Zero Net Carbon Building Zoning **Embodied Carbon TAG #2 Presentation - Discussion**



boston planning & development agency

June 2, 2021

Zoom Meeting Guidance

The BPDA will record this meeting and post it on BPDA's Zero Net Carbon Building Zoning webpage. The recording will include the presentations, discussions and a transcript of Q&A / Chat comments.

It is possible that participants may be recording this meeting as well. If you prefer not to be recorded during the meeting, please turn off your microphone and camera.



Zoom Meeting Guidance

- Help us ensure that this conversation is a pleasant experience for all.
- Please mute your mics during the presentation to avoid background noise.
- It's great to see you! Participant video can be on during the meeting.
- Use the Chat feature for questions and comments during the presentation.
- Use the Raise Hand feature during the discussion segment.
- Please be respectful of each other's time.
- As always please feel free to reach out to me directly!
 John Dalzell, AIA, LEED Fellow at <u>John.Dalzell@Boston.gov</u>



COVID-19 Resources

Stay up-to-date with COVID-19 related announcements, City of Boston reopening plans, and resources for you and your community at:

boston.gov/coronavirus





AGENDA

OPPORTUNITIES FOR POLICY AND AWARENESS

- 1. Welcome and Introductions (5 min)
- 2. TAG Meeting #1 Summary Michelle Lambert (10 min)
- 3. Policy and Awareness Overviews:
 - Policy Meghan Lewis, CLF (15 min)
 - Awareness John Dalzell / (5 min)
- 4. Facilitated Breakout Discussion (3 pre-assigned rooms)
 - Policy (20 min)
 - Awareness (20 min)
- 5. Breakout Room Takeaways (10 minutes)
- 6. Updates and Next Steps Julie Janiski / John Dalzell (5 min)



WELCOME & BRIEF INTRODUCTIONS

WORKING GROUP

Michelle Lambert, CPHC®, LEED BD+C Lambert Sustainability / Carbon Leadership Forum Rachelle Ain, AIA CPHC®, WELL AP, Utile Design Carbon Leadership Forum Julie Janiski, Buro Happold Carbon Leadership Forum Andrea Love, Payette Olivia Humphrey, Jacobs Lori Ferriss, Goody Clancy Jennifer Effron, BSA Meredith Elbaum, BE+

CITY STAFF

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WELCOME & BRIEF INTRODUCTIONS

TAG MEMBERS

Alison Nash, DiMella Shaffer Andrea Love, Payette Anthony Pak, Priopta Aurora Jensen, Buro Happold Brad Mahoney, MP Boston Brenda Pike, Caroline Shannon, Howeler + Yoon Architecture Chen Qin, HED (Harley Ellis Devereaux) Christopher Stanley, Trinity Financial Ciarán Smyth, BALA Engineers Courtney Koslow, Beacon Communities Dan Whittet, AHA consulting Engineers Daniel Bailey, Takeda Pharmaceuticals Dennis Carlberg, Boston University Erin McDade, Architecture 2030 Gunnar Hubbard, Thornton Tomasetti Ivan Lee, Morrison Hershfield



James Rogers, Turner Construction Jim Newman, Linnean Solutions, LLC Kayla Natividad, NSG Pilkington North America Kevin Maguire, Oxbow Urban LLC Lori Ferriss, Goody Clancy Maura Zlody, Meghan Lewis, Carbon Leadership Forum, University of Washington Michael Orbank, Commodore Builders Michael Gryniuk, LeMessurier Michelle Apigian, ICON Architecture Nicole Knobloch, Olifant, LLC Patrick Kenny, Thornton Tomasetti Paul Richardson, Buro Happold Peter Sun, BPDA Steven Burke, Consigli Construction Company, Inc. Tamar Warburg, Sasaki Associates, Inc. Tom Chase, New Ecology, Inc. Turan Karakus, BR+A Consulting Engineers

TAG Meeting #1 on May 12 - Summary

42 attendees! Thank you!

Discussions around-

- 1. Practice, Structure, Materials, Tools
- 2. Policy- Precedents and Boston-specific ideas
- 3. Awareness, Education & Stakeholder Outreach



TAG Meeting #1 on May 12 - Summary

Today's Focus-

- **1. Practice, Structure, Materials, Tools**
- 2. Policy- Precedents and Boston-specific ideas
- 3. Awareness, Education & Stakeholder Outreach



- Incentive Ideas (the carrots)
 - Permitting process speed
 - Density bonuses
 - MassSave or MassCEC financial incentives
 - Similar to Passive House incentives
 - Design challenge (ie: Triple Decker) grants to spark innovation
 - Tax credits



- Requirements & Mandates ideas (the sticks)
 - 1. Disclosure and reporting requirements
 - 1st step allows for learning curve (on teams and City)
 - Increases embodied carbon literacy
 - Pushes products for EPDs/transparency
 - Pushes CLT market/production



- Requirements & Mandates ideas (the sticks)
 - 2. Building level carbon budget (per sf, use type)
 - Need baseline assumptions and reduction targets
 - Tool and materials agnostic (allows for flexibility)
 - Require offsets if needed
 - Or fees for noncompliance (ie: BERDO)



- Requirements & Mandates ideas (the sticks)
 3. Building and Materials Reuse
 - Deconstruction and reuse requirements
 - EC study (and offsets?) required for demolition
 - Push CW recycling/reuse market
 - Revisit old assumptions for tear-downs with climate lens



TAG Meeting #1 on May 12 - Summary

Awareness, Education & Stakeholder Outreach

More Topics to Incorporate-

- Community and worker health impacts (new materials)
- Affordable housing, housing shortage (don't create barriers)
- Smaller projects (cost barriers to doing LCA, less access to tools, resources and consultants)
 - Stick-built multifamily (important type to study)
- Panelization/Modular construction for more control of materials
- Engage stakeholders (Unions for CLT construction, manufacturers for EPDs)



Policy Examples

Meghan Lewis

Senior Researcher, Carbon Leadership Forum at University of Washington

meghancl@uw.edu





boston planning & development agency

From Strategies to Policy Opportunities



Examples of embodied carbon reduction strategies



Identifying strategies is only a part of the puzzle! Whether there is an appropriate policy lever to require or incentivize strategies is equally important to impact.



From Strategies to Policy Opportunities - Option 1





Prescribe specific set of strategies

- 1. Identify strategies to reduce embodied carbon
- 2. Prioritize top strategies
- 3. Assess available policy levers to require implementation of strategy
- 4. Develop prescriptive requirements and compliance mechanisms



From Strategies to Policy Opportunities - Option 2



OPTION 2

Adopt other green building certification requirements

- 1. Identify green building certifications that include embodied carbon
- 2. Incentivize or require adoption of the green building program



construction requirements

Case Study City of Somerville <u>Zoning</u> **Ordinance**

Passed in December 2019, updated 2021 with additional pathways to achieve 'net zero ready building' status (confirm?)

Built off of success with affordable housing density bonuses

Includes:

- Requirements for buildings >25,000 sf to be LEED Gold certifiable and for buildings >50,000 sf to be LEED Platinum certifiable.
- Developers will be allowed to increase the unit count of their buildings if they meet Net Zero Ready requirements, which include a high performing building envelope and no fossil fuel combustion for heating or cooking.
- The Living Building Zero Carbon certification (and Passive House certification) are included as pathways to achieving "Net Zero Ready building" status to qualify for density bonuses.





S T R A T E G I C PLANNING & COMMUNITY DEVELOPMENT

JOSEPH A. CURTATONE MAYOR



From Strategies to Policy Opportunities - Option 3



OPTION 3 (Performance-based)

Allows for <u>any</u> strategy that can <u>demonstrate</u> its benefit/carbon reduction

- 1. Identify calculation requirements for demonstrating carbon reduction
- 2. (Can be phased in): Set performance target/limit

Performance-Based Policies for Embodied Carbon

Building Approach

 Uses <u>Whole Building LCA tools</u> or early-design estimators to measure performance

Material Approach

Use <u>Environmental Product</u>
 <u>Declarations</u> to measure performance

- Incentivizes <u>Designers</u> to collaborate to design a lower carbon building
- Captures strategies like:
 - Building/material reuse
 - Use of bio-based materials
 - Efficient structural design

- Incentivizes <u>Manufacturers</u> to invest in clean manufacturing and <u>Contractors</u> to procure low carbon materials
- Captures strategies like:
 - Concrete mix designs
 - Plant efficiency/fuel source

Most relevant for zoning policies due to when required along project timelines



Case Study City of Vancouver Green Buildings Policy for Rezoning

Disclosure (2017 -)

"All projects shall **report the life-cycle equivalent carbon dioxide emissions** (ie: global warming potential impact, or 'embodied carbon') **of each building, in kgCO2e/m²**, as calculated by a whole-building life-cycle assessment (LCA)."

In addition to reporting the embodied emissions intensity in kgCO2e/m², projects must also report the total lifecycle embodied emissions in kgCO2e, and the equivalent annual embodied emissions intensity in kgCO2e/m²/year.

Link to <u>Guidelines</u>

Targets (2021/22 -)

- Establish standardized baselines to measure reductions for developments and the city
- Require rezoning reduction targets through updates to the "Green Buildings Policy for Rezonings"
- Learnings from rezoning will be used to update the building code by ~5 year delays to give the broader industry the time needed to ramp up and become comfortable with these new requirements.

🗲 Inform new policies (2023 -)

- **2021/22:** The first reduction target(s) is introduced in the <u>rezoning plan</u>.
- 2023: Possible first embodied carbon requirements are added to the Building By-law.
- 2025/26: The <u>rezoning policy targets</u> <u>are updated</u> & 2021/22 rezoning targets are possibly <u>adopted into the</u> <u>code.</u>
- 2030: 2025/26 rezoning targets are adopted into the code & higher targets are set for the rezoning policy to move towards net-zero emissions.



City of Vancouver 6.2 Requirements for Calculating Embodied Emissions

There are design team LCA software tools currently available that can greatly streamline the workflow of LCA and that meet the technical requirements below, such as the free Canadian-based Athena Impact Estimator. For consistency in LCA calculations, projects shall use the following standard requirements:

1) The LCA must include all envelope and structural elements (including parking structure), including footings and foundations, and complete structural wall assemblies (from cladding to interior finishes, including basement), structural floors and ceilings (not including finishes), roof assemblies, and stairs construction, but exclude excavation and other site development, partitions, building services (electrical, mechanical, fire detection, alarm systems, elevators, etc.), and parking lots;

2) The LCA must assume a building lifetime of 60 years;

- 3) The life-cycle boundary must account for cradle-to-grave impacts, including resource extraction, product manufacturing and transportation, building construction, product maintenance and replacement, and building demolition/deconstruction/disposal (EN 15804/15978 modules A1-A5, B2-B4, and C1-C4). Operating energy and water consumption are excluded.
- 4) The Life-Cycle Inventory (LCI) database used must be ISO 14040, 14044, and 21930 compliant, and regionally-specific, if possible;
- 5) The Life-Cycle Impact Assessment (LCIA) method used must be the US EPA's Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI);
- 6) If the service life of a product used in initial construction is greater than the building's assumed service life, the impacts associated with the product may not be discounted to reflect its remaining service life.

In addition to reporting the embodied carbon as detailed above, projects shall separately report, where readily available, the impacts and benefits beyond the system boundary (EN 15804/15978 module D). This is a quantification of environmental benefits or loads associated with reuse, recycling and energy recovery from flows exiting the system boundary. Note that these impacts are reported for information only, and are not counted towards the embodied carbon of the building.

- Minimum building scope requirement
- → Building service life assumptions
- → Life cycle scope requirement
- → LCI Database requirements
- TRACI Impact assessment method requirement

Separate reporting for module D (beyond the system boundary)



City of Vancouver 6.2 Requirements for Calculating Embodied Emissions

Projects are also encouraged, but not required, to report:

- 1) The lifecycle impacts associated with other building elements that are excluded from the mandatory Embodied Carbon reporting.
- 2) Other calculated life-cycle indicators and impacts, such as ozone layer depletion, acidification, eutrophication, photochemical ozone creation, primary renewable energy use, fresh water consumption, human toxicity, respiratory inorganics, eco-toxicity, and other impacts;
- 3) A breakdown of impacts by activity (materials/products, transportation, on-site activities, wastage, etc), life-cycle stages (extraction, manufacturing, construction, use/maintenance, end of life), product category (structure, foundation, wall, glazing, etc.), and material type (steel, wood, concrete, plastic, etc).

For projects pursuing LEED v4, calculations created to demonstrate achievement of the Life-cycle Impact Reduction credit, Option 4, and reporting of the proposed building results, are acceptable to meet the intent of this requirement.

OPTIONAL reporting:

Additional building scope

Additional life-cycle impacts (in addition to global warming potential)

Additional analysis/breakdown for reporting beyond per square foot



Example language/phasing

Disclosure

From January 1, 2022:

All projects shall **report the life-cycle equivalent carbon dioxide emissions** (ie: global warming potential impact, or 'embodied carbon') **of each building, in kgCO2e/m²**, as calculated by a whole-building life-cycle assessment [that meets the City of Boston WBLCA requirements in Appendix X].

(+ Calculation Guidelines)

*Can include examples of strategies to use to reduce embodied carbon, but don't have to prescribe which WBLCA results disclosed for zoning policies are used (in addition to other relevant research and resources) to establish Boston building baselines for zoning types

Targets From January 1, 2024/5: All projects must **reduce their embodied** carbon intensity (i.e. kgCO₂e/m2) by X% as demonstrated by a whole-building LCA [that meets the City of Boston LCA requirements in Appendix X]. All projects must **be below the global** warming potential limit of X kgCO₂e/m2, as demonstrated by a whole-building LCA [that meets the City of Boston LCA requirements in Appendix X].

Targets updated at regular intervals, ideally aligning with City Climate Action Plan targets



Additional Case Studies CNCA Framework

ZONING AND LAND USE POLICIES

	POLICY CODE	POLICY NAME	CARBON IMPACT	COST- EFFICIENCY	IMPLEMEN- TABILITY	ENFORCE- ABILITY	SUM OF SCORES	EXAMPLES PROVIDED		
	Z1	EMBODIED CARBON TARGETS FOR ZONING PROCESS	•••••	••••0	•••00	••••0	16	-		
V	Z2	SET ZONING REQUIREMENTS FOR BIO- BASED MATERIALS	••••0	•••00	••••0	••••0	15	Helsinki	Embodied carbon specific	
	Z3	CARBON-SCORED LAND SALES COMPETITIONS	••••0	•••00	•••00	••••0	14	Porvoo, Tampere		
	Z4	PARKING REQUIREMENT OPTIMIZATION	•••00	••••	••••0	•••••	17	London, Portland, Helsinki	Prescriptive strategies with large co-benefits	
	Z5	APARTMENT SIZE AND SPACE EFFICIENCY GUIDELINES	•••00	•••••	••••0	•••••	17	NYC		
	Z6	PREFABRICATED OR MODULAR CONSTRUCTION PRIORITY	•••00	••••0	•••00	••••0	14	-		
	Z7	INCREASING DENSITY USING EXISTING INFRASTRUCTURE	••000	••••0	••••0	••••0	14	-		
	Z8	USE LOW CARBON BUILDING TYPOLOGIES IN ZONING	••000	•••00	••••0	•••••	14	-		

Source: CNCA Framework





Broader Embodied Carbon Policy Landscape

North American Embodied Carbon Policy Landscape

- Building-approach
 - **Zoning,** like in Vancouver, Helsinki, and Poorvo (Finland)
- Material-approach
 - Procurement bills
 - Federal Buy Clean proposed, GSA developing
 - State bills introduced in WA, OR, CA, MN, CO, NY, NJ, CT
 - Local procurement like in LA and Portland's Low-Carbon Concrete Purchasing Program
 - Transportation agencies, like PANYNJ, Port of Seattle, and Sound Transit
 - Building Codes like Marin County Low Carbon Concrete
 Code passed in 2019

Multiple/holistic

- **Climate action plans** in Vancouver, King County (includes Seattle), Austin, Eugene, and (upcoming) San Francisco
- Green building incentive programs like in Seattle, San Diego, Austin, and Somerville



https://carbonleadershipforum.org/clf-policy-toolkit/



	Active since 2017		State bills introduced in 2021							Federal 2021
	Buy Clean CA	<u>Minnesota B3</u>	BCBF WA	NY LECCLA	<u>NJ AB 5223</u>	<u>CA AB 1365</u>	<u>CO 1303</u>	OR Pilot	<u>CA AB 1369</u>	CLEAN Future
Materials	Steel, glass, mineral wool	5+ Products	Concrete, steel, wood	Concrete	Concrete	+ Concrete	Asphalt, cement, concrete, glass, steel, wood	Concrete, Asphalt, Steel	+ Gypsum board, insulation, carpet ceiling tiles, and future expansion	(Initial list:) Aluminum, iron, steel, concrete, cement
Includes Buildings	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark
Includes DOT Projects	\checkmark	\times				\checkmark	\checkmark	\checkmark		
Requires Disclosure	\checkmark	\checkmark	\checkmark			\checkmark	\checkmark	\checkmark		\checkmark
Will set GWP Limits	\checkmark	X	X	?	X	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
\$ Provides Incentives	X	X					X		X	

State / Federal Procurement Policy Landscape

Case Study New York LECCLA (SB542)



Three incentive types in SB542:

- 1. Low embodied carbon concrete discount rate set by commissioner, applied to 1+ bids based on the GWP from analysis (includes "concrete delivery miles")
- 2. LECC breakthrough discount rate also set by commissioner, applied to 1+ bids based on use of breakthrough technologies (CCUS, etc) to be defined by NYSERDA
- **3. EPD Tax Credit:** Manufacturers can receive up to \$3k in support for EPD analysis (*would be valid until 2023*)







Case Study Portland Low Carbon Concrete Program

Phase 1: Environmental Product Declaration (EPD) Requirements (2020)

- Portland Cement Concrete (including: Commercial Grade Concrete, Plain Concrete Pavement, and High-Performance Concrete/Structural Concrete) for City construction projects
- Product-specific Type III EPD provided for all pre-approved concrete mix designs and concrete mixes for projects over 50 yd3

Phase 2: Data Collection, including Lower Carbon Concrete Pilot Projects (2020)

- Collecting baseline data on concrete mixes in Portland Metro Area (from a variety of sources, including EPDs, historical project usage, and pilot projects)
- Pilot tests of different lower-carbon concrete mixes, such as the <u>sidewalk pilot</u> with the Portland Bureau of Transportation (PBOT)

Phase 3: Establishing Global-Warming Potential (GWP) Thresholds

- City intends to publish maximum global-warming potential (GWP) thresholds for concrete on City construction projects (by type of concrete and strength class)
- Publishing by April/May 2021 with the goal of implementation in 2022 after stakeholder engagement



Case Study <u>Austin Climate Equity Plan 2020 [Public Comment Draft]</u>

Goal 3: By 2030, reduce the embodied carbon footprint of building materials used in local construction by 40% from a 2020 baseline.* *Target cannot exceed 500 kg CO2e/m2 (~100 lbs CO2e/sf).

- Strategy 1 Lead by example through design and construction standards: In partnership with other cities and states, develop City of Austin design and construction specifications and purchasing agreements to result in healthy, low-carbon buildings.
 - As an example, encourage lower-carbon building materials, whole-building life cycle analysis, healthy building certifications and building reuse and deconstruction in City funded projects. Purchasing policies should be structured to promote building product transparency and preferred outcomes.
 - Ensure healthy building strategies and certifications are prioritized in community centers, libraries and other community facilities serving low-income communities and communities of color first.
 - Employ circular design strategies to ensure building and building material longevity, such as designing for a building's deconstruction and potential future uses.
- Strategy 2 Incentivize lower-carbon materials: Enhance and integrate lower-carbon building materials and deconstruction
 practices into City incentive programs, like the expedited permitting process and Austin Energy's Green Building program, to
 transition voluntary design guidance into planning and development agreements over time.
 - Develop an embodied carbon baseline to effectively measure success.
 - Consider feasibility and cost to determine the most effective pathways to stimulate voluntary action.
 - Invest in culturally relevant marketing to highlight success cases and drive participation.
- Strategy 3 Educate stakeholders on materials best practices: Create a performance framework and educational programming for industry professionals and the general public, with a focus on low-income communities and communities of color, to reduce the lifecycle and negative health impacts of building materials and construction practices.
 - Provide resources that address and help mitigate the health impact of materials from the point of extraction to operation, including availability of environmental and health product declarations.
- Strategy 4 Stimulate decarbonization with local producers: Prioritize partnerships within local materials markets to decarbonize high-impact materials, specifically: glass, steel, aluminum, concrete, drywall, insulation and carpet.
 - Leverage and align with existing local and national efforts to create equitable outcomes in materials decarbonization and look for opportunities for coworking and collaboration among businesses.
 - Encourage the growth of local businesses that can create building materials from current waste streams, including construction, manufacturing and municipal.

AUSTIN CLIMATE EQUITY PLAN 2020

[Draft Full Plan for Public Comment 09-02-20]





Case Study King County 2020 Climate Action Plan

- Strategy 4.2.2 Parter with King County cities on C&D recovery and reuse. King County will work with and support city partners and partnering agencies to implement codes, policies, and incentives resulting in the maximum recovery and reuse of structural and nonstructural components of existing structures. King County's goal is for at least eight cities to have taken one of these steps by 2025.
- Strategy 5.2.2 Support the transition to a reusable wood market. The County will dedicate resources to catalyze the movement of wood markets away from combustion and toward higher value uses that are more sustainable for both the environment and people of King County.
- Strategies GHG 3.3.1/GHG 4.2.1/GHG 4.3.1 [related to Green Building Codes] Proposed requirements may include ... construction and demolition (C&D material management), materials with low embodied carbon and toxicity...
- Strategy GHG 4.14 Manage King County capital portfolios to maximize GHG emissions reductions in operational and embodied emissions. They will use the following strategies...Use the Embodied Carbon in Construction Calculator (EC3) tool to identify low embodied emissions materials that meet construction specifications, and to inform decisions in materials selections in accordance with King County's Sustainable Purchasing Guide.
- Strategy GHG 5.8.1 Specifying low-embodied carbon building materials in King County capital projects. The mining, manufacturing and transportation of building materials result in significant GHG emissions. To reduce these "embodied" emissions, King County will develop requirements and specifications for the use of low emission alternatives for concrete, asphalt, wood, and steel by County project managers and designers in bid solicitations.

By 2022, the County shall create standard specifications for concrete and begin requesting environmental product declarations (EPDs) for this material in construction bids. By 2023, it will require the use of EPDs for concrete and, by 2024, require a maximum global warming potential (GWP) for concrete products, which it will enforce for all construction projects starting in 2025. The Embodied Carbon in Construction Calculator (EC3) tool will be used to help choose the lowest embodied carbon materials per project that meets the specification. Based on lessons learned, the County will expand these specifications to other high embodied emissions materials including asphalt, wood, and steel.





Case Study Los Angeles

Green New Deal Sustainable City pLAn 2019

Industrial Emissions & Air Quality Monitoring

Target: Reduce industrial emissions by 38% by 2035; and 82% by 2050

Lead by Example

- Target: Ensure all new municipally owned buildings and major renovations will be all-electric, effective immediately
 - 2021 Milestones: Implement GHG performance standards for material procurement for purchasing by City Departments Update the City's Environmentally Preferred Products Purchasing Program to

include additional construction materials and a GHG performance standard, such as the Buy Clean California Act

Further identify embedded carbon emissions in the City's supply chain through Departmental participation in the Carbon Disclosure Project supply chain reporting program

C40 Clean Construction Declaration Commitment

3 commitments + 8 supporting actions. Commitments include:

- Reduce embodied emissions by at least 50% for all new buildings and **major retrofits** by 2030, striving for at least 30% by 2025
- Reduce embodied emissions by at least 50% of all **infrastructure** projects by 2030, striving for at least 30% by 2025
- Procure and, when possible, use only **zero emission construction** machinery from 2025 and require zero emission construction sites city-wide by 2030





Reduce embodied emissions by at least 50% for all new buildings and major retrofits by 2030, striving for at least 30% by 2025	 Select a set of City buildings and calculate the embodied carbon of their design, construction, and operation to pilot as a baseline, by Q4 2021. 	 Launch working groups in 2021 for architecture, engineering, contractors, developers, and tenants to develop a roadmap to 2030. 		
	 Collaborate with industry groups to deliver training on the EC3 tool so the industry gains familiarity with low-carbon products and design choices throughout 2021. 			
Reduce embodied emissions by at least 50% of all infrastructure projects by 2030, striving for at least 30% by 2025	 Select a set of City infrastructure projects and calculate the embodied carbon of their design, construction, and operation to 	Pilot use of above products throughout 2021. Work with Contract		
	pilot as a baseline by Q4 2021. • Send market signals for low carbon and/or carbon sequestering concrete throughout 2021.	Administration, Procurement, and relevant departments to standardize terms for all City infrastructure project contracts by 2022.		
Procure and, when possible, use only zero emission construction machinery from 2025 and require zero emission construction sites city-wide by 2030	 By Q1 2021, investigate potential to add procurement preference to City contracts for contractors who use zero emission equipment. Implement for Public Works contracts by 2022. 	 By Q4 2021, develop with South Coast Air Quality Management District a trade-in program for ga equipment to electric equipment. 		
	 Convene focus groups in 2021 for general contractors to discuss how to advance electric equipment use in the region in accordance with the 2025 and 2030 goals. 			

AL SUPPORTIVE	INTENDED ACTION/APPROACH TO P				
he better use, g, and retrofit of liding stock and ure across the city to ir optimal use before uuction projects ared.	 LA adopted the Adaptive Reuse Ordinance (ARO) in 1999 which offers regulatory examptions and project streamlining for developers susing an odd site for a new purpose. 725 of ARO project: and developed within 1/2 mile from Metro rail stations and so have reduced VMT. ARO bucyed development during the last recession and is expected to do so again during this recession. 	In 2021, revisit the ARO to see what enhancements might be helpful. Encourage adaptive reuse of existing buildings through developing incentives and fast track permitting for qualified projects by Q4 2021.			
ample with municipal int by requiring life issments (LCAs) and the of construction and waste from disposal for al projects. Use purchasing power to demand zero emission on machinery in projects. Reward ficient and circular so of low carbon on slow to zero waste on sites for all new id major retrofit.	 Since 2010, the City of LA has a policy requiring all mixed CAD waste to City-certified CAD waste processing facilities. Non-compliance penalties of \$5,000 per load are levied. Launch Zero by Design, a utility program to incentivize design teambodied carbon, by 02 2021. By Q4 2021, investigate how to offer preference points for contractors who utilize zero emission construction equipment on City projects. 	Work with BOE to implement Clean CA requirements for ste flat glass, and mineral wool boo insulation procurement throughout 2021. Work with BOE to pilot LCA review for City buildings by utilizing the LEED v4.1 pilot cre by Q4 2022.			
ansparency and lifty, starting with CAs in planning s and embedding planning policies, and building codes ar of endorsing this. . Require the public of this data to facilitate of this data to facilitate insparency and foster lifty to develop robust standards, certifications s.	 Encourage LCA review and disclosure for projects through developing incentives and fast track permitting for qualified projects by Q4 2024. 				

Prioritise existing be infrastruct ensure the new const

Lead by e

Lead by e procurem cycle asse diversion demolitio all munici municipal procure o constructi municipal resource a design us

design, us materials constructi

Demand to accountable requiring in permission them into processes within a you declaration disclosure greater tra accountable baselines, and policie



Case Study City of Vancouver Climate Emergency Action Plan

Lower carbon construction

By 2030, we will ensure 40% less embodied emissions from new buildings and construction projects compared to 2018. Vancouver's Embodied Carbon Strategy sets a vision for a healthy, equitable, circular, and carbon-positive construction economy.

We aim to take responsibility for carbon pollution created while extracting, manufacturing, assembling, replacing and disposing of building materials, such as concrete, metals, insulation. This means:

- Using materials more efficiently
- Reusing existing buildings and materials
- Building more from sustainably sourced wood and mass timber
- Using lower-carbon blends of concrete
- Powering construction sites with renewable energy instead of diesel fuel
- Using low-carbon insulation instead of spray foam, and
- Putting less parking in buildings

To ensure we meet our target, we'll:

- Set embodied carbon pollution limits for new buildings
- Make it easier and less expensive to use lower carbon materials in new buildings
- Support people using low-carbon materials in new buildings
- Align low carbon planning and strategies

By 2030, we're aiming: **HOW WE BUILD** To cut our carbon pollution from buildings in half compared to what we had in 2007 For 40% less embodied emissions from new buildings RENO and construction projects compared to 2018 We need to build and renovate differently We have to construct and operate Vancouver's buildings in a climate-friendly, healthy and resilient way.

By 2030, people will be able to live and work in zero emissions buildings, and benefit from the comfort, quiet, healthy air, and lower energy costs they offer.

You'll notice:

More people trained and working on low-carbon construction and renovation projects Additional resources and incentives to help with zero emissions retrofits Increased number of buildings with low-carbon equipment, like heat pumps, which also provide cooling in the summer



Case Study Port Authority of New York and New Jersey

Port Authority of New York and New Jersey launched their **Clean Construction Program** during Climate Week (September) 2020





Including:

- **Specification for low carbon concrete:** reduces the required cement content in certain concrete mixes by 25%, significantly reducing its carbon intensity and allowing for lower-carbon alternatives
- Pilot projects to develop low carbon concrete and materials
- **Requirement for Environmental Product Declaration:** enables systematic collection of environmental data directly from construction contractors to help inform more environmentally focused material selection



Performance-Based Policies Certification and Commitment Examples



% Reduction Target

LEED v4 awards points to teams that "conduct a life-cycle assessment of the project's structure and enclosure that demonstrates a minimum of 10% reduction, compared with a baseline building." (<u>Credit</u>)



Building GWP Limits

The Zero Carbon <u>Certification</u> requires that *"The total embodied carbon emissions of the project must not exceed* $500 \text{ kg-CO}_2 \text{e/m}^2$."



Targets

The <u>2030 Challenge for Embodied Carbon</u> asks the global architecture and building community to commit to:

- "[E]mbodied carbon
 emissions...shall immediately
 meet a maximum global
 warming potential (GWP) of
 40% below the industry
 average today, increasing to:
 - 45% or better in 2025
 - 65% or better in 2030
- Zero GWP by 2040."



Targets

Signatories to the <u>Clean Construction</u> <u>Declaration</u> from C40 Cities pledge to: "Reduce embodied emissions by at least 50% for all new buildings and major retrofits by 2030, striving for at least 30% by 2025."



Cambridge Embodied Carbon Proposal

2.5 Embodied Carbon (New Action)

Overview

Structural materials are responsible for over 10% of global carbon dioxide emissions, with particular impact in the short-term. The purpose of this action is to reduce GHG emissions of construction in Cambridge through the calculation and analysis of and potential standards for embodied carbon used in the construction and renovation of new and existing buildings.

Contribution to Net Zero Objective

Net Zero projects should consider the impact <u>of</u> both embodied carbon and operational carbon. Including Embodied carbon neutrality in the NZAP is an important step in the pathway to achieve a net zero carbon future.

Projected GHG Reductions

Additional investigation is needed to quantify the impact of embodied carbon on the Net Zero pathways

Key Actions:

Short Term (1-2 Years)

- Require an embodied carbon narrative for all new construction projects and adaptive reuse study for existing buildings.
- Develop a policy that requires developers to prioritize the re-use of existing structures in their developments
- Create education materials and toolkit for
 implementation of embodied carbon calculations
- Perform a technical assessment on carbon impacts of using biogenic carbon materials.
- Participate in peer learning sessions with the City of Boston and others exploring this issue

Medium Term (3-5 Years)

 Require a whole building Life Cycle Analysis of the primary structural materials demonstrating a 20% reduction of embodied carbon

Long Term (5+ Years)

- Require a Life Cycle Analysis of the primary structural materials demonstrating a 50% reduction of embodied carbon
- Investigate the use of a Zero Carbon certification mandate for new construction projects.

Equitable Design

Track implementation and provide publicly available updates to facilitate transparency and accountability.

Ensuring Equity

When considering embodied carbon, also consider the cost implications, including how and that incremental costs are unfairly passed onto may be distributed across tenants and small business owners.

Cross-cutting Issues

Climate Change Preparedness / Resilience n/a

Electric Transport - n/a

Capacity / Local Carbon Fund - Limited



Newton Embodied Carbon Policy

Sustainable Development Requirements, Adopted December 2019-

Applies to any proposed development in any zoning district that includes the construction or substantial reconstruction of one or more buildings totaling 20,000 sf or more of gross floor area that also requires issuance of a special permit under any provision of this Zoning Ordinance.

- Requires LEED Silver for 20,000 sf, LEED Gold for 50,000 sf or Passive House or Enterprise Green Communities
- AND "The Petitioner's design teams will utilize the best available information to **assess embodied carbon** in building materials and **incorporate that information** into the design process so that low embodied carbon materials can be incorporated when cost, availability and performance is feasible."





Thank You! Questions?

Awareness Opportunities

Education

- Case Studies and Research
- Partnerships CLF Boston Hub, BSA, BE+, others
- Participation Municipal Summit, professional development

Recognition

Awards, Certifications

Climate Resilience Building Case Study





Awareness Opportunities

Program and Initiatives

- Competitions Boston Living with Water, E+ Green Buildings
- Community Engagement -Greenovate Boston, and Climate Corps
- Programs & Incentives technical assistance, feasibility studies





Facilitated Breakout Discussion

LOGISTICS

- Three Breakout Room each with a facilitator and note-taker
- Participants are pre-assigned to distribute perspectives
- ID a Spokesperson to briefly report
- We will reconvene and wrap up at the end

Policy (20 min)

- Policies aspects that seem most impactful / feasible to implement near-term?
- Steps and hurdles to effective implementation?

Awareness (20 min)

- Primary audiences, their needs, and most impactful / feasible actions?
- Tools / resources for effective implementation? City and City partners roles?



Facilitated Breakout Discussion - Policy

Policy Opportunities (10 min. discussion + 10 min. assessing / summarizing)

- Which aspects of the example policies seem most impactful and most feasible to implement in Boston in the near-term?
- What are the steps and hurdles to effectively implementing EC policy in Boston?



Room 1 Notes- Policy

What resonated from the presentation? What is relevant to Boston?

- Focus on the design before the material consideration since this is part of zoning and you can intervene earlier in the process
- Boston is a really high cost place so any ways to incentivize to build in Boston
 - Maybe tax credits?
 - Newton example probably will have the effect of increasing cost b/c it's another permitting hurdle and could negatively impact development (permit required for net zero qualifications)
- Expedited permitting and density bonuses would be great!
 - Cambridge is looking at expedited permitting
- Measuring EC is more realistic for larger projects but much harder for small projects
 - How can we help/support smaller projects or help to simplify it?
 - smaller projects could have prescriptive rather than performative- this can also be good for adaptive reuse
 - There is a tool for smaller project construction (BEAM)
 - In Canada they provided funding as well
- 40B has helped with expedited and density bonus- when using in friendly way it helps with the timeline
 - Could 40B align with Net Zero goals? Could net zero goals mimic 40B- this is a state regulation but it is based in zoning so could have local applicability



Room 1 Notes- Policy - continued

- More holistic look at demolition impacts (rather than just historic significance review which is the current consideration)
- A full LCA can help you determine whether it is better to demo or keep the building
 - Remember that operational carbon happens over time but that embodied carbon all happens as you are building (right now)
- want to make sure that the building can handle the systems and mechanics that are being replaced too



Room 2 Notes - Policy

- Disclosure for new construction over a certain threshold
- Easy tool for smaller buildings and early decision making in concept phase
 - ideal not to have to hire a consultant
 - Guidelines must be clear
 - BH developing tool can we have 1 tool? collaborate w/ CLF? evolution of ecosystem of tools.
 - could prepopulate for particular city/regional data
 - how to compare across products
 - unclear guidelines
 - ease of access, ease of review
 - hard to find info.
 - 2030 EC disclosure as model?
- EPD/disclosure by manuf to have the local data
 - mechanism to incentivize?
- Setting specific targets/thresholds
 - gradual over time (like Boston Emissions Std forthcoming, NY LL97, etc)?
- Deconstruction regulations
- Collab re racial/social justice on policy development (eg Pittsburgh)
- Reuse/Renovation
 - re showing study for why it can't be kept?
 - grants/incentives? (eg Austin)



Room 3 Notes - Policy

Vancouver Planning / Schematic Stage

Software tools - how to account for the variations among them

Vancouver going with Percentage reduction approach

What if the marketplace helps put this together? Design challenge or grants or lowest embodied carbon - data generated for the registry?

Roadmap that started with narrative + WBLCA; then reporting is part of BERDO to develop standards and baselines; then percent reduction; then a fixed carbon budget



Room 3 Notes - Policy - continued

- Importance of defining long-term targets: people care early b/c they know what's coming, what will be regulated later
- Reporting wrapped into BERDO
- Bringing a lot of people along in this process
- Does focus on baselines and benchmarks cause more harm than good?
 - They have to be set artificially high
 - EPD's prohibitive cost of new epd's
 - Importance of balancing depth of data requirements vs. making actual progress
- Percentage reduction approach better than absolute value targets?
 - How to define the baselines Vancouver providing building archetypes to establish what those baselines are - eg - SCM content, typ. Insulation
 - Where are the reductions are coming from?
- Total EC reduction targets or EC to 0 right away w/ offsets allowed?
 - The amount of offsets allowed ramps down as we get to 2040.



Room 3 Notes - Policy - continued

- Registry to record emissions "what gets measured gets managed"
 - Get hung up on data type. Agree on a margin of error/generalize order of magnitude
 - Metric that people can understand. Not too complicated. What metric could be made universal?
 - This could be the embodied carbon / sf (corollary to EUI)
 - How do we get people used to LCA (not see this a prohibitive or too time consuming)
 - + for Vancouver's approach how do you differentiate metrics per different phases of design? (SD, DD, etc.)
 - Regulation vs. incentives- in Vancouver, re-zoning set the roadmap. What does it take to get to 40%?
- Procurement/grants based on EC reductions (not one specific material)
- Roadmap: narrative, WBLCA → codified/standards w/baselines (model on Buy Green)--> % reduction. Eventually, fixed carbon budget.
- What would be the simple baseline?
 - Concern for focus to be on baseline/benchmark have to be set arbitrarily high. This sends the wrong message.
 - Is this project a potential for mass timber? Y/N Huge savings (for structural).
 - EDPs can be cause for concern. Advanced concrete mix, manuf. Didn't have EDP to confirm reduction. Based on 28 day strength (vs. 56). Need first steps on ths structural side.
 - Baseline for functionality equivalent building. Guidance for baseline assumptions ie. concrete, typ. Insulation, etc. then what are the intentional design decisions
 - Net Zero Carbon target start with zero net carbon as the baseline. Allow for a % that you can offset.



Room 3 Notes - Policy - continued

- WGBC proposed offset approach Useful to have 2030 as a strategy / model, 2030 Challenge points to the building code as baseline
 - Aimed to educating architects; shifted to including code officials and contractors
- Awareness: Local Hubs as a good initial step as baseline; webinars there's a lot of content out there; targeted content specific discipline; address training gaps on how to navigate and grown LCA literacy
- We learn the most in the context of real projects City of Boston, measure embodied Carbon and develop real life case studies to address real problem solving issues - tie this into grants, competition - would be good to include Mass Timber
- Ask the question why Mass Timber isn't being considered?
- Opportunities to optimize and reduce through reducing structural factor of safety? We do need it given how buildings are built and it's a sensitive subject.



Facilitated Breakout Discussion - Awareness

Awareness Opportunities (10 min. discussion + 10 min. assessing / summarizing)

- Who are the primary audiences, what are their needs? Consider who is missing and why.
- What would be the most impactful and feasible actions?
- What tools and resources are critical for effective implementation? Consider both City and City partners roles.



Room 1 Notes- Awareness

What can we recommend the City start taking? Where is it most important to raise awareness (audience)?

- The policies will also increase the awareness just by introducing them
- Cambridge is raising awareness by requiring projects to consider it
- Developers and those that fund them (DND)
- If the City requires it that also gets the developers' attention
- The cost is also a big issue! This is a good awareness area for developers (BE+ study)
 - Modeling/LCA
 - Construction cost is a concern with developers
 - But...consider the initial response to LEED was also negative and now it's just practice
- Consider how this work benefits the larger community too
- City could provide case studies and understanding about the cost and whether there is a premium and how projects are developing this
- Market EC like LEED



Room 2 Notes- Awareness

- city reaching out to vendors/manufacturers on what's possible
- city hire consultant to study what materials are at the top of the list that need more focus
- who needs to be in the room to tackle building reuse question?
 - demolition delay permit could this process include reuse metrics? perhaps for buildings larger than X?
 - expedited permitting for deconstruction / reuse?
- how does the general public gain more awareness?
- professional awareness re holistic carbon analysis (operational v embodied re building reuse/renovation)
- awareness to building owners re benefits of reuse/renovation
 - can the City incentivize adequately as part of the 'benefits'
- what can happen in the market re retrofit for envelope improvements?
 - competition to imagine how to upgrade existing building with cost-competitive solutions?
 - vendors/manuf invited in to Boston and supported by the City with pitches to the AEC community?
- WGBC whole building carbon pathway launch June 26: net zero ops + embodied by 2030
 - deferring to local GBC re: reduction + offset
 - will publish guidelines



Room 2: some resources

http://allforreuse.org/index.html

<u>https://www.arup.com/perspectives/publications/research/section/circular-ec</u> <u>onomy-in-the-built-environment</u>

<u>https://www.arup.com/perspectives/publications/research/section/realising-th</u> <u>e-value-of-circular-economy-in-real-estate</u>

https://www.arup.com/perspectives/publications/research/section/circular-bu siness-models-for-the-built-environment



Room 3 Notes - Awareness

- Awareness two-way street. Who needs to know this? What do we need to know about them?
- We need targeted outreach for each discipline:
 - Developers
 - \circ Designers
 - Policymakers
 - Other...
 - City of Boston to incentivize owners to pilot "real life case study"
 - Struct. engineer has to explain why or why not mass timber could work (for example)



June Events!

CLF Boston Hub Working Groups

- Advocacy & Policy
- Case Studies
- Design: Project Timeline
- Reuse Group
- Roadmap SE2050
- Education Series

boston planning &

development agency

Connect with Us!

Email <u>CLF.Boston@gmail.com</u> if you are interested in being part of the community!

JUNE 2021: EMBODIED CARBON EVENTS







Today's Presentation and Discussion notes will be posted by Friday

We will follow up with a calendar invite for our next TAG Meeting - TBD

ZNC Building Zoning Initiative

- Public engagement opportunities (ongoing)
- Public Meeting #2 Late summer / early (TBD)
- Recommendations Report will follow
- Regulatory zoning process will follow

