



Regional Hub Policy Series

# Embodied Carbon & Climate Action Plans

# Overview

## This Presentation

1. Climate Action Plans (CAPs)
2. Integrating Embodied Carbon into CAPs
3. Greenhouse Gas Inventories and Baselines
4. Case Studies
5. Development Process and Stakeholders

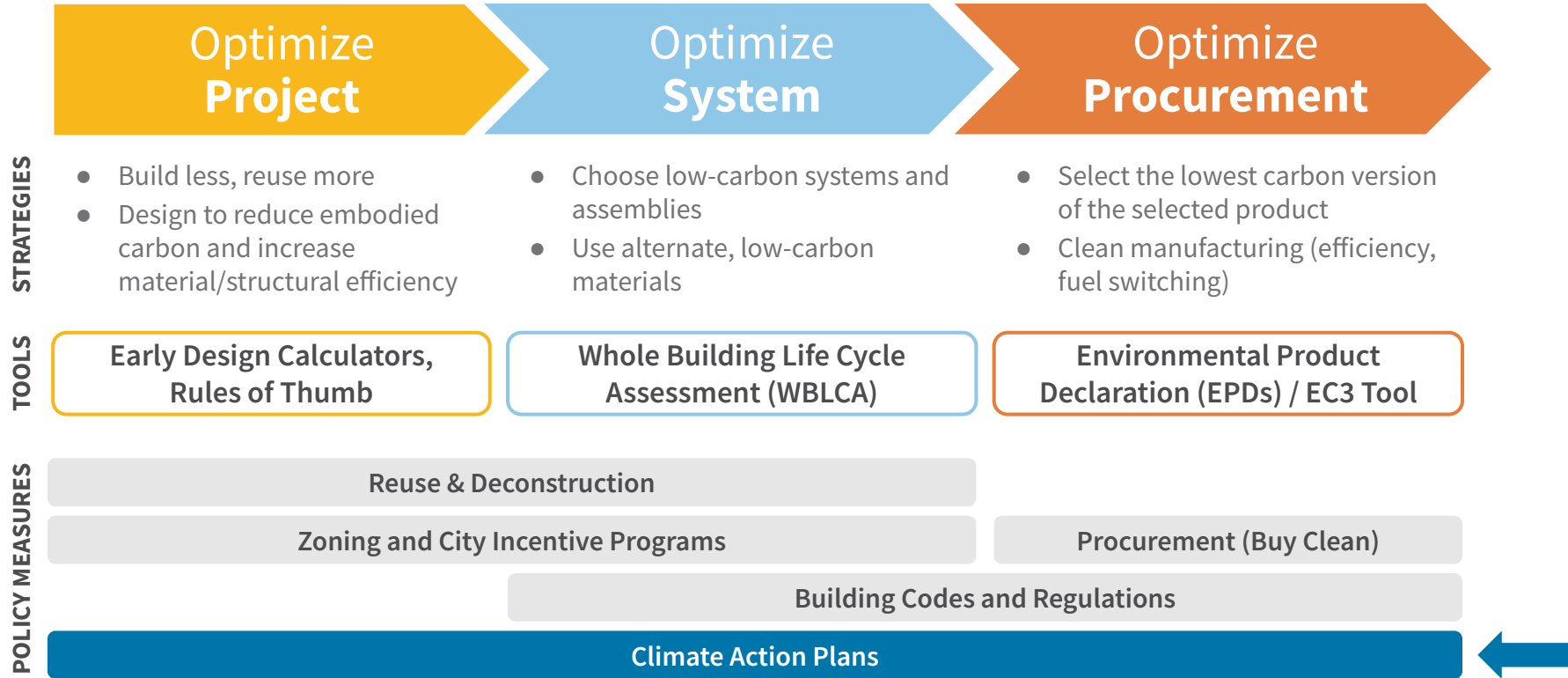
## Policy Introductory Series

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



*Thanks to the CLF Regional Hub Policy Leads for feedback and review, and to our partners in the Carbon-Free Buildings Program at RMI for collaborating on development of the case study content in this presentation in summer 2021.*

# Matching Policy Opportunities with Embodied Carbon Reduction Strategies

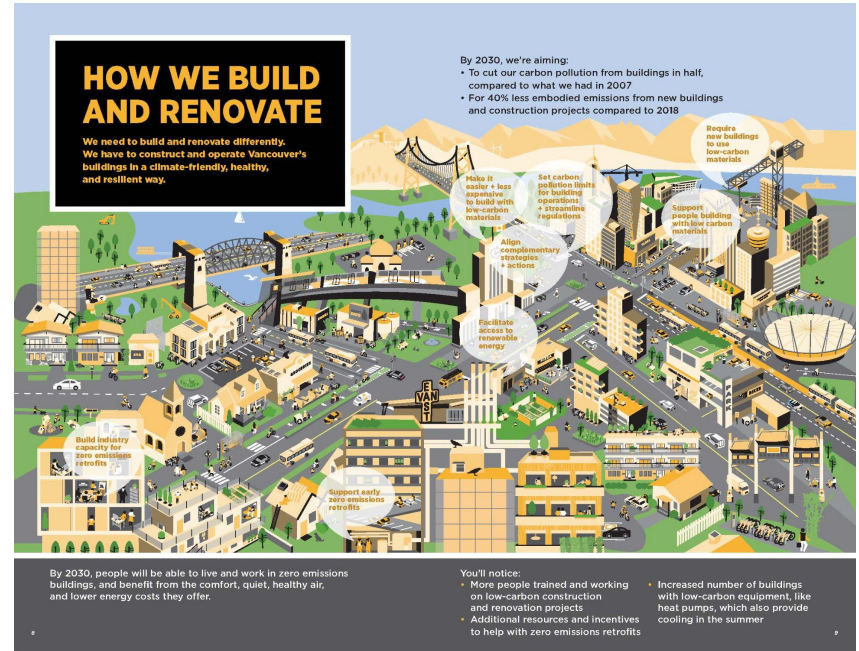




# **Intro to Climate Action Plans**

# What is a Climate Action Plan (CAP)?

CAPs are **roadmaps** that outline specific activities that an agency will undertake to reduce GHG emissions



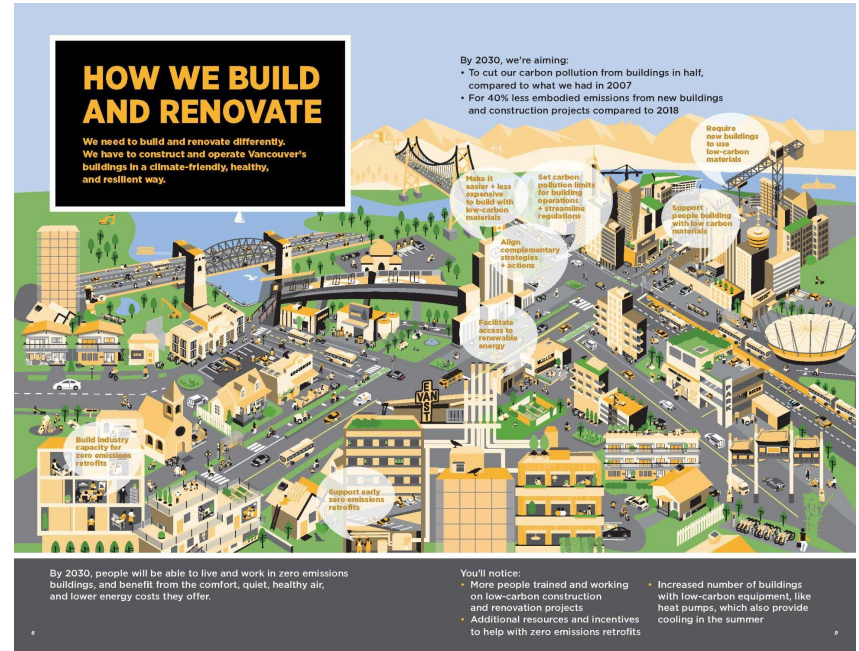
Summary of the 'How We Build and Renovate' Section of the City of Vancouver Climate Emergency Action Plan

# What is a Climate Action Plan (CAP)?

CAPs are **roadmaps** that outline specific activities that an agency will undertake to reduce GHG emissions

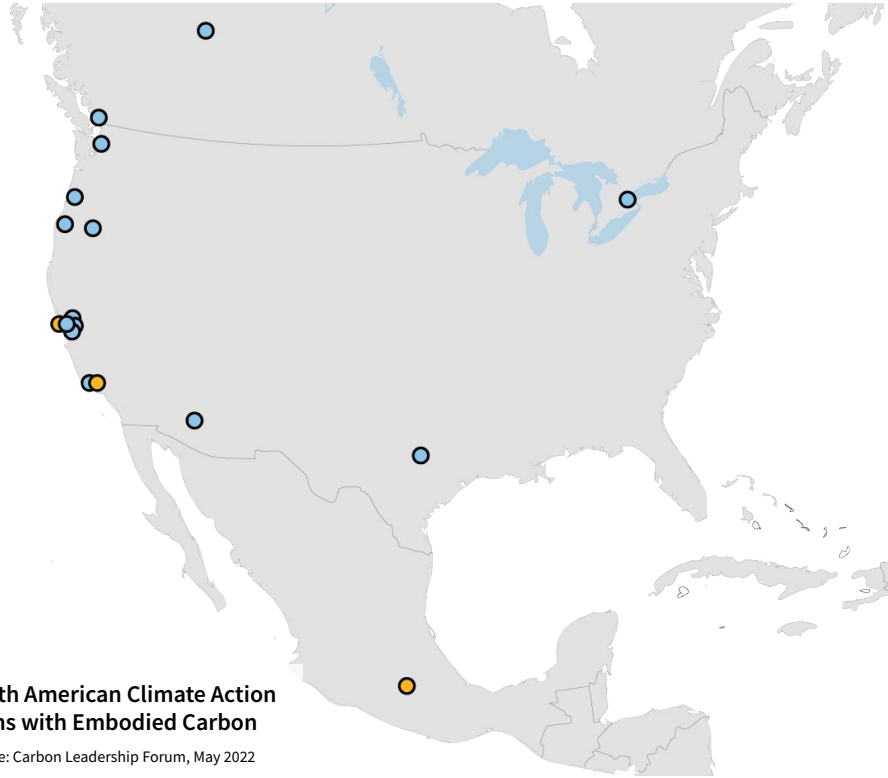
## Why include embodied carbon in CAPs?

- Create alignment around regionally relevant goals and strategies
- Encourage complementary policy development
- Encourage regional collaboration
- Highlight municipal 'lead by example' policies and opportunities



Summary of the 'How We Build and Renovate' Section of the City of Vancouver Climate Emergency Action Plan

# North American Climate Action Plan (CAP) Precedents with Embodied Carbon



North American Climate Action Plans with Embodied Carbon

Source: Carbon Leadership Forum, May 2022

## CAPs with embodied carbon

- [Edmonton](#) (AB)
- [Toronto](#) (ON)
- [Vancouver Climate Emergency Action Plan](#) (B.C.)
- [King County 2020 Strategic Climate Action Plan](#) (WA)
- [Portland](#) (OR)
- [Bend](#) (OR)
- [Eugene Community Climate Action Plan](#) (OR)
- Bay Area, CA
  - [San Francisco Climate Action Plan](#)
  - [Oakland 2030 Equitable Climate Action Plan](#)
  - [Albany 2019 Climate Action and Adaptation Plan](#)
  - [City of Dublin 2020 Climate Action Plan](#)
- [L.A. Green New Deal Sustainable City pLAN](#) (CA)
- [Phoenix Climate Action Plan](#) (AZ)
- [City of Austin Climate Equity Action Plan](#) (TX)

## C40 Clean Construction - Planned Actions

- [Los Angeles, CA \(USA\)](#)
- [Mexico City \(Mexico\)](#)
- [San Francisco](#)



# Integrating Embodied Carbon into CAPs



## How is embodied carbon integrated into CAPS?

Every climate action plan is different, but embodied carbon typically falls into the following areas:

1. Buildings
2. Waste and Material Recovery
3. Local Production / Industry
4. Consumption Emissions

Setting goals related to buildings **and** materials or consumption can help ensure that transportation construction materials are included (concrete, asphalt, etc.)

City	Area E.C. Strategies are Included
<a href="#">Austin</a>	<ul style="list-style-type: none"><li>• Sustainable Buildings</li></ul>
<a href="#">Eugene</a>	<ul style="list-style-type: none"><li>• Consumption Emissions</li></ul>
<a href="#">King County</a>	<ul style="list-style-type: none"><li>• Green Building</li><li>• Consumption &amp; Materials</li></ul>
<a href="#">Los Angeles</a>	<ul style="list-style-type: none"><li>• Industrial Emissions &amp; Air Quality Monitoring</li><li>• Lead by Example (Municipal Buildings)</li></ul>
<a href="#">Phoenix</a>	<ul style="list-style-type: none"><li>• Stationary Energy Sector Goals (Net-Zero Buildings)</li></ul>
<a href="#">San Francisco</a>	<ul style="list-style-type: none"><li>• Responsible Production and Consumption</li></ul>
<a href="#">Vancouver B.C.</a>	<ul style="list-style-type: none"><li>• How We Build and Renovate</li></ul>

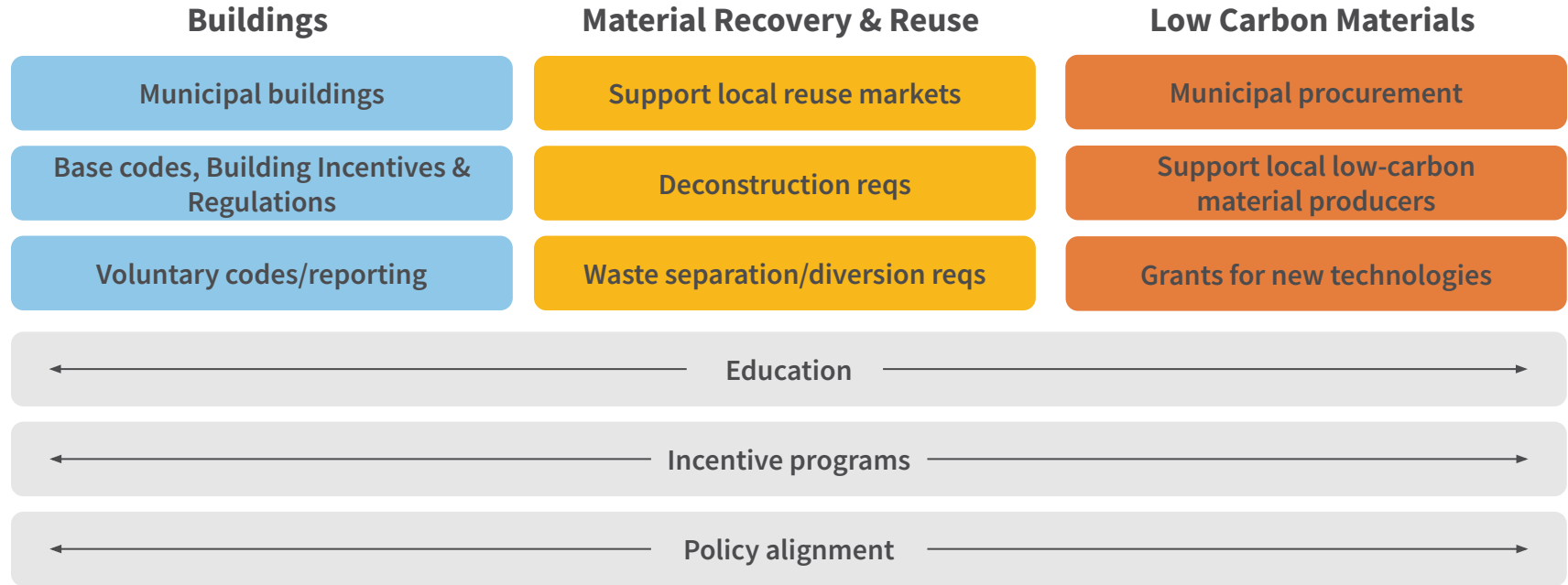
## Strategies included in Climate Action Plans

Strategies identified by Climate Action Plans that incorporate embodied carbon goals and targets.

Buildings	Material Recovery & Reuse	Low Carbon Materials
Municipal buildings	Support local reuse markets	Municipal procurement
Base codes, Building Incentives & Regulations	Deconstruction reqs	Support local low-carbon material producers
Voluntary codes/reporting	Waste separation/diversion reqs	Grants for new technologies

## Strategies included in Climate Action Plans

Strategies identified by Climate Action Plans that incorporate embodied carbon goals and targets.



## Targets included in Climate Action Plans

Targets are a key component of any climate action plan strategy. Embodied carbon is no exception.

Embodied carbon targets recommended by NGOs:



C40 [Clean Construction Declaration](#)  
Targets (Buildings and infrastructure)

- 30% by 2025
- 50% by 2030



[Architecture 2030](#) Embodied Carbon  
Targets

- 45% or better in 2025
- 65% or better in 2030
- **Zero** global warming potential (GWP) by 2040

*(In the future, may also be able to reference CDP and Scope 3 Science Based Targets)*

CAP	Target
<a href="#">Austin</a>	40% reduction by 2030 from a 2020 baseline
<a href="#">Los Angeles</a>	50% by 2030 (from 2020 baseline, but not confirmed)
<a href="#">Phoenix</a>	Design and construct all new buildings within the city to LBC, Net-Positive Design, or equivalent design standards by 2050
<a href="#">San Francisco</a>	Achieve total carbon balance 10% per project from 2021-2025 (municipal)
<a href="#">Vancouver B.C.</a>	40% reduction by 2030 from a 2018 baseline
<a href="#">Eugene</a>	Overall target not included
<a href="#">King County</a>	Overall target not included



# **Greenhouse Gas Inventories and Baselines**

# GHG Emissions Inventories: Production vs. Consumption based

## PRODUCTION-BASED INVENTORY

Quantifies emissions  
**produced within a regional boundary**

*(power plants, factories, cars, cattle, forestry, etc.)*

Methodology fairly standardized - guidelines include [IPCC](#) (national), [US EPA](#) (state), and [CDP-ICLEI](#) (city)

## CONSUMPTION-BASED INVENTORY

Quantify emissions  
**consumed within a regional boundary**

*(electricity, food, construction goods, etc.)*

Methodology **not** yet standardized; [state approach](#) published by US EPA

## Why does it matter?



### PRODUCTION-BASED INVENTORY

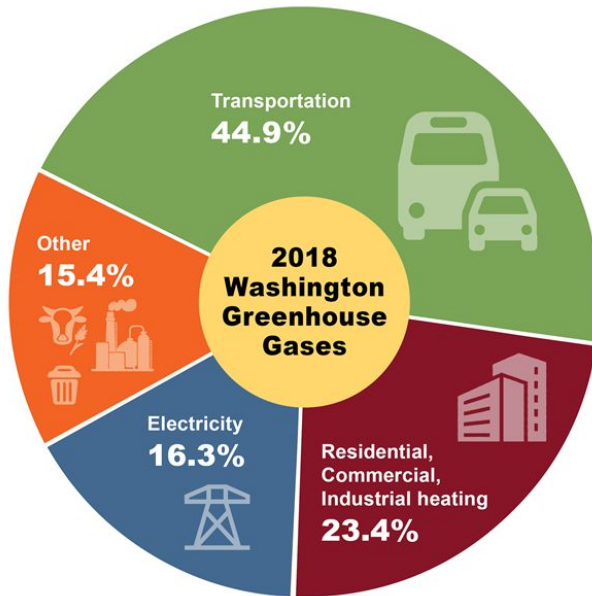
- **Excludes** upstream and downstream life cycle stages
- Can unintentionally incentivize **emissions outsourcing**

### CONSUMPTION-BASED INVENTORY

- **Includes** most life cycle stages
- Incentivizes development of policies informed by upstream and downstream emissions impacts

# Case Study Washington and Oregon

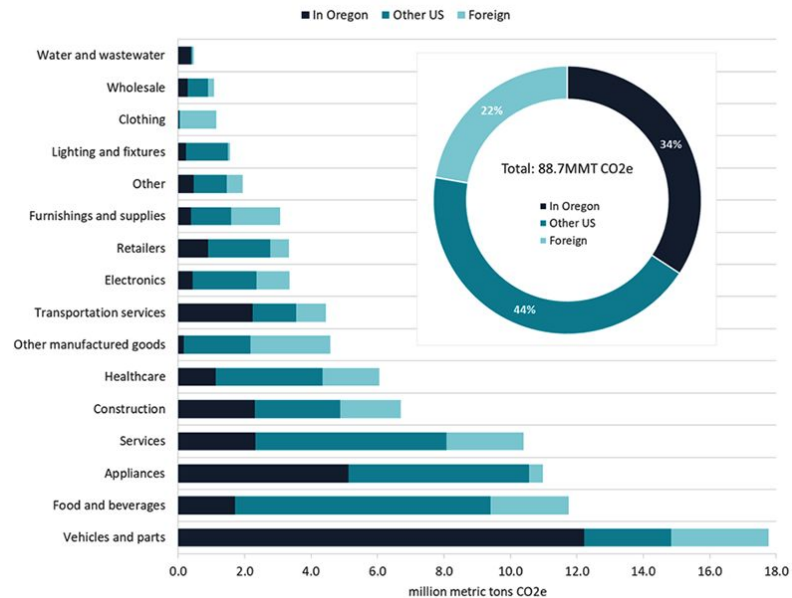
## EXAMPLE (Production-based):



Sources of Washington State GHG, 2018

Source: WA [Department of Ecology](#)

## EXAMPLE (Consumption-based)

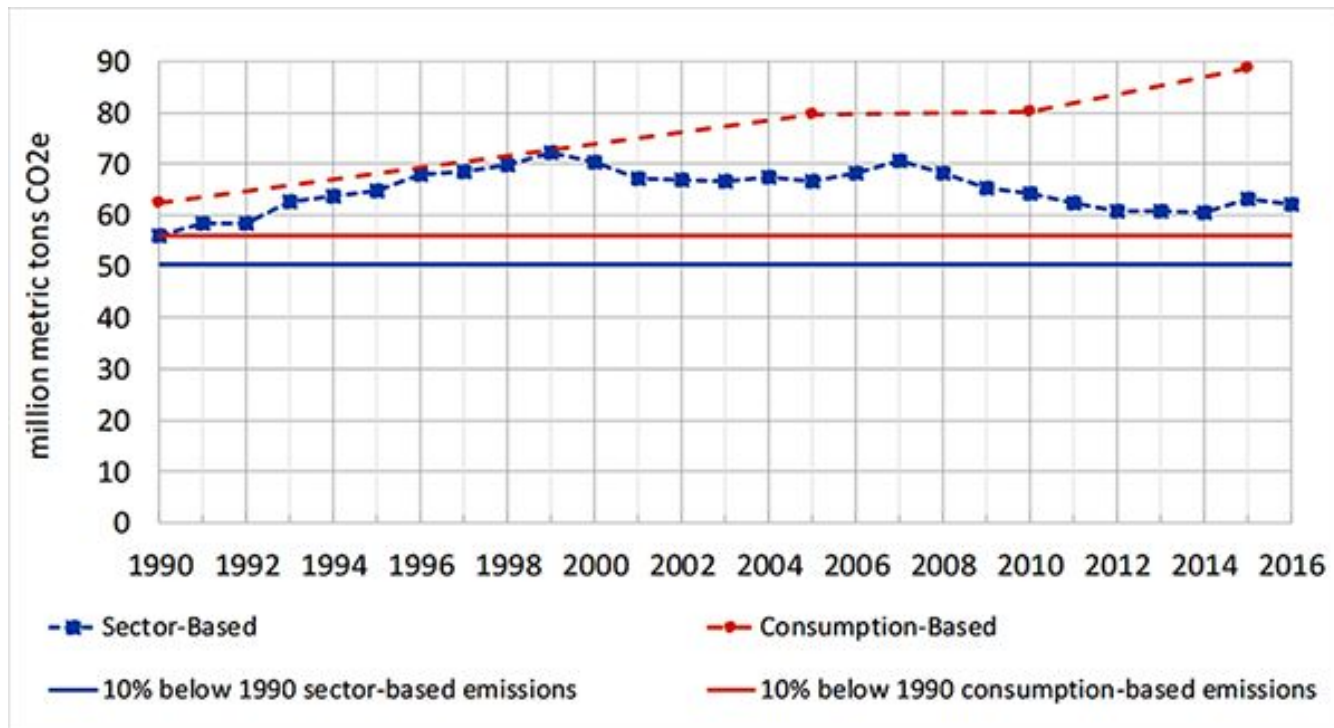


Consumption-based GHG Emissions Inventory for Oregon

Source: [Oregon Department of Environmental Quality](#)



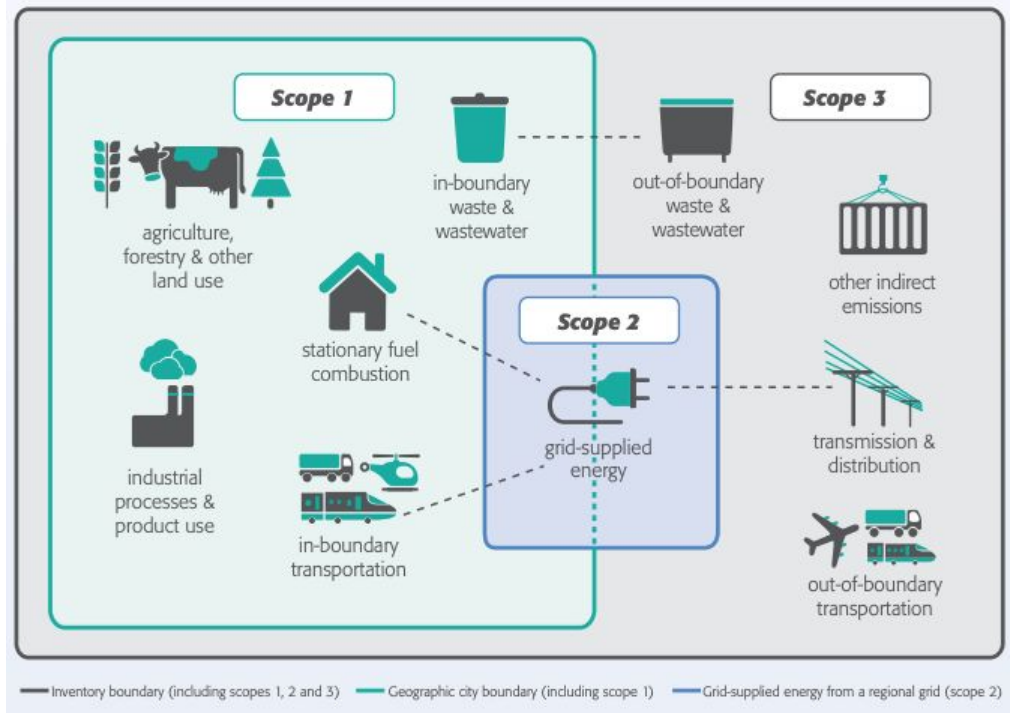
## Case Study Oregon GHG Inventory



GHG Emissions for Oregon

Source: [Oregon Department of Environmental Quality](#)

# Corporate GHG Reporting: Scopes 1, 2, and 3



The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard splits GHG emissions into three scopes:

- **Scope 1 emissions** are from a company's operations that are under a facility's direct control, e.g., on-site fuel combustion;
- **Scope 2 emissions** are from usage of electricity, steam, heat and/or cooling purchased from third parties; and
- **Scope 3 emissions** are upstream and downstream value chain emissions, **including upstream supply chain emissions from purchased products**, transport emissions, and business travel and downstream emissions from transport of products, usage of sold products and product disposal.





# Case Studies

## Austin Climate Equity Plan 2020-21

### Target:

- By 2030, reduce the embodied carbon footprint of building materials used in local construction by 40% from a 2020 baseline.

## AUSTIN CLIMATE EQUITY PLAN



## Austin Climate Equity Plan 2020-21

Category	Strategy
Municipal buildings	Create design and construction specifications and purchasing agreements for city-owned projects.
Incentives	Integrate lower-carbon building materials and deconstruction practices into City incentive programs, such as expedited permitting and Green Building program. Transition voluntary practices into requirements over time.
Education	Create a performance framework and educational programming for industry professionals and the general public.
Support local producers	Encourage growth of local businesses, prioritize partnerships within local materials markets to decarbonize high-impact materials, specifically: glass, steel, aluminum, concrete, drywall, insulation, and carpet.

## San Francisco Climate Action Plan 2021

### Target:

- Achieve total carbon balance across the buildings and infrastructure sectors.
- By 2030, buildings constructed will have a 40% reduction in embodied carbon.



SAN FRANCISCO'S

# CLIMATE ACTION PLAN 2021



## San Francisco Climate Action Plan 2021

Category	Strategy
Policy Instruments	Develop a suite of incentives, policies, and/or guidelines for adaptive reuse of existing buildings, as well as the design and procurement of low carbon structural materials for new construction.
Materials	Amend existing policies to require deconstruction of buildings and increase the source separation of specific materials.
Incentives	Policy framework to expand and cultivate regional building material reuse markets that support workforce development, small business enterprises, and entrepreneurial innovation.
Education	Advance best practices for “Design for Disassembly” and “Buildings As Material Banks” by creating implementation resources in partnership with global cities, and pilot at least one municipal project to maximize the value of carbon already invested in buildings.



## King County 2020 Climate Action Plan (Seattle Area)

### Target:

- Overall target not included.

### KING COUNTY 2020 Strategic Climate Action Plan





## King County 2020 Climate Action Plan (Seattle Area)

Category	Strategy
Base construction codes	Introduce building code requirements that lower embodied carbon in certain building materials.
Municipal buildings	Specify low-embodied carbon building materials in King County capital projects, starting with concrete and expanding to other materials.
Support local producers	Dedicate resources to increase the reuse of wood products in construction and support a reusable wood market.
Incentives	Provide financial and technical support to bridge the gap between code-minimum buildings and high-performance buildings with lower embodied carbon emissions.



# Development Process & Stakeholders

# Development Process for CAPs

## Who:

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- Municipalities of cities/counties, institutions, organizations
  - Engagement of a variety of stakeholders (residents, businesses, elected officials, design and construction communities, etc.)

## How:

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- Iterative Process
  - Set preliminary goals/targets
  - Evaluate measures/strategies
  - Calculate financial impact (sometimes)
- Public comment process
- Revise goals based on feedback

## Takeaways

**CAPs are roadmaps that outline specific activities that an agency will undertake to reduce GHG emissions**

Embodied Carbon:

- GHG Inventories: Production vs. Consumption based
- Create alignment around regionally relevant goals and strategies
- Encourage complementary policy development
- Encourage regional collaboration
- Highlight municipal 'lead by example' policies and opportunities

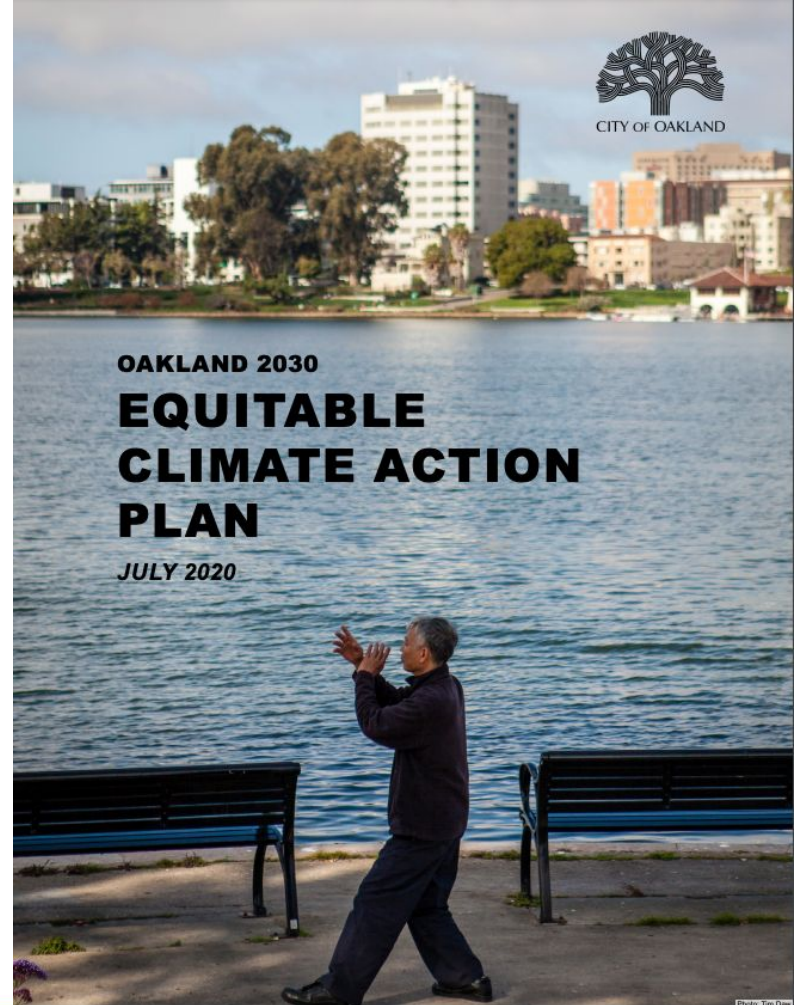


**Thank You!**

# Oakland 2030 Equitable Climate Action Plan

## Target:

- Estimate reduction in GHG impact from embodied carbon standards.



## Oakland 2030 Equitable Climate Action Plan

Category	Strategy
Base codes and regulations	Reduce lifecycle emissions: Adopt a concrete code for new construction that limits embodied carbon emissions. Performance standards for existing buildings.
Education	Support the Reuse, Repair, Recovery, and Refurbishment Economy.
Education	Expand Community Repair Resources.
Materials + Waste	Establish a deconstruction requirement.
City Procurement	Track annual embodied GHG emissions related to City expenditures for construction, building maintenance, travel, and food. Establish maximum GHG performance thresholds.

# Oakland 2030 Equitable Climate Action Plan

## Buildings

- **B-4: Reduce lifecycle emissions**

“By 2023, adopt a concrete code for new construction that limits embodied carbon emissions. In subsequent building code updates, implement improved embodied carbon performance standards including additional materials and material-efficient building practices, with exemptions for cost barriers as needed to prevent these changes from directly increasing housing or rent costs.”

## Material Consumption + Waste

- **MCW-4: Support the Reuse, Repair, Recovery, and Refurbishment Economy**

“By 2025, create a community reuse and repair program to increase waste diversion, reduce material consumption, and create green jobs”

- **MCW-5: Expand Community Repair Resources**

“Expand the City’s existing tool lending library services to at least 5 other Oakland Public Library branches, recreation facilities, community centers, or other community sites by 2030”

- **MCW-6: Establish a deconstruction requirement**

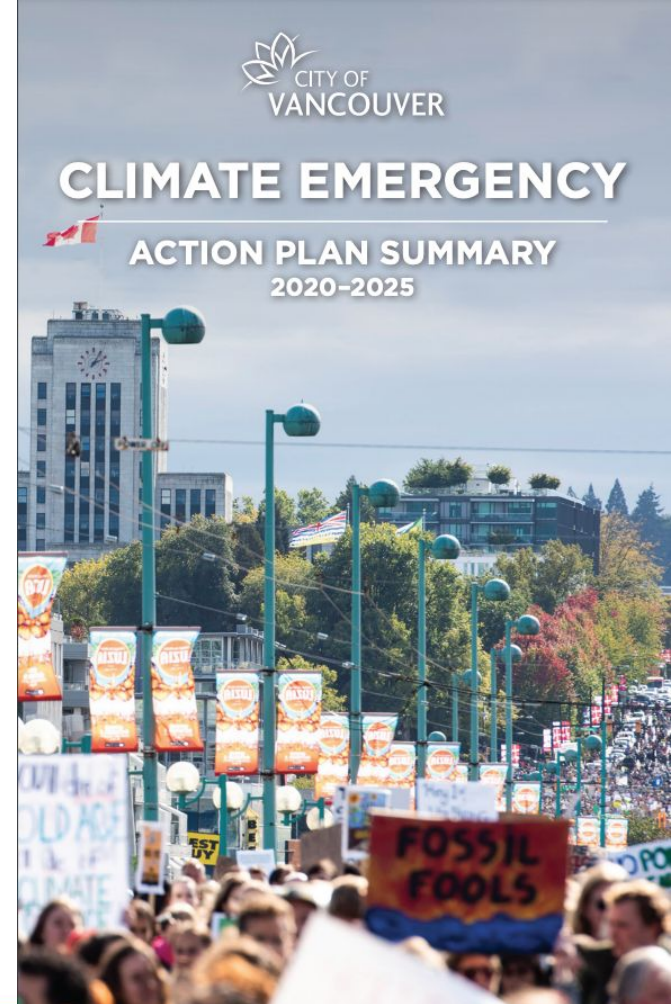
“Establish a deconstruction requirement to reduce demolition waste from construction and renovation and facilitate material reuse”



## Vancouver Climate Emergency Action Plan

### Target:

- By 2030, the embodied emissions from new buildings will be reduced by 40% compared to a 2018 baseline.



# Vancouver Climate Emergency Action Plan

## Lower carbon construction

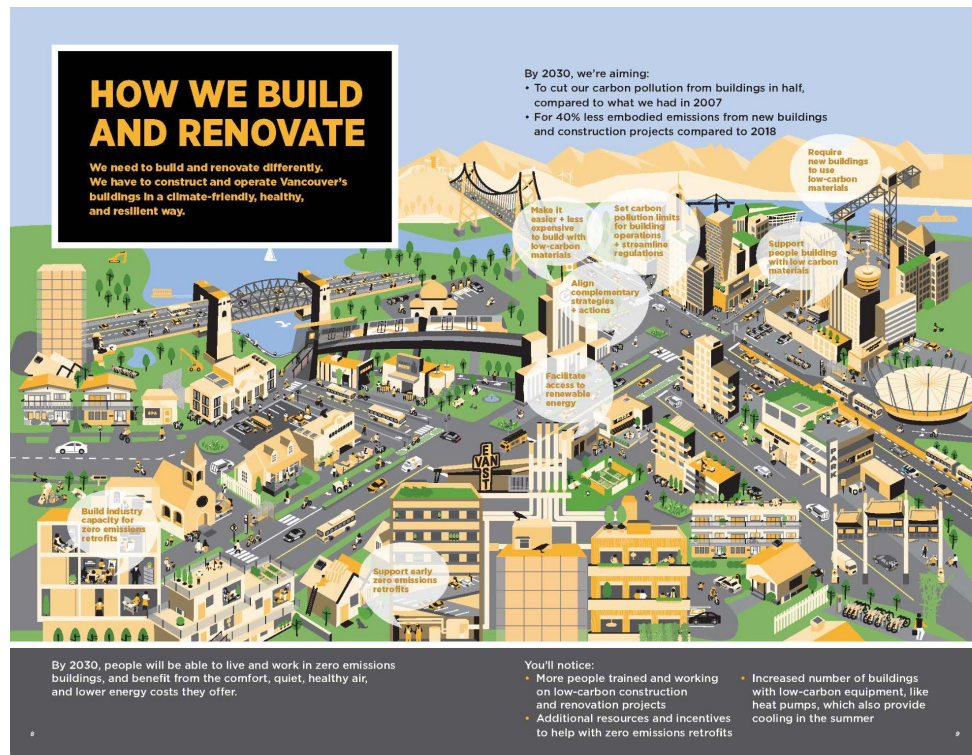
By 2030, we will ensure **40% less embodied emissions** from new buildings and construction projects compared to 2018. Vancouver's Embodied Carbon Strategy sets a vision for a healthy, equitable, circular, and carbon-positive construction economy.

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:

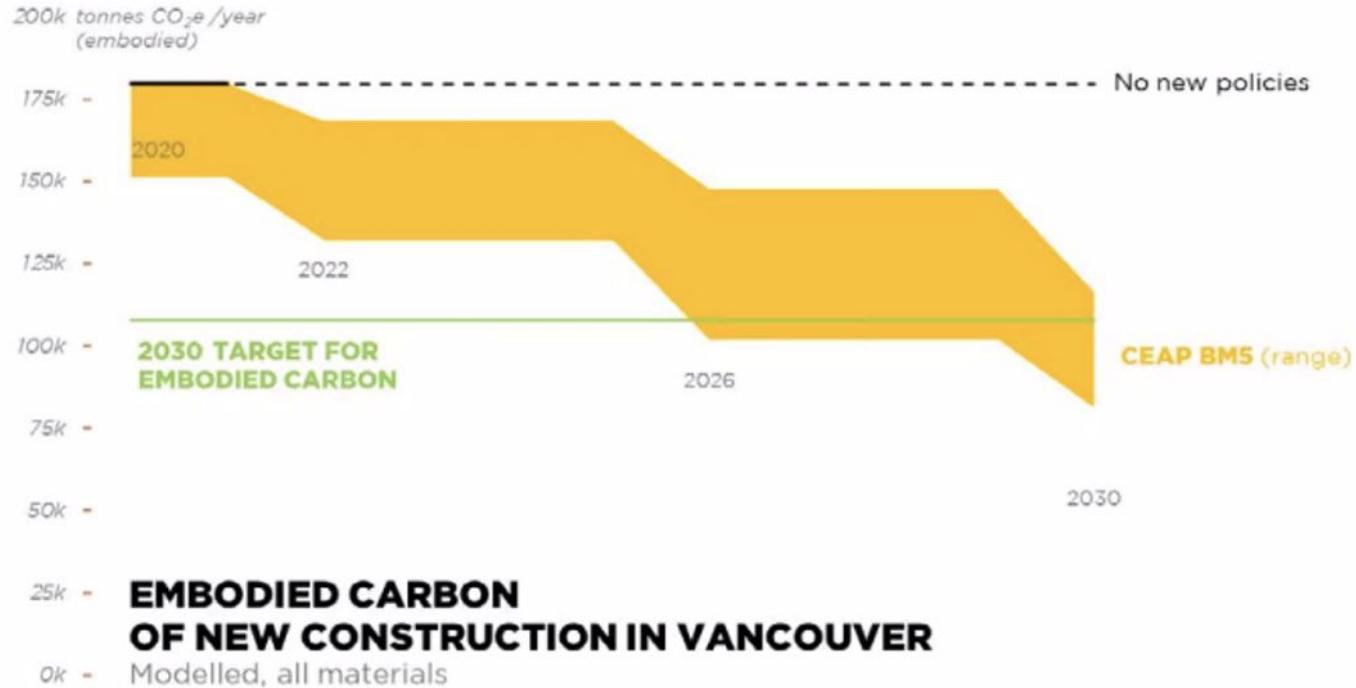
- Using materials more efficiently
- Reusing existing buildings and materials
- Building more from sustainably sourced wood and mass timber
- Using lower-carbon blends of concrete
- Powering construction sites with renewable energy instead of diesel fuel
- Using low-carbon insulation instead of spray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



## Vancouver Climate Emergency Action Plan



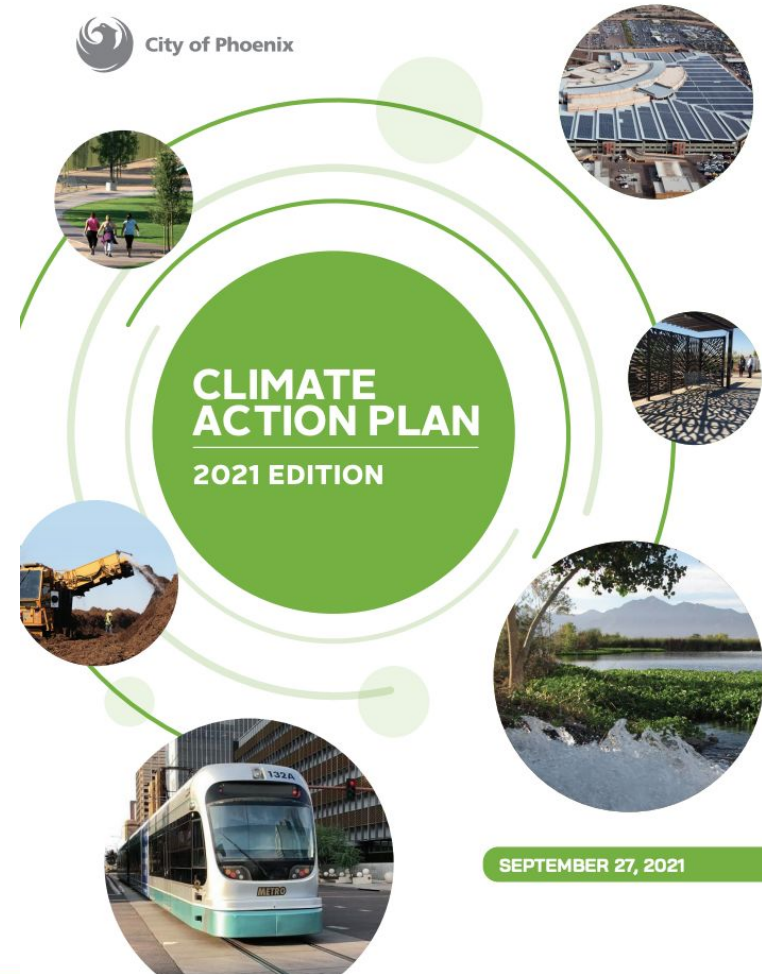
## Vancouver Climate Emergency Action Plan

Category	Strategy
Base codes and regulations	Require new buildings to use low carbon materials. Whole building life cycle assessment that demonstrates embodied carbon reductions required for all new construction.
Incentives	Remove barriers to build with mass timber and expand existing incentive programs, such as Near Zero Program, to include embodied carbon.
Education	Fund tools and training, support events and knowledge-sharing networks, advocate with other organizations and governments.
Policy alignment	Connect and remove barriers to reducing embodied carbon in planning, zoning, transportation, and zero waste efforts.

## Phoenix Climate Action Plan 2021

### Target:

- Net positive new construction by 2050 in terms of both energy use and the embodied energy in building materials.



SEPTEMBER 27, 2021

## Phoenix Climate Action Plan 2021

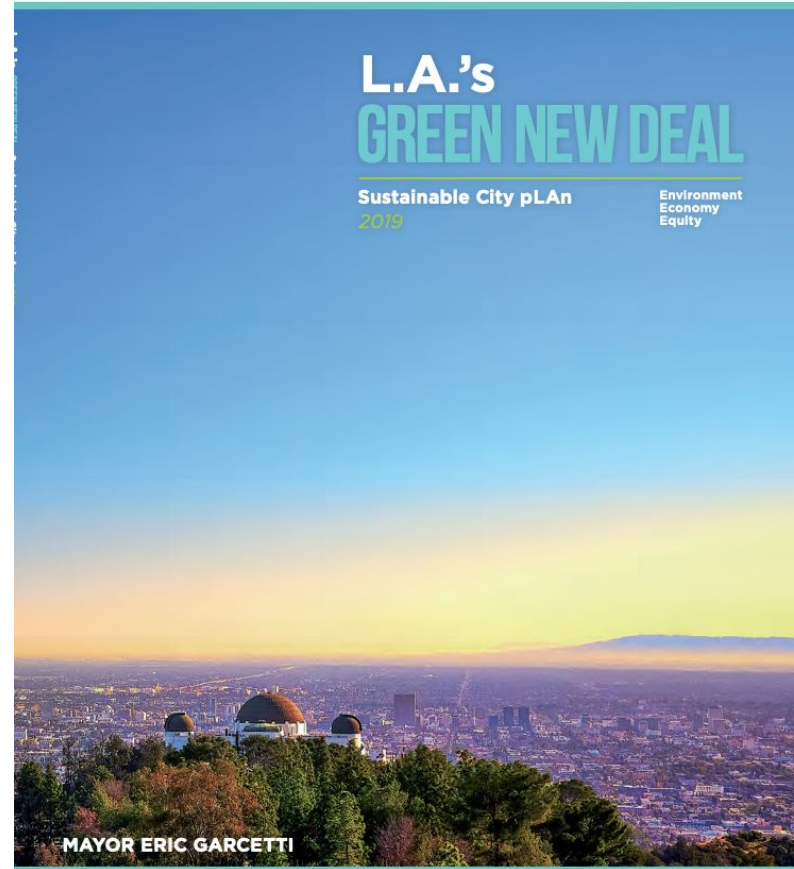
Category	Strategy
Voluntary codes	Include standards to reduce embodied carbon emissions through a “whole project” approach. Streamline permitting process for green/sustainable construction.
Reporting	Use EC3 calculator to test on a sample of building stock to determine which methods of construction can be targeted to lower GHG impact.
Municipal buildings	Design all municipal buildings to meet Living Building Challenge, Net Positive Design, or equivalent by 2050.
Incentives	Improve existing Adaptive Reuse Program that encourages adaptive reuse of buildings through financial incentives.



## Los Angeles Green New Deal Sustainable City pLAn 2019

### Target:

- Reduce industrial emissions by 38% by 2035; and 82% by 2050



## Los Angeles Green New Deal Sustainable City pLAn 2019

Category	Strategy
Municipal buildings	Ensure all new municipally owned buildings and major renovations will be all-electric, effective immediately.
Reporting	Implement GHG performance standards for material procurement for purchasing by City Departments.
Reporting	Identify embedded carbon emissions in the City's supply chain through Departmental participation in the Carbon Disclosure Project supply chain reporting program.
Procurement	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.



# Los Angeles 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

C40  
CITIES



## DECLARATION COMMITMENT

**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.

• Collaborate with industry groups to deliver training on the EC2 tool to the industry guests familiar 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 as a baseline by Q4 2021.

• Send market signals for low carbon and/or carbon sequestering concrete throughout 2021.

**Procure and, when possible, use only zero emission construction machinery from 2025 and require zero emission construction sites city-wide by 2030**

• By Q4 2021, investigate potential to add procurement preference to City contracts for contractors who use zero emission equipment. Implement for Public Works contracts by 2022.

• 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.

• Launch working groups in 2021 for architecture, engineering, contractors, developers, and tenants to develop a roadmap to 2030.

• Pilot use of above products throughout 2021.

• Work with Contract Administration, Procurement, and relevant departments to standardize terms for all City infrastructure project contracts by 2022.

• By Q4 2021, develop with South Coast Air Quality Management District a trade-in program for gas equipment to electric equipment.

## ADDITIONAL SUPPORTIVE ACTIONS

**Prioritize the better use, repurposing, and retrofit of existing building stock and infrastructure across the city to ensure their optimal use before new construction projects are considered.**

**Lead by example with municipal procurement by requiring life cycle assessments (LCAs) and the diversion of construction and demolition waste from disposal for all municipal projects. Use municipal purchasing power to procure or demand zero emission construction machinery in municipal projects. Reward resource efficient and circular design, use of low carbon materials and low to zero waste construction sites for all new projects and major retrofits.**

**Demand transparency and accountability, starting with requiring LCAs in planning, permitting and embedding them into planning policies, processes and building codes within a year of endorsing this declaration. Require the public disclosure of this data to facilitate greater transparency and foster accountability to develop robust baselines, standards, certifications and policies.**

## INTENDED ACTION/APPROACH TO MEET COMMITMENT

• LA adopted the Adaptive Reuse Ordinance (ARO) in 1999 which offers regulatory exemptions and project streamlining for developers reusing an old site for a new purpose. 72% of ARO projects are developed within 1/2 mile from Metro rail stations and so have reduced VMT. ARO buoyed development during the last recession and is expected to do so again during this recession.

• Since 2010, the City of LA has a policy requiring all mixed C&D waste to be taken to City-certified C&D waste processing facilities. Non-compliance penalties of \$5,000 per load are levied.

• Launch Zero by Design, a utility program to incentivize design teams to reduce operational and embodied carbon, by Q2 2021.

• By Q4 2021, investigate how to offer reference points for contractors who utilize zero emission construction equipment on City projects.

• Encourage LCA review and disclosure for projects through developing incentives and fast track permitting for qualified projects by Q4 2024.

• 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.

• Work with BOE to implement Buy Clean CA requirements for steel, flat glass, and mineral wool board insulation procurement throughout 2021.

• Work with BOE to pilot LCA review for City buildings by utilizing the LEED v4.1 pilot credit by Q4 2022.

## Albany, CA Climate Action & Adaptation Plan 2019

### Target:

- No overall embodied carbon target but has strategies to facilitate a Carbon-Free Economy



## Albany, CA Climate Action & Adaptation Plan 2019

Category	Strategy
Partnerships	Partner with regional entities (architects, designers, and contractors) to encourage carbon-smart building materials. To enable and promote carbon-sequestering building materials in new construction and renovations. Ultimately lead to requirements for the disclosure and/or limit the embodied carbon emissions of buildings through whole-building or material specific policies.
Municipal buildings	Adopt CALGreen voluntary green building tiers.

# Albany, CA Climate Action & Adaptation Plan 2019

## **Facilitate a Carbon-Free Economy**

### Strategy 3.2.5

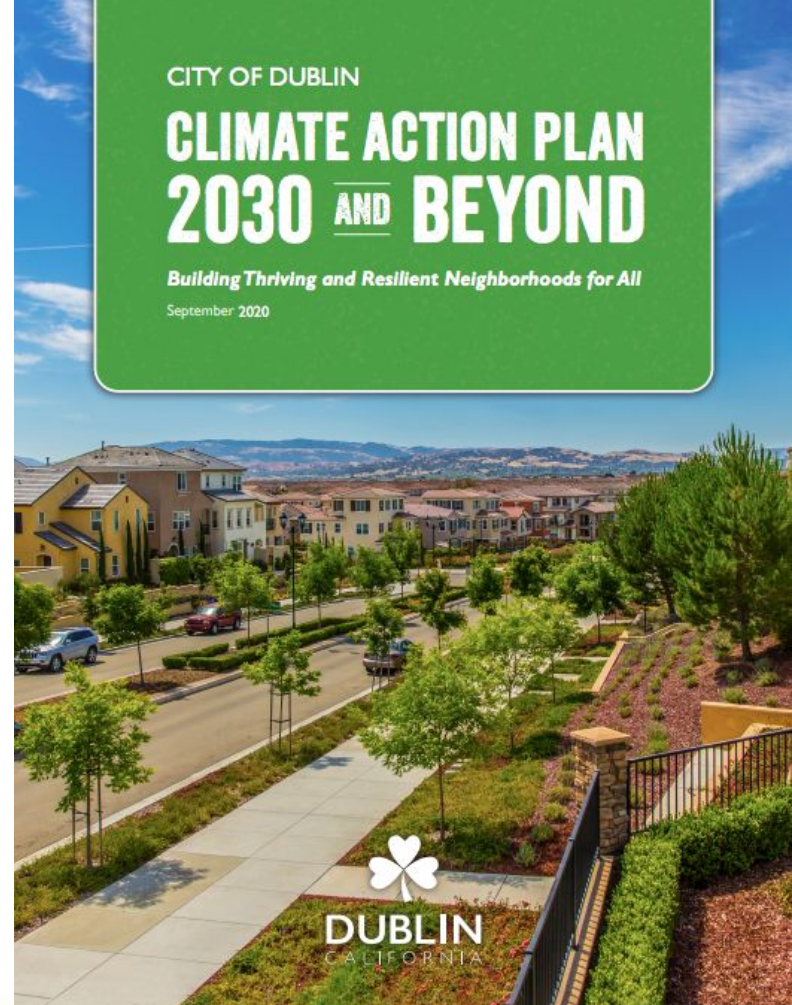
"Partner with regional entities to encourage carbon-smart building materials.

This includes educating architects, designers, and contractors. This action would enable and promote carbon-sequestering building materials in new construction and renovations. Ultimately, this action could lead to requirements for the disclosure and/or limit the embodied carbon emissions of buildings through whole-building or material specific policies"

## Dublin, CA Climate Action Plan 2030 and Beyond

### Target:

- Adopt an ordinance mandating low carbon concrete for all new development projects by 2023



## Dublin, CA Climate Action Plan 2030 and Beyond

Category	Strategy
Education	Conduct outreach to the development community regarding low carbon concrete using the Bay Area Low Carbon Concrete Codes Project.
Regulation	Present a low carbon concrete ordinance to City Council based on the Marin County model ordinance with specifications for residential and non-residential development applications.
Education	Educate City staff, and the development community on the new reach code requirements.
Education	Keep current on new model ordinances that identify other building materials to target for additional embodied carbon reductions.

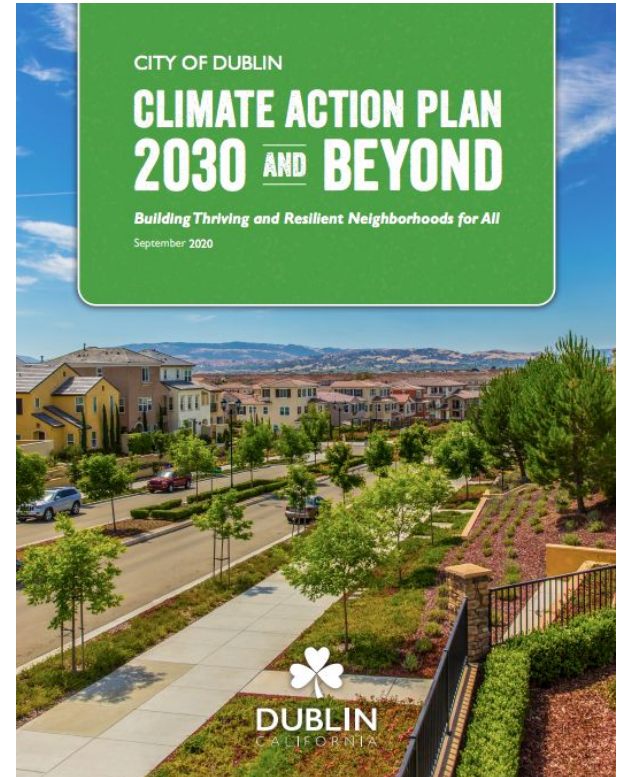


# Dublin, CA Climate Action Plan 2030 and Beyond

## Section 6.4: Strategy 4: Materials and Waste Management

### Measure MM-2: Reduce the Embodied GHG Emissions Associated with Building Materials

- The City of Dublin will require the use of low carbon concrete in new construction projects to reduce lifecycle GHG emissions and the embodied carbon associated with construction projects.
- **Target:** Adopt an ordinance mandating low carbon concrete for all new development projects by 2023
- **Actions:**
  1. Conduct outreach to the development community regarding low carbon concrete using the Bay Area Low Carbon Concrete Codes Project.
  2. Present a low carbon concrete ordinance to City Council based on the Marin County model ordinance with specifications for residential and non-residential development applications.
  3. Educate City staff, and the development community on the new reach code requirements.
  4. Keep current on new model ordinances that identify other building materials to target for additional embodied carbon reductions.



# King County 2020 Climate Action Plan

- **Strategy 4.2.2 Partner 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.





## Eugene, OR Climate Action Plan 2.0

### Target:

- Overall target not included.

## Eugene's Community Climate Action Plan 2.0: A Roadmap for Eugene's Climate Journey

Summer 2020



## Eugene, OR Climate Action Plan 2.0

Strategy	Action
Incentives	Use less building materials during construction. Single family home decrease from 2,300 to 1,600 sq ft.
Incentives	30% low-carbon materials used in 50% of community concrete consumption to incentivize or require use of low-carbon concrete.
Improve construction and demolition waste recovery	Add new infrastructure and sorting equipment to allow for material recovery.

## City of San Francisco

### **Responsible Production and Consumption (RPC) 1: Achieve total carbon balance across the buildings and infrastructure sectors.**

#### Supporting actions

1. Between 2021-2025, phase-in policies to reduce embodied carbon more than 10% per project by addressing at least three product categories or building assembly types.
2. By 2023, develop a suite of incentives, policies, and/or guidelines for adaptive reuse of existing buildings, as well as the design and procurement of low carbon structural materials for new construction.
3. By 2025, establish a maximum allowance for embodied carbon of buildings, to be adjusted in regular intervals.
4. By 2025, amend existing policies to require deconstruction of buildings and increase the source separation of specific materials.
5. By 2025, engage with designers, landlords, and lessees to develop guidelines for tenant improvement and space turnover projects that reduce excess material purchases and support reuse distribution channels.
6. By 2025, create a policy framework to expand and cultivate regional building material reuse markets that support workforce development, small business enterprises, and entrepreneurial innovation.
7. By 2030, advance best practices for “Design for Disassembly” and “Buildings As Material Banks” by creating implementation resources in partnership with global cities, and pilot at least one municipal project to maximize the value of carbon already invested in buildings.

## Strategies included in Climate Action Plans

Strategies identified by climate action plans that incorporate embodied carbon goals and targets:

- **Municipal ‘Lead by Example’ requirements**
  - Green / Net-Zero Building Design
  - Low-carbon material procurement
- **Support local materials markets**
  - Material reuse markets
  - Low-carbon material producers
- **Education**
  - Tools and training
  - Support events and knowledge sharing
  - Focus: local industry, workforce development around deconstruction
- **Incentives**
  - Financial (density bonus, tax incentive, etc.)
  - Schedule (expedited permitting)
  - Encourage adaptive reuse, deconstruction
- **Base codes and building regulations** (*may start as voluntary*)
  - Maximum carbon emissions limits for buildings
  - Reporting requirements
  - Low carbon fuels on construction sites
  - Reduce parking requirements
- **Waste recovery requirements**
  - Deconstruction
  - Construction waste separation and diversion requirements
- **Policy alignment**