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Oregon DEQ Climate/Materials Research Projects - Update

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Oregon Department of Environmental Quality

December 1, 2009



Three Projects

- Drinking water delivery LCA
- LCA of waste prevention in green building
- Consumption-based emissions inventory



DEQ's Life Cycle Analysis of Water Delivery

- 3 basic systems:





DEQ's Life Cycle Analysis of Water Delivery: Why We Did It

- Generate information that consumers and producers can use to reduce environmental impacts.
- Explicitly compare prevention, recycling, and disposal.

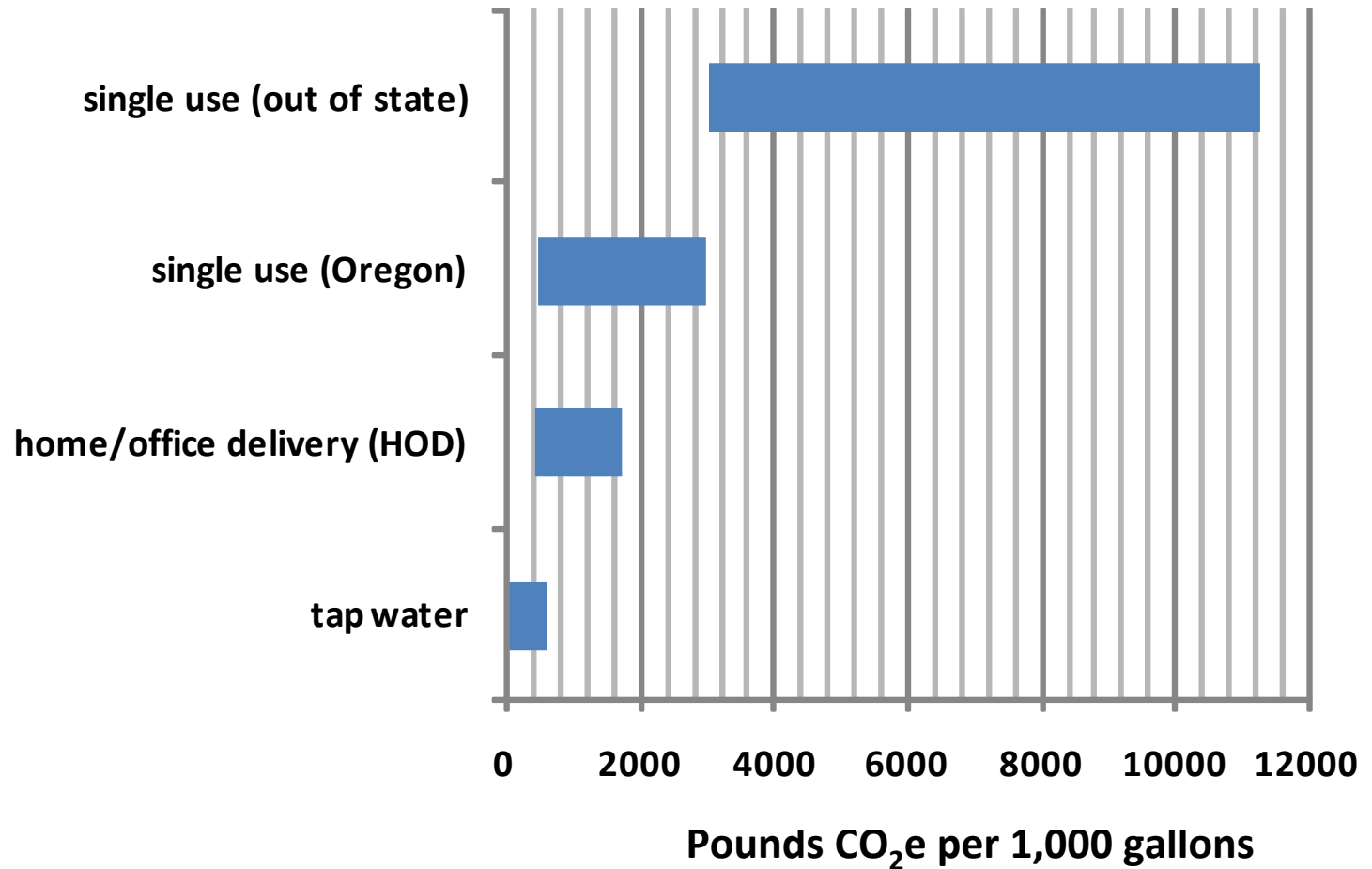


DEQ's Life Cycle Analysis of Water Delivery: What It Is

- A full, ISO-compliant life cycle inventory and impact assessment of 48 different methods of delivering drinking water.
 - Multiple impact categories; today we'll focus on GHGs
- Published November, 2009
- Available at <http://www.deq.state.or.us/lq/sw/wasteprevention/drinkingwater.htm>

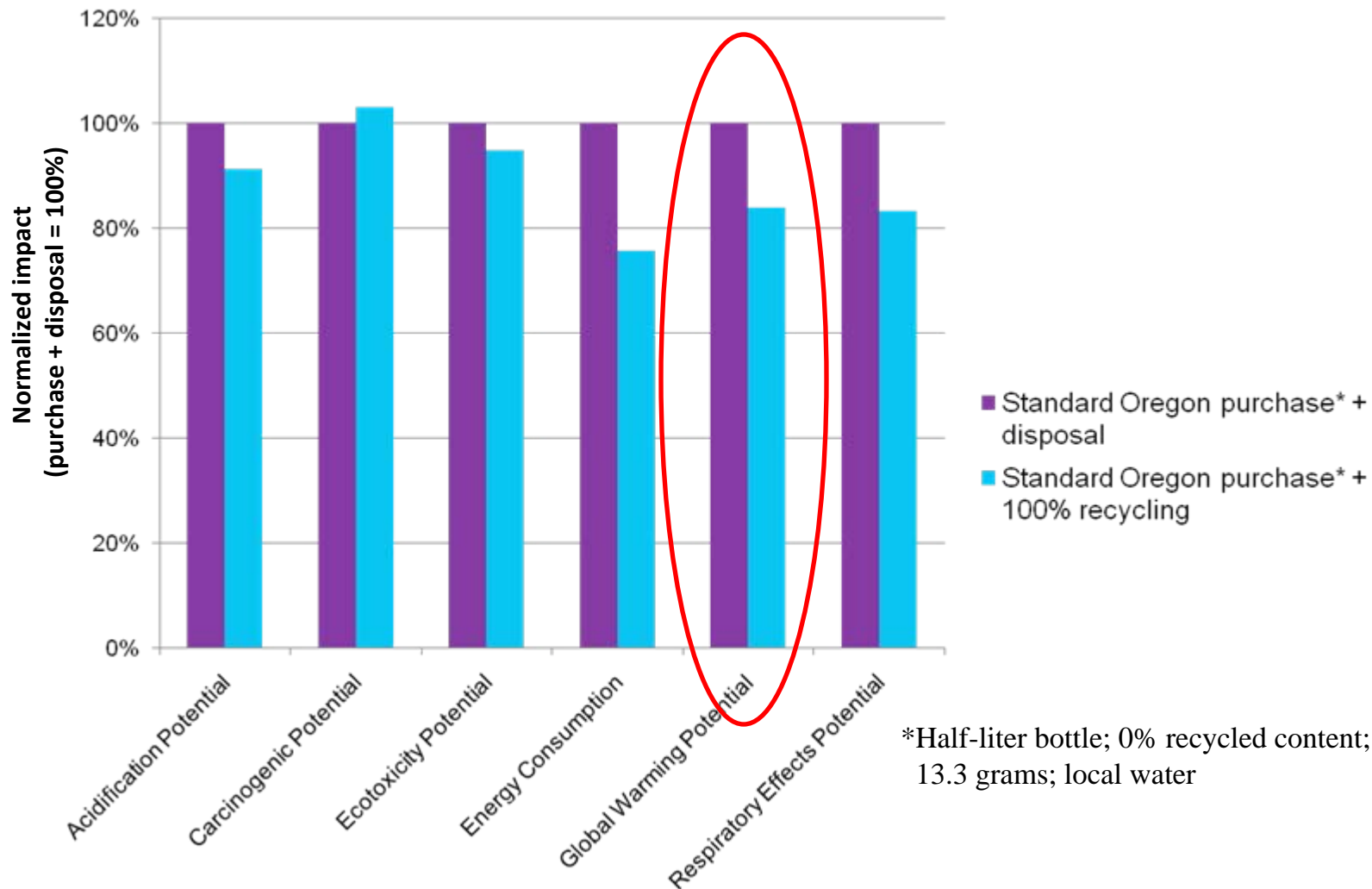


Life Cycle Global Warming Potential



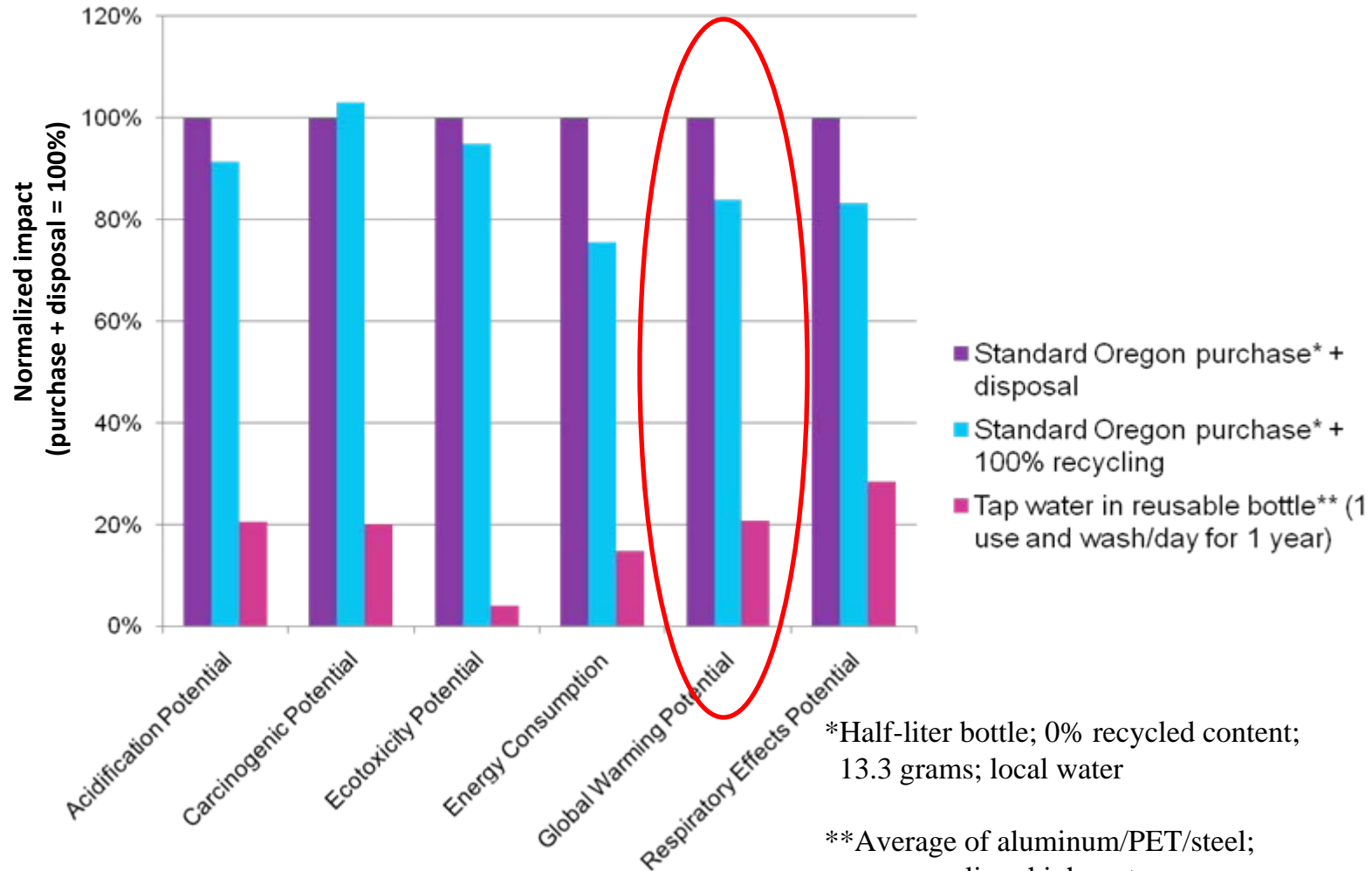


Disposal vs. Recycling





Disposal vs. Recycling vs. Prevention

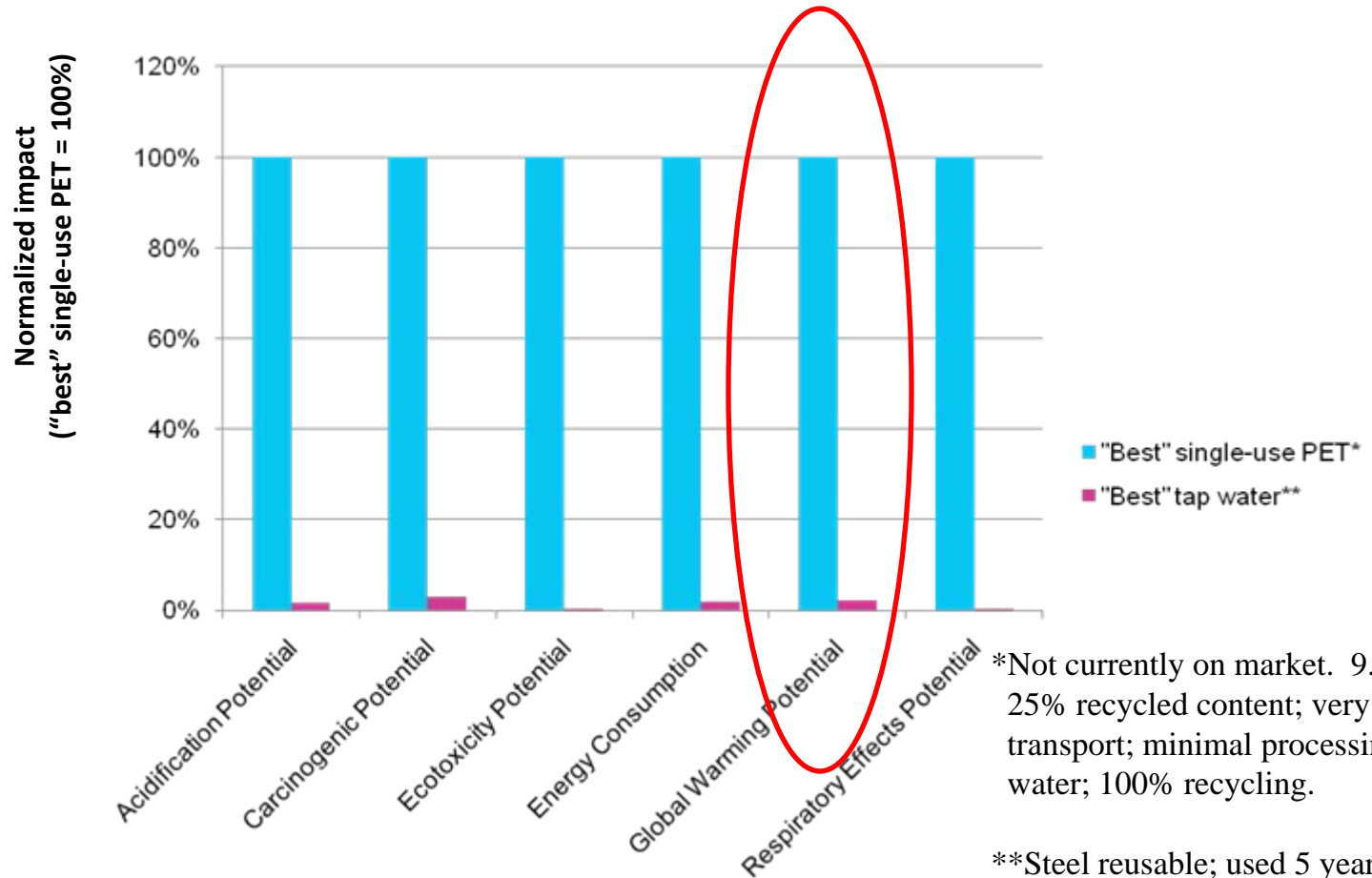


*Half-liter bottle; 0% recycled content; 13.3 grams; local water

**Average of aluminum/PET/steel; no recycling; high-water use dishwasher



Best Case Recycling vs. Best Case Prevention

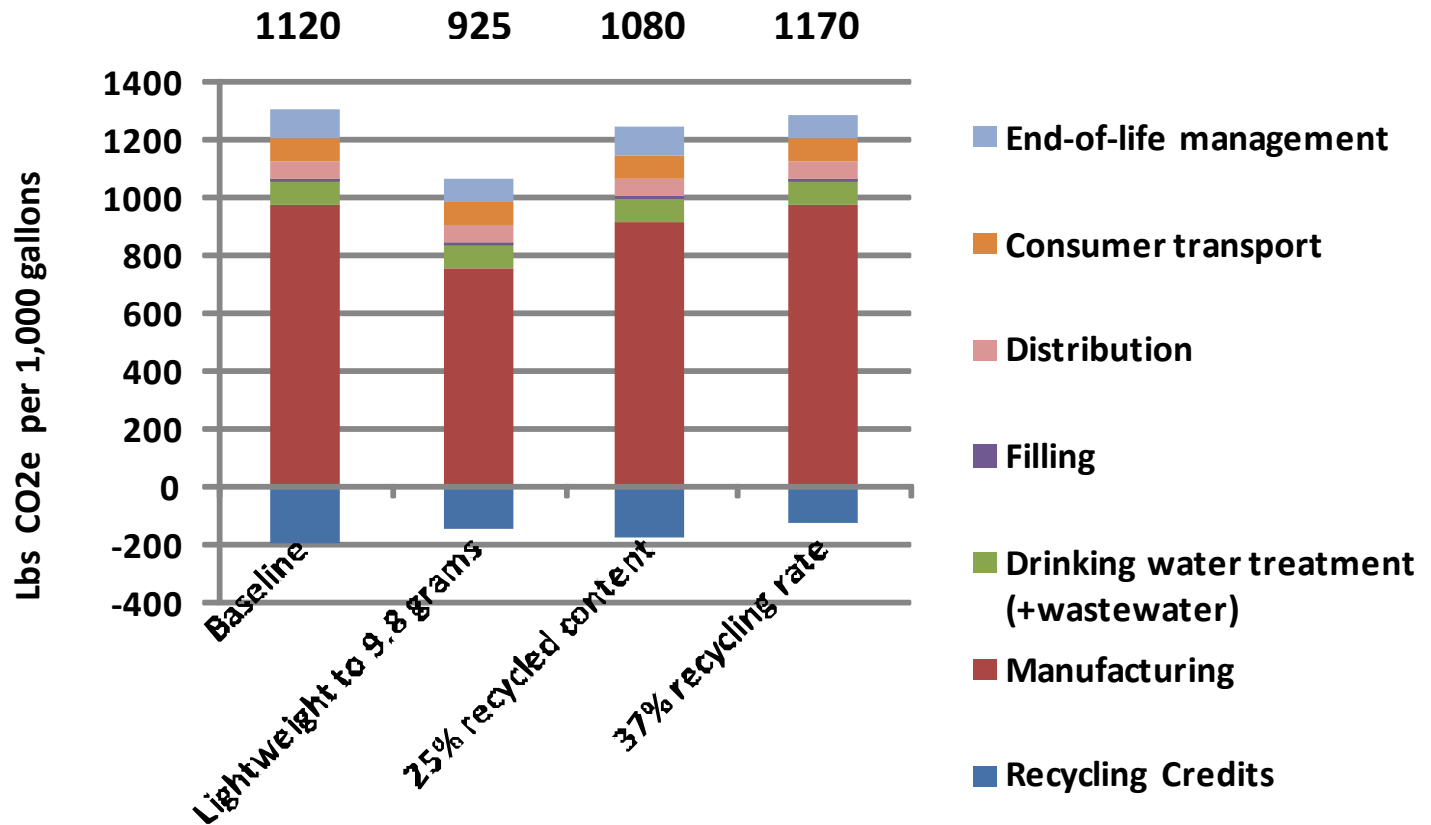


*Not currently on market. 9.8 grams; 25% recycled content; very short transport; minimal processing of water; 100% recycling.

**Steel reusable; used 5 years; used 2 times/day; washed weekly in efficient, full dishwasher; 100% recycling



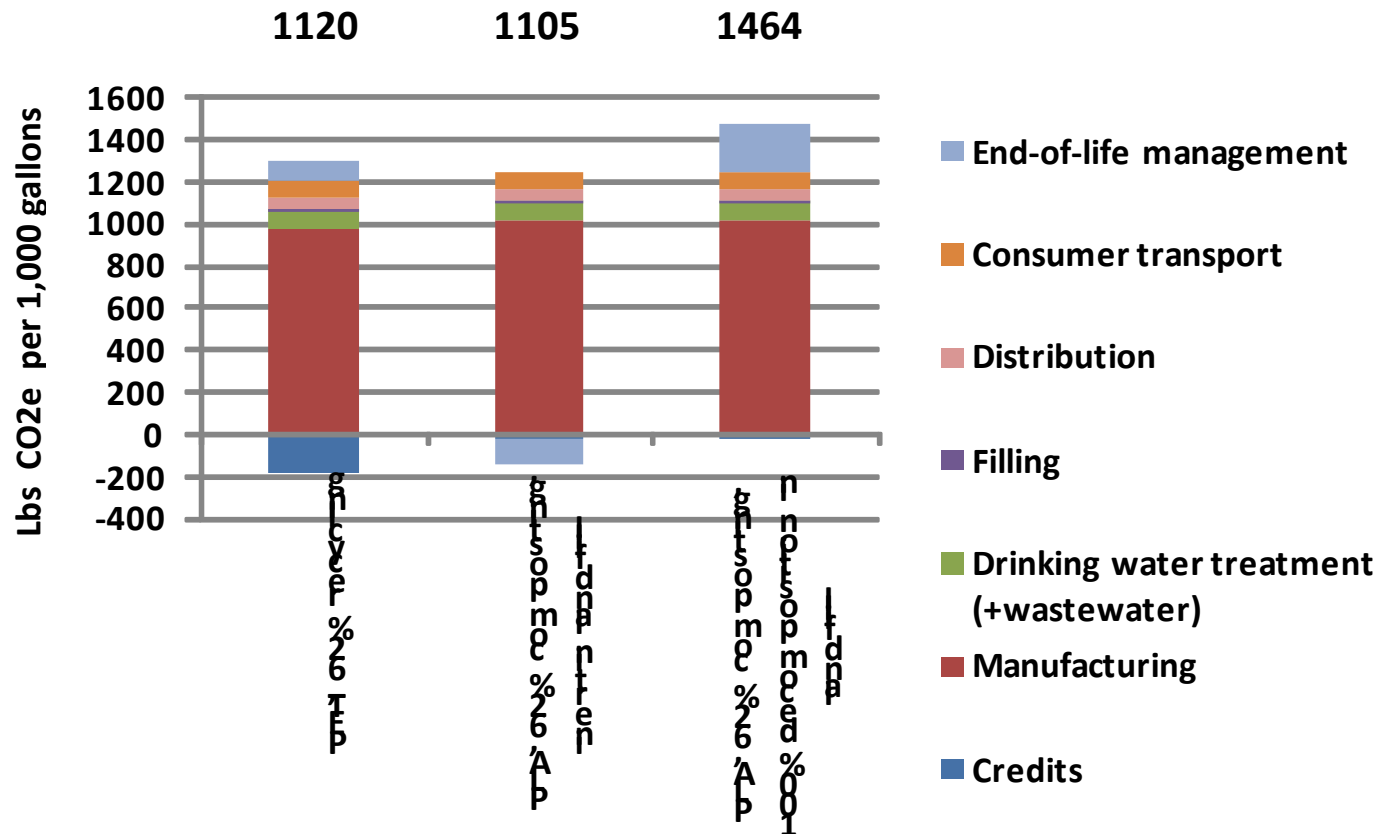
Sample Contribution Analysis (GHGs): Single-Use Bottles



“Baseline” = PET, half-liter, 13.3 g, 0% recycled content, on-site molding, purified municipal water (reverse osmosis, ozone and uv), 50 miles to retail, 5 miles home-to-retail, co-purchase w/24 other products, no chilling, 62% recycling.



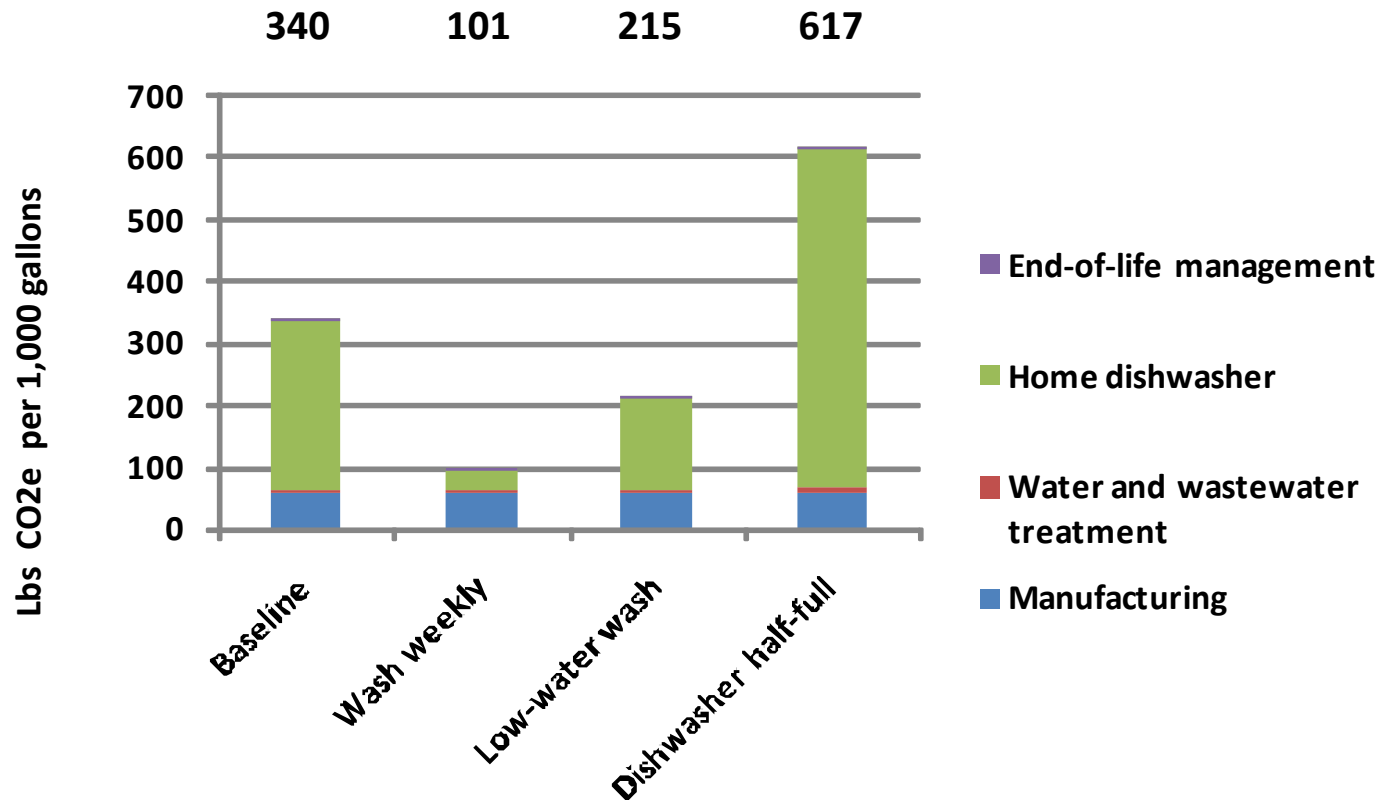
Contribution Analysis (GHGs): Single-Use Bottles



Assumes no cross-contamination between PET and PLA



Sample Contribution Analysis (GHGs): Tap Water



Baseline = aluminum 20 oz reusable bottle; use for 1 year, then landfill;
1 filling per day; 1 wash per day; high water use dishwasher run when full;
no chilling

Oregon DEQ: Climate/Materials Research





Residential Buildings:

**an evaluation of waste prevention practices using
lifecycle analysis**



Presented for:
West Coast Climate Forum

Jordan Palmeri, Oregon DEQ
December 1st, 2009



Residential Waste Prevention Practices





Practices Evaluated

- Intermediate Framing
- Advanced Floor Framing
- Advanced Framing (w/ drywall clips)
- Smaller Homes
- Insulating Concrete Forms
- Structural Insulated Panels
- Strawbale w/ timber frame
- Adaptability: Design for Disassembly
- Adaptability: Utility Chase
- Dematerializing and Design for Simplicity
- Design using Salvaged Materials
- Adaptability: Reduced Remodeling
- Design using Salvaged Materials
- Homeowner Maintenance Training
- Restoration
- Multifamily Housing
- Thermal Curtains
- Reusable Packaging
- Reduced Packaging
- Single-story Homes
- Detailed Framing Cut List
- Offsite Prefabricated Components
- Flashing and Rainscreening
- Deconstruction
- Durable roofing, siding and flooring



Standard Home

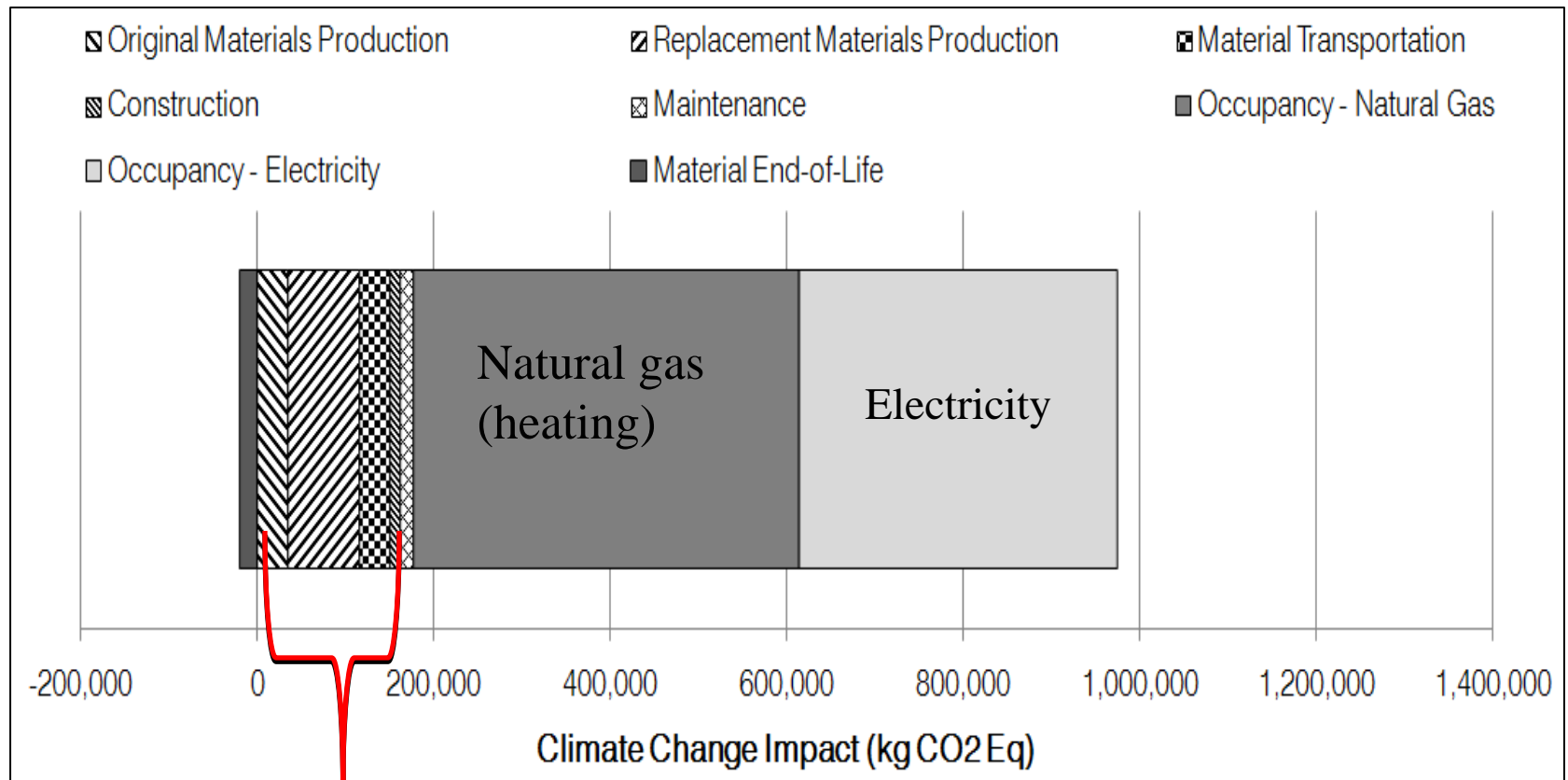
- 2262 sq.ft
- 3 br
- 2 baths
- 2 car garage
- Stem wall foundation
- Post and Beam floor system
- 16inch stud spacing
- Vinyl windows
- Asphalt roof
- Gas furnace, no A/C
- Designed to 2008 Oregon energy code
- Energy use modeled for Portland, OR climate



*****Lifetime = 70 years*****



Climate change impacts for the Standard Home by lifecycle stage

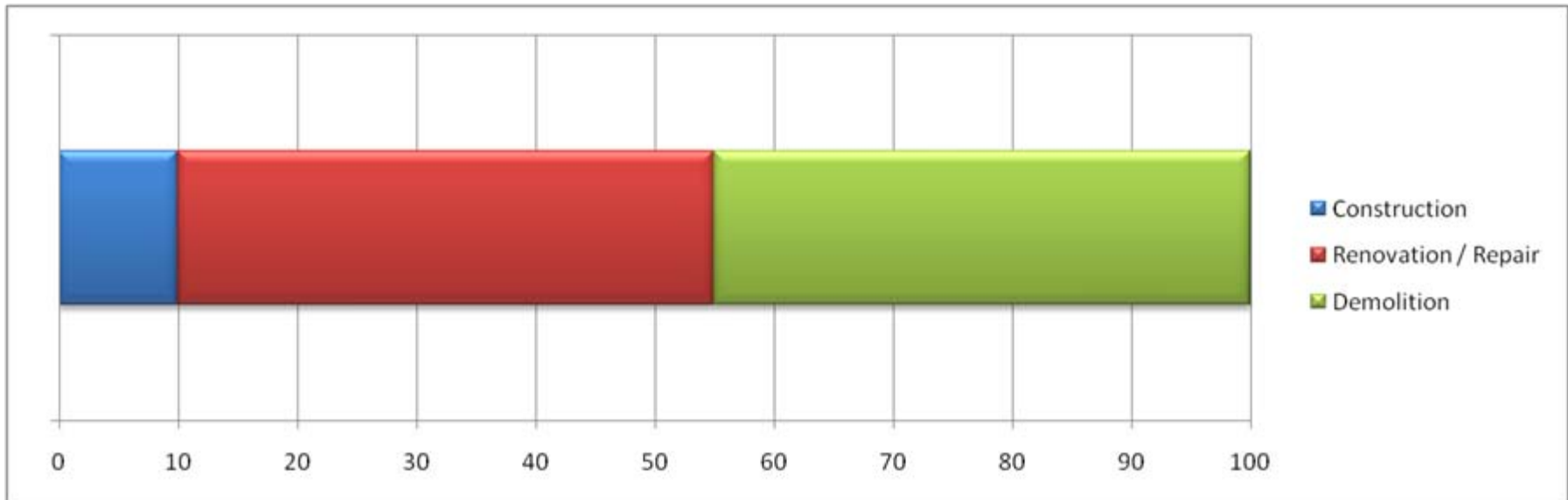


Material Production
and Transport

*** 70 year lifetime ***



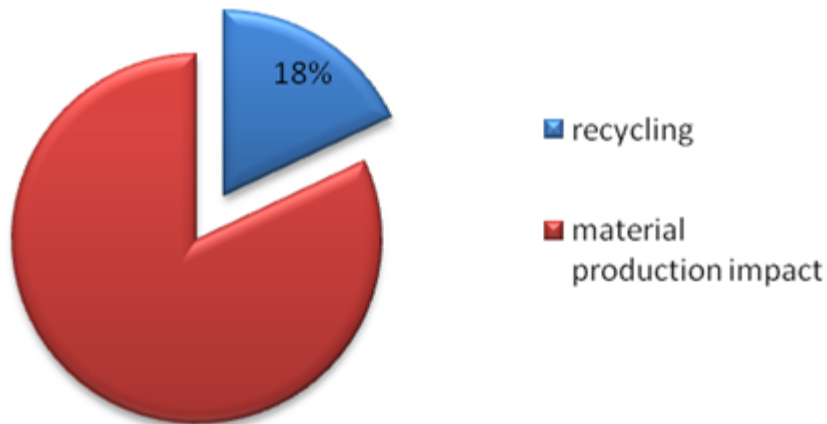
Waste Generated (tons) by lifecycle stage over 70 years



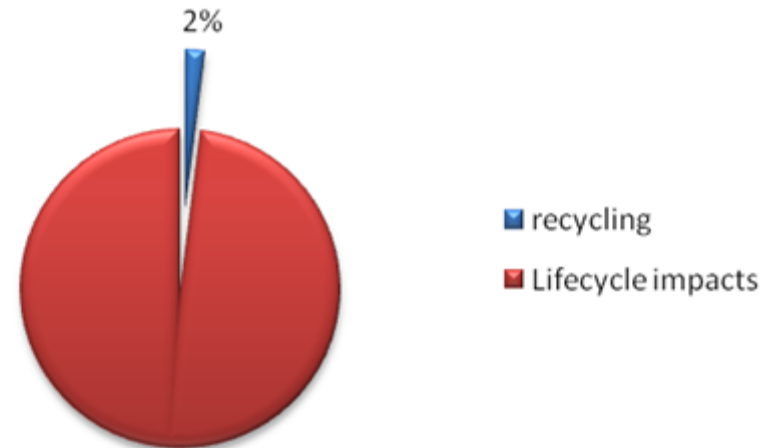


Benefits of Statewide C&D Recycling efforts in Oregon

Material Production GHG benefits of recycling

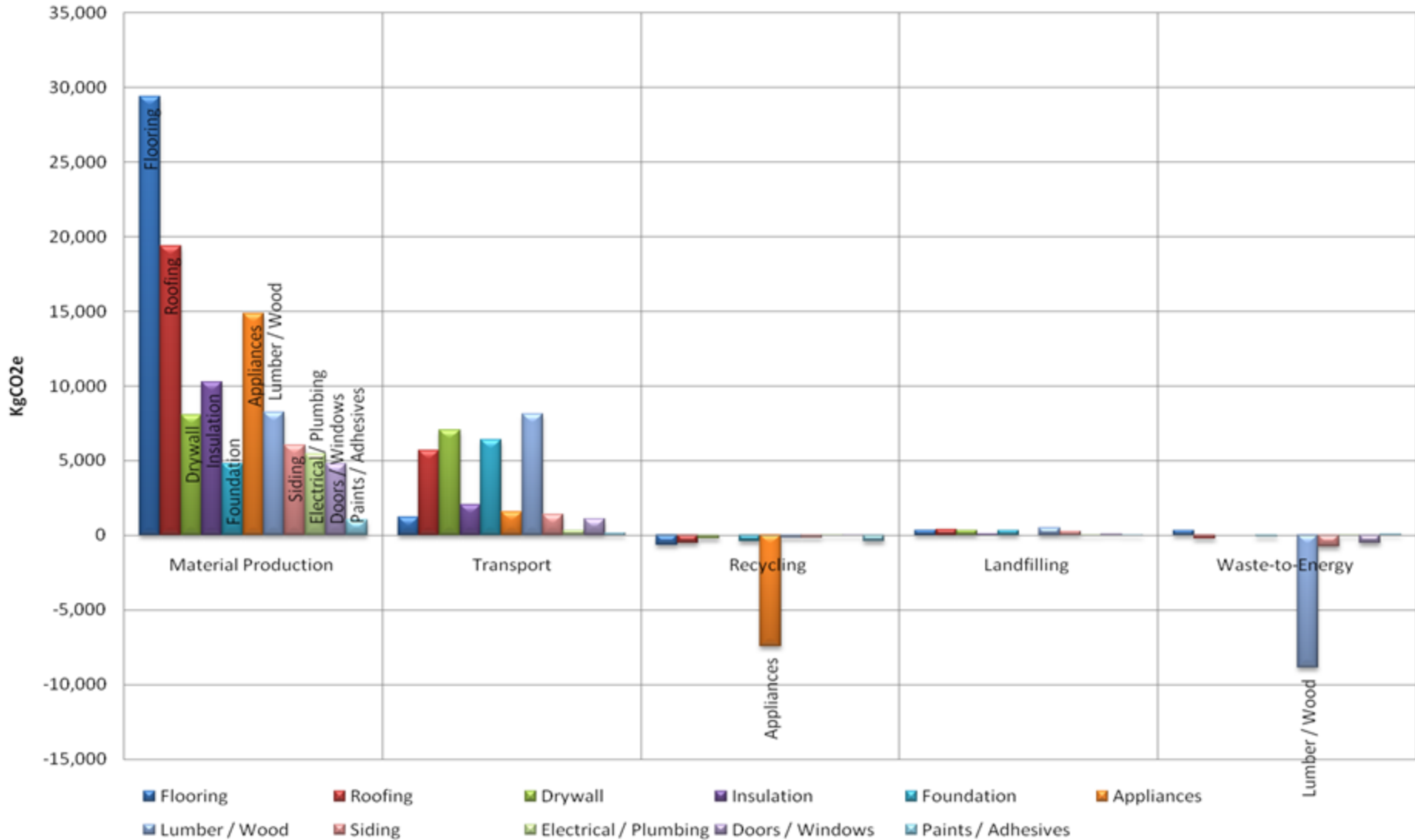


Lifecycle GHG benefits of recycling



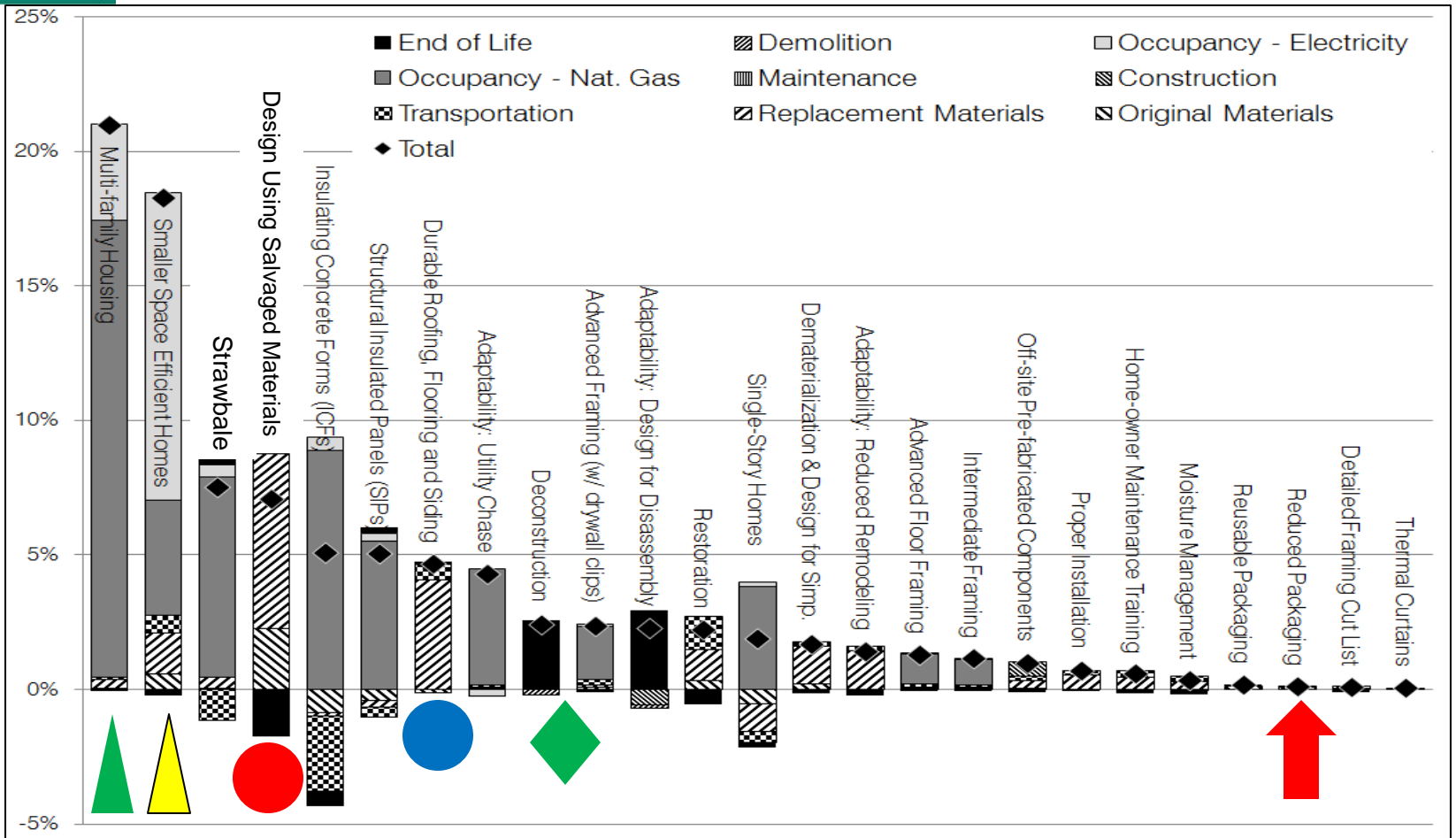
Oregon DEQ: Climate/Materials Research

Climate Change Impacts for Materials by Lifecycle Stage



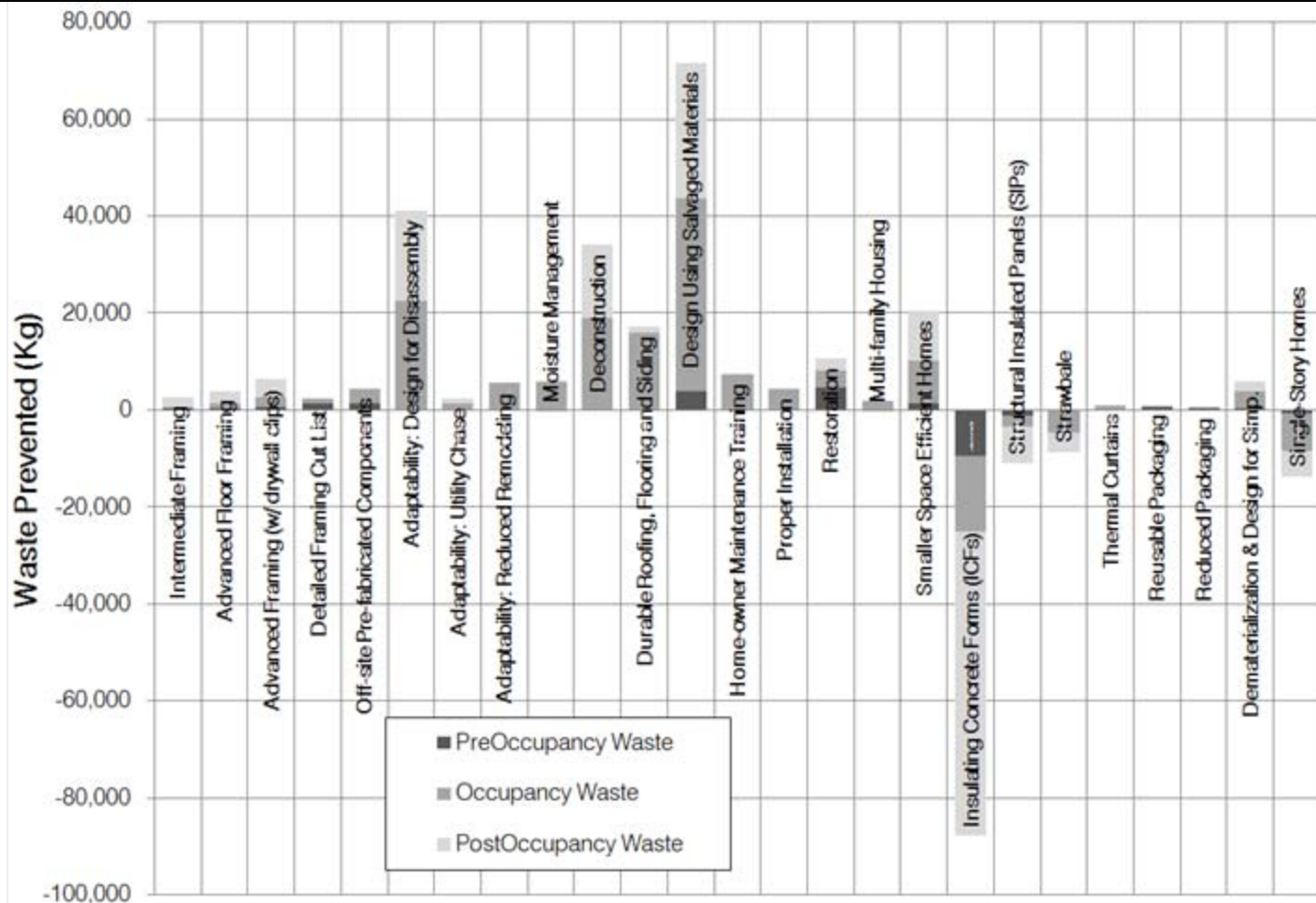


Climate Change Benefits of all Waste Prevention Practices (compared to the standard home)





Waste Prevented for all Practices





Phase 2 Research Categories

- Small and Multifamily Housing
 - 1200sqft home and apartment
 - 1600sqft home
 - 2200sqft home
 - 3500sqft home
- Durable Materials
 - Roofing and flooring
- Wall Framing
 - Staggered stud
 - Double Stud
- Salvage and Reuse
 - Transport distances
 - Best materials to salvage
- Benchmarking
 - Higher recycling rates
 - Transportation of occupants
 - Super insulated home
- DEQ supplemental research





Thank You!

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Oregon DEQ

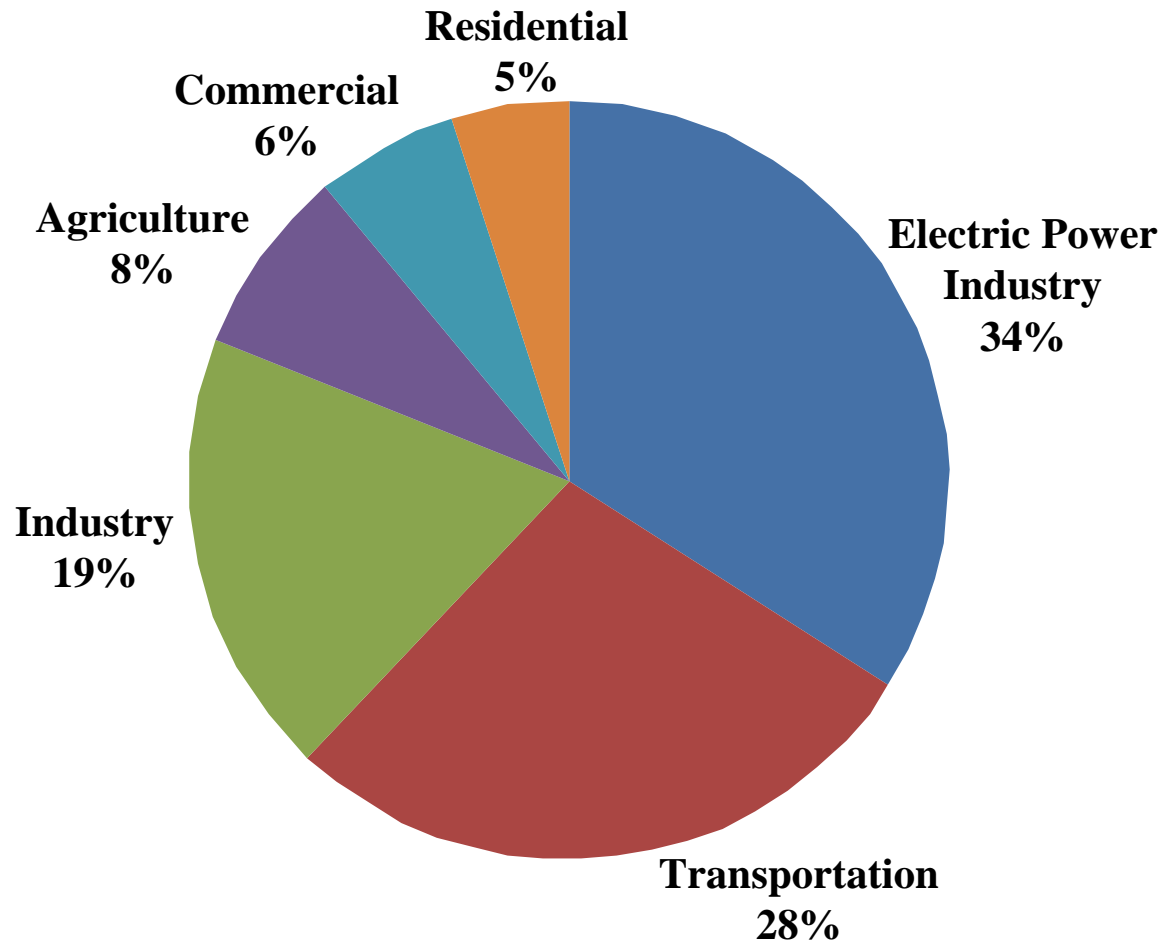
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<http://www.deq.state.or.us/lq/sw/wasteprevention/greenbuilding.htm>

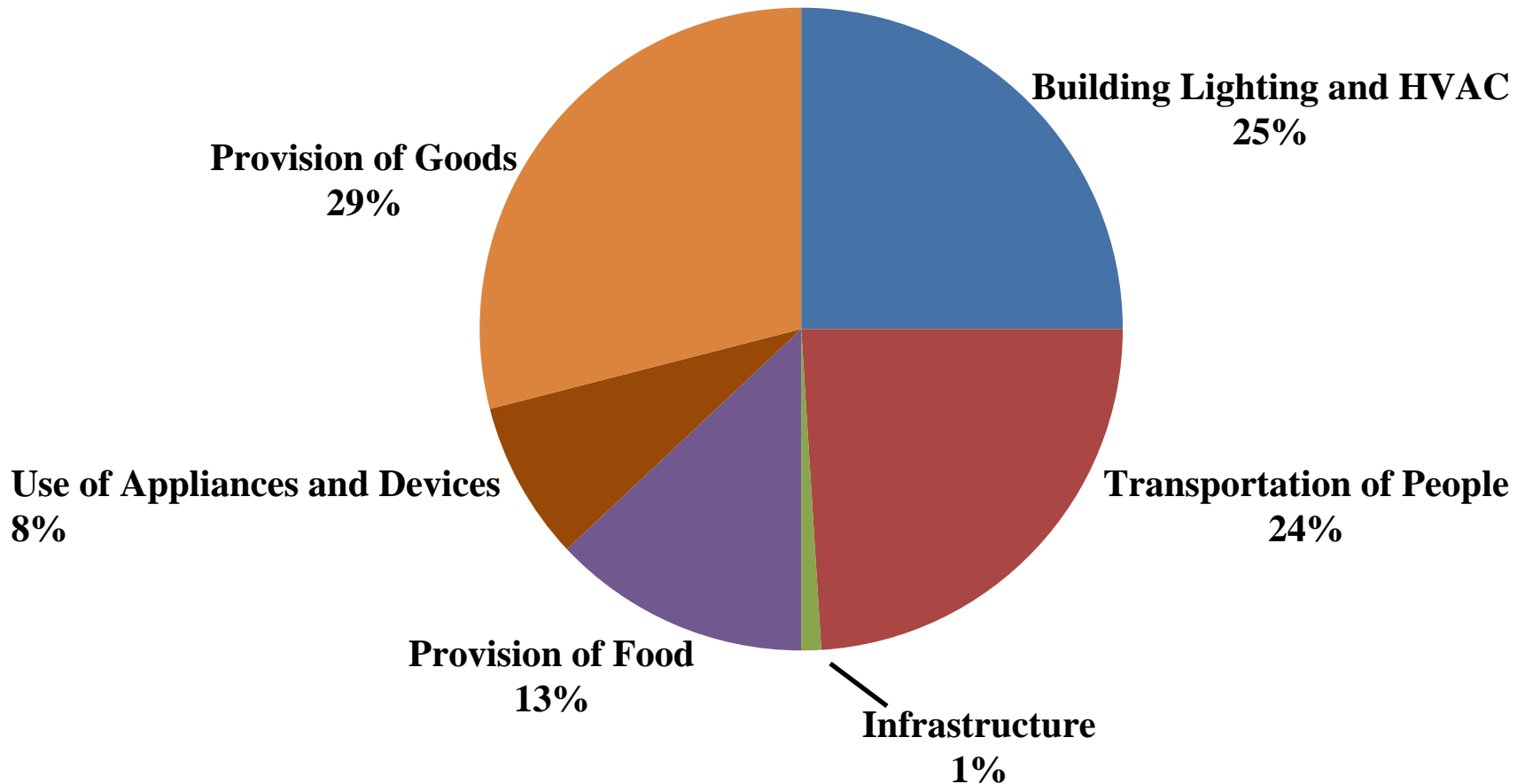


Traditional Sector-Based Geographic Emissions Inventory (“The Bubble”)



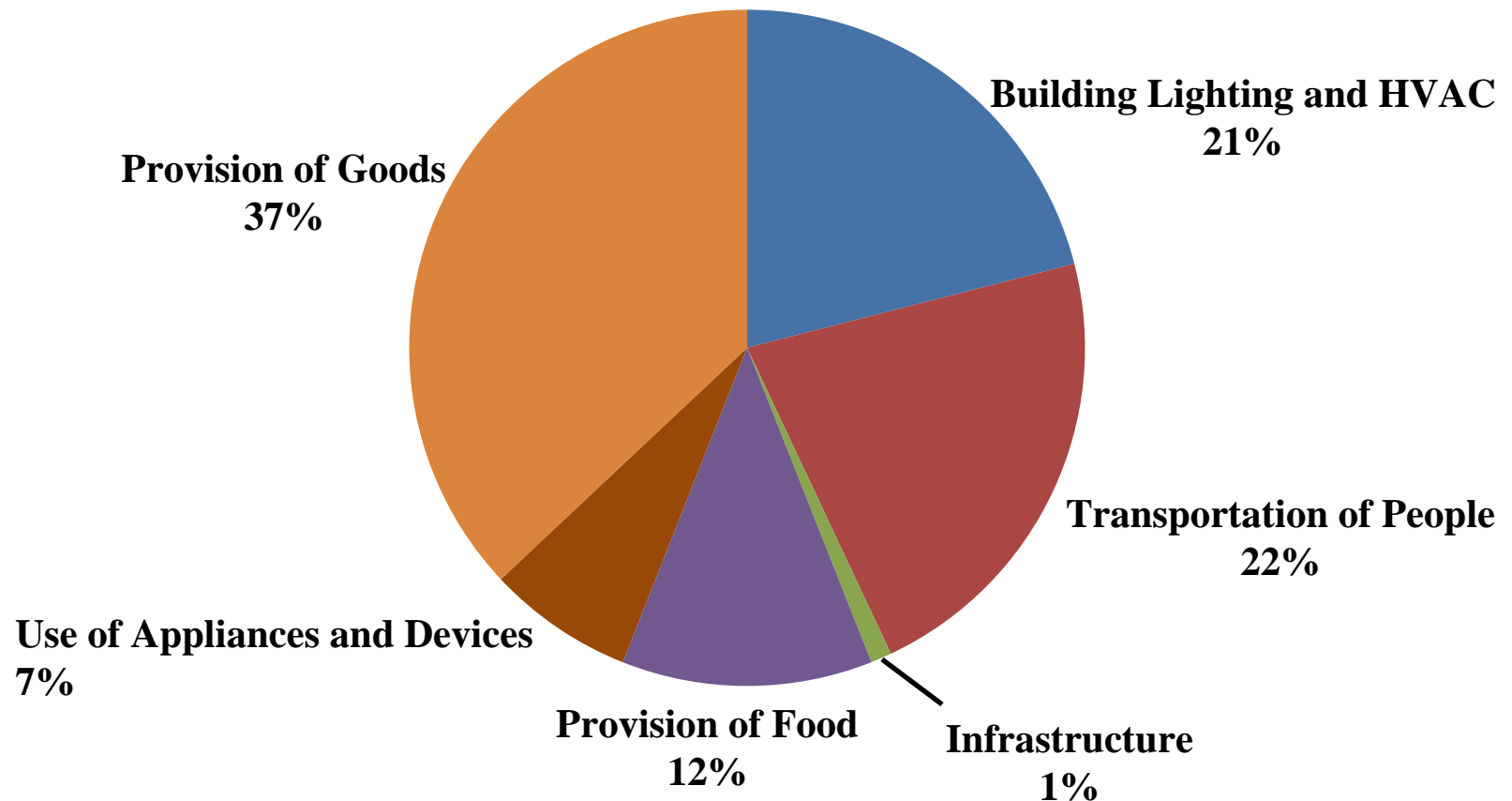


Systems-Based Geographic Emissions Inventory (still “The Bubble”)





Systems-Based Emissions Inventory, Geographic Emissions *Adjusted for Imports and Exports* (2006)



Source: Joshua Stolaroff/Product Policy Institute (2009), based on EPA (2009) and Weber & Matthews (2007)



“Pure” Consumption Based Emissions Inventory

- Economists’ definition of “consumption” (final demand)
 - Households
 - Governments
 - Investment expenditures
 - Not other B2B
- Full life cycle and supply chain emissions

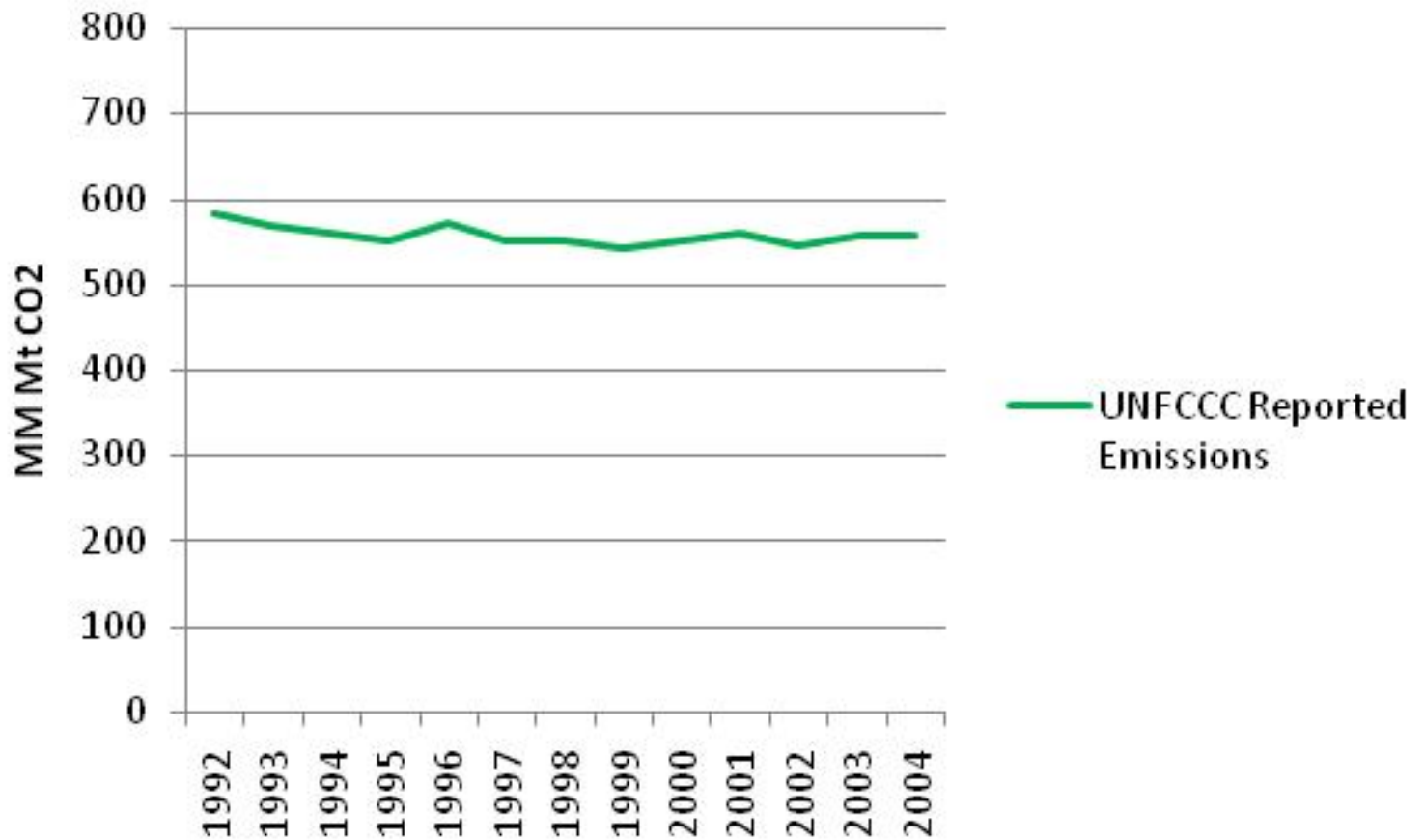


Oregon Consumption Based Emissions Inventory: Desired Outcomes

- More complete picture of how Oregon contributes to greenhouse gas emissions
 - Integrate traditional and consumption-based emissions inventories
- Provide information that can be used to identify and evaluate actions to reduce emissions, i.e.:
 - Reduce emissions intensity of production (make lower carbon stuff)
 - Reduce emissions intensity of consumption (buy lower carbon stuff)
- Minimize rebound effects, leakage

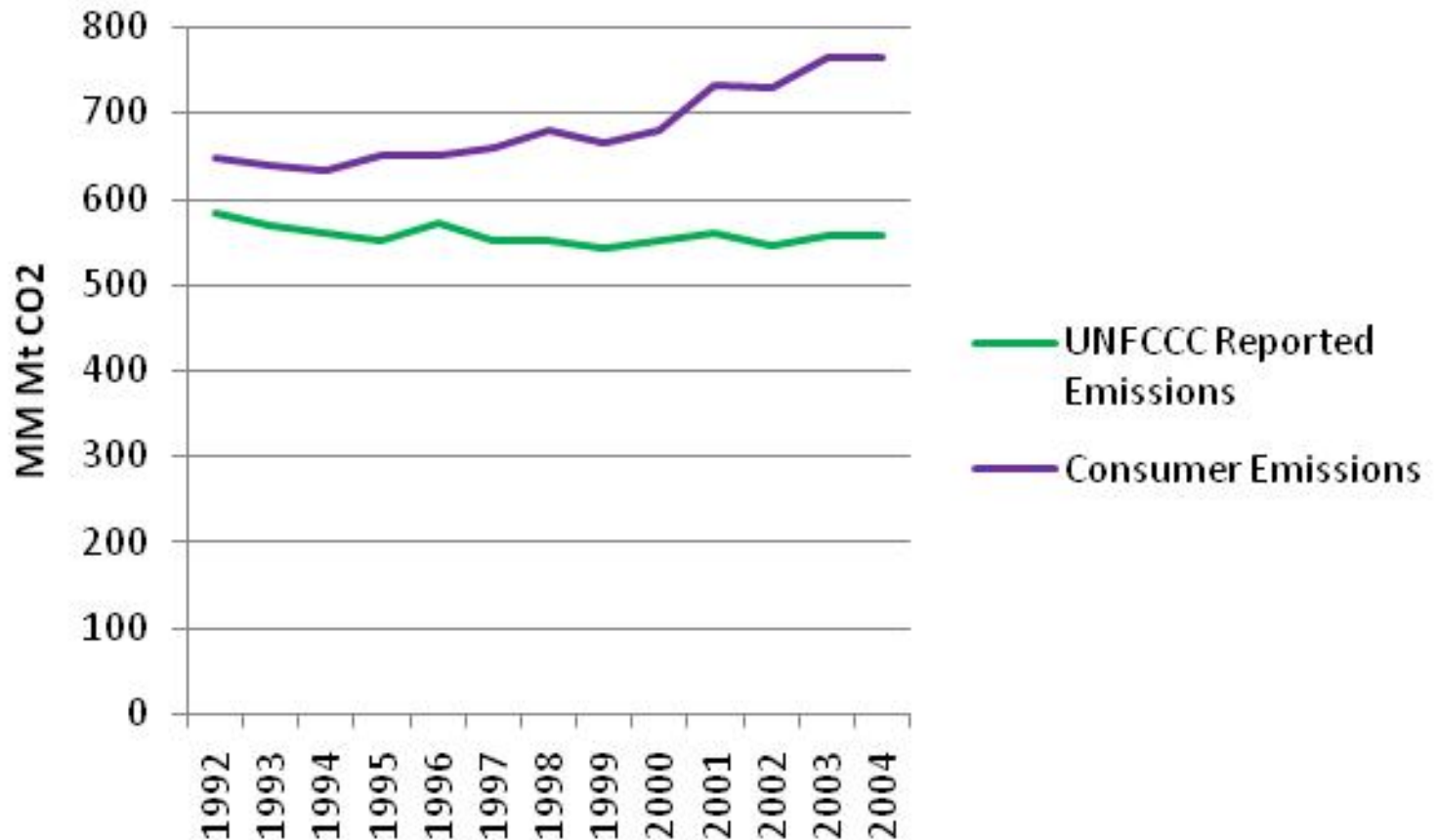


An Example of Leakage: United Kingdom Greenhouse Gas Emissions





United Kingdom Greenhouse Gas Emissions – A More Complete Picture





Oregon Consumption Based Emissions Inventory: Key Questions

- How do materials in Oregon contribute to GHG emissions?
 - Using a production-based frame of reference
 - Using a consumption-based frame of reference.
- Which materials contribute the most?
 - On an absolute basis.
 - Per dollar spent.
 - By life-cycle stage.
- Can we estimate where these emissions occur?



Oregon Consumption Based Emissions Inventory: Key Questions (continued)

- How do consumption-related emissions compare against the conventional inventory?
 - How do different categories of consumption compare?
- How do materials-related emissions intensities compare?
 - In-state production.
 - Other US production.
 - Foreign production.
- Can our model be readily replicated and extended (to other years)?



Oregon Consumption Based Emissions Inventory: Current Status

- Contractor hired (Stockholm Environment Institute – U.S. Center)
- Research and modeling partially completed
 - First version of model prepared, reviewed, revised
- Revised model/draft reports currently under review by DEQ
- Hope to share preliminary information with stakeholders early in 2010



Thank You!

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