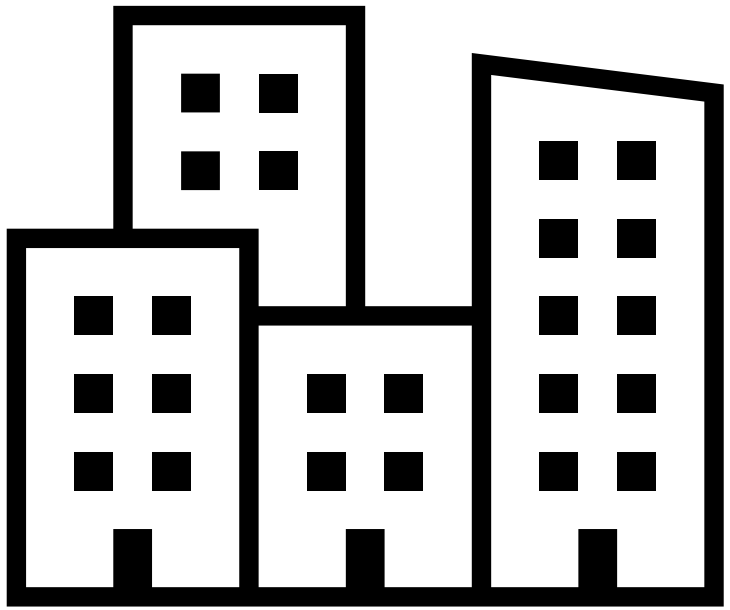
Industry Leadership Credit options:

Report Additional Emissions	
Optional building elements *(e.g. MEP & Interior)*	1-5%
Construction site activities	2-5%
Transportation to site	2%

Reuse Materials & Biomaterials	
Relocate existing building	5%
Reuse salvaged materials	5%
Salvage material from existing building	1-5%
Design for disassembly	1-5%
Use more wood products	1%

Embodied Carbon Requirements

In VBBL 2025



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PART 1

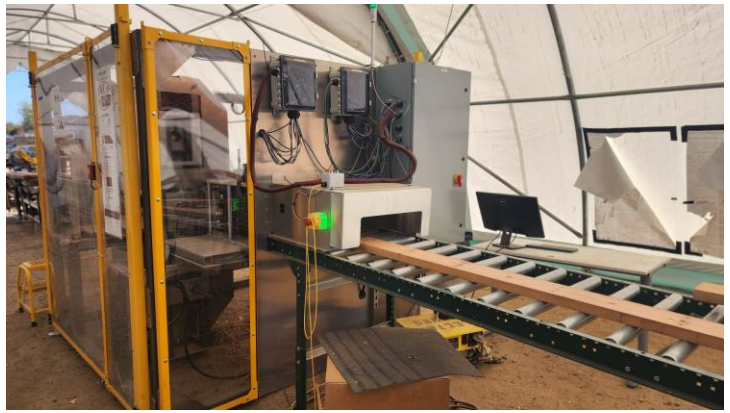
Where Embodied Carbon & Circularity Meet

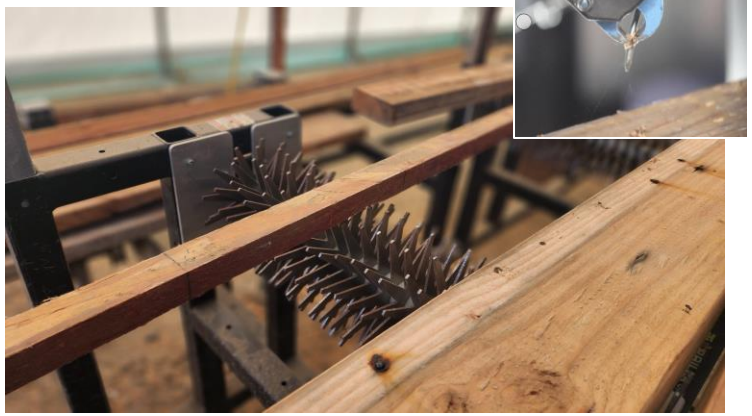
Deconstruction & Material Reuse

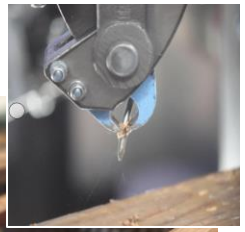
Source: VEMA Deconstruction, 2024

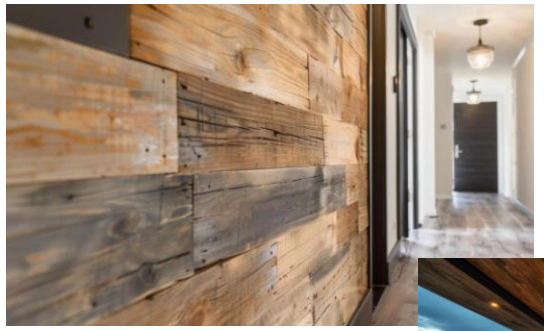
Source: Brad Guy BCIT DfD Guest Lecture, 2024

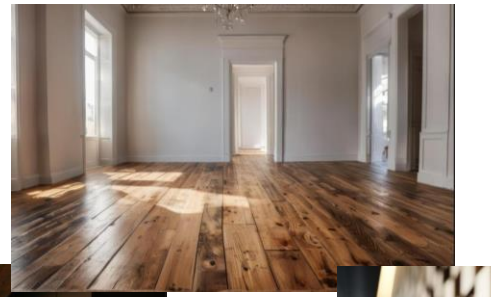
Deconstruction & Material Reuse

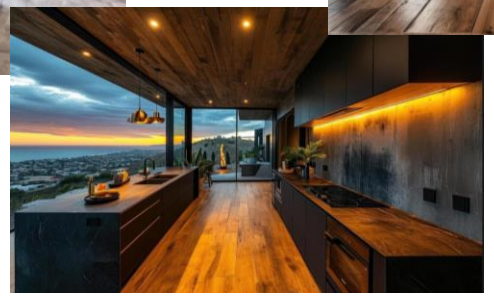












Source: Urban Machine

Design for Disassembly

CONNECTIONS

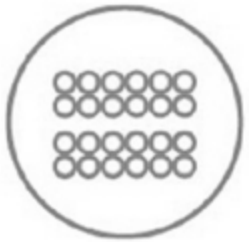
- Make connections reversible and accessible
- Use mechanical joints that don't damage material
- Use dissolvable binders where possible

MATERIALS

- Pure and easily recyclable
- High quality and durability

SERVICE LIFE

- Flexible elements
- Easier changing of short-life systems
- Adaptable to life cycle layers



STANDARDS

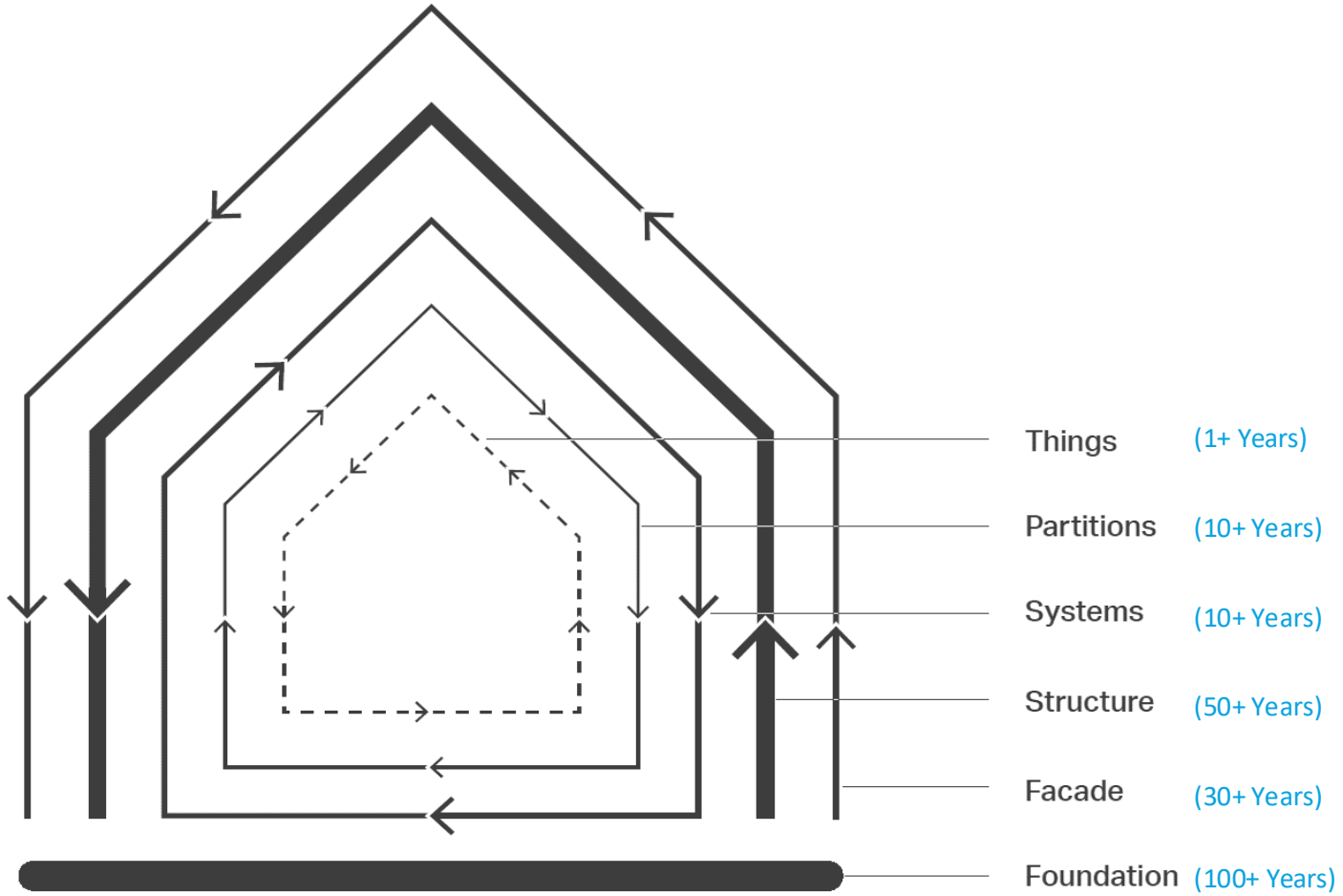
- Standardizing components and groups
- Prefabrication

DECONSTRUCTION

- Create a simple deconstruction strategy
- Ensure the deconstruction plan is minimally disruptive to its surroundings

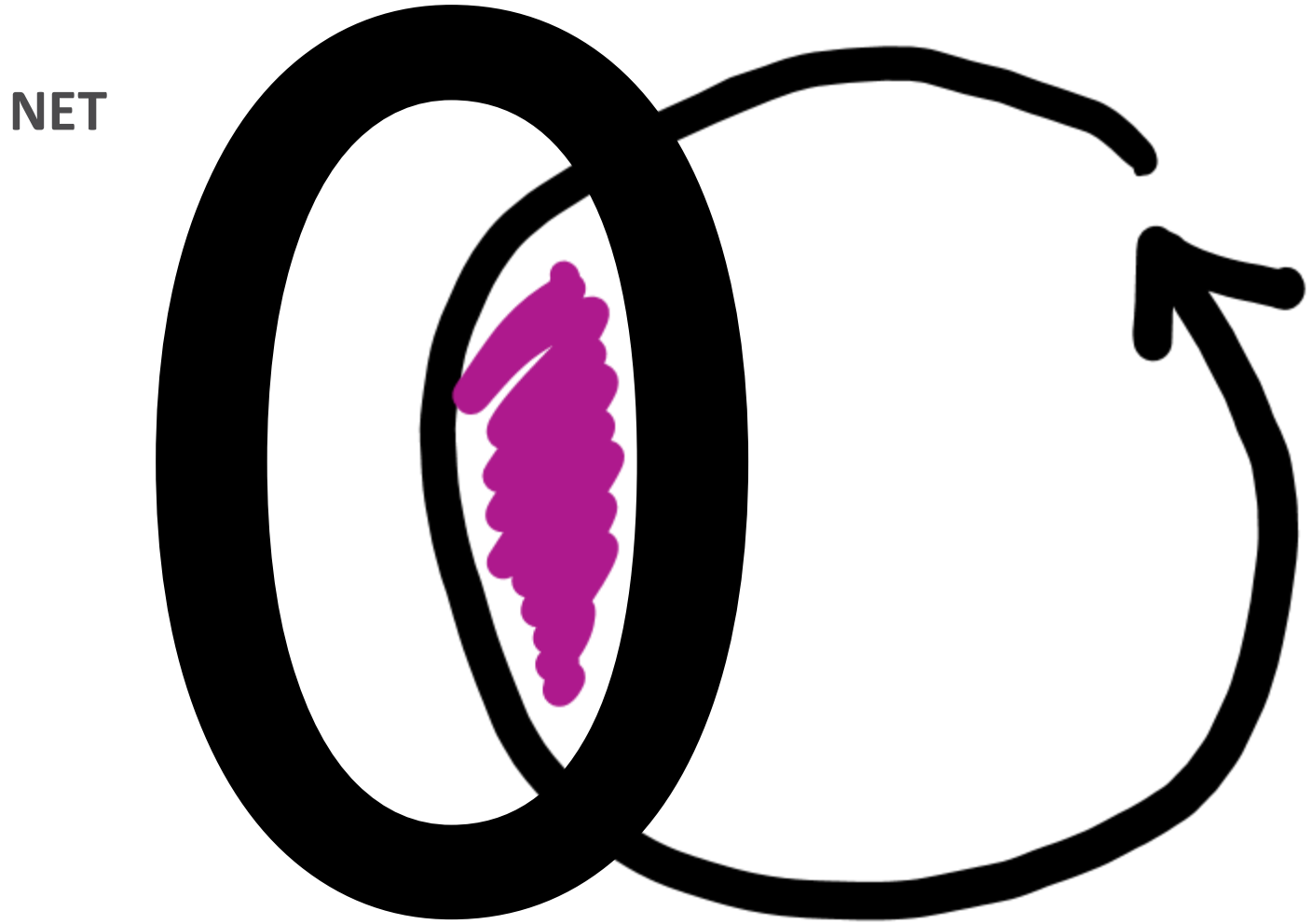
Source: Building a Circular Future - 3rd Edition, GXN, 2019

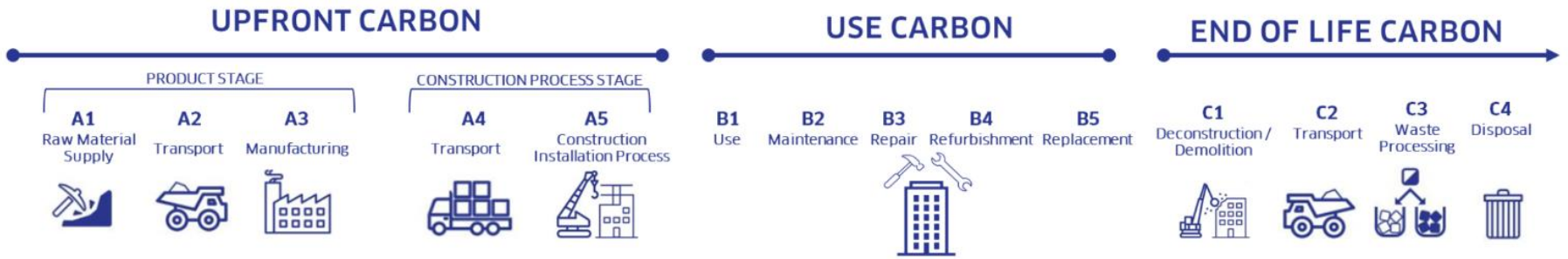
Building Life Cycle Layers



Reinterpretation of original diagram by Steward Brand, 1994

PART 1: WHERE EMBODIED CARBON & CIRCULARITY MEET





Shifting perspective away from linear thinking, and realizing **reuse potential**

Mindset Shift	Behaviour Change
Cultural Changes	Systems Change

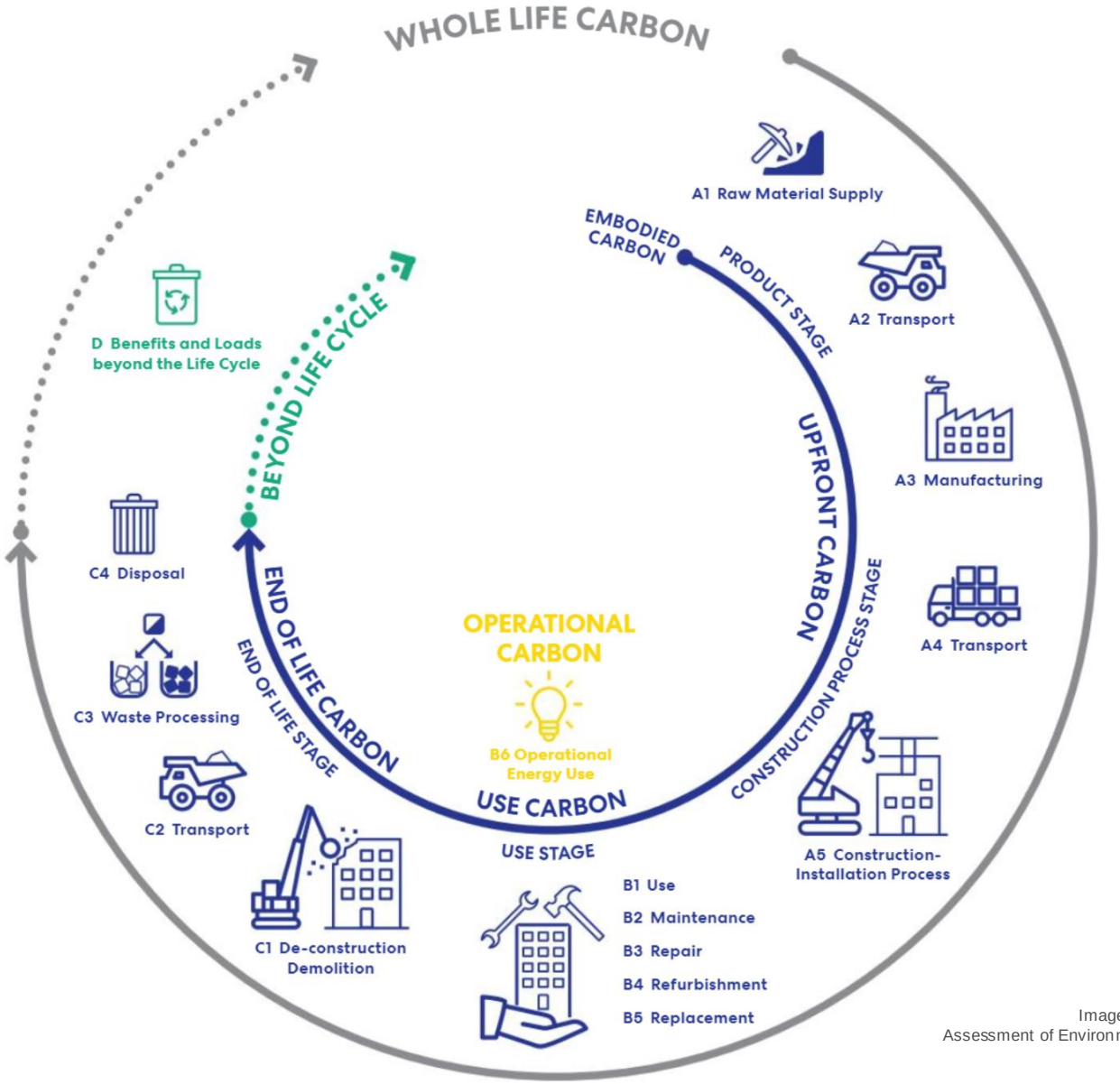
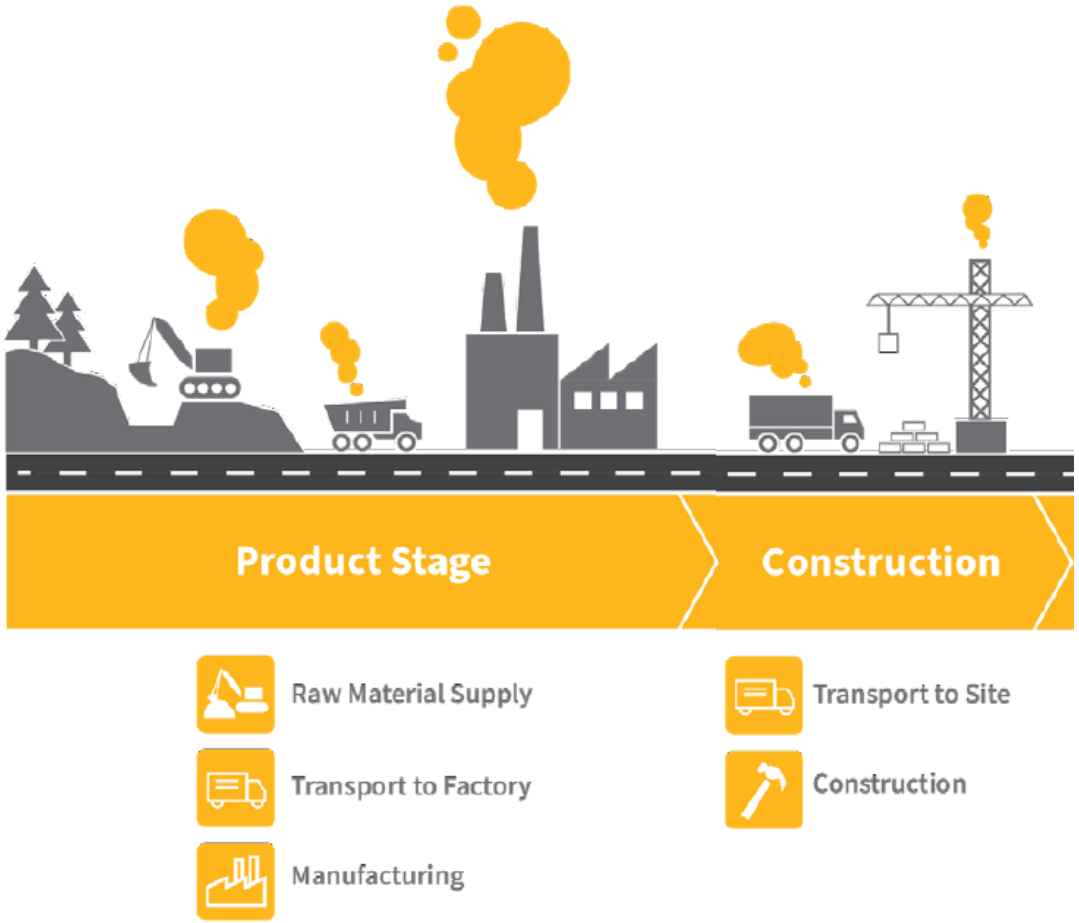
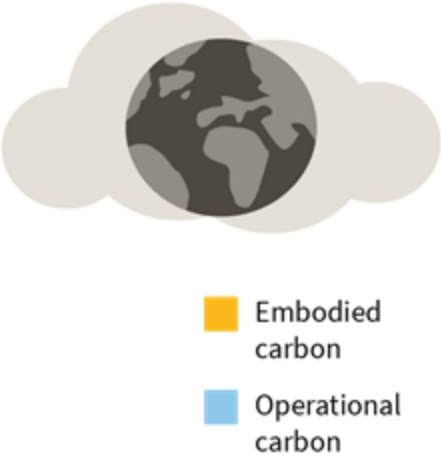


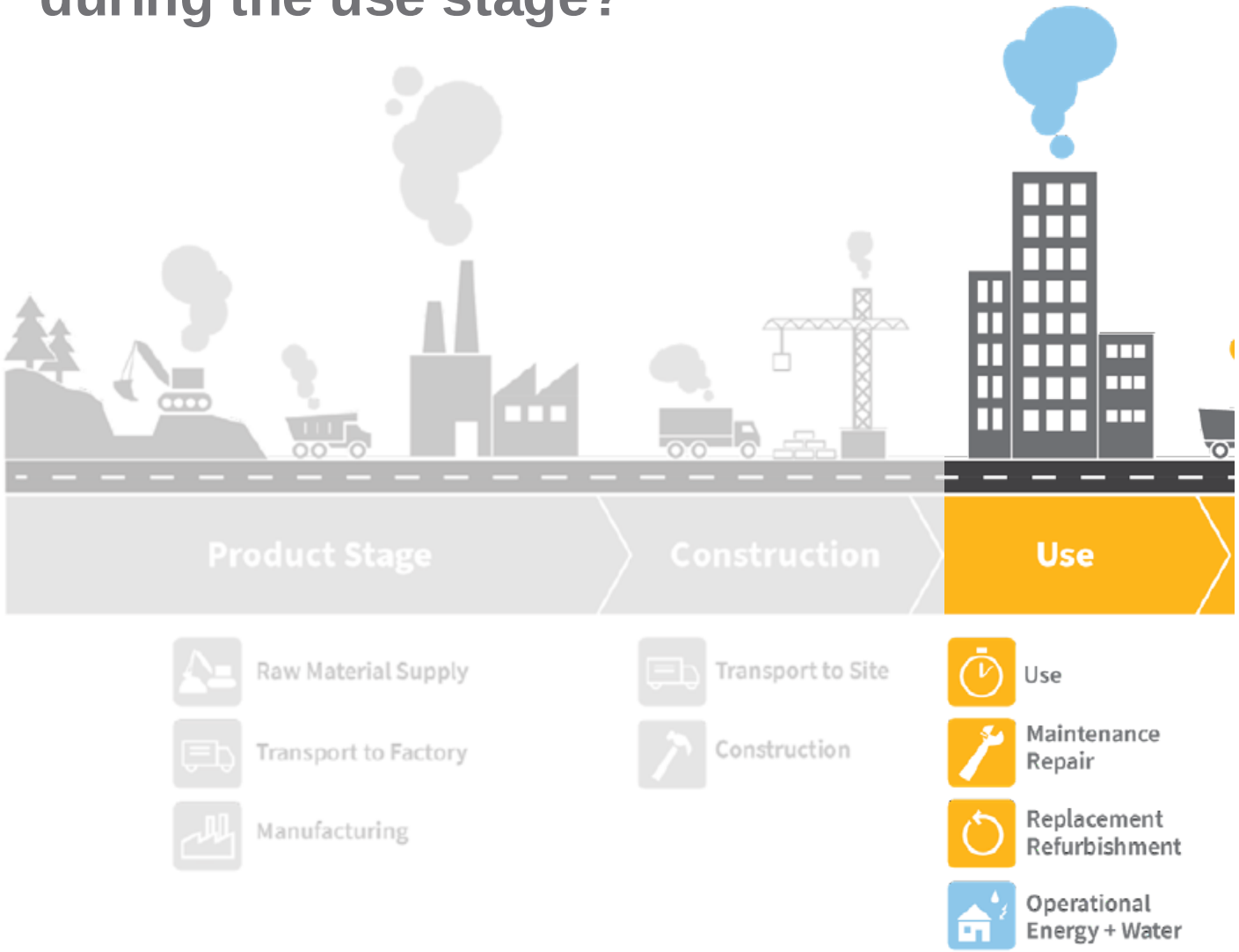
Image adapted from BS EN 15978:2011 Sustainability of Construction Works—Assessment of Environmental Performance of Buildings—Calculation Method, Perkins&Will, 2020

How does material reuse and DfD impact upfront embodied emissions?





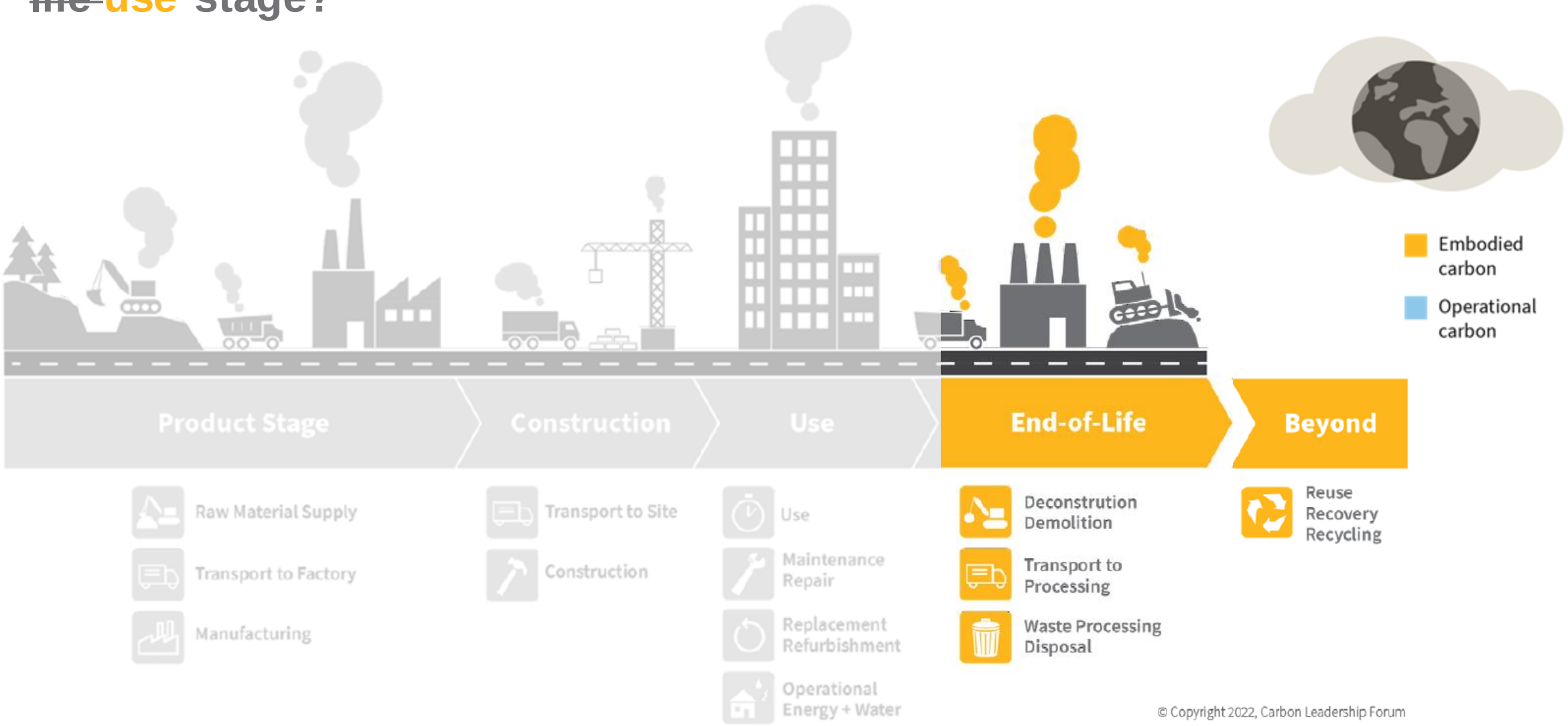
How do deconstruction, material reuse and DfD impact embodied emissions during the use stage?



Embodied carbon

Operational carbon

How do deconstruction and DfD impact embodied emissions at the end-of-~~life~~ use* stage?



PART 2

Net Zero by 2050:
Creating the most impact with 25 years left to go

Structure & Envelope Emissions

Façade system

Superstructure

Insulation

Foundations

Full Scope Emissions

Interior Partitions

Façade system

Mechanical Equipment

Lighting

Superstructure

Insulation

Doors

Landscaping

Interior Finishes

Foundations

We still do not know the full scale of carbon impacts from interior materials

New construction

Initial up-front impact of new buildings

Up to:

370

million tons CO_2e per year in the U.S.

Interior renovations

Continual impacts of all buildings

Up to:

?

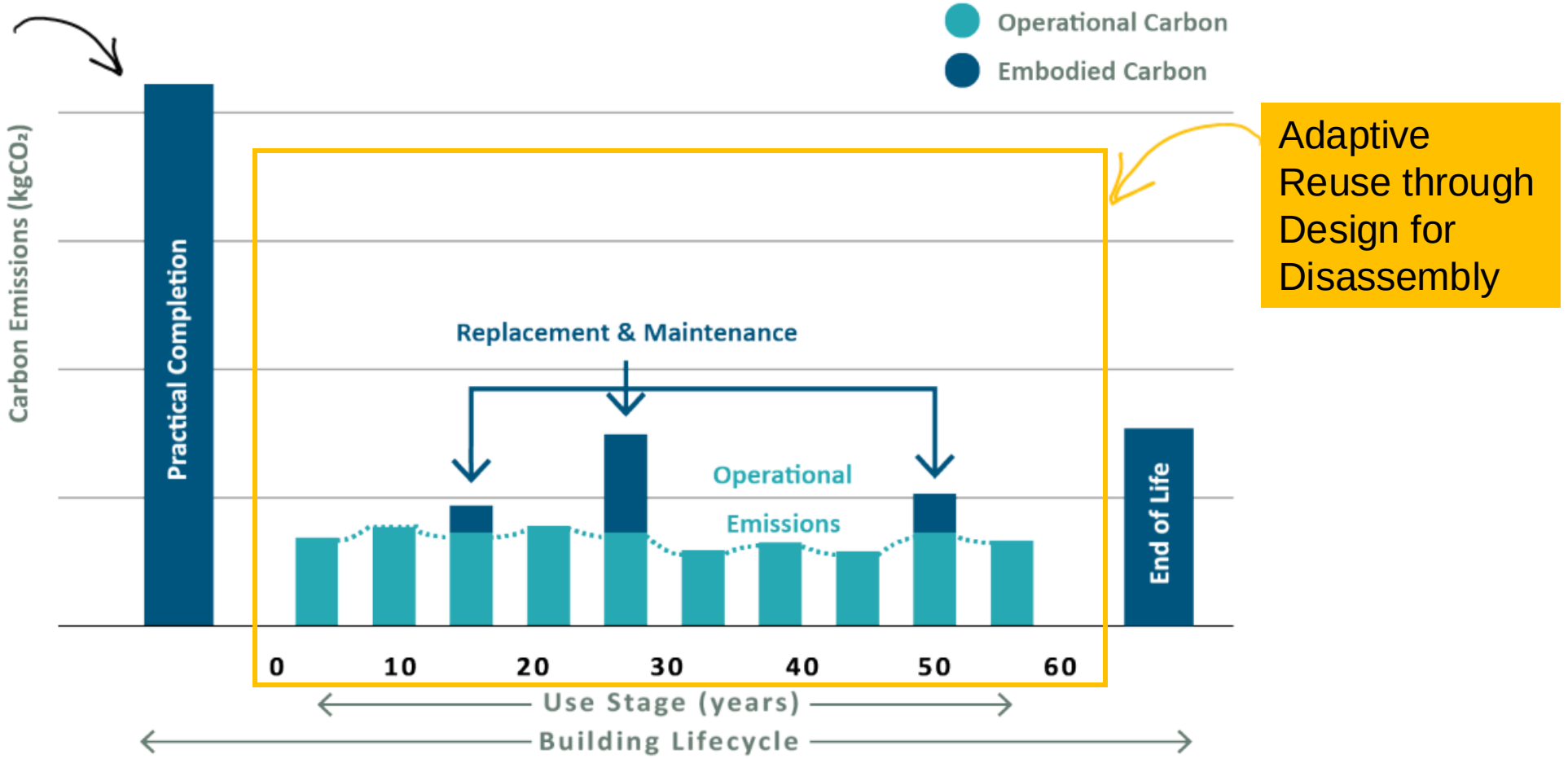
million tons CO_2e per year in the U.S.

Source: Driving Action on Embodied Carbon in Buildings, RMI & USGBC, September 2023

RMI Graphic. Larry Strain, "Time Value of Carbon," 2017, https://www.siegelstrain.com/wp-content/uploads/2017/09/Time-Value-of-Carbon-170530.pdf

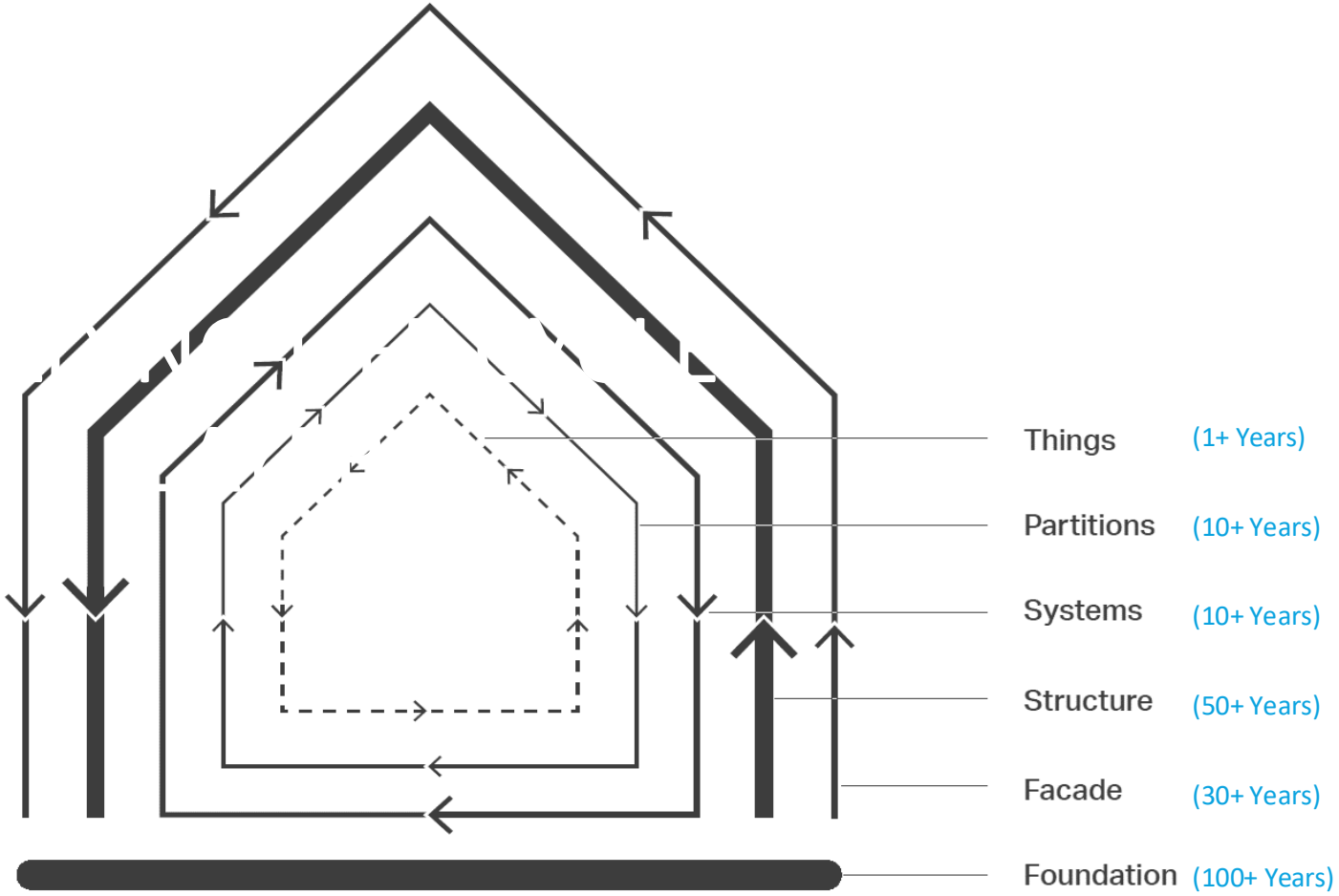
Emissions Breakdown of a Building's Life Cycle

Upfront carbon



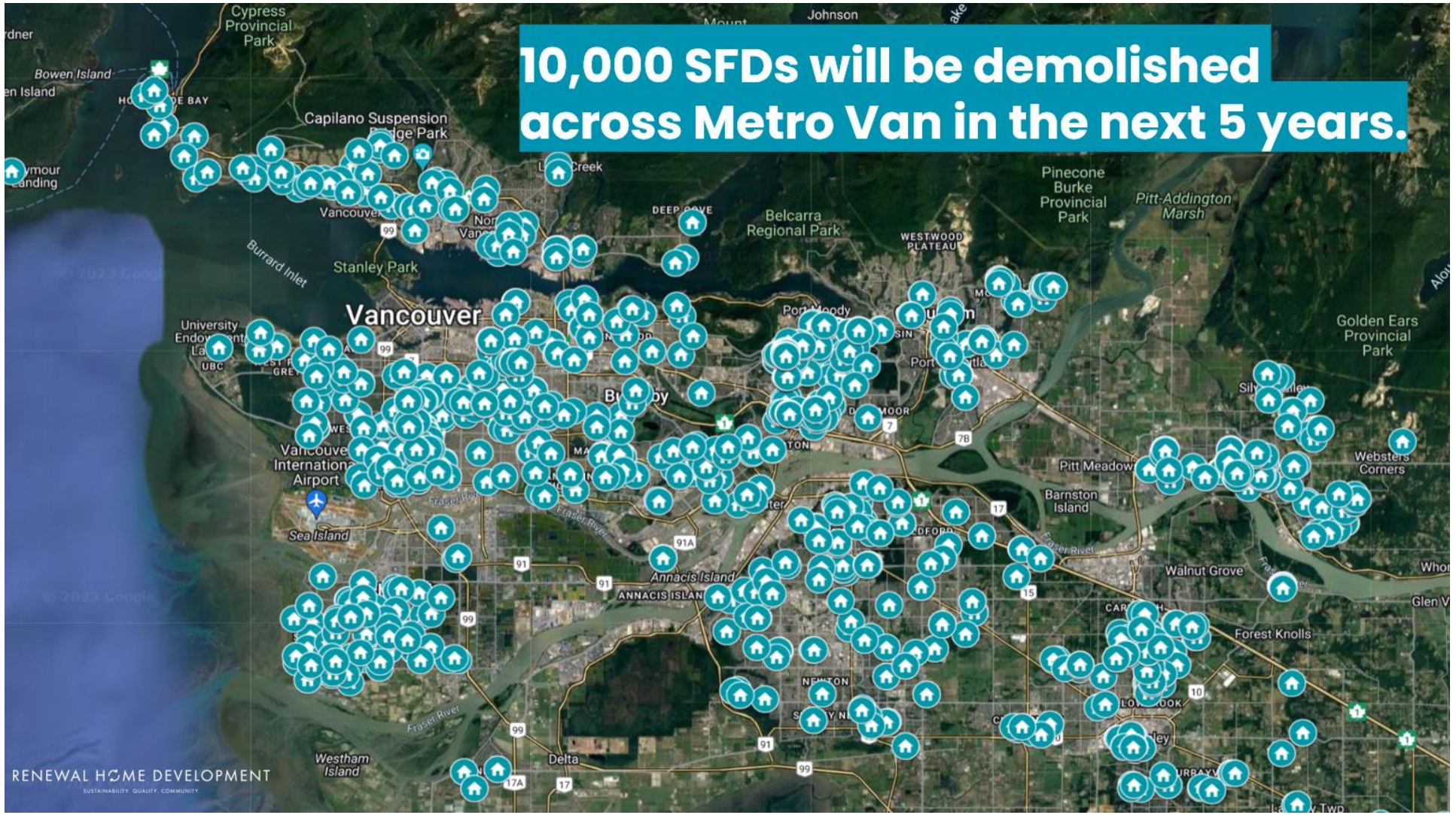
Adaptive Reuse through Design for Disassembly

Keeping in mind the building life cycle layers….



Reinterpretation of original diagram by Steward Brand, 1994

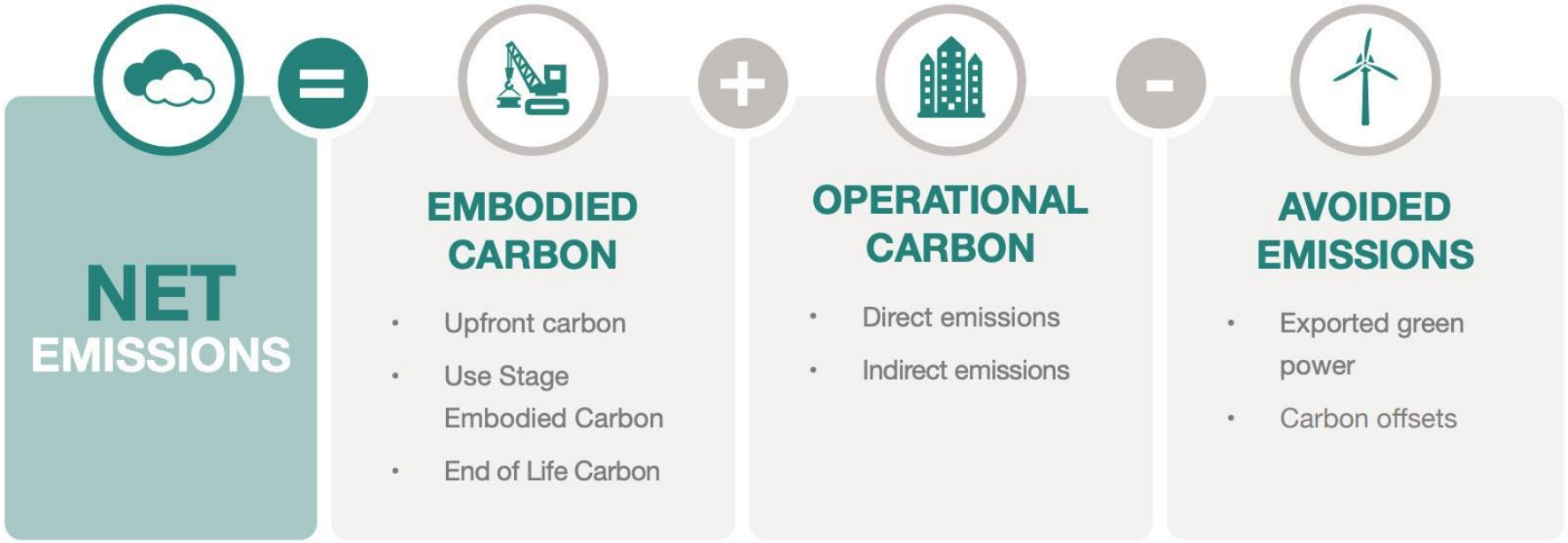
We can achieve significant reductions in embodied carbon when designing for disassembly and designing with reused materials for layers that have shorter service life


10,000 SFDs will be demolished across Metro Van in the next 5 years.
Vancouver
Burrard Inlet
Stanley Park
Capilano Suspension Bridge Park
Cypress Provincial Park
Bowen Island
Belcarra Regional Park
Pinecone Burke Provincial Park
Pitt-Addington Marsh
Golden Ears Provincial Park
Vancouver International Airport
Sea Island
Annacis Island
Barnston Island
Pitt Meadows
Walnut Grove
Forest Knolls
Websters Corners
Westham Island
Delta
Fraser River
RENEWAL HOME DEVELOPMENT

PART 3

Rethinking Carbon Offsets

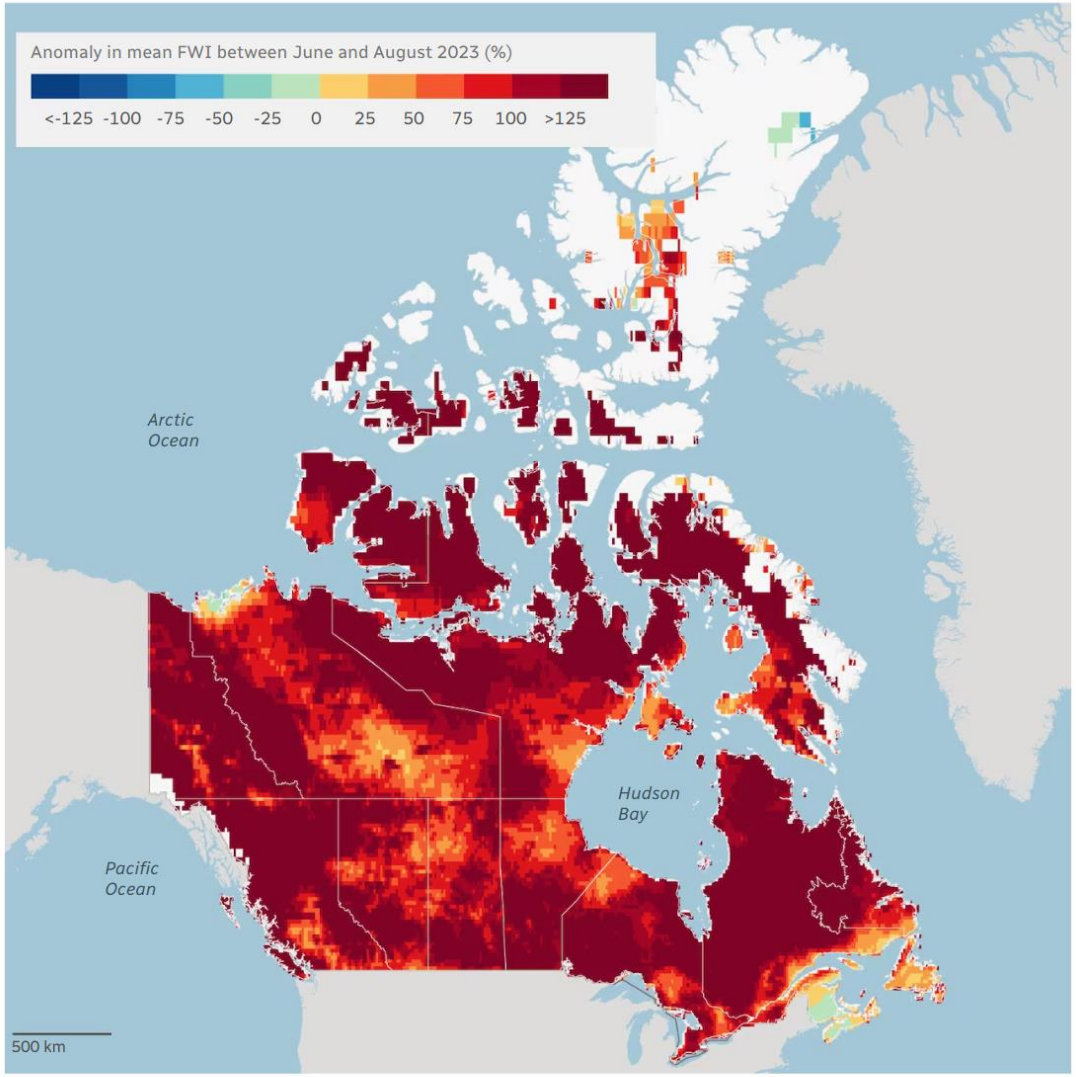
…and the zero carbon balancing act



CARBON OFFSETS

Dry, hot weather made wildfires far more likely this summer

The Fire Weather Index (FWI) measures the dryness of the forest, along with temperature, humidity, level of precipitation and wind speed.



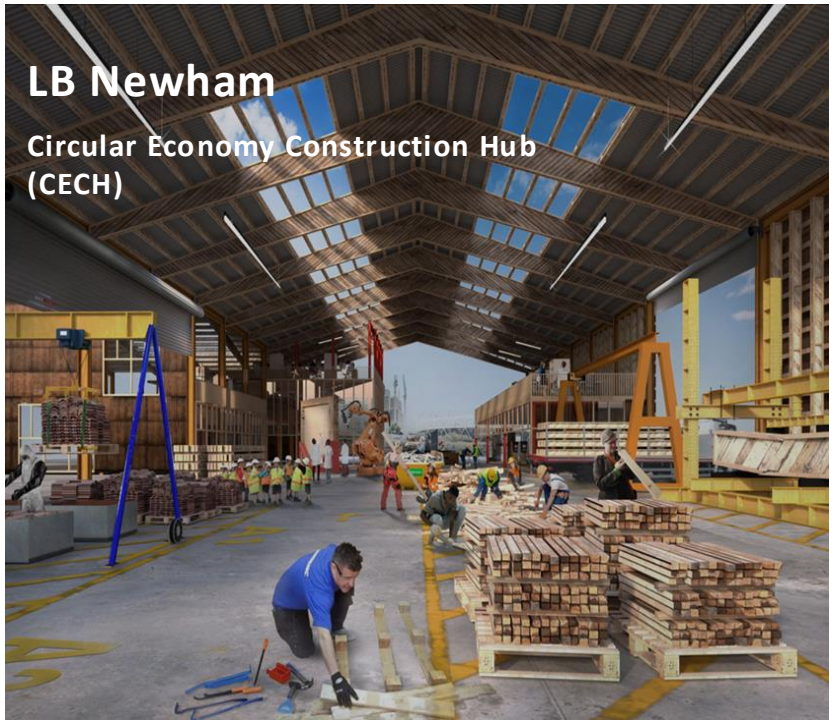
Note: Reference period for normal values calculated using 1991-2020 data.

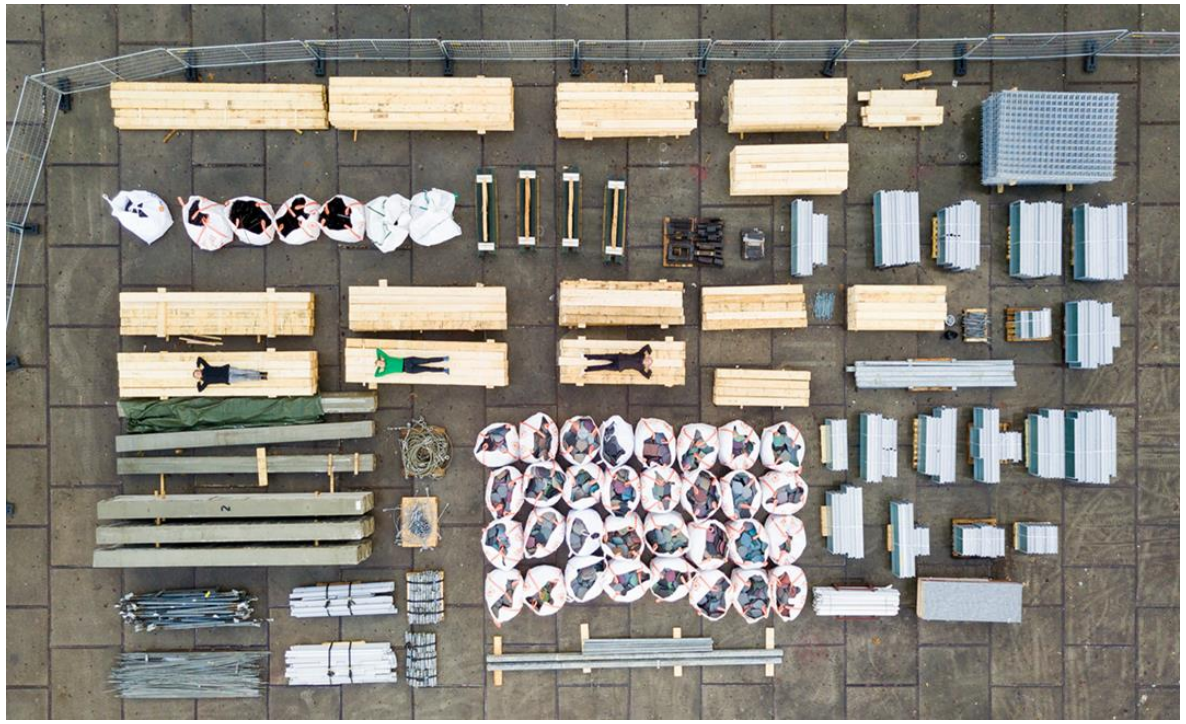
Source: Centre pour l'Étude et la Simulation du Climat à l'Échelle Régionale, ©Mapcreator | OSM.org (CBC)

To offset even a fraction of our global CO_2 emissions, we would have to plant AND protect a massive number of trees for decades. A newly planted tree could take upwards of 20 years to capture the amount of CO_2 that a carbon offset program promises. Furthermore, there is always the risk of droughts, wildfires, tree diseases, and deforestation wiping out newly planted trees. **In short, there is no permanence!**

Considerations…..

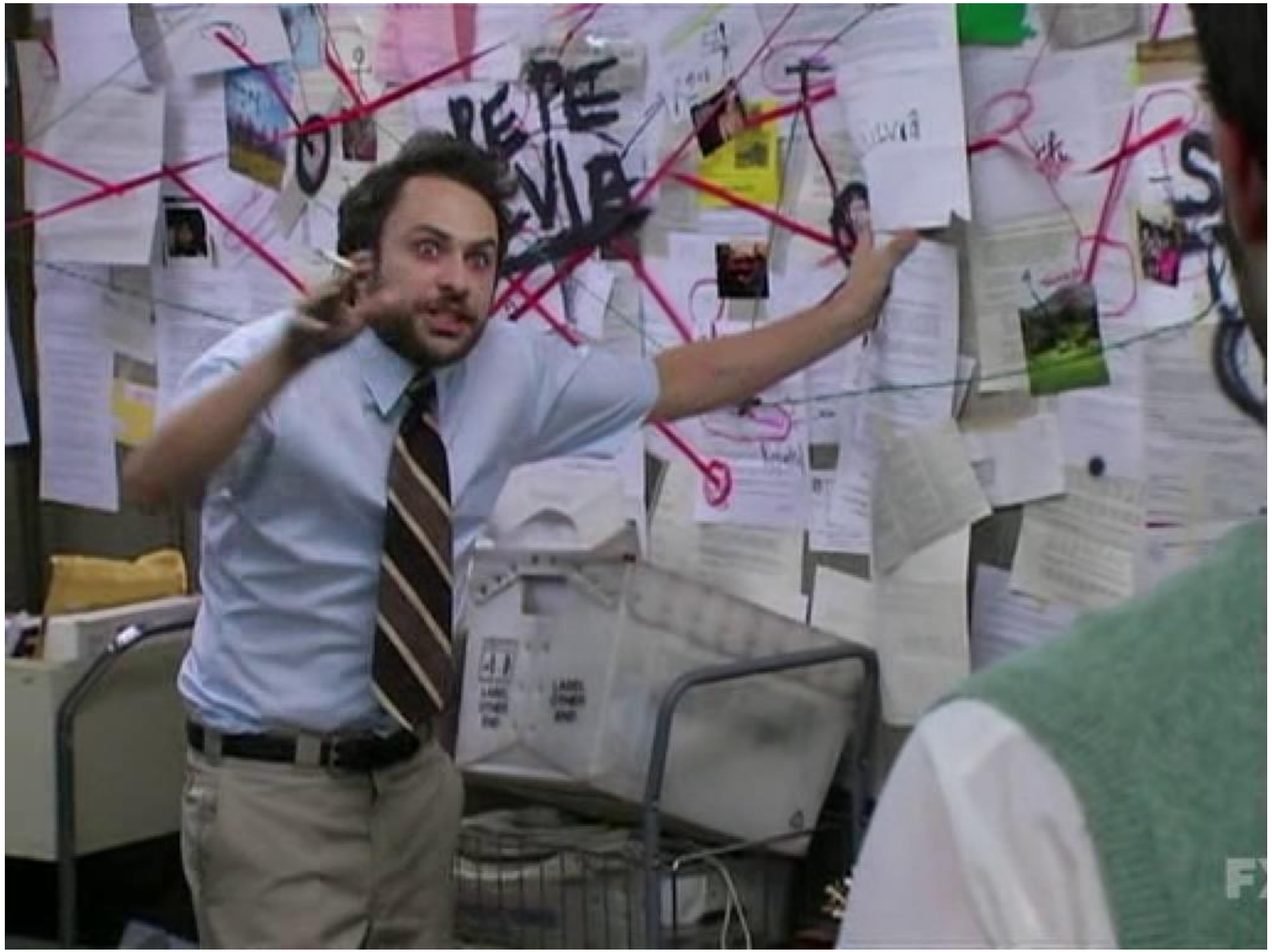
- Can a new type of “Carbon Offset Program” be created to subsidize the cost of deconstruction, reclamation, and storage?
  - Would that incentivize building owners to opt into deconstruction and design for disassembly?





Carbon Leadership Forum British Columbia

Final Take Aways & Reflections



1 BUILD LESS, REUSE MORE

2 DESIGN LIGHTER AND SMARTER

3 USE LOW-CARBON ALTERNATIVES

4 PROCURE LOW(ER) CARBON PRODUCTS

1 BUILD LESS, REUSE MORE

2 DESIGN LIGHTER AND SMARTER

3 USE LOW-CARBON ALTERNATIVES

4 PROCURE LOW(ER) CARBON PRODUCTS

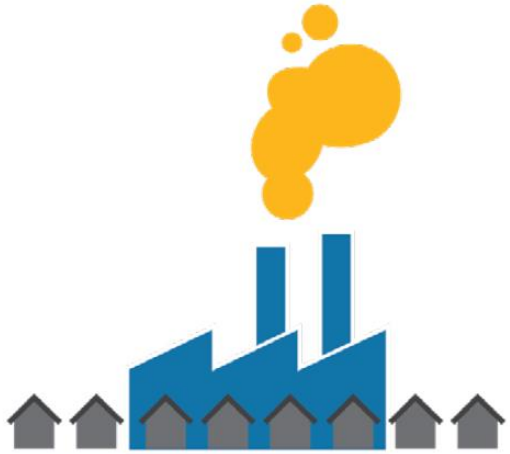
REFLECTIONS…..

- How can we continue to align the Part 3 & Part 9 embodied carbon & deconstruction policies?
- Can we create bylaw that requires design for disassembly?
- Can deconstruction of existing building and design for disassembly of new buildings be advanced at the same time?
- Bonus: If a Cradle to Cradle / Circular Building Standard was created, applied and achieved, could upfront biogenic carbon sequestration be included in wbLCA?

Embodied carbon is directly linked to public health & equity

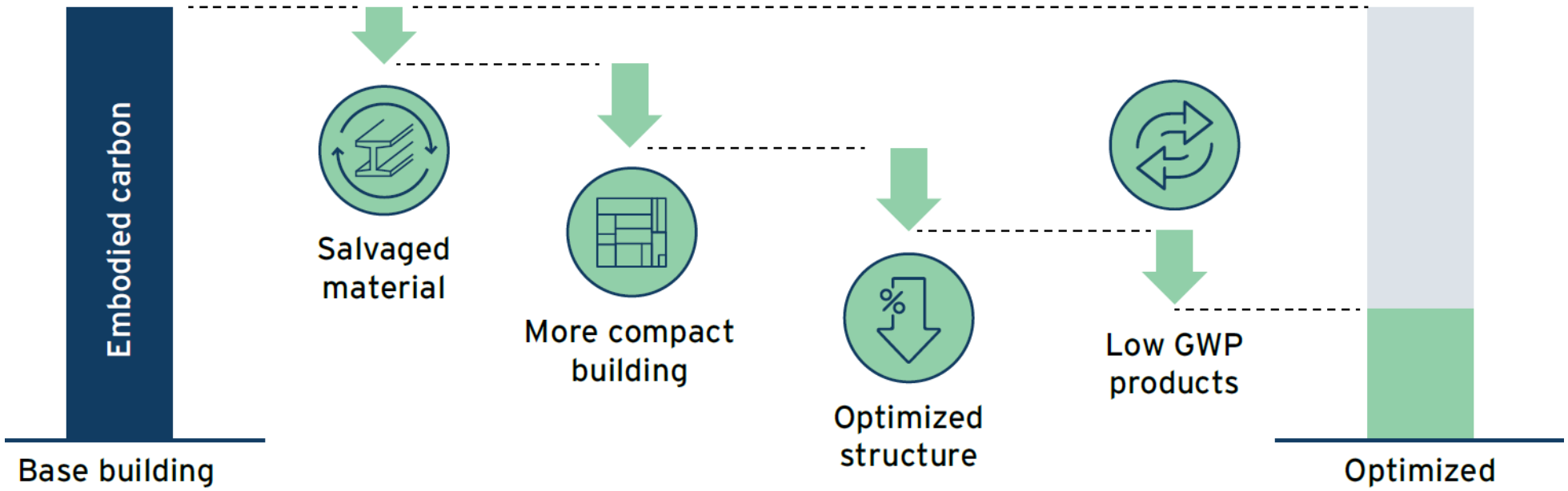
Mitigate global climate change

Reduce regional and local health impacts



Increase supply chain transparency

A combination of interventions can result in deeper reductions than pursuing jus one



Source: Driving Action on Embodied Carbon in Buildings, RMI & USGBC, September 2023

Continuing the conversation of circular strategies & embodied carbon…

Light House

Life Cycle Assessment of Relocated and Retrofitted Homes

Carbon Leadership Forum British Columbia

Powered by zeic

THANK YOU!

Contact Info:

stephanie.dalo@zeic.ca