



West Coast Climate & Materials Management Forum

October 30, 2024

Materials Management Emissions Reduction Strategies in Climate Action Plans

Zoom Logistics and Technical Orientation

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- For closed captioning of today's discussion, please select the closed captioning icon at the bottom of your screen.
- All participants are in listen-only mode now. Please email jenna.feinauer@erg.com if you experience any technical difficulties with Zoom.
- Please submit questions for discussion into the Q&A feature.
- Today's session will be recorded and shared at a later date through the Forum website at www.westcoastclimateforum.com



West Coast Climate
& Materials Management Forum

West Coast Climate Forum Webinar Series Disclaimer

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This webinar is being provided as part of the West Coast Climate and Materials Management Forum Webinar Series. The Forum is a collaboration of state, local, and tribal governments. We invite guest speakers to share their views on climate change topics to get participants thinking and talking about new strategies for achieving our environmental goals. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Please note the opinions, ideas, or data presented by speakers in this series do not represent West Coast Climate and Materials Management Forum members policy or constitute endorsement by the forum.

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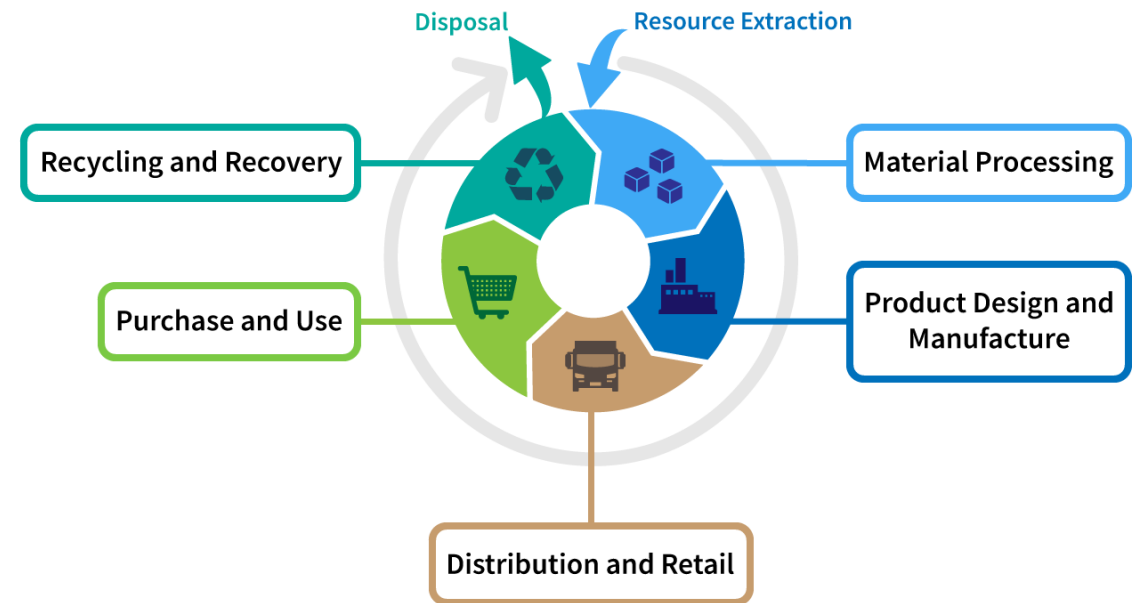
West Coast Climate
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West Coast Climate & Materials Management Forum

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A collaboration of state, local, and tribal governments with the mission to:

- Develop ways to institutionalize sustainable materials management practices.
- Develop tools to help jurisdictions reduce the greenhouse gas emissions associated with materials



West Coast Climate
& Materials Management Forum

Agenda

- ❖ CCAP 101
- ❖ Consumption-Based Accounting – Example and Oregon Results
- ❖ Local Government Examples
- ❖ Examples of Emissions Reduction Calculations
- ❖ Q&A



CLIMATE POLLUTION REDUCTION GRANTS

U.S. Environmental Protection Agency

CPRG Planning Grants Overview

Jenny Stephenson

EPA Region 9 – Zero Waste

Co-Lead of the CPRG Technical Assistance Forum on
Waste & Materials Management



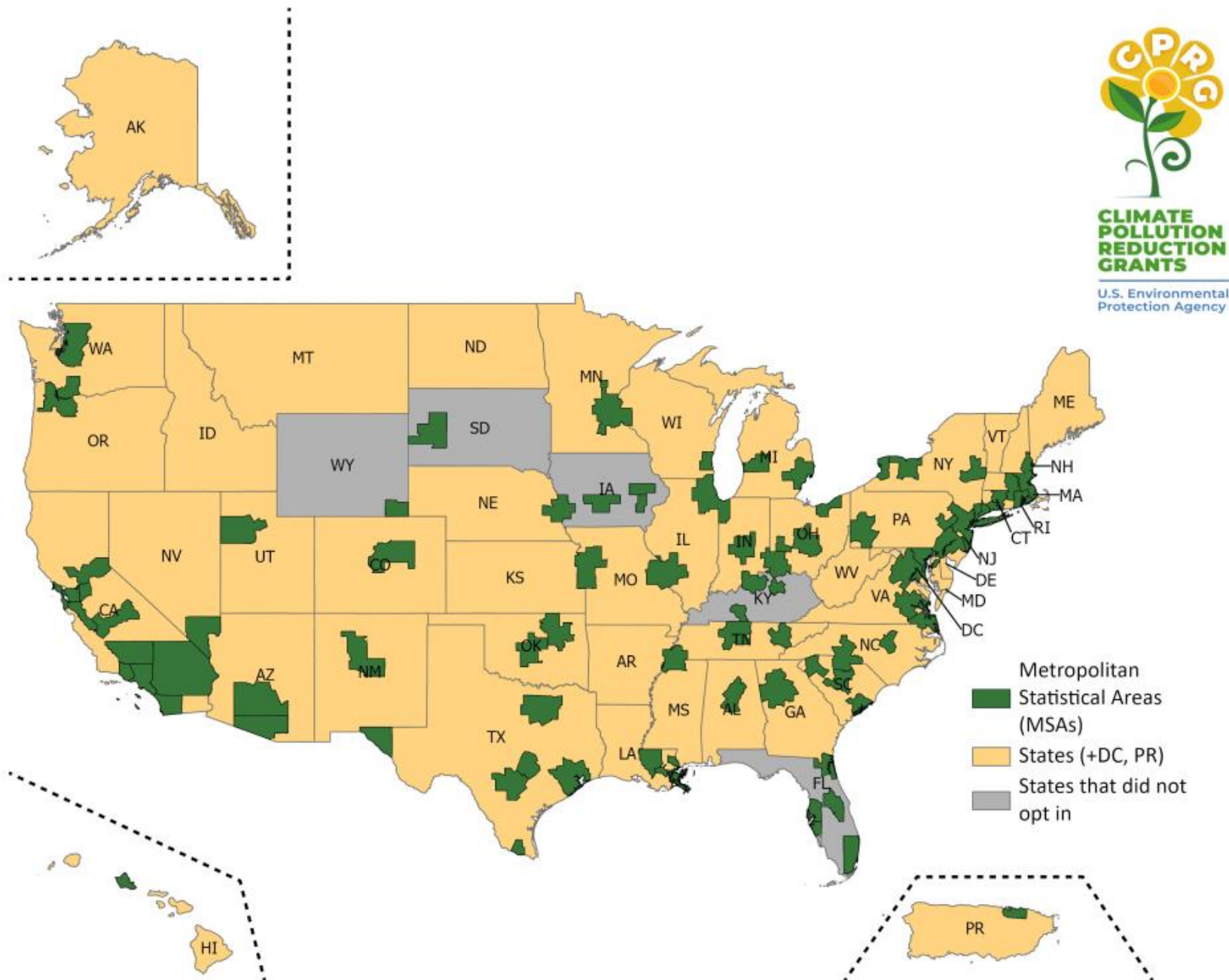


CLIMATE POLLUTION REDUCTION GRANTS

U.S. Environmental Protection Agency

Authorized under the Inflation Reduction Act, EPA's CPRG program provides nearly \$5 billion in grants for states, local governments, Tribes, and territories to develop and implement ambitious plans to reduce greenhouse gas emissions and other harmful air pollution and benefit low-income & disadvantaged communities

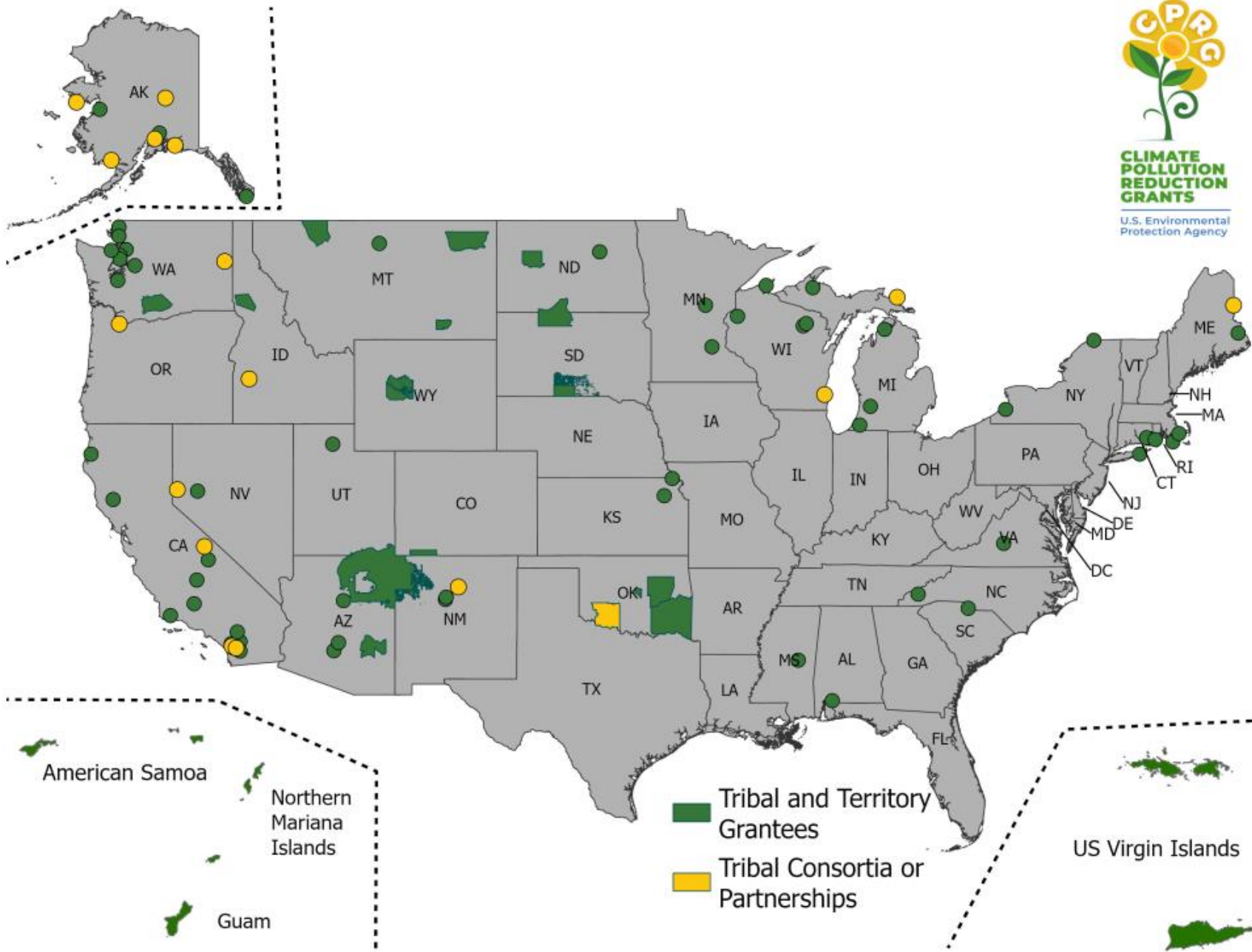
- \$250 million for noncompetitive planning grants to design climate action plans



Recipients of CPRG planning grants:

- 45 states
- The District of Columbia
- Puerto Rico
- 82 metropolitan statistical areas (MSAs)

<https://www.epa.gov/inflation-reduction-act/about-cprg-planning-grant-information>



Recipients of CPRG planning grants:

- 90 Tribes & Tribal consortia
- 4 territories

<https://www.epa.gov/inflation-reduction-act/about-cprg-planning-grant-information>

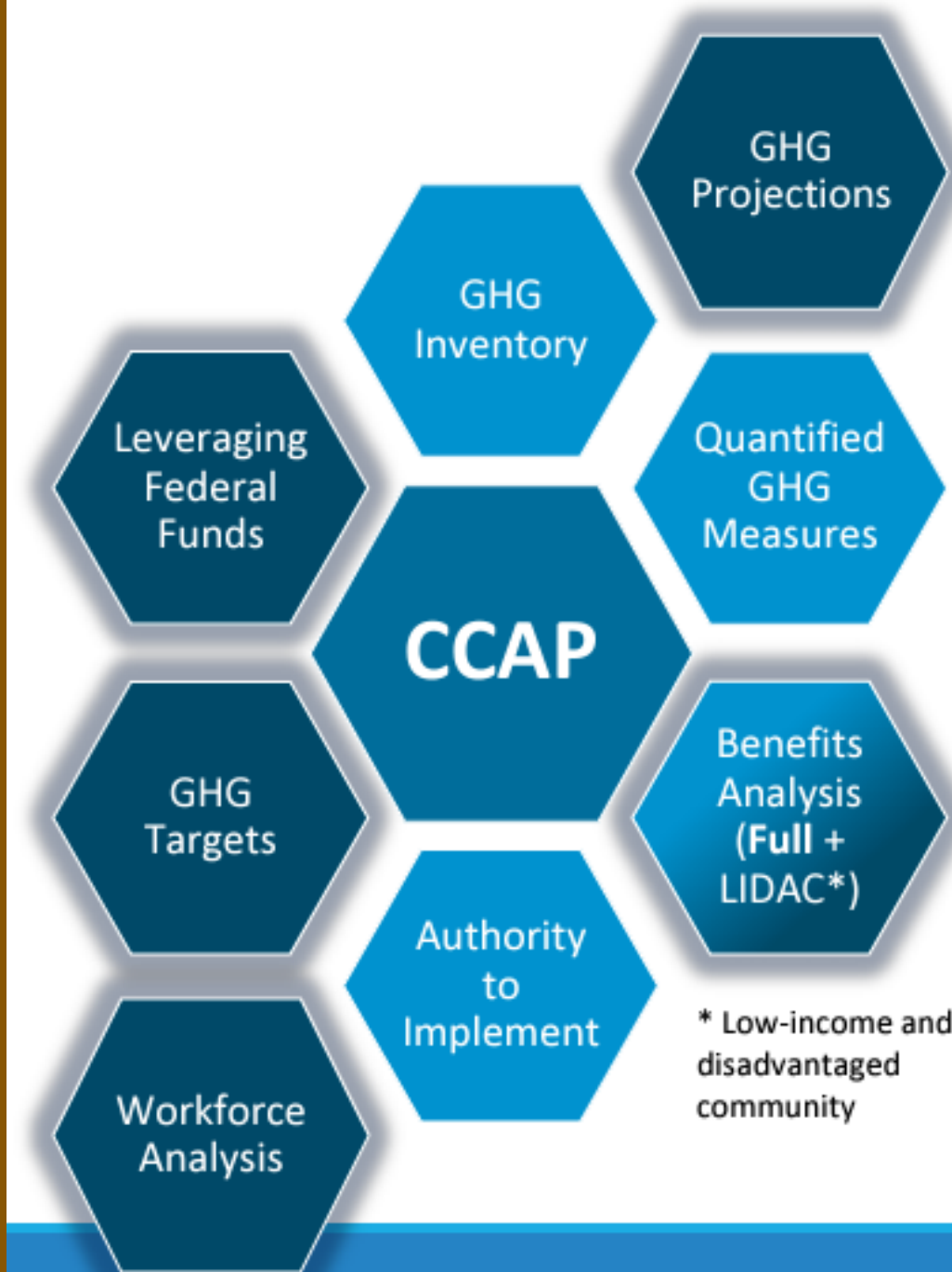
Priority Climate Action Plans

- submitted Spring 2024
- posted online

<https://www.epa.gov/inflation-reduction-act/priority-climate-action-plans-states-msas-tribes-and-territories>

Comprehensive Climate Action Plans

- due Dec 1, 2025 for states & MSAs



Covers GHG reduction measures across **all significant sources/sinks and sectors**

Establishes near-term **and long-term** GHG emission reduction targets

Adds additional required analyses to support robust implementation



Greenhouse Gases from Waste and Materials Management

The waste management sectors include greenhouse gas (GHG) emissions from significant sources such as landfills and wastewater treatment facilities.¹ In addition to emissions from management of waste, the production, transportation and consumption of consumer products also results in emissions (e.g., from fuel use for transport, electricity, etc.).²



Materials Management & Waste measures in Climate Action Plans

<https://www.epa.gov/smm/example-government-climate-action-plans-address-materials-management-and-waste>

Topics Covered:

- ☐ Alternative Fuel Collection Vehicles
- ☐ Built Environment: Deconstruction and Reducing Construction and Demolition Materials
 - ☐ Adaptive Reuse
 - ☐ Building Materials Reuse
 - ☐ Construction and Demolition Diversion
 - ☐ C and D Reuse and Recycling
 - ☐ C and D Reuse and Recycling Facility
 - ☐ C and D Technical Assistance
 - ☐ Deconstruction
 - ☐ Deconstruction/Diversion Ordinance
 - ☐ Design for Disassembly and Reuse
 - ☐ Government Requirements
 - ☐ Preservation
 - ☐ Reduce Surplus
 - ☐ Update C and D Standards
- ☐ Circular Economy or Zero Waste
- ☐ Embodied Carbon or Green Purchasing
- ☐ Environmental Justice and Equity - Materials Management and Waste
- ☐ Landfill Gas Recovery
- ☐ Organics and Wasted Food
 - ☐ Anaerobic Digestion
 - ☐ Carbon Sequestration
 - ☐ Composting
 - ☐ Encourage Highest and Best Use
 - ☐ Food Donation
 - ☐ Food Waste Reduction
 - ☐ Local Food Systems
 - ☐ Low Carbon Organics Diversion
- ☐ Plastics Reduction
- ☐ Recycling
- ☐ Reuse and Repair
- ☐ Waste Prevention

State/Tribe:

- ☐ Arizona
- ☐ California
- ☐ Colorado
- ☐ Delaware
- ☐ Florida
- ☐ Georgia
- ☐ Hawaii
- ☐ Idaho
- ☐ Illinois
- ☐ Louisiana
- ☐ Maine
- ☐ Maryland
- ☐ Massachusetts
- ☐ Michigan
- ☐ Minnesota
- ☐ Missouri
- ☐ Nebraska
- ☐ Nevada
- ☐ New Jersey
- ☐ New Mexico
- ☐ North Carolina
- ☐ New York
- ☐ Ohio
- ☐ Oklahoma
- ☐ Oregon
- ☐ Pennsylvania
- ☐ Rhode Island
- ☐ Sault Ste. Marie
- ☐ South Carolina
- ☐ Tennessee
- ☐ Texas
- ☐ Washington

Examples of how States and Tribes have included materials management & waste in Climate Action Plans

Materials Management in Climate Action Plans

Jenna Throckmorton and Martin Brown
Oregon Department of Environmental Quality

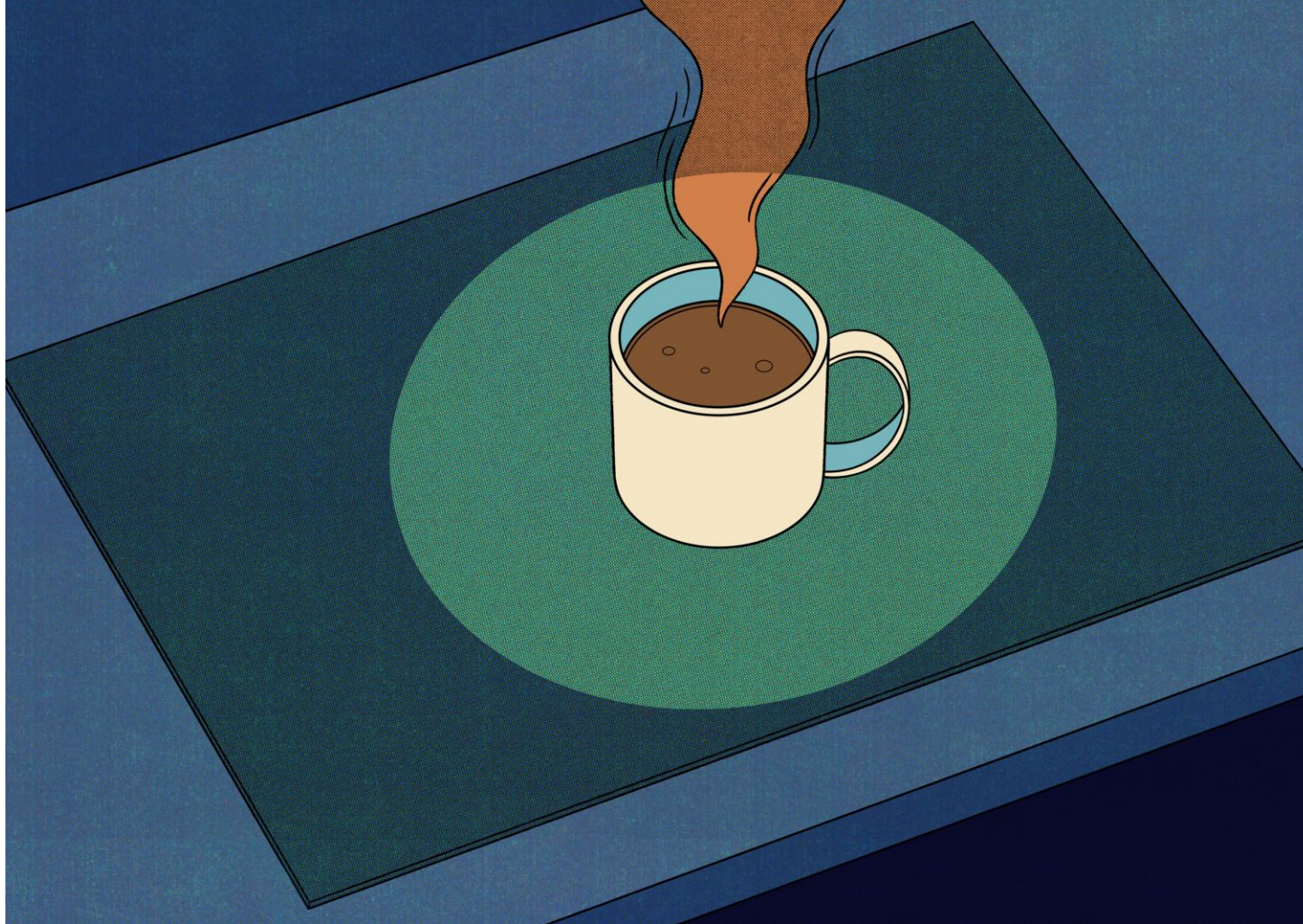
For West Coast Waste Management Forum
October 30, 2024



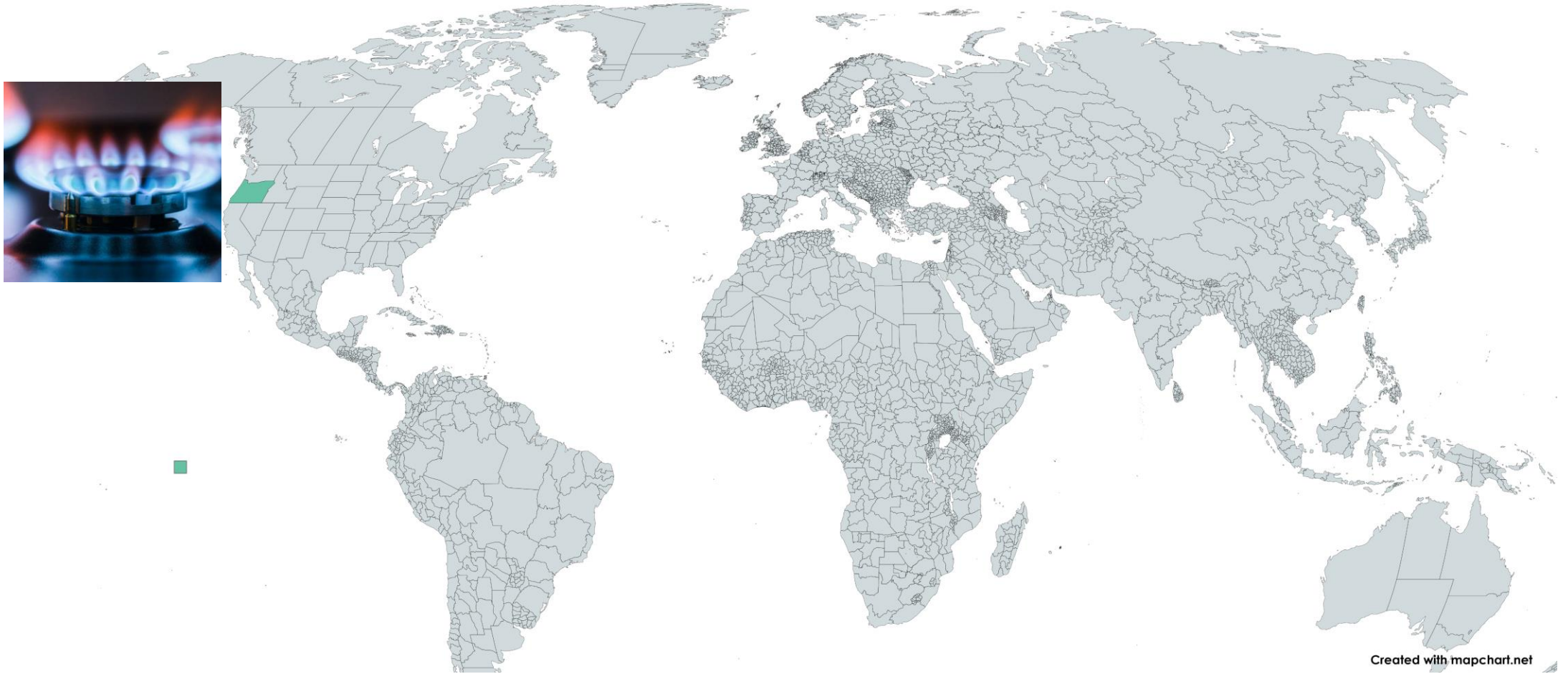
First – A Quick Refresher on Consumption-Based Emissions Accounting



Let's start with the emissions from my cup of coffee this morning...



There are emissions from heating water in Oregon...



Created with mapchart.net

... from roasting coffee in New Jersey...



Created with mapchart.net

...from growing and harvesting beans in Malabar...



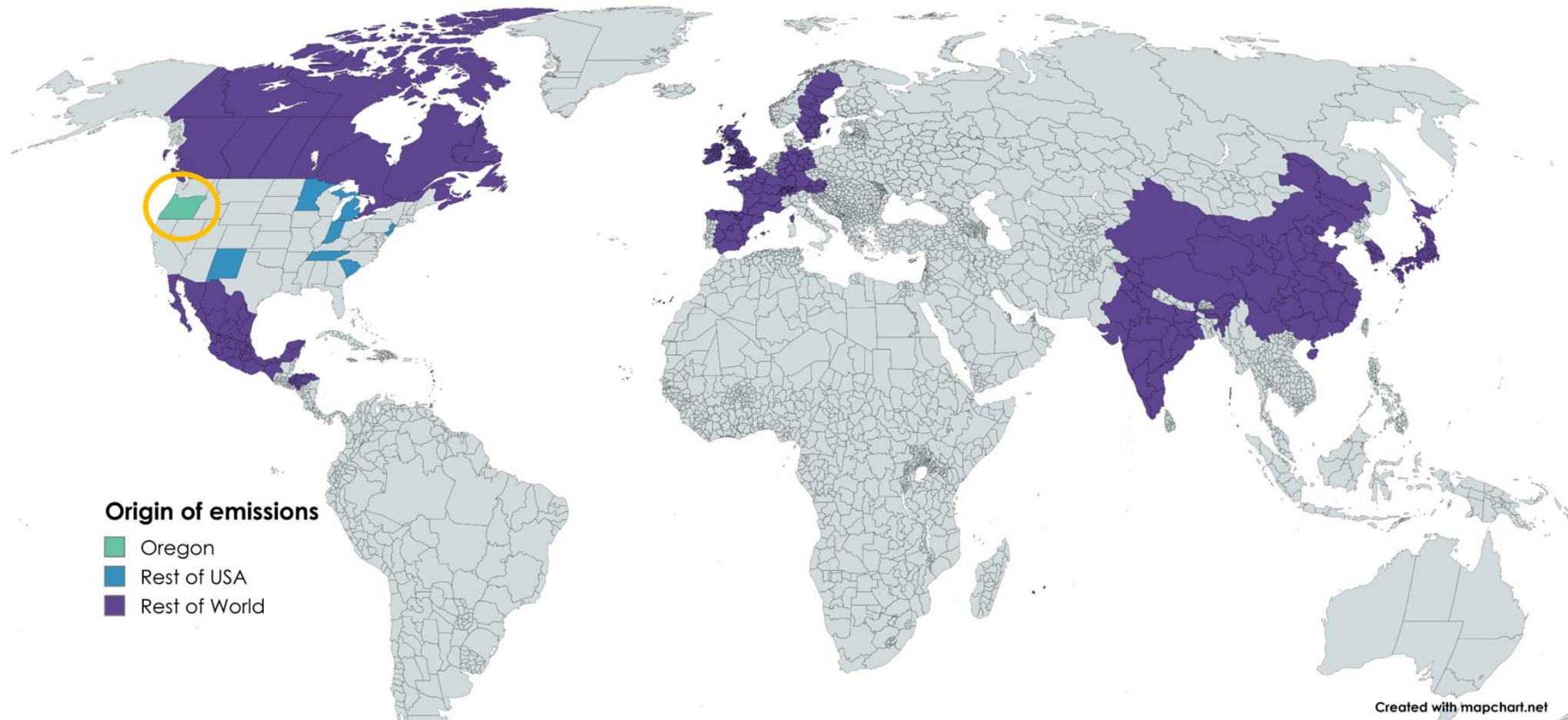
Created with mapchart.net

... from making trucks and parts all over the world.

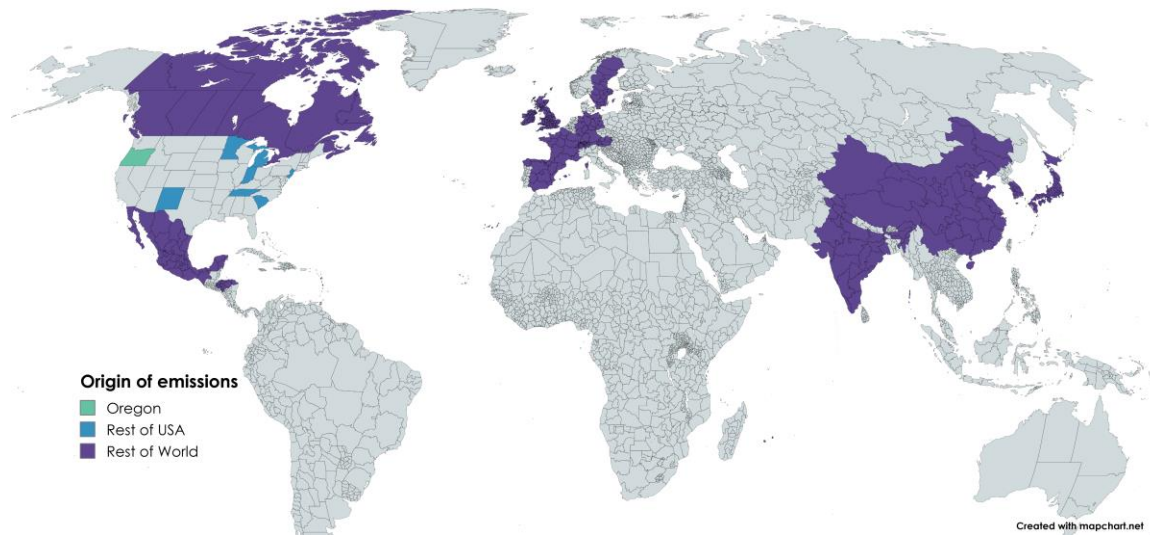


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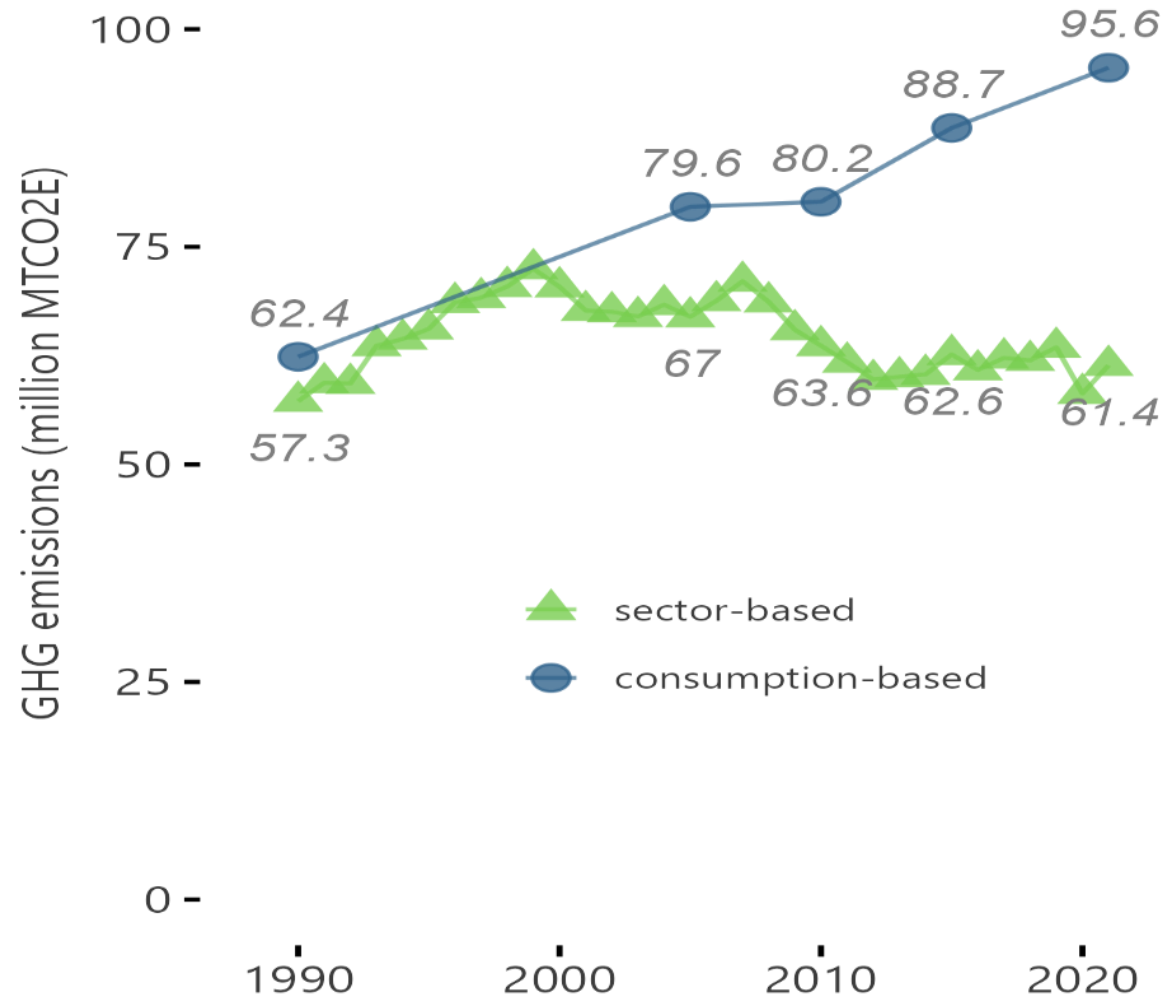
But sector-based accounting only accounts for emissions within the state



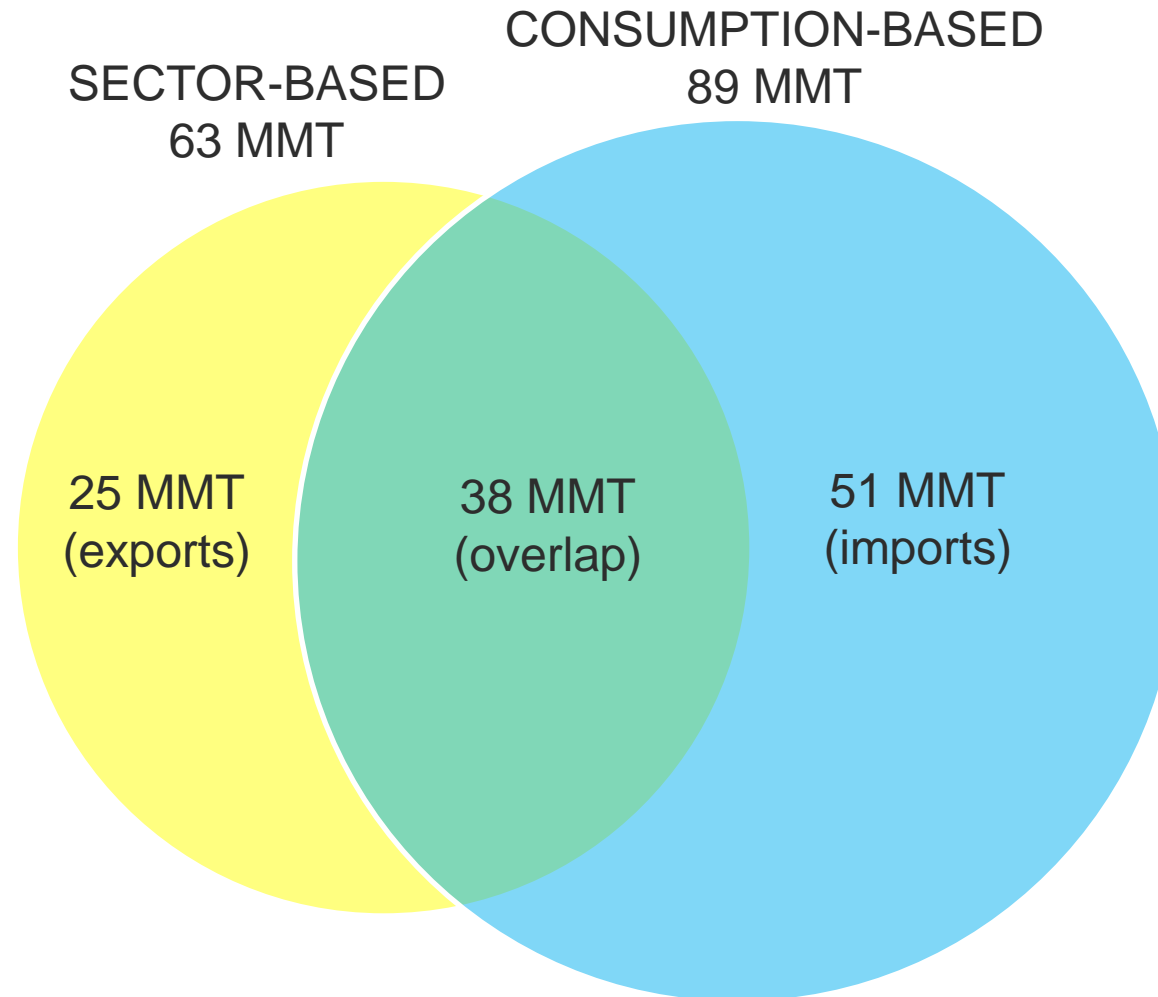
Consumption-based accounting sees beyond borders in two ways



In recent decades, Oregon's sector-based emissions have flattened, but consumption-based ones have grown



Comparison of Oregon's sector- and consumption-based emissions, 2021

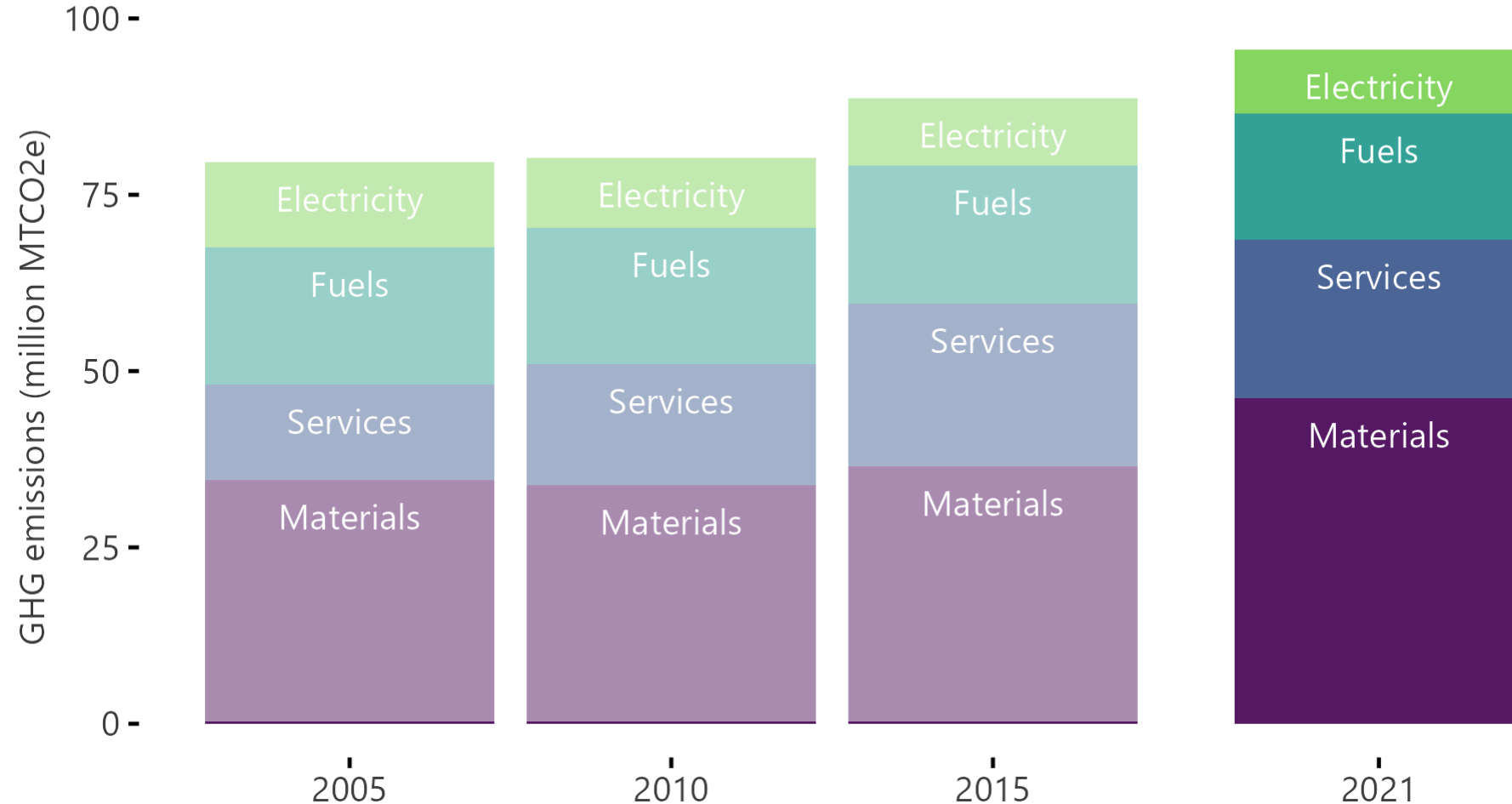


Data source: <https://www.oregon.gov/deq/FilterDocs/OregonGHGreport.pdf>

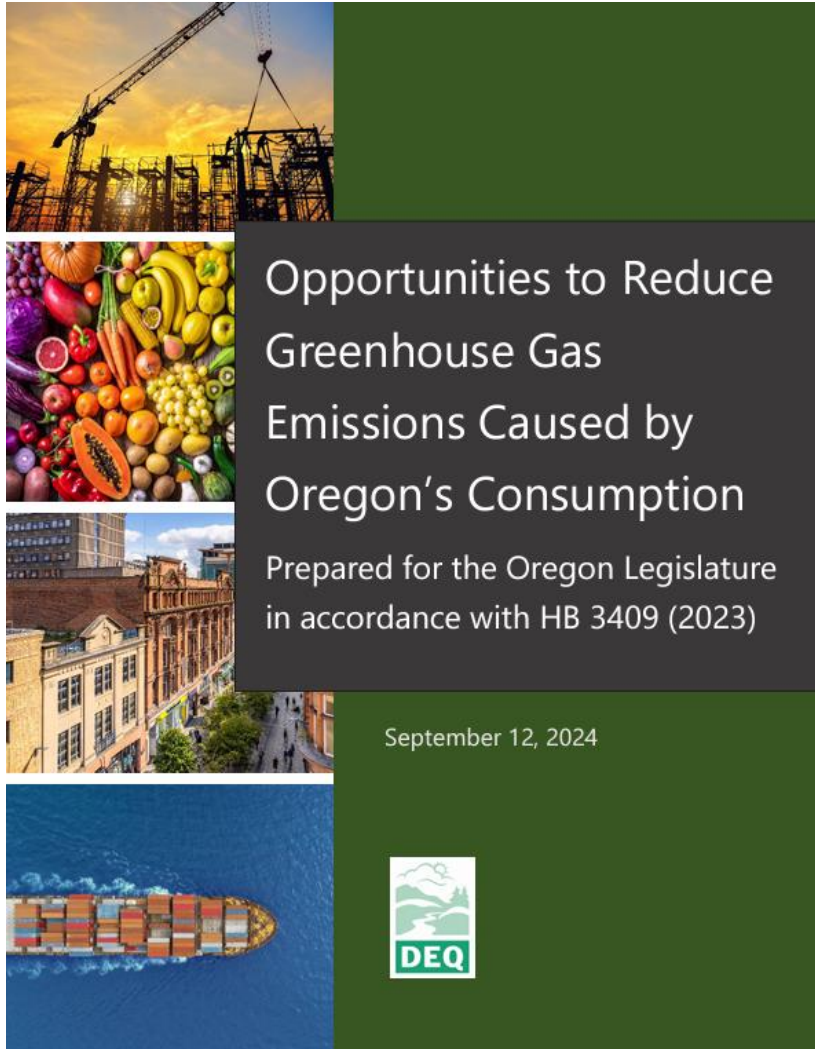
Materials are driving growth in total emissions

Changes in Oregon's consumption-based impacts, 2005-2021

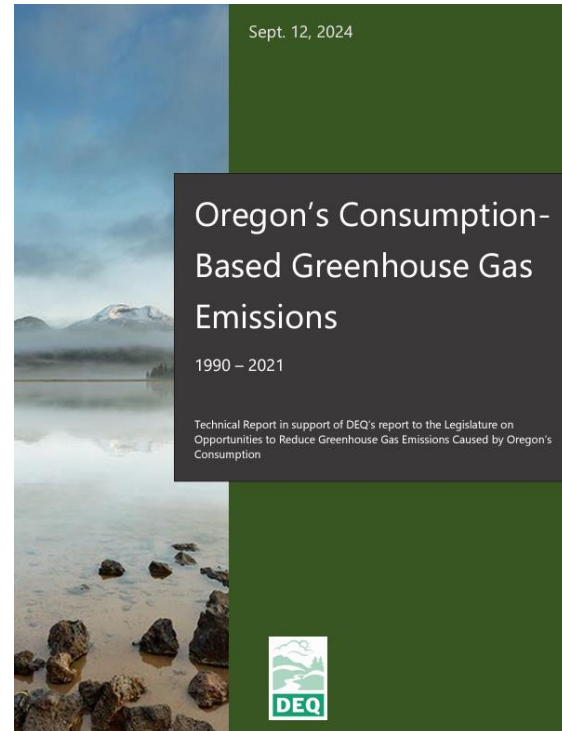
by metacategory



DEQ Reports



Companion Technical Reports



All available at:

www.oregon.gov/deq/mm/pages/consumption-based-ghg.aspx

Qualitative Evaluation of Options

Outcomes evaluated:

1. Expanded smart growth
2. Enhanced building utilization
3. Smaller new home construction
4. Reduced embodied emissions in new construction
5. Reduced food waste (households)
6. Reduced food waste (non-residential)
7. Reduced meat and dairy consumption
8. Shift to lower-emission meat and dairy products
9. Reduced clothing consumption
10. Reduced electronics consumption
11. Reduced appliances and furnishings consumption
12. Lighter weight cars
13. Reduced air travel
14. Others (see SEI Section 3.17)

Types of policies:

1. Outreach and education
2. Information disclosure
3. Product regulations & standards
4. Financial incentives
5. Zoning and land use policies
6. Other regulatory requirements
7. Public investment
8. Public procurement standards & requirements
9. Internal (government operations) policies and programs

Evaluation framework:

1. Greenhouse gas reduction potential
2. Likelihood and durability of impact
3. Ease of implementation
4. Ease of enforceability
5. Cost-effectiveness
6. Equity considerations
7. Job impacts
8. Health impacts
9. Environmental impacts

Thank you!

Jenna Throckmorton

(503) 568 - 6716

Jenna.Throckmorton@deq.oregon.gov



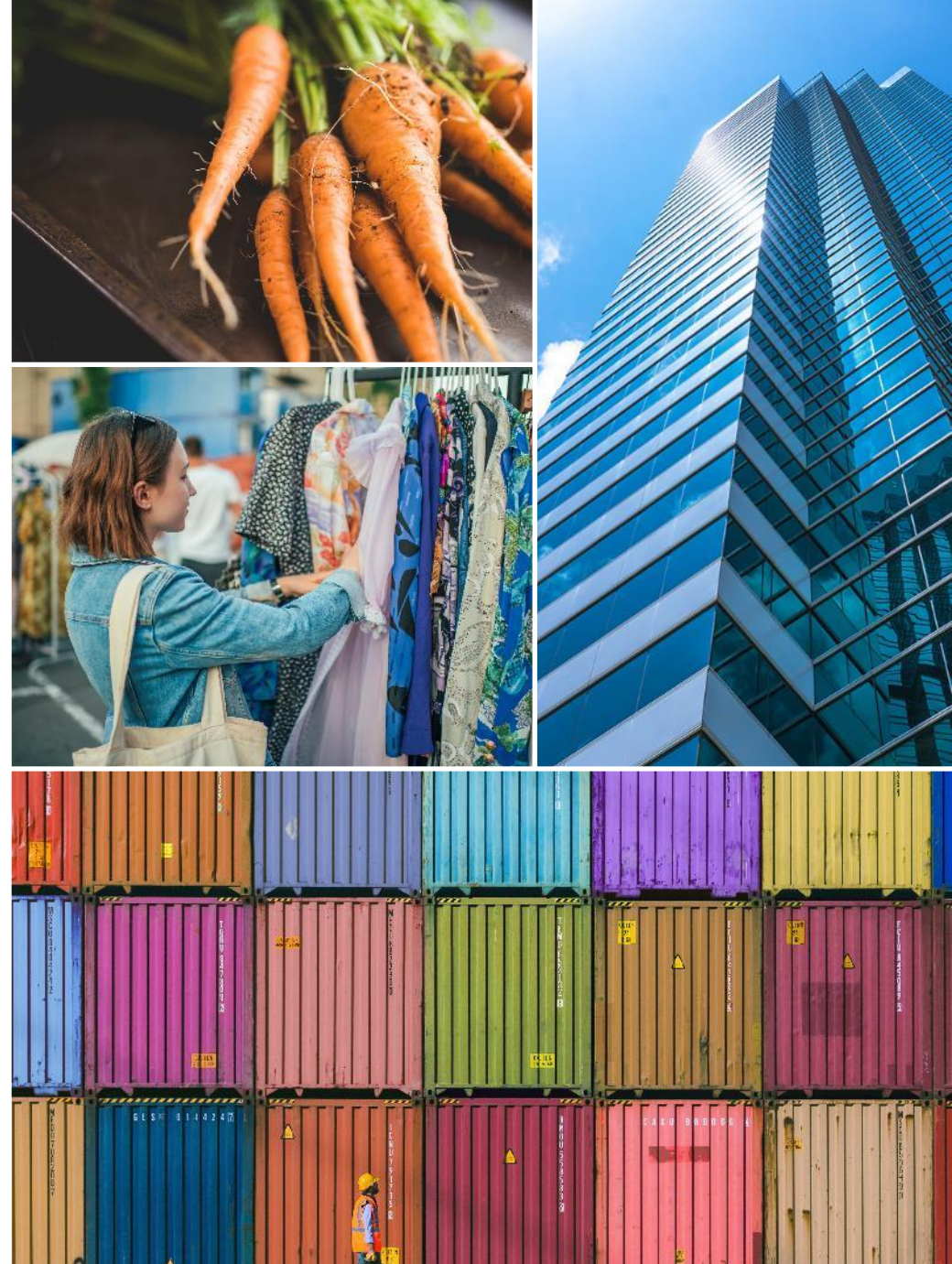


Materials in CCAPs Opportunities & Resources

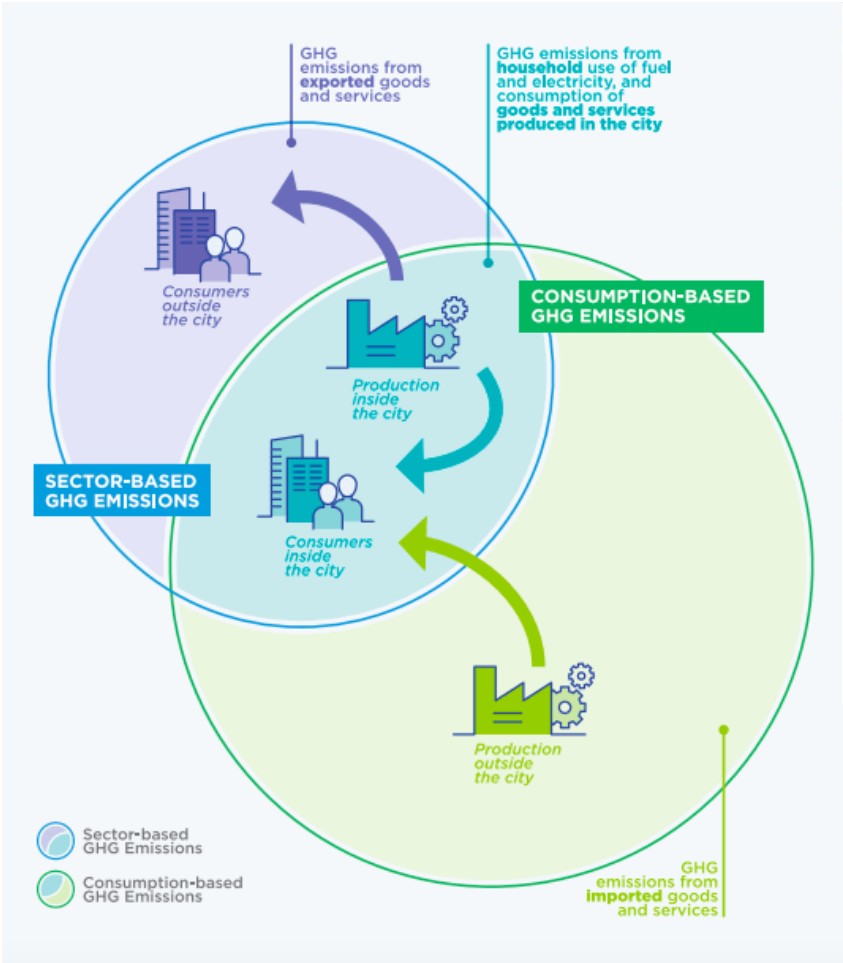
Miya Kitahara, Program Manager

West Coast Climate and
Materials Management Forum

Oct 30, 2024



Consumption-Based Emissions at the MSA/Local Level



Source: C40



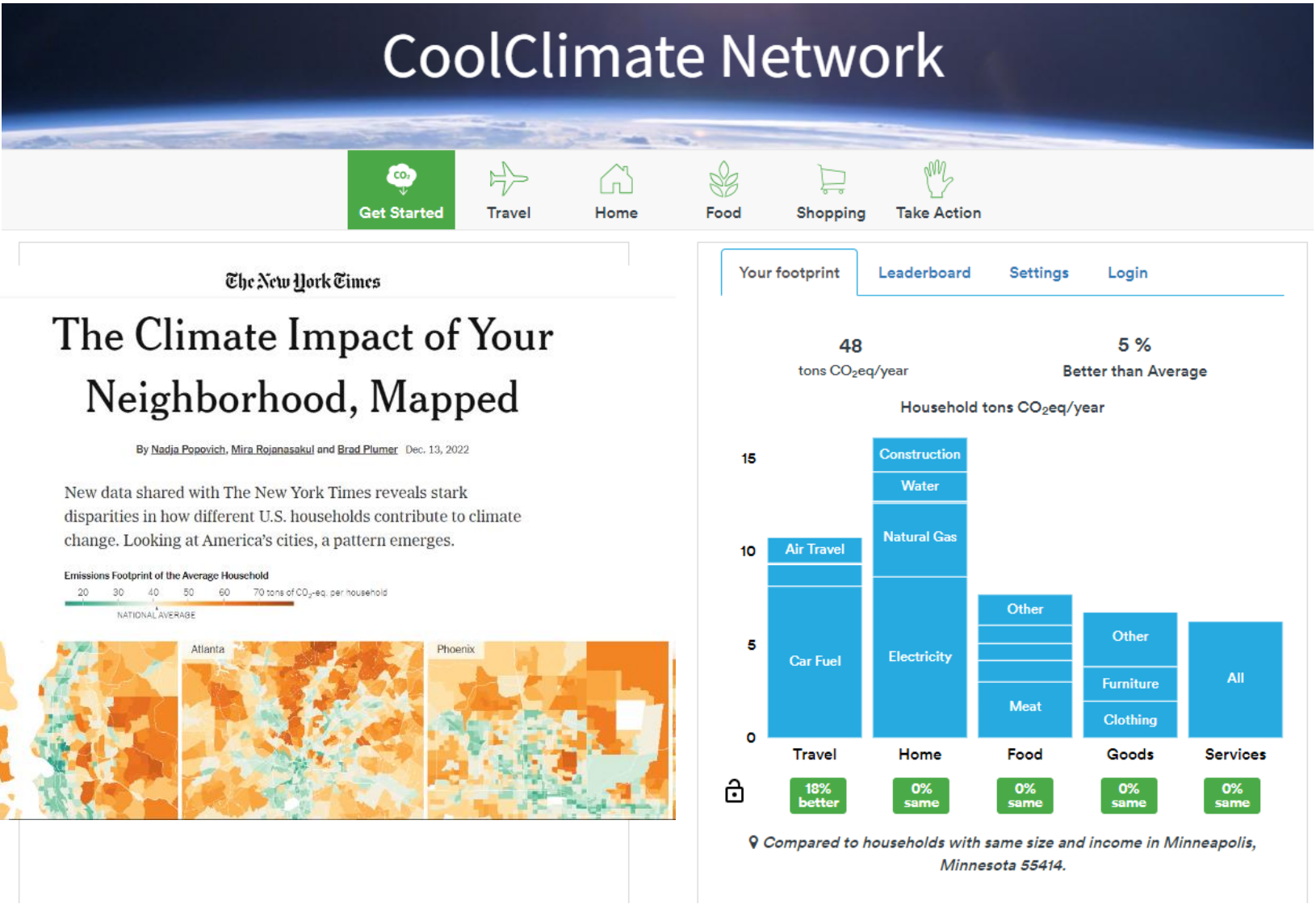
Boxes of fruits and veggies sit at the Hunts Point Terminal Produce Market in New York City, the largest distribution center of its kind in the world. New analysis suggests that cities need to do a better job counting the embodied carbon of the products they import.
PHOTOGRAPH BY JOHN TAGGART, BLOOMBERG VIA GETTY IMAGES

Cities Emit 60% More Carbon Than Thought



Source: City of Albany, CA

Quick CBEI Tools

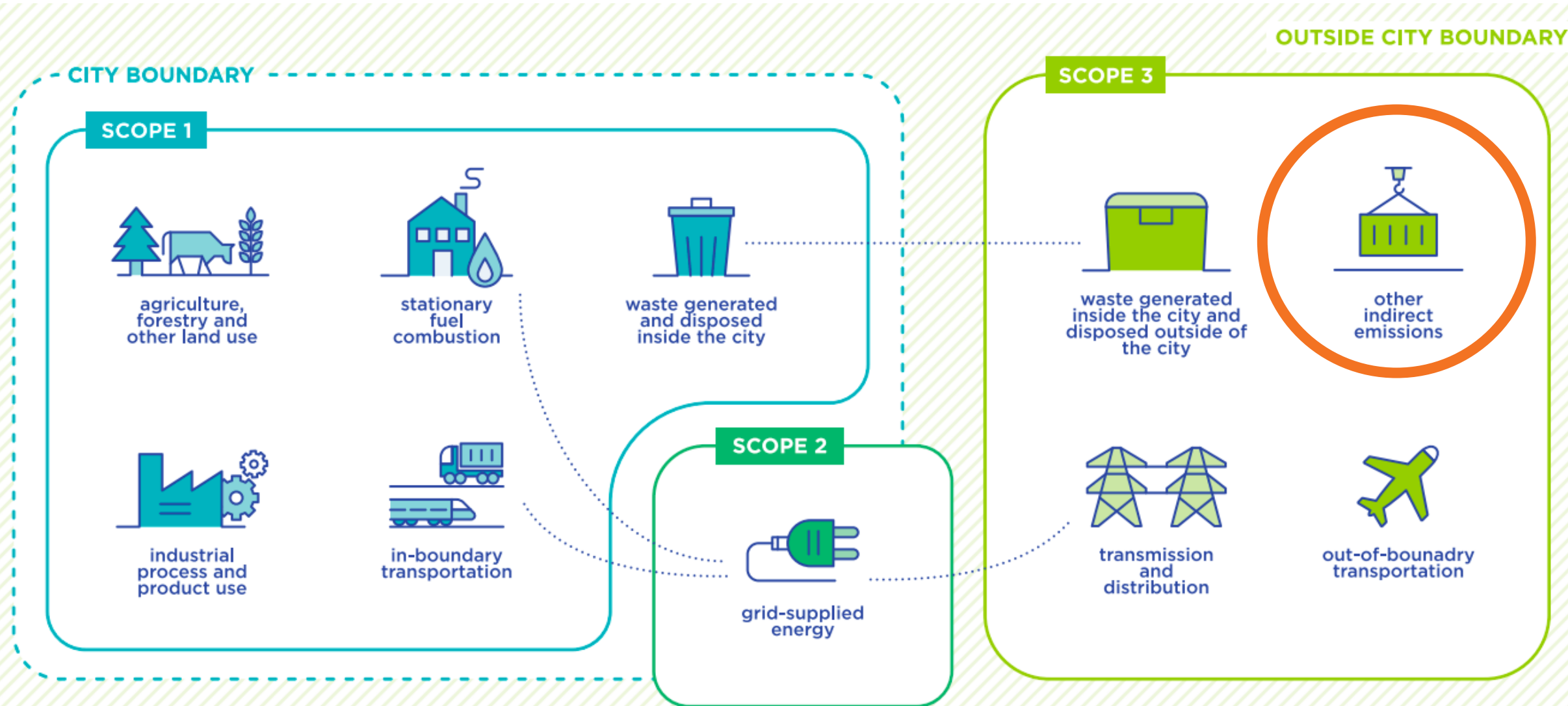


Coming in 2025:

CBEI for every city in California

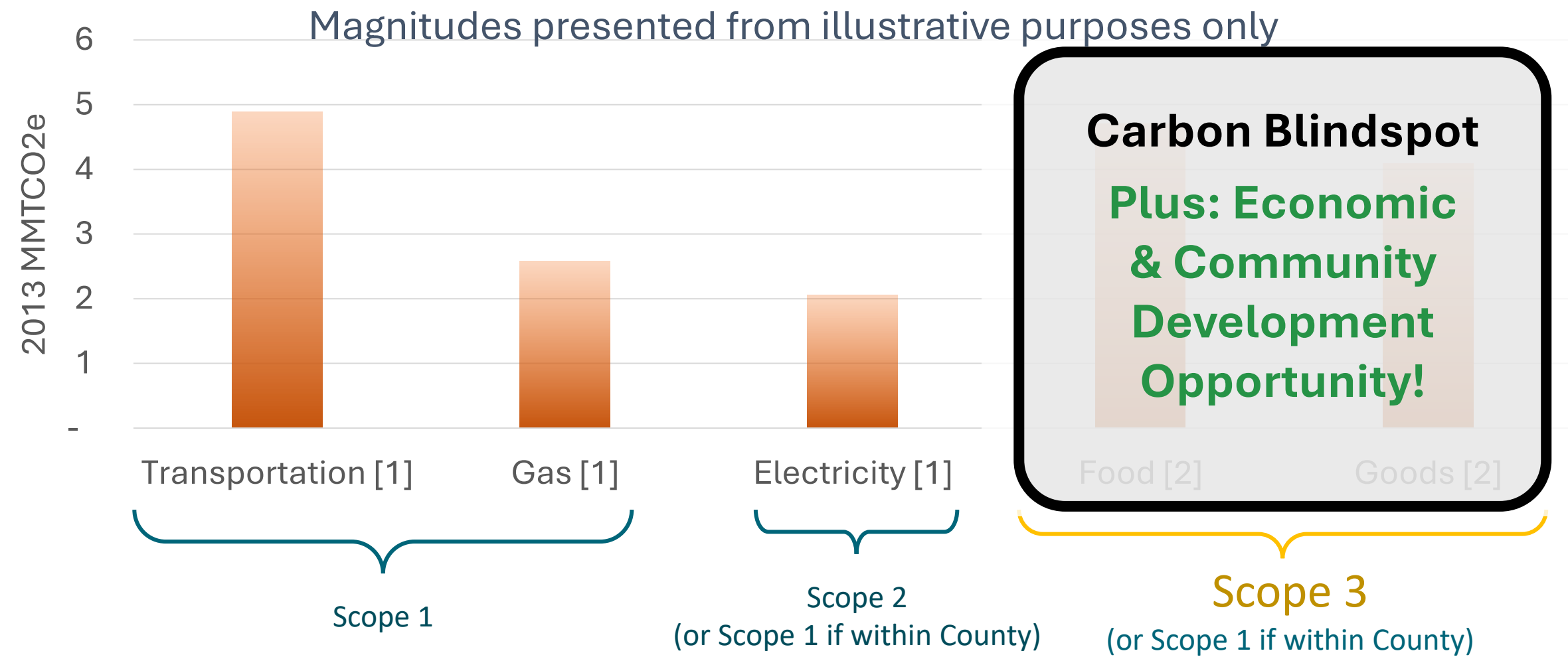
CoolClimate.org/calculator

CBEI and/or Specific Scope 3 Emissions Sources



Source: C40

CO2e Estimated for Alameda County (mixed data sources)



Sources: [1] MTC Vital Signs and [2] Cool Climate Network Bay Area CBEI.

Key Opportunity Areas



Food

Community health
Food security
Economic opportunity



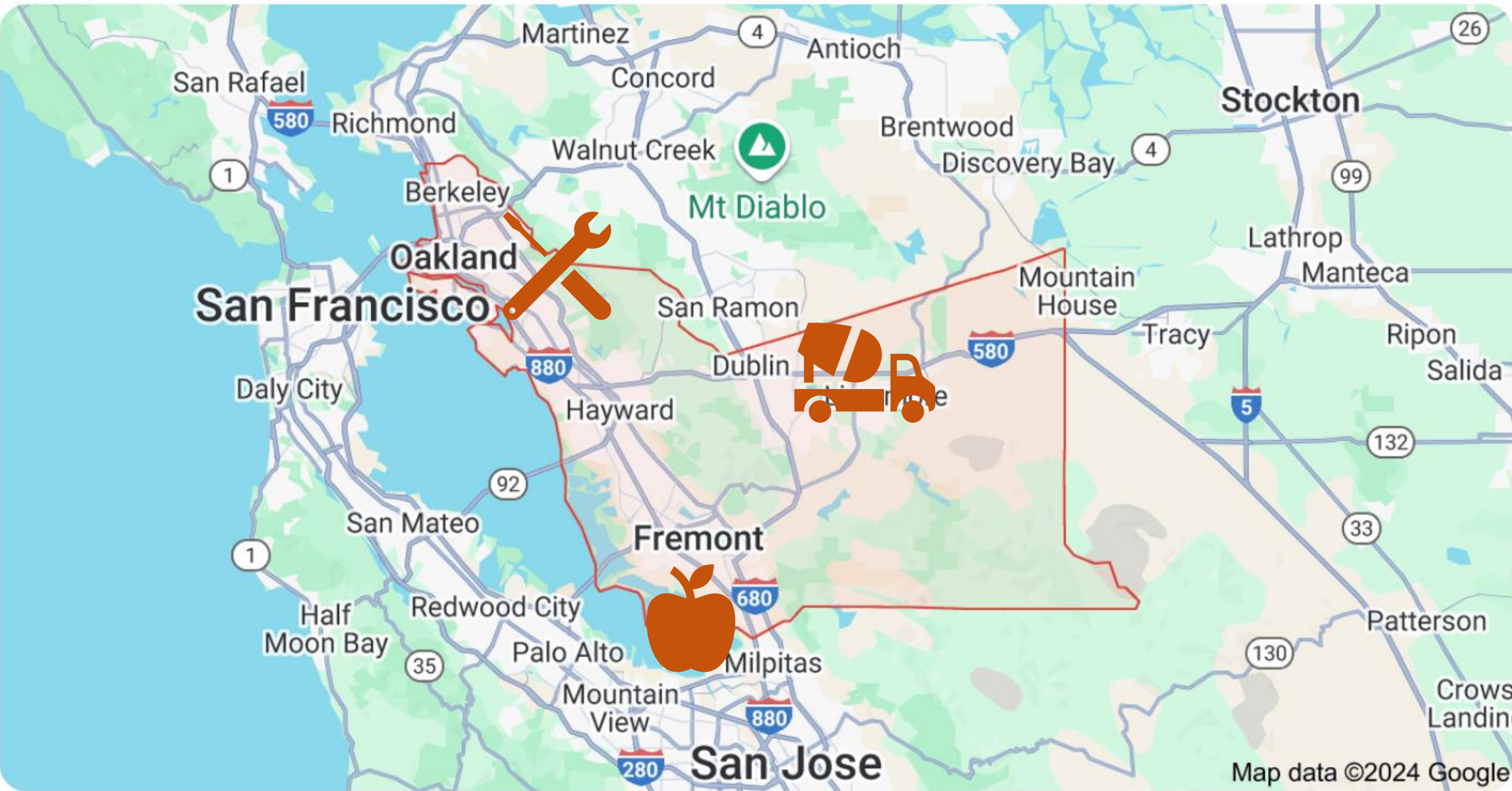
Construction

Housing intersection
Economic opportunity
Government influence

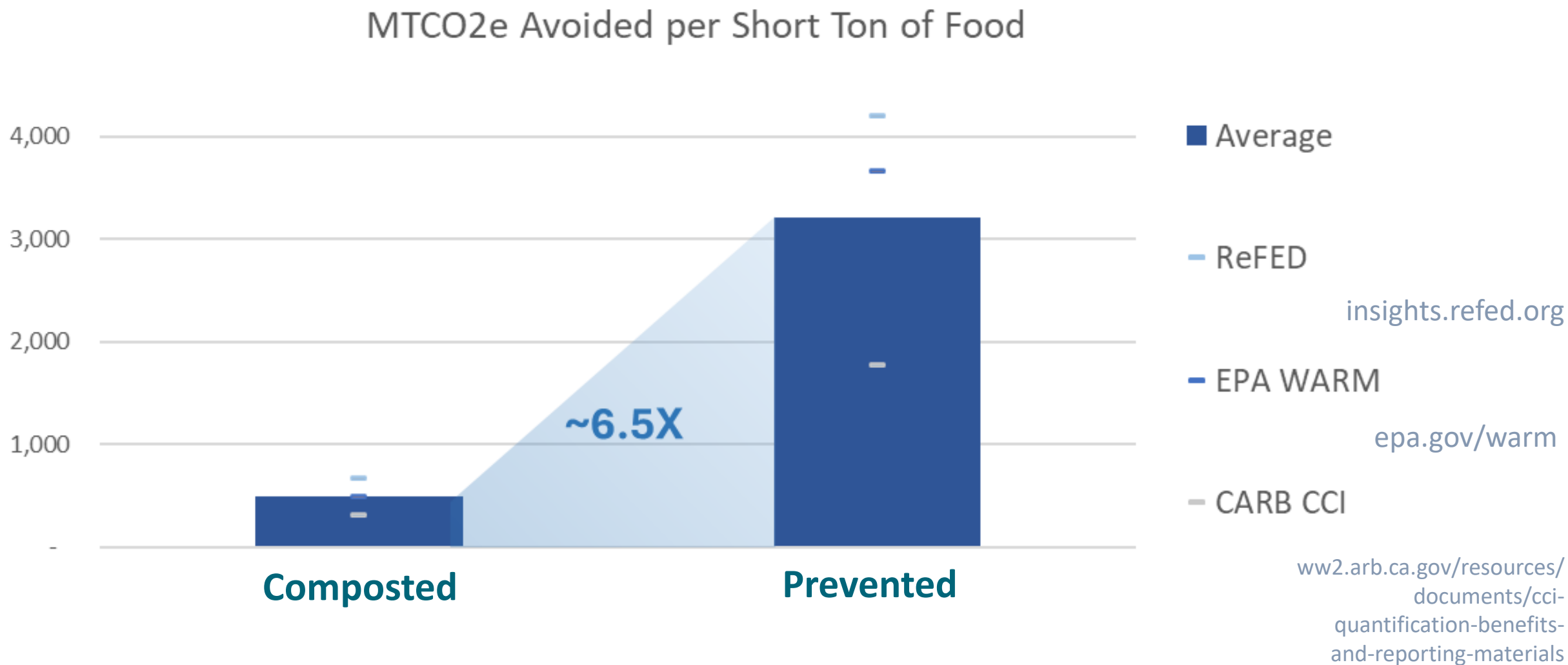


Durable Goods

Economic opportunity
Resource sharing
Community vitality



Landfill Diversion & Upstream Opportunities



Opportunities to Optimize Edible Food

- Effective distribution of food resources to feed people
- Promote food waste prevention practices
- Remove barriers where they exist (e.g. date labeling Calif AB 660)
- Help people stretch their food dollars



Opportunities to Increase Low-Carbon Food Options

- Awareness of where food comes from
- Government procurement (e.g. Good Food Purchasing Program)
- Support small farms with regenerative agriculture practices and low-carbon crops
- Support food retailers and restaurants to incorporate and market low-carbon options
- Connect rural and urban communities



Fremont: Food Security as Resilience

Measure AR-13: Improve food security.



HEALTH AND
WELL-BEING



COMMUNITY
RESILIENCE



EQUITY



RESOURCE
PRESERVATION

Specific Actions to Achieve Measure AR-13

Community Level

AR-C-13.1 Support the development of farmers' markets and other venues where locally grown produce and fresh foods can be sold

AR-C-13.2 Support increased access to local food for limited income residents through promotion of food assistance programs/benefits and collaboration with local farmers' markets

AR-C-13.3 Support existing community and school gardens and facilitate opportunities to expand community growing spaces with a focus on youth, non-native English speakers, and low-income residents

AR-C-13.4 Partner with regional organizations to support organic and regenerative urban agricultural practices, including community gardens, edible landscapes, and pollinator habitats

AR-C-13.5 Encourage low-carbon plant-based diets and develop outreach and tips for residents to reduce the GHG emissions associated with their food consumption


Consumption-
based
emissions



Ideas & Impact Estimation Tools

**ReFED Insights Engine**

An online hub for data and solutions featuring the most comprehensive examination of food loss and waste in the United States – includes the Food Waste Monitor, Solutions Database, Solution Provider Directory, Impact Calculator, Capital Tracker, and Policy Finder.

Launched with anchor funding from 

insights.refed.org

Understand the Problem

Find out how much food is being wasted in the US, learn why it's happening, and see where it goes.
[Visit the Food Waste Monitor](#) ▶

Explore Solutions

Learn which food waste reduction solutions are the most relevant and impactful for meeting specific goals.
[Visit the Solutions Database](#) ▶

Find Solution Providers

Explore our database of more than 1,500 organizations offering products and services to help you reduce food waste.
[Visit the Solution Provider Directory](#) ▶

Calculate Impact

Quantify the climate, natural resource, and food security impacts of wasted food.
[Visit the Impact Calculator](#) ▶

Track Capital

Examine private capital food waste investments over the last ten years, from industry-wide trends to deal-level details.
[Visit the Capital Tracker](#) ▶

Review Policies

Research current food waste policy at the federal and state levels and discover the best practices.
[Visit the Policy Finder](#) ▶



Construction & Demolition Waste



600 million tons of C&D debris were generated in the United States in 2018, which is more than twice the amount of generated municipal solid waste. – EPA's 2018 Fact Sheet

Opportunities Beyond C&D Waste (End of Life)

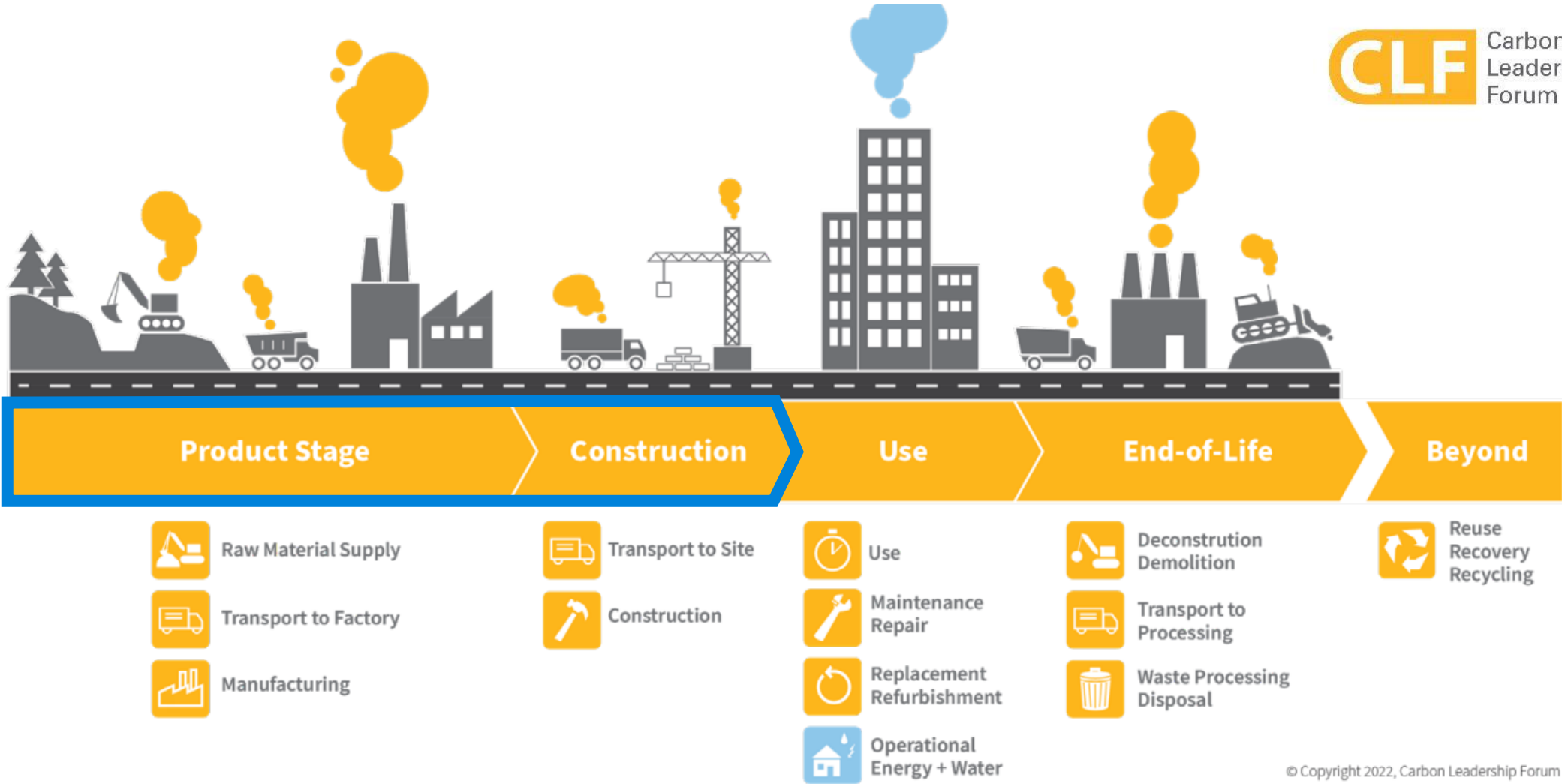


Figure 1. Embodied carbon (yellow) and operational carbon (blue) across the life cycle stage of a building

California's Green Building Code

Embodied Carbon Requirements for
100+SF nonresidential
and 50+SF schools
Effective July 1, 2024



Pathway	Mandatory
Option 1: Building Reuse	45% of the structure and enclosure to be reused
Option 2: Whole Building LCA (WBLCA)	10% reduction from baseline
Option 3: Prescriptive Approach	175% of industry-wide Environmental Product Declarations Global Warming Potential limits

California's Green Building Code

Embodied Carbon Requirements for
100+SF nonresidential
and 50+SF schools
Effective July 1, 2024

← Adopt a Tier or lower
square footage threshold ↓



Pathway	Mandatory	Tier 1	Tier 2
Option 1: Building Reuse	45% of the structure and enclosure to be reused	75% of the structure and enclosure to be reuse	75% of the structure and enclosure to be reused AND 30% of interior non-structural elements to be reused
Option 2: Whole Building LCA (WBLCA)	10% reduction from baseline	15% Reduction from baseline	20% Reduction from baseline
Option 3: Prescriptive Approach	175% of industry-wide Environmental Product Declarations Global Warming Potential limits	150% of industry-wide Environmental Product Declarations Global Warming Potential limits	100% of industry-wide Environmental Product Declarations Global Warming Potential limits

Supporting Strategies

Source: Urban Machine

- Equitable access to embodied carbon skills for architects/engineers
- Deconstruction infrastructure and workforce
- R&D and entrepreneurs introducing new materials, products, construction methods
- Agriculture & Working Lands: Renewable sourcing of biobased materials



Source: Verdant Panel

Dublin: Reduce the Embodied GHG Emissions Associated with Building Materials

CITY OF DUBLIN CLIMATE ACTION PLAN



Measure MM-2 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.

Co-Benefits:   



Low Carbon Concrete
Code Amendment
adopted Sept 2024 to
be effective Jan 2025

+ Marin County,
Palo Alto, Santa Monica

Adoption support
resources:
stopwaste.org/concrete


GHG Reduction Target Years

Policy Effective Year	2025
Short-Term Target Year	2030
Long-Term Target Year	2050

← **Instructions:** Start here

Unit of Measure for Embodied Carbon

Mt CO2e

 **Instructions:** Use to convert units

Projected Construction Growth

Instructions: Input projected residential unit and commercial and public construction growth anticipated for short-term and long-term target years. Update default values for distribution of growth within each typology.

		Residential Units as % of Total Building Typology Units	Default Assumption	Default Assumption Source	Average Housing Unit Area (sq ft)	Default Assumption
Residential	Single Family	59%	59%	Based on https://www.census.gov/construction/nrc/pdf/newresconst.pdf (2022 US Annual)	2300	2300
	Two to Four Units	3%	3%	Based on https://www.census.gov/construction/nrc/pdf/newresconst.pdf (2022 US Annual)	1300	1300
	Five or More Units	38%	38%	Based on https://www.census.gov/construction/nrc/pdf/newresconst.pdf (2022 US Annual)	1000	1000
		Building Area as % of Total Building Typology Area	Default Assumption	Default Assumption Source		Default Assumption
Commercial	Low Rise (1-5 Stories)	40%	None available			None available
	Mid-Rise (6-10 Stories)	45%	None available			None available
	High Rise (>10 Stories)	15%	None available			None available
Public	Low - Rise (1-5 Stories)	50%	None available			None available
	Mid-Rise (6-10 Stories)	45%	None available			None available
	High Rise (>10 Stories)	5%	None available			None available

Embodied Carbon Reduction Measures

Instructions: Input a short-term and long-term reduction target for each embodied carbon reduction measure against the projected baseline and select policy coverage by building typology.

Low Carbon Materials				By 2030					
If an embodied carbon reduction target is set for certain construction materials, how much could overall GHG emissions be reduced?				Annualized GHG Emissions Reduction by 2030 (Mt CO2e)	Total GHG Emissions Reduction by 2030 (Mt CO2e)	Total % Emissions Reduction by 2030			
		Short-Term	Long-Term	23	114	0%			
	Concrete Reduction Target	20%	40%						
	Rebar Reduction Target	0%	0%						
	Steel Reduction Target	0%	0%						
	Glass Reduction Target	0%	0%						
	Insulation Reduction Target	0%	0%						
Projected Coverage by Building Typology									
	Residential	0%	0%						
	Single Family	0%	0%						
	Two to Four Units	0%	0%						
	Five or More Units	0%	0%						
	Commercial	0%	0%						
	Low-Rise (1-5 Stories)	0%	0%						
	Mid-Rise (6-10 Stories)	0%	0%						
	High-Rise (>10 Stories)	0%	0%						
	Public	5%	5%						
	Low-Rise (1-5 Stories)	0%	0%						
	Mid-Rise (6-10 Stories)	0%	0%						
	High-Rise (>10 Stories)	100%	100%						

Other High Impact Sectors



Apparel

Electronics

Appliances

Furniture

Oakland: Materials as Key Green Economy Opportunities



Green Economy

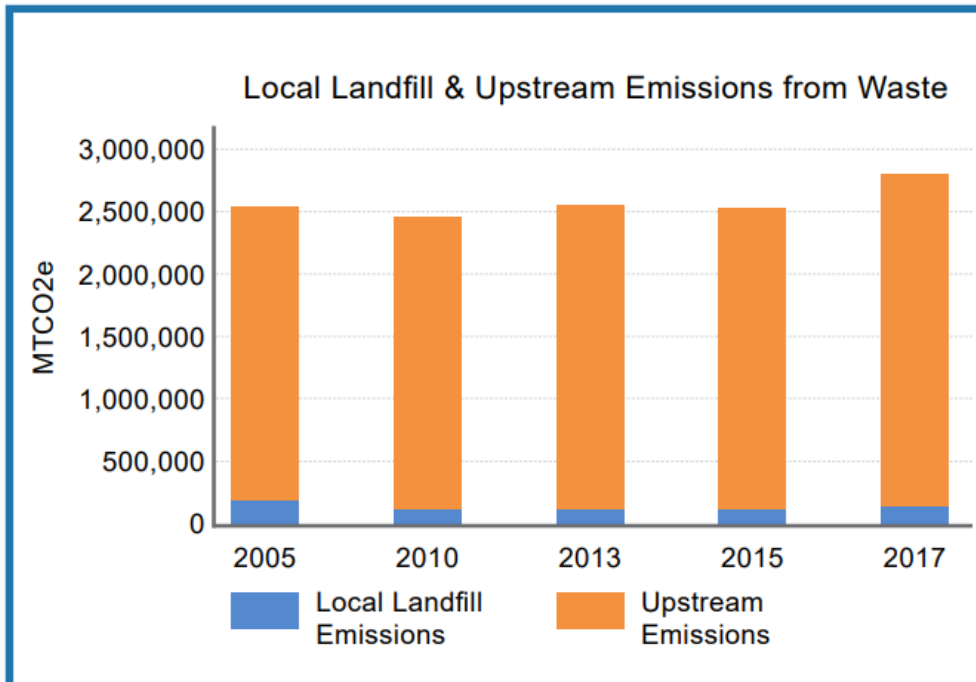


MATERIAL CONSUMPTION + WASTE

- » MCW-2 Strengthen Infrastructure and Partnerships for Edible Food Recovery
- » MCW-4 Support the Reuse, Repair, Recovery, and Refurbishment Economy
- » MCW-5 Expand Community Repair Resources
- » MCW-6 Establish a Deconstruction Requirements



Oakland: Upstream Emissions and Vision



While Oakland's landfill emissions decreased from 2005 to 2017, upstream consumption emissions (emissions involved in the extraction, manufacture, and transport of anything we buy and use) increased. This shows that our purchasing habits have a far larger impact on global emissions than the decisions we make when we throw things away.



EPA's Database of Examples of Materials in CAPs



Responsible Productions & Consumption
RPC.1

STRATEGY
Achieve total carbon balance across the buildings and infrastructure sectors.

Waste and Materials

2030 Objectives

- Reduce the amount of organic waste that is landfilled 75% from 2014 levels by 2025
- Maintain or exceed 75% solid waste diversion each year
- Improve local reuse and repair programs
- Expand the use of low-carbon and recycled building materials

GHG Reductions

□ Strategy W-1 = 19,379 MT CO₂e

COMPOST

15% of Total 2030 GHG Reductions

W-1

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 to reduce the embodied carbon associated with building materials.

BUILDINGS

B-4

Reduce Lifecycle Emissions from Building Materials

Lead Agency	Climate Benefit	Cost	Benefits
PBD		\$\$\$\$	

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. Ensure requirements are at least as stringent as the State of California procurement standards in effect at the time of the building code adoption. Explore ways of supporting local market development for low-lifecycle-emission and carbon-storing biogenic building materials.

Going Deeper

Building materials have significant GHG emissions associated with their procurement, manufacturing, and transportation, collectively known as embodied carbon or upstream emissions. As buildings get more energy efficient and are powered by low-carbon sources, embodied emissions become a larger portion of the lifecycle emissions for which they are responsible. These emissions have not historically been the focus of reducing GHG emissions in buildings, but they are an important part of the City's strategy to make our buildings cleaner, safer, and more resilient.

As the City identifies strategies for reducing embodied carbon in building construction and renovations, including through building code requirements, care must be taken to ensure that new requirements do not increase construction costs, and that the overall building stock can remain affordable for existing Oaklanders. Green building techniques include minimizing embodied carbon, increasing the use of natural materials, and moving towards more regenerative processes and materials. These are often pathways to affordability because lifetime operating costs – including utility bills – are minimized through space and appliance efficiency, healthier indoor air, and reduced need for heating and cooling. The City will work with partners such as StopWaste to identify best practices for reducing embodied carbon while maximizing affordability. This Action also has strong potential to contribute to new green job pathways, which the City can support by promoting local training programs.

Photo: Greg Levine, City of Oakland

epa.gov/smm/example-government-climate-action-plans-address-materials-management-and-waste



STOP WASTE
at home • at work • at school

Thank you!

miya@stopwaste.org

Calculating emissions reductions for materials measures: some principles and examples

Martin.Brown@deq.Oregon.gov

My goal is to bring these calculations down to earth

I will:

- List some actual examples of measures for which Oregon DEQ has calculated emissions reductions
- Include both waste-based and pure consumption-based examples
- Name the models we used (and alternatives that you might use)

But first!

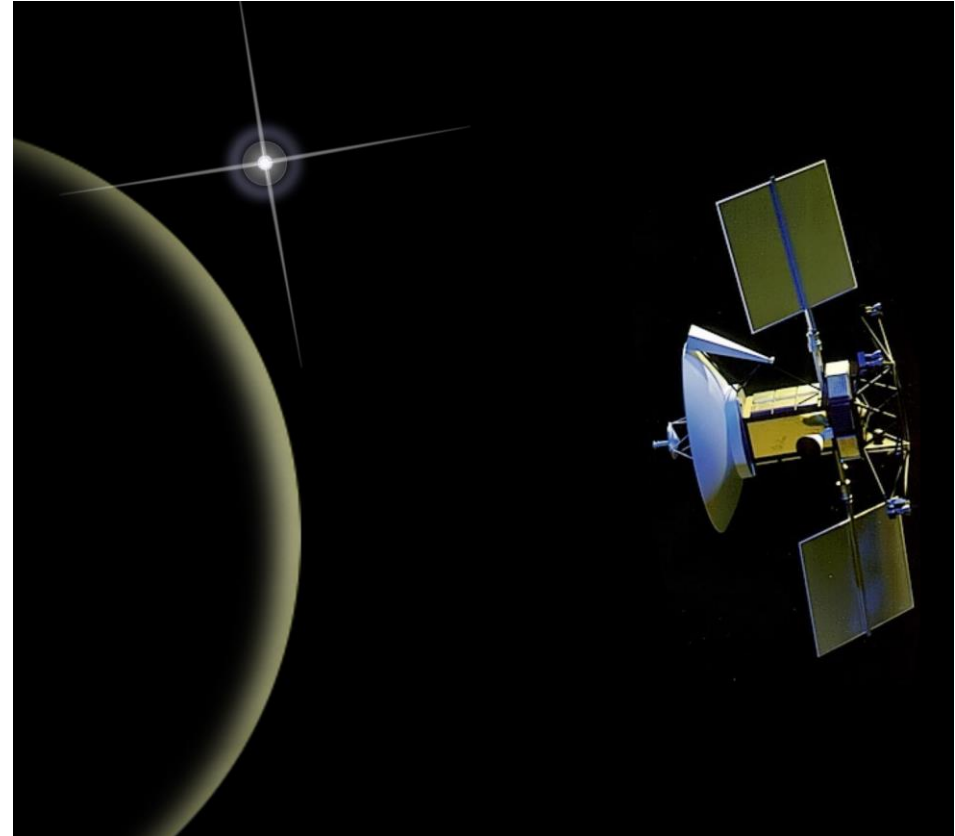
- Disclaimer: I am not EPA
- Fine details are being omitted to save time
- A little pep talk (next slide)

Don't get perfection paralysis!

Start with a rough estimate



Then improve the details

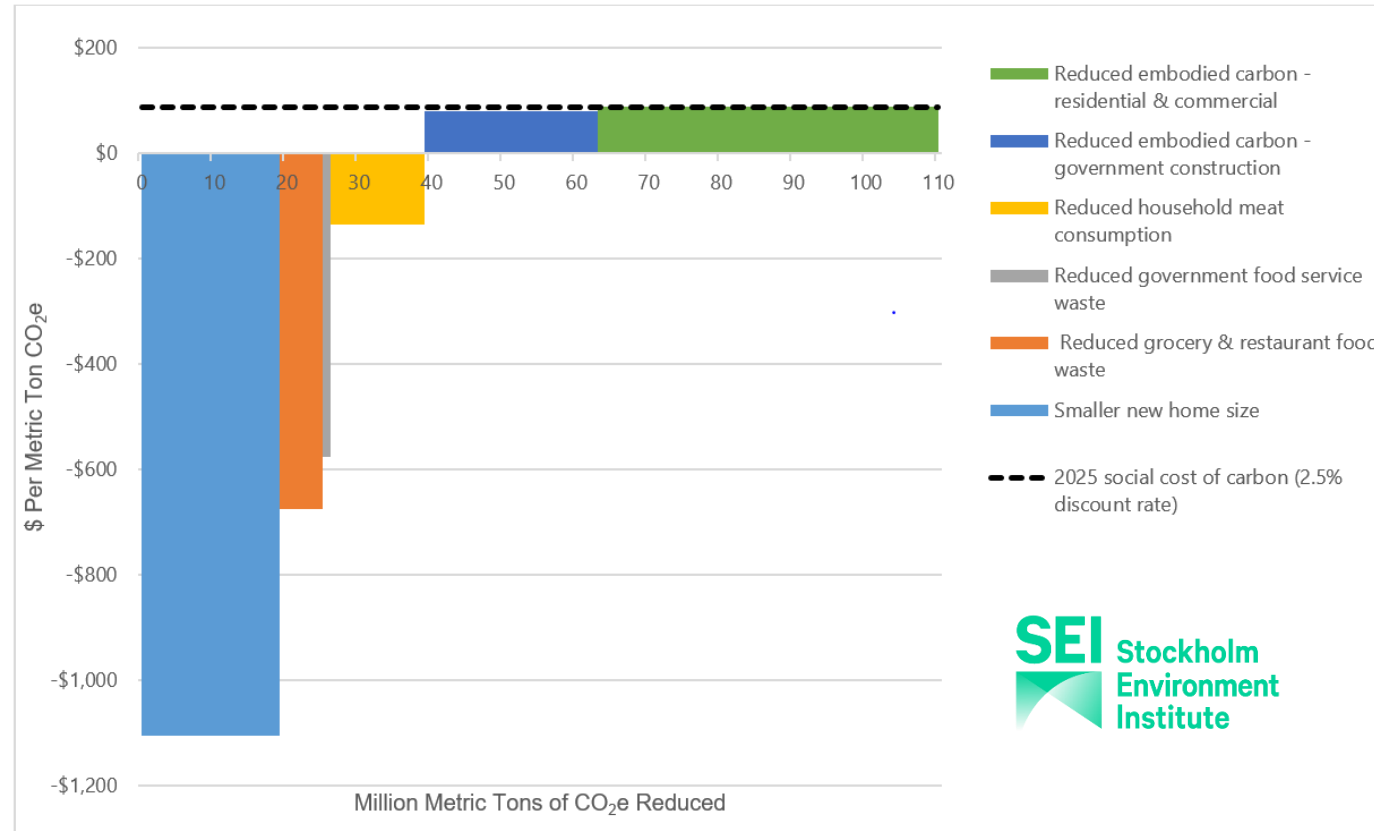


Ingredients of an emissions reduction calculation

- One or more inventories, and helpful supplementary data
- Projections of emissions in two scenarios
 - The BAU or “reference case” scenario
 - A scenario where you accomplish your measure
 - OR, a way to calculate the difference
- Explicit acknowledgment of contributing factors
- Cost estimates (\$)

Cost results can be surprisingly encouraging

Figure 4-3. Abatement costs and 2025 social cost of carbon calculated using a 2.5% social discount rate

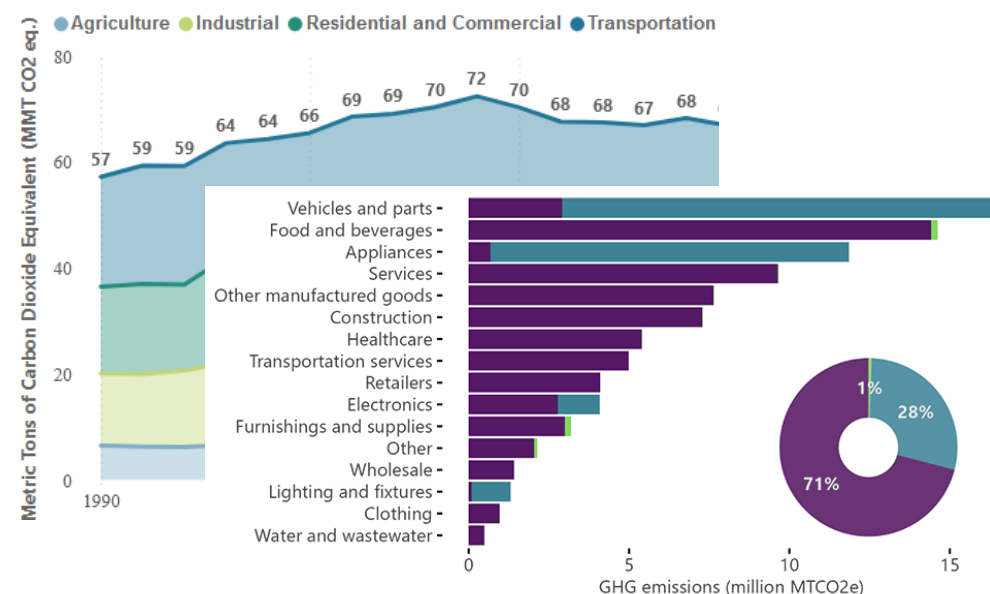


Full details in SEI's technical report at
<http://www.oregon.gov/deq/mm/pages/consumption-based-ghg.aspx>

Start with 1+ inventories (totals, with useful categories)

Full state inventories

Greenhouse Gas Inventory 1990-2021

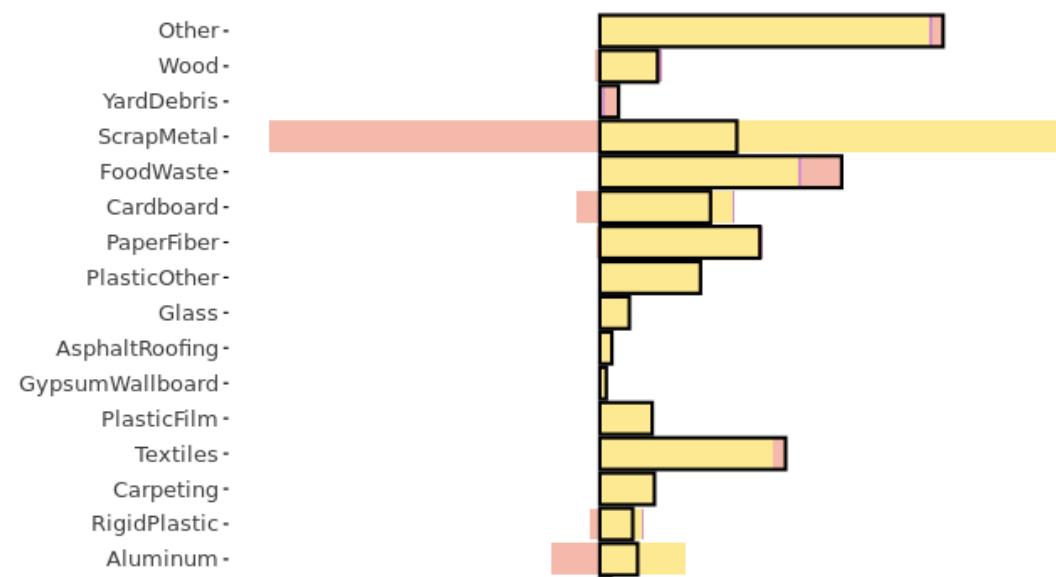


Sources of inventories:

- Your state/MSA territorial inventory
- EPA state inventory tool (territorial)
- USEEIO state models (consumption-based, check for availability)
- Consultants such as EcoDataLab (consumption-based)

"Sub-inventories" and supplemental data

GWP 100 impact (kg CO2 eq.)

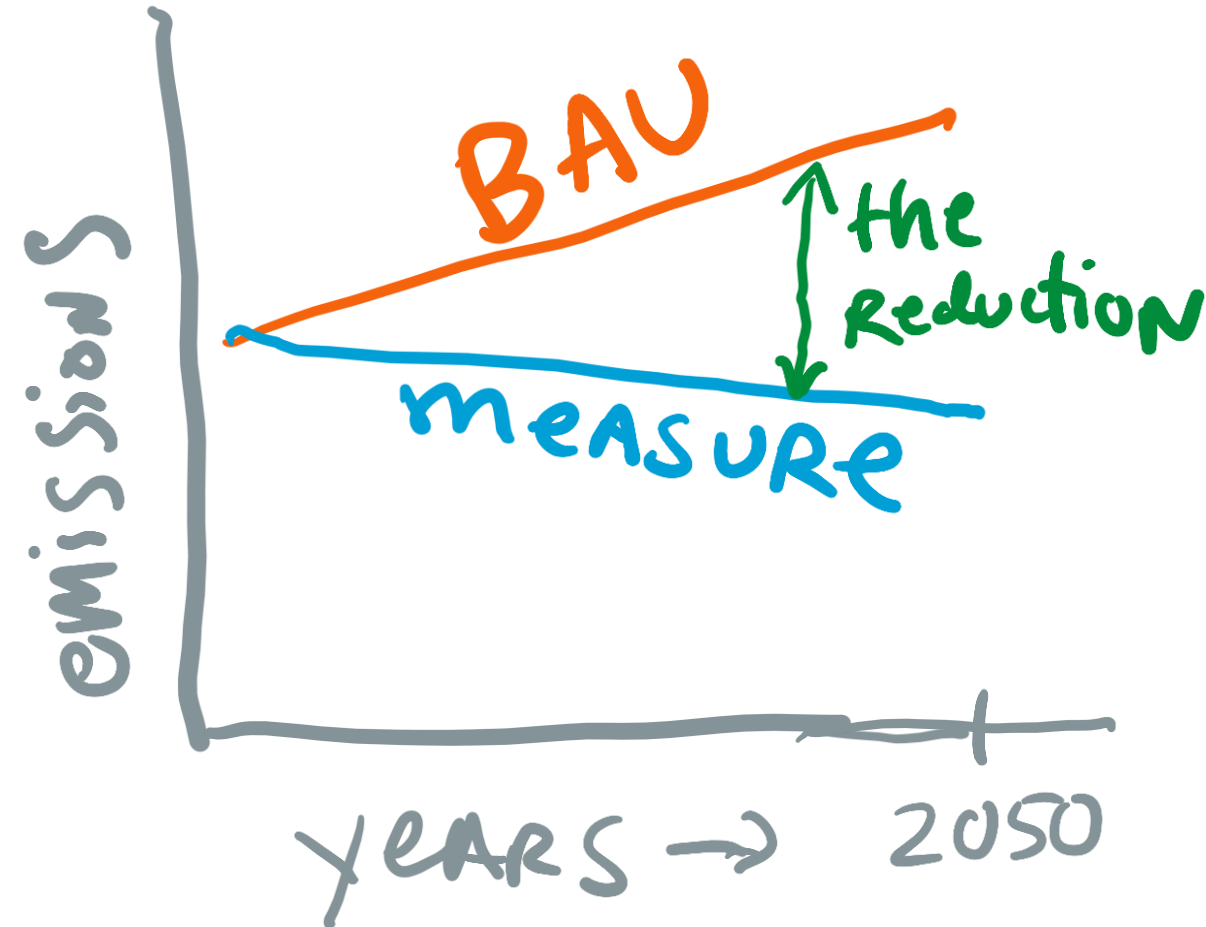


Oregon Waste Impact Calculator:

- Life cycle model of solid waste impacts
- <https://rstudioconnect.deq.state.or.us/content/706a4deb-f353-4d08-826d-85bf7856c154/>

Then, project emissions into the future, and subtract!

It's super simple!



Ok, there may be complications 😊

- Population will be changing in both scenarios
- Remember some tools are set by default to show you the *difference*. That may or may not be what you want.
- Watch out for complications that reduce your reductions.
- Celebrate synergies or side effects that increase your savings

Measure: food waste diversion to composting

Basic action	<ul style="list-style-type: none">• Divert food waste from landfilling and into composting
Relevant inventories and supplemental data	<ul style="list-style-type: none">• State territorial inventory• Life cycle impacts of state solid waste stream, in useful categories including "food"
Tool for measure-related emissions and/or emissions differences	<ul style="list-style-type: none">• Waste Impact Calculator• (WARM would also work)
Notable factors in defining scenarios	<ul style="list-style-type: none">• Population growth;• Transportation distances;• Capacity limits
Comments	<ul style="list-style-type: none">• WIC and WARM are life cycle models; need to convert to yearly impacts



Measure: food waste prevention*

Basic action	<ul style="list-style-type: none"> Prevent food waste from being generated in the first place
Relevant inventories and supplemental data	<ul style="list-style-type: none"> State consumption-based inventory Life cycle impacts of state solid waste stream, in useful categories including "food"
Tool for measure-related emissions and/or emissions differences	<ul style="list-style-type: none"> Waste Impact Calculator WARM could also work A simple consumption approach could <i>also</i> work, see below
Notable factors in defining scenarios	<ul style="list-style-type: none"> Population growth; Realistic expectations
Comments	<ul style="list-style-type: none"> WIC and WARM are life cycle models; need to convert to yearly impacts A consumption approach: combine spending on food with USEEIO supply chain GHG factors, available in Excel, see https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=349324&Lab=CESER



** This particular calculation performed by DEQ, but not used in any publication*

Measure: smaller & retrofit housing (embodied carbon)

Basic action	<ul style="list-style-type: none">• Subsidize the creation of more materially efficient housing, replacing conventional suburban SFR development
Relevant inventories and supplemental data	<ul style="list-style-type: none">• State consumption-based inventory
Tool for measure-related emissions and/or emissions differences	<ul style="list-style-type: none">• ARUP embodied carbon tool (available from StopWaste)
Notable factors in defining scenarios	<ul style="list-style-type: none">• Square footage;• Housing forms;• Anticipated material efficiencies
Comments	<ul style="list-style-type: none">• There are many calculators for individual buildings, but the ARUP tool describes whole development patterns. Study the tool carefully as it is evolving.

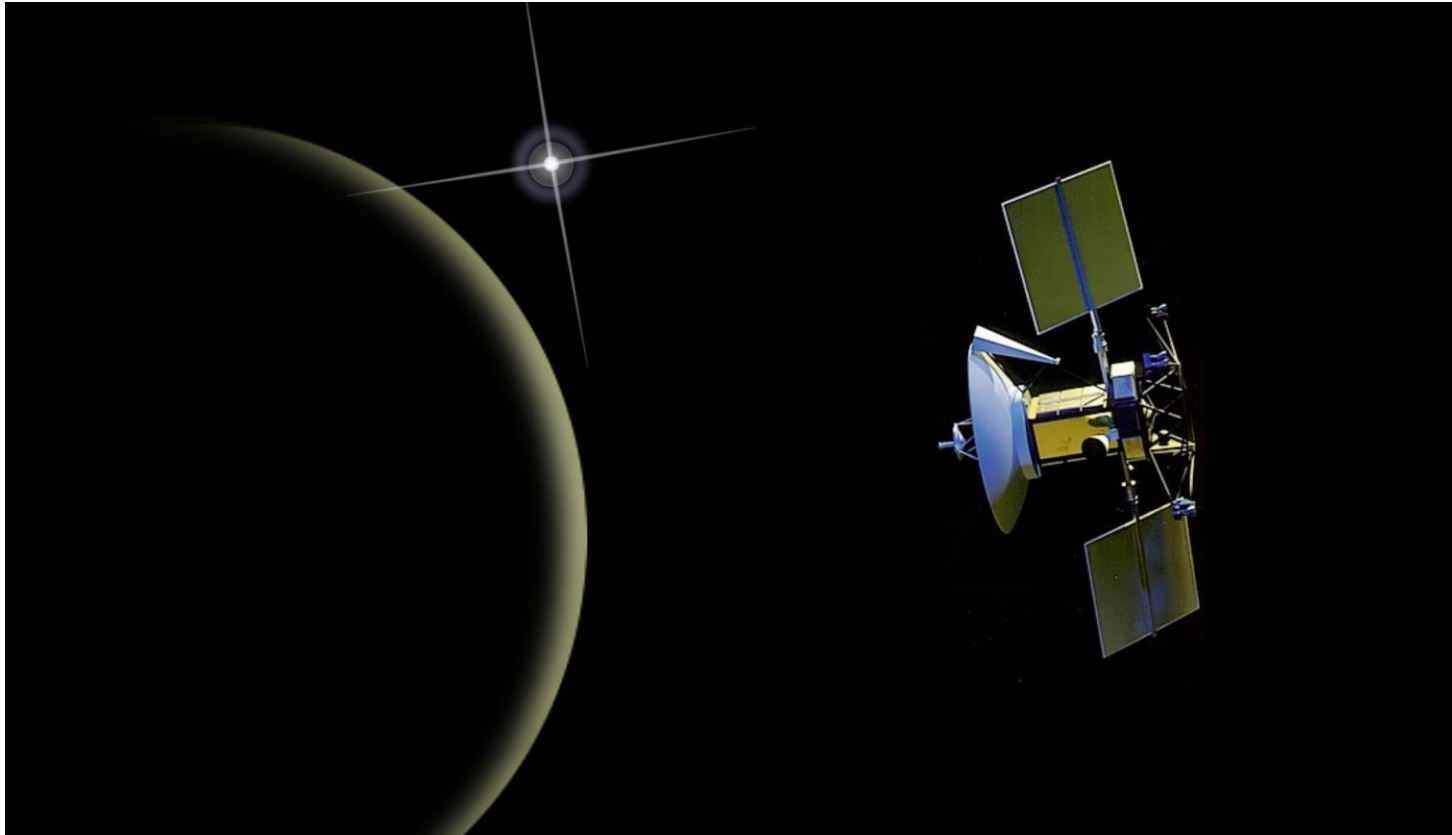


Measure: smart growth

Basic action	<ul style="list-style-type: none">• Model the provision of new housing and civic services in more compact and walkable communities
Relevant inventories and supplemental data	<ul style="list-style-type: none">• State consumption-based inventory• Emissions intensities (emissions/\$) from state consumption-based inventory• Statistical studies of CBE and transport in communities
Tool for measure-related emissions	<ul style="list-style-type: none">• Consultant's custom projection of statewide all-sector consumption-based emissions under reference and treatment cases
Notable factors in defining scenarios	<ul style="list-style-type: none">• Economic growth projections• VMT reductions• Infrastructure expenses
Comments	<ul style="list-style-type: none">• Though complex to model, this measure can create sizable emissions reductions because it influences many sources of emissions at once: transport, housing, infrastructure, and domestic purchases.



To sum up, these calculations can take you a long way



Thank you!

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Questions & Answers



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