Regional Hub Policy Series

Embodied Carbon and
Zoning and City Incentive Programs
Overview

This Presentation

1. Zoning and City Incentive Programs
2. Integrating Embodied Carbon
3. Case Studies

Policy Introductory Series

1. Introduction to the Embodied Carbon Policy Landscape
2. Climate Action Plans
3. Procurement Policy
4. Building Codes
5. Zoning and City Incentive Programs
6. Reuse and Deconstruction

Thanks to the CLF Regional Hub Policy Leads for feedback and review of this series.
Matching Policy Opportunities with Embodied Carbon Reduction Strategies

**STRATEGIES**

- **Optimize Project**
  - Build less, reuse more
  - Design to reduce embodied carbon and increase material/structural efficiency

- **Optimize System**
  - Choose low-carbon systems and assemblies
  - Use alternate, low-carbon materials

- **Optimize Procurement**
  - Select the lowest carbon version of the selected product
  - Clean manufacturing (efficiency, fuel switching)

**TOOLS**

- Early Design Calculators, Rules of Thumb
- Whole Building Life Cycle Assessment (WBLCA)
- Environmental Product Declaration (EPDs) / EC3 Tool

**POLICY MEASURES**

- Zoning and City Incentive Programs
- Procurement (Buy Clean)
- Building Codes and Regulations
- Climate Action Plans
- Reuse & Deconstruction
Zoning and City Incentive Programs
# City Control and Influence

<table>
<thead>
<tr>
<th>Land</th>
<th>Infrastructure</th>
<th>Buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>City owned:</strong></td>
<td><strong>City owned:</strong></td>
<td><strong>City owned:</strong></td>
</tr>
<tr>
<td>● Cities commonly own significant amounts of land</td>
<td>● Ability to establish basic infrastructure</td>
<td>● Cities own most of the buildings required for their own operations</td>
</tr>
<tr>
<td>● In Canada, much of the publicly owned land is owned by provincial or federal government</td>
<td>● Cities own most underground infrastructure, as well as most of the groundlevel infrastructure</td>
<td>● Particularly in Europe, own social housing companies, most schools and sports and recreation buildings</td>
</tr>
<tr>
<td><strong>City regulated:</strong></td>
<td><strong>City regulated:</strong></td>
<td><strong>City regulated:</strong></td>
</tr>
<tr>
<td>● Establish zoning and develop the land as well as rezone any partly built areas</td>
<td>● Exception of national/state roads and rails</td>
<td>● Cities have control over private development of land and buildings via zoning and permitting</td>
</tr>
<tr>
<td>● Zoning also differs by country and states</td>
<td></td>
<td>● Care and medical facilities depending on country</td>
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</table>
Zoning and Land Use

Regulations governing how land can be used

- Rules for where/how of residential, commercial, mixed-use, green space, and industrial areas
- Nature, function, density
- How land use is managed and optimized can create a significant impact on embodied carbon reductions

Example zoning: City of Seattle, 2012
City Planning and Permitting Incentive Programs

Complement (or precursor) to phasing-in regulatory requirements

Broader group of voluntary policies that provide incentives such as:

- Expedited permitting or plan check time
- Fee reduction
- Density bonuses
- Design challenges with awards and media attention to spark awareness/innovation

Benefits

- Test requirements
- Establish case studies
- Increase external and internal capacity and awareness before regulation
Integrating Embodied Carbon
Embodied Carbon

Zoning, land use, and city incentive programs can narrow the range of emissions early on with long-term impact

- Decisions made in these phases have very high potential impact
  - Ex. Choosing the land to zone and to build on to moving to determining constraints for density, massing and height.

- Cities are in a great position to implement regulations regarding these sectors compared to on a national scale.

**ZONING AND LAND USE POLICIES**

<table>
<thead>
<tr>
<th>POLICY CODE</th>
<th>POLICY NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z1</td>
<td>EMBODIED CARBON TARGETS FOR ZONING PROCESS</td>
</tr>
<tr>
<td>Z2</td>
<td>SET ZONING REQUIREMENTS FOR BIO-BASED MATERIALS</td>
</tr>
<tr>
<td>Z3</td>
<td>CARBON-SCORED LAND SALES COMPETITIONS</td>
</tr>
<tr>
<td>Z4</td>
<td>PARKING REQUIREMENT OPTIMIZATION</td>
</tr>
<tr>
<td>Z5</td>
<td>APARTMENT SIZE AND SPACE EFFICIENCY GUIDELINES</td>
</tr>
<tr>
<td>Z6</td>
<td>PREFABRICATED OR MODULAR CONSTRUCTION PRIORITY</td>
</tr>
<tr>
<td>Z7</td>
<td>INCREASING DENSITY USING EXISTING INFRASTRUCTURE</td>
</tr>
<tr>
<td>Z8</td>
<td>USE LOW CARBON BUILDING TYPOLOGIES IN ZONING</td>
</tr>
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</table>

Source: CNCA Framework
Building Policies: Prescriptive and Performance Requirements

<table>
<thead>
<tr>
<th>Material</th>
<th>Prescriptive</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sourcing Requirements/ Material Specifications (recycled content, maximum cement content, etc.)</td>
<td>Carbon Standards / Reduction Targets measured with Environmental Product Declarations (EPDs)</td>
<td></td>
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<table>
<thead>
<tr>
<th>Building</th>
<th>Prescriptive</th>
<th>Performance</th>
</tr>
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<tbody>
<tr>
<td>Design Requirements (building reuse, use of carbon storing materials and assemblies, etc.)</td>
<td>Carbon Standards / Reduction Targets measured with Whole Building Life Cycle Assessment (WBLCA)</td>
<td></td>
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</table>
Performance-based Building Policies for Embodied Carbon

Building Approach

- Uses **Whole Building LCA tools or calculators** to measure performance

  - Incentivizes **Designers** to collaborate to design a lower carbon building
  - Captures strategies like:
    - Building/material reuse
    - Use of carbon-storing materials
    - Efficient structural/building design

What does this policy look like in action?

1. City sets building carbon budget ($\text{kgCO}_2\text{e}/\text{m}^2$) for different building types **OR** percentage % reduction requirements from a baseline
2. City requires disclosure of WBLCA results during permitting/similar to verify compliance

- Well-suited city policies because *early* in design
- Broadest set of strategies available for reductions
- Led by design team
Prescriptive Approaches

Require/incentivize predetermined list of strategies that reduce embodied carbon

Examples:
- Zoning requirements for carbon-storing materials
- Parking requirement optimization
- Apartment size and space efficiency guidelines/requirements
- Zone lower carbon building typologies

Read more: CNCA Framework

Pros:
- Requires less capacity-building to implement
- Easier to scale

Cons:
- Need additional research to determine most effective strategies
  - Ex. defining lower carbon building typologies
- Does not allow for/reward project-specific approaches and innovation
Overview

Zoning and Land Use Case Studies
1. City of Vancouver (B.C.) Green Building Rezoning Policy
2. Helsinki (Finland) Zoning Requirements for Bio-based Materials
3. London, UK Citywide Parking Reform

City Incentive Programs Case Studies
1. City of Seattle Green Building / Expedited Green Program
   a. Related example: San Diego County Green Building Incentive Program
   b. Related example: Austin Energy Green Building Program
2. City of Somerville Zoning Ordinance
Case Study City of Vancouver Green Buildings Policy for Rezoning

Phase 1: 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).”
Case Study **City of Vancouver** *Green Buildings Policy for Rezoning*

### Phase 1: 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).”

### Phase 2: Set Reduction Targets (2022 -)

Projects must **demonstrate % reduction** from baseline guided by the city *(publishing soon, updates ~5 years)*
Case Study **City of Vancouver** *Green Buildings Policy for Rezoning*

**Phase 1: 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).”

**Phase 2: Set Reduction Targets (2022 -)**

Project must demonstrate % reduction from baseline guided by the city *(publishing soon, updates ~5 years)*

**Inform new policies (2023 -)**

- **2022**: The first reduction target(s) is introduced in the rezoning plan.
- **2023**: Possible first embodied carbon requirements are added to the Building By-law.
- **2026**: The rezoning policy targets are updated & 2022 rezoning targets are possibly adopted into the code.
- **2030**: 2026 rezoning targets are adopted into the code & higher targets are set for the rezoning policy to move towards net-zero emissions.
Case Study Helsinki, Finland

Designating zoning requirements for bio-based materials.

Benefits:

- Increasing carbon storage
- Reduced embodied carbon emissions when ensuring sustainable sources of wood (FSC or PEFC certified)
Case Study Helsinki, Finland

Example language:
- The building frame and facade must be predominantly wood.
- The wood elements must be possible to disassemble and reuse in other buildings.
- Buildings must incorporate at least 50 kg of sustainably sourced wood (FSC or PEFC certified), or other bio-sourced material.
- Buildings must incorporate at least 100 kg CO2e of biogenic carbon storage in permanently installed building structures and materials.
Case Study London, UK

Citywide parking reform
- Greater London Authority eliminated minimum parking standards
- London’s 33 boroughs updated their local plans
- 40% reduction in spaces
- Other municipalities reducing minimum parking standards

Parking and equity
- Market-based parking requirements
Case Study Seattle “Priority Green Expedited”

Proposed Green Building Incentives Update
under the 2018 editions of Seattle Construction Codes
Effective February 1, 2021

The Seattle Energy Codes set the minimum requirements for building energy use and greenhouse gas emissions. The Seattle Department of Construction and Inspections Green Building Incentives encourage energy savings and reduced greenhouse gas emissions beyond code to support Seattle’s transition to a clean energy future.

Proposed updates include:

- **All new buildings using the Green Building Standard**
  - Use only electricity for space, water heating, and cooking.
  - Obtain a green building certification.
  - Remove and properly dispose of any asbestos or non-asbestos containing materials (hetically speaking) prior to demolition or building prior to 1970.

- **All new buildings using the Priority Green Expedited**
  - Use only electricity for space, water heating, and cooking.
  - Obtain a green building certification or use the EPD Alternative Path option for residential projects three stories or less in height.
  - Remove and properly dispose of any asbestos or non-asbestos containing materials (hetically speaking) prior to demolition or building prior to 1970.
  - Meet additional criteria for size limits, energy efficiency, refrigerant management, embodied carbon, and indoor air quality.

**Size Limit**
- Dwelling units are limited to 2,000 square feet of conditioned space. Accessory dwelling units are considered separately. Exception: up to 3,000 SF If project meets a net positive energy certification and Blown Green Emerald Star materials requirements are met.

**Energy Efficiency and Refrigerant Management**
- Efficiency options equivalent to 15% savings for residential buildings, and 6% energy savings beyond code for multifamily buildings (over 3 stories) and commercial buildings beyond 2018 Seattle Energy Code.

**Embodied Carbon**
- Identify embodied carbon of primary building materials by providing Environmental Product Declarations (EPDs) for concrete and primary structural frame for steel.

**Indoor Air Quality**
- Use Low-Volatile Organic Compounds (VOC) interior paints, adhesives, caulks, floor finishes, and sealants in interior spaces per South Coast Air Quality Management District (SCAQMD) Rule 1168 and 1173 or equivalent. Only use terminated wood products with no residual formaldehyde. To be verified by green building verifier or consultant.

**PLEASE SEND COMMENTS & FEEDBACK**
Green Building Program Manager
(206) 684-7744
asc.priority.green@seattle.gov
www.seattle.gov/edcl/permits/green-building

Requires EPDs for concrete and primary structural steel.

Related examples: San Diego County **Green Building Incentive Program** and Austin Energy **Green Building Program**
Case Study City of Somerville Zoning Ordinance

- Passed in December 2019, updated 2021 with additional pathways to achieve ‘net zero ready building’ status
- 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.
Takeaways

- Zoning, land use, and city incentive programs can narrow the range of emissions early on with long-term impact.
- Cities are in a great position to implement regulations regarding these sectors compared to on a national scale.
- Many different approaches: performance and prescriptive.
Thank You!