

ACCO Climate Change Leadership Series



Life Cycle Assessment: A Powerful Tool for Environmental Decision Making

Prepared for the ACCO Climate Change Leadership
Series

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Life Cycle Assessment (LCA)

A technique for analyzing the environmental
performance over the entire life cycle of a
product or service.

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Three Examples (DEQ studies)

- E-commerce packaging
- Water delivery
- Waste prevention in residential housing

Plus a sneak peek at a new application of LCA:
consumption-based GHG inventories


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E-Commerce packaging



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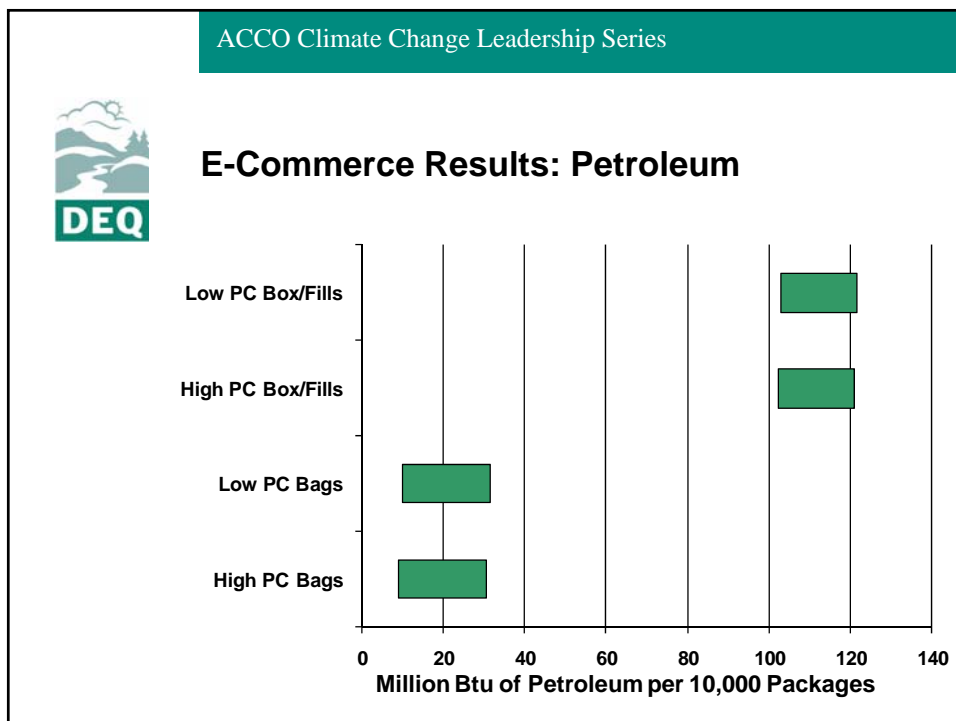


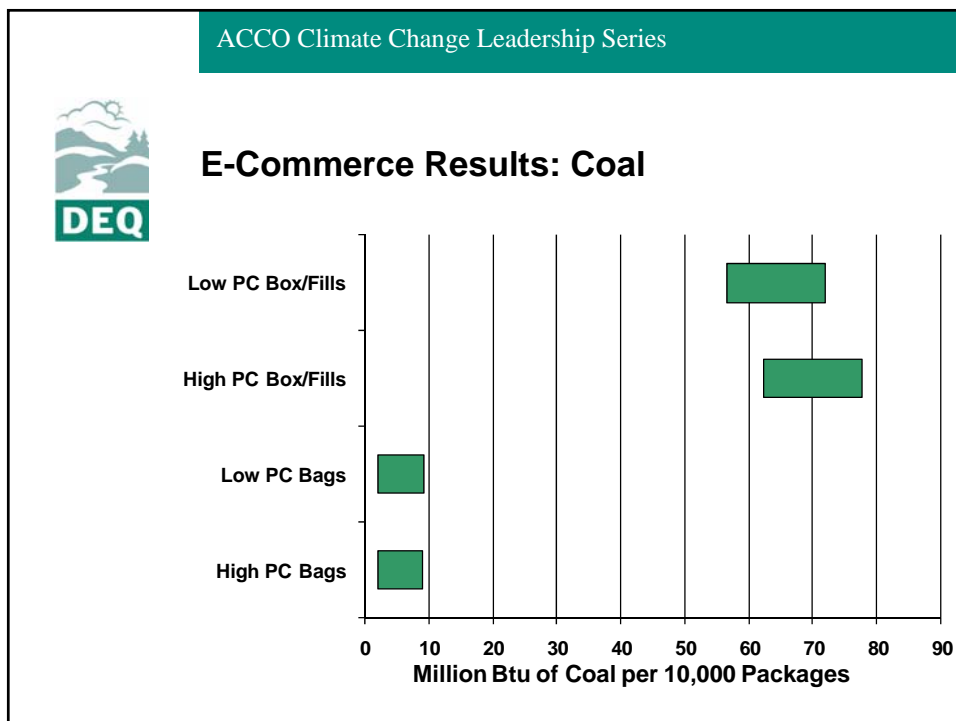
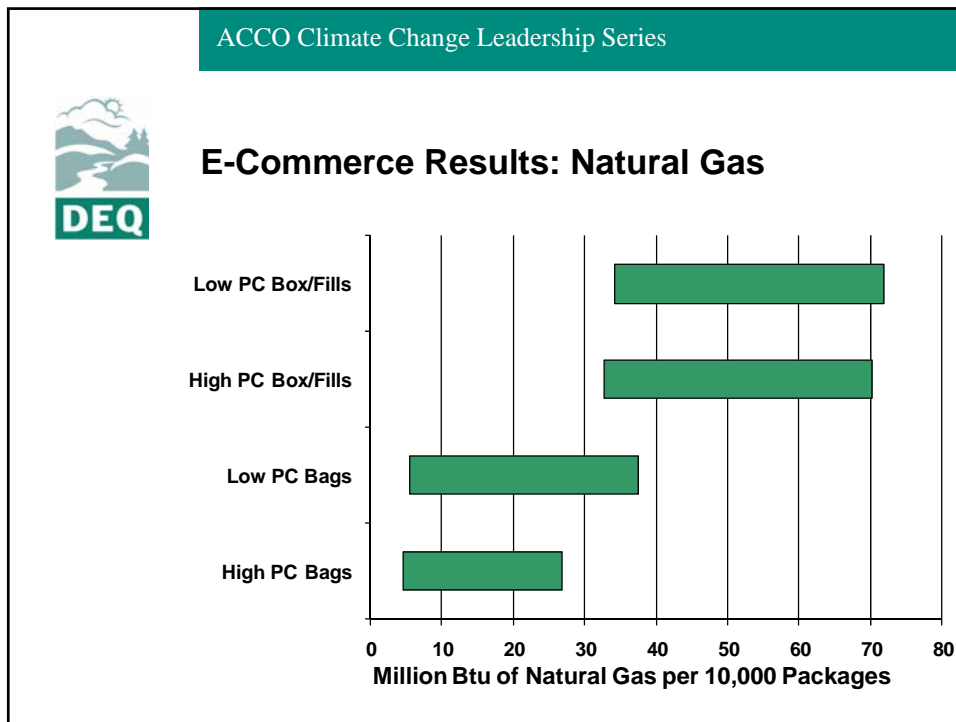
DEQ's E-Commerce Life Cycle Assessment (LCA): Materials Evaluated

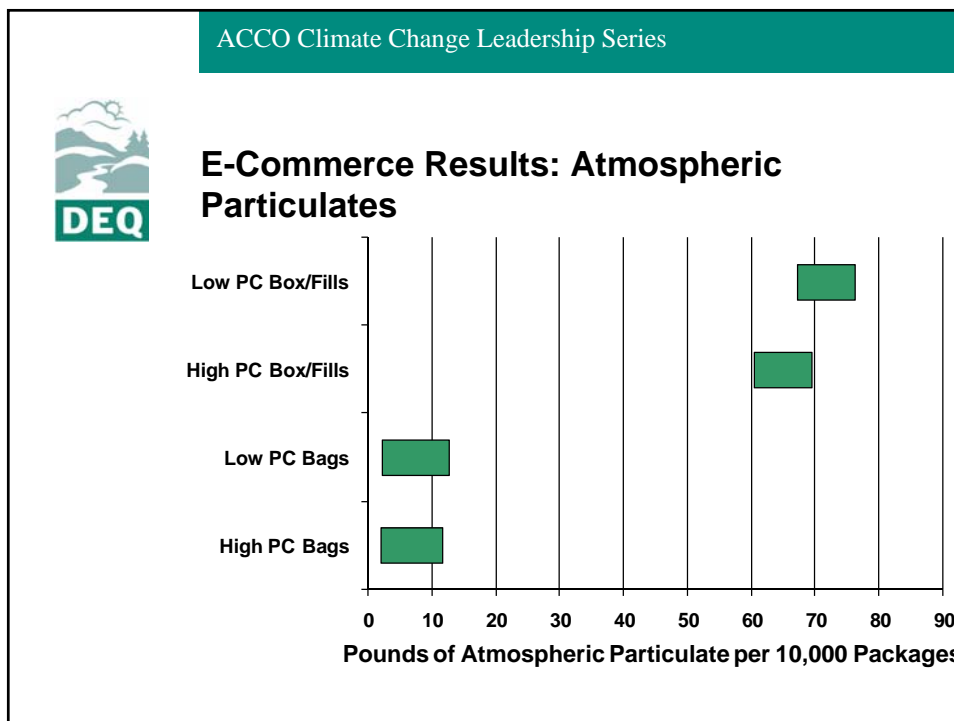
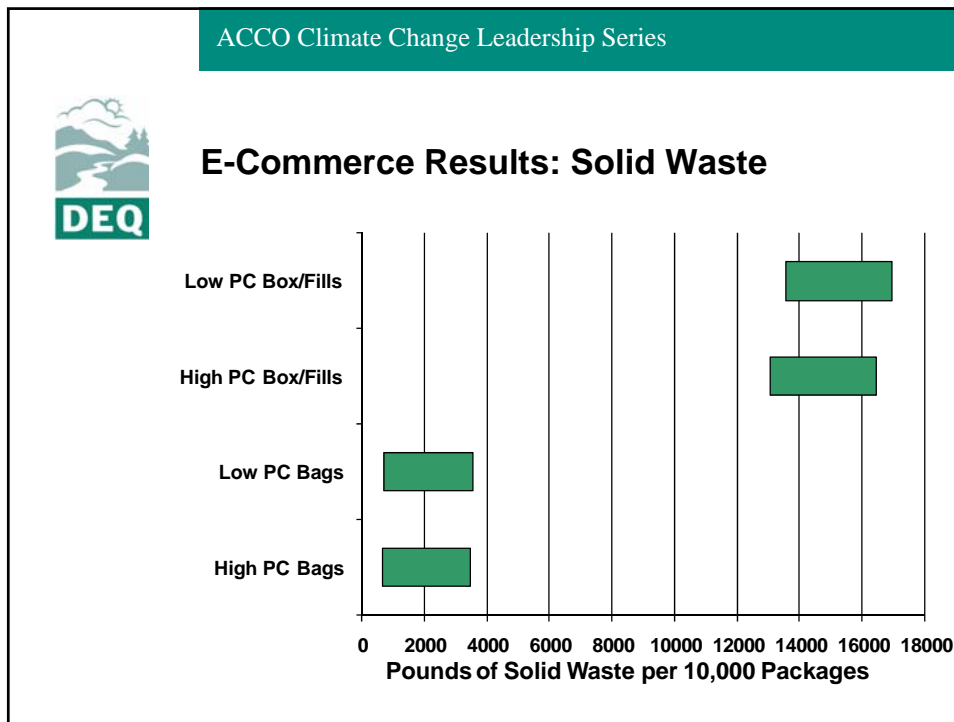
Corrugated box*

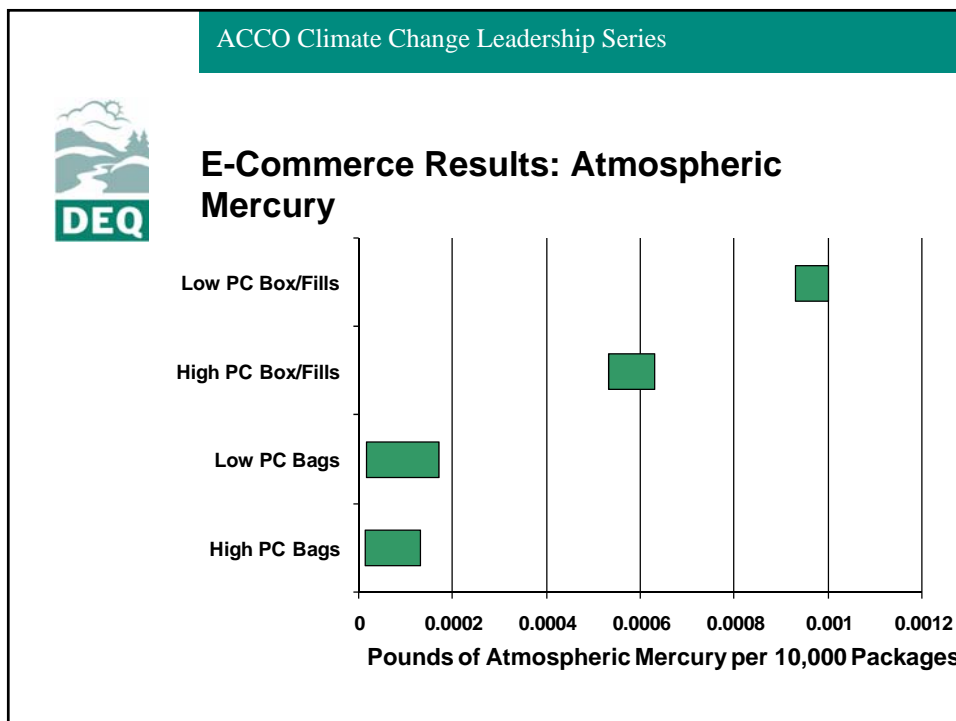
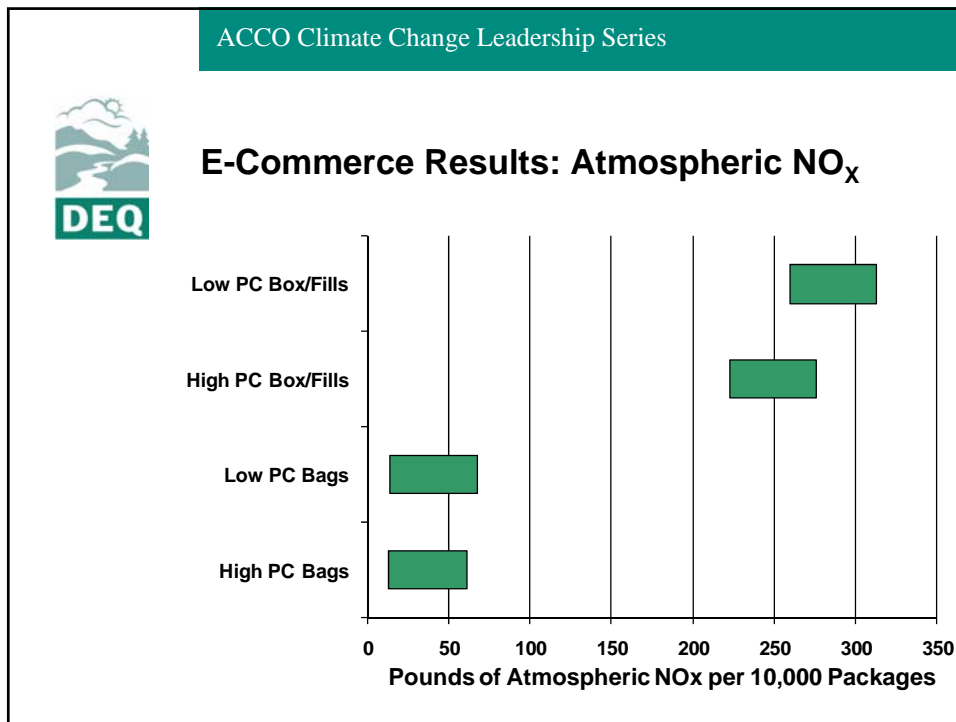
<p><u>Void Fill (for boxes)</u> Polystyrene loose fill* Corn starch loose fill Molded paper loose fill Inflated "air pillows"* Newsprint dunnage* Kraft dunnage* Shredded office paper Shredded boxes</p>	<p><u>Shipping Bags</u> Unpadded all-kraft mailer* Unpadded all-poly mailer* Kraft mailer with ONP padding* Kraft mailer with poly bubble padding* Poly mailer with poly bubble padding*</p>
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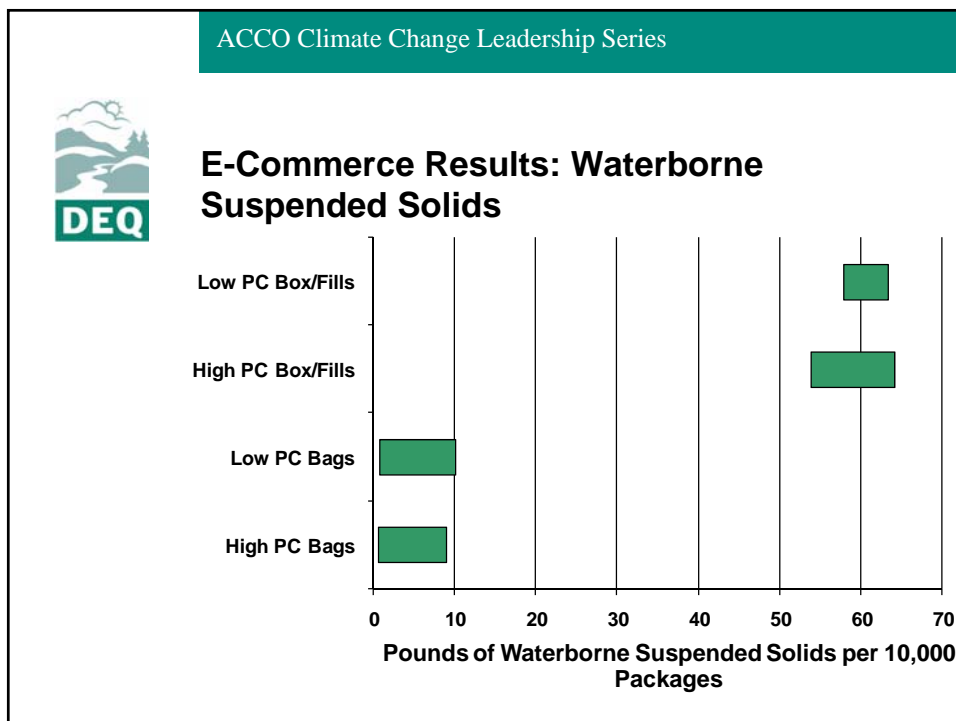
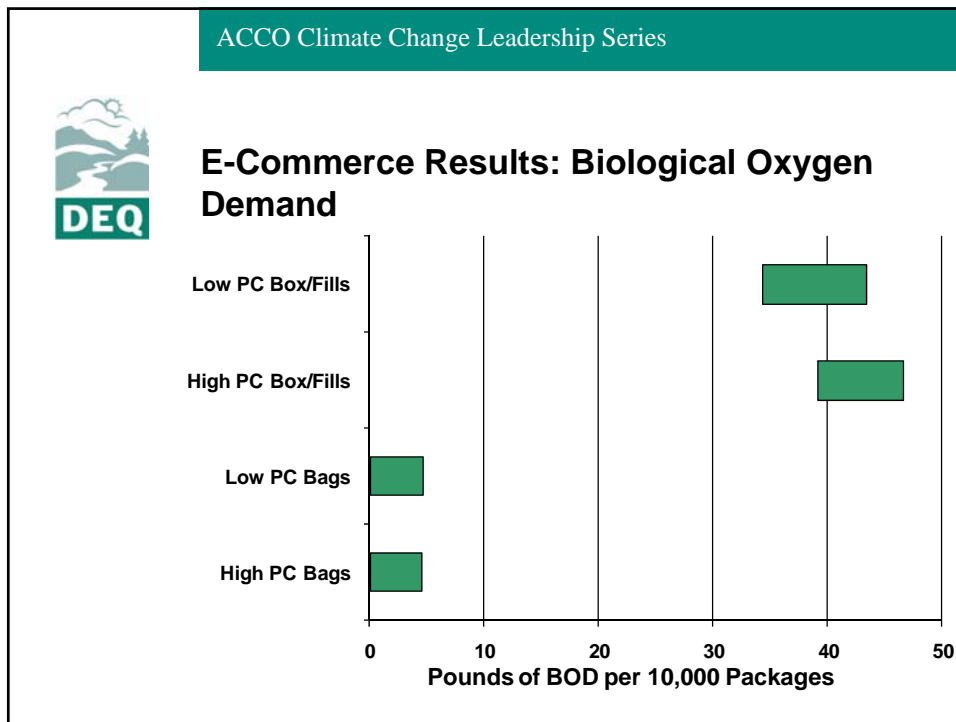
*Different levels of post-consumer content also evaluated.











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**Mass Matters!**

- Weight of materials used is a critical factor:
 - All bags evaluated have lower burdens than boxes (in most categories) because of their much lower weight.
 - This confirms (indirectly) the relative ranking of waste prevention and recycling in the waste management hierarchy.
- Recyclability and recycled content are not always the best predictor of life cycle energy use or emissions:
 - BUT, once you've chosen a packaging material, increasing post-consumer content and recycling opportunities can have benefits.

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**Water Delivery**

- 3 basic systems:





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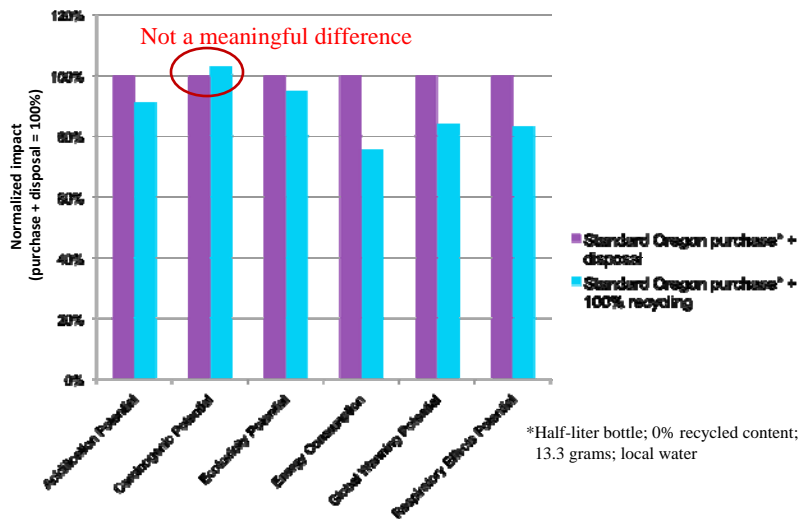
Why this study?

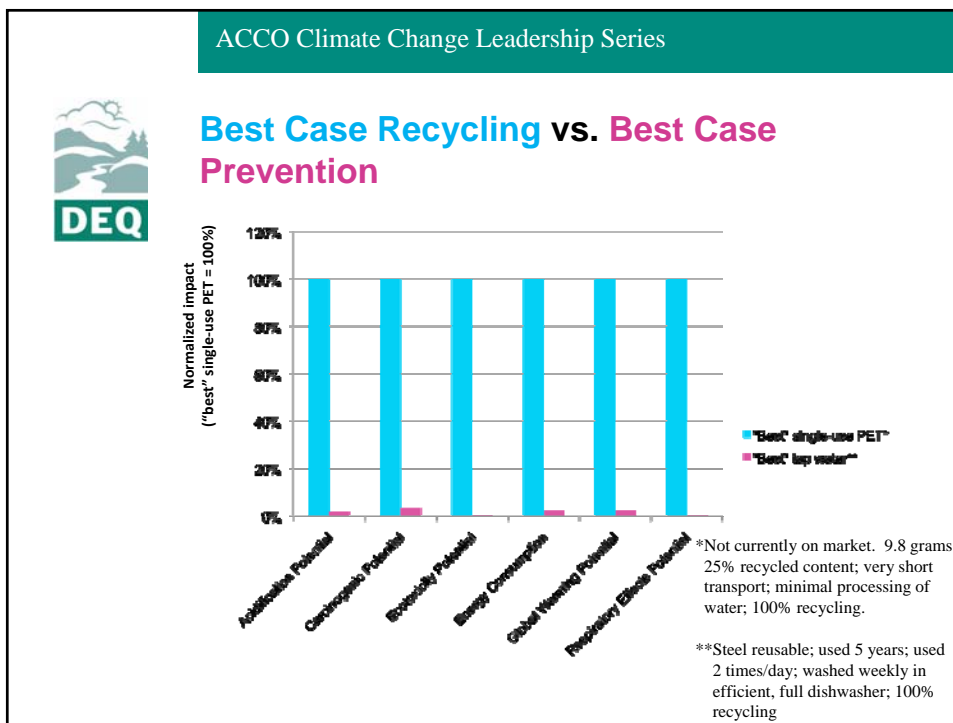
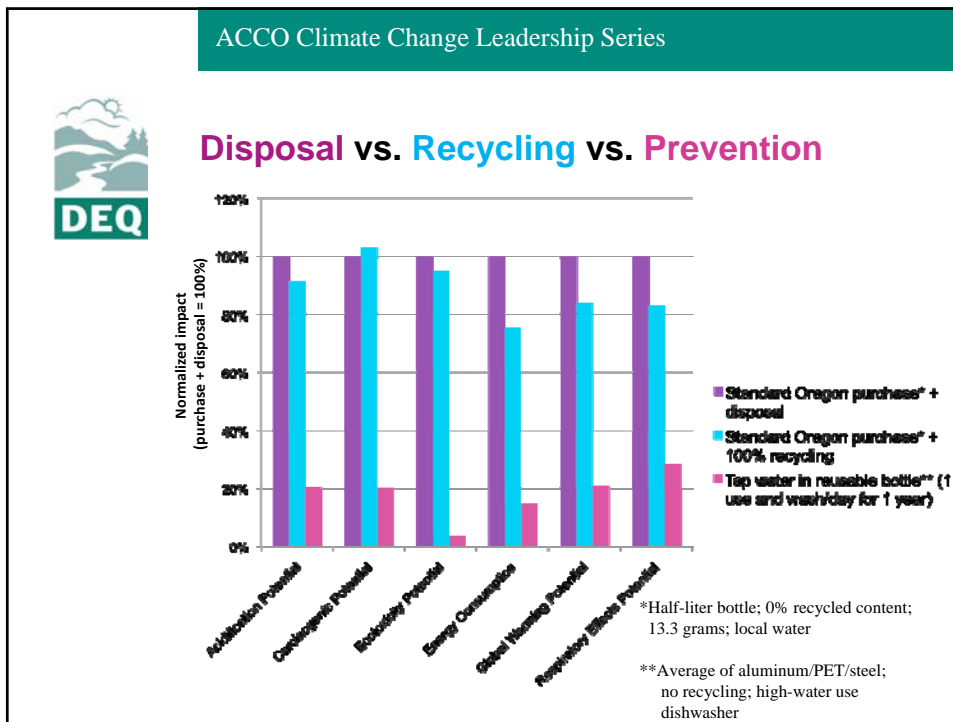
- Widespread belief: recycling prevents/avoids/negates the environmental impacts of consumption
 - “I recycle my bottles . . . Isn’t that enough?”
- Existing water studies aren’t specific to North America, lack transparency, and/or aren’t comprehensive
- Oregon’s bottle bill expansion
- Lots of interesting packaging questions

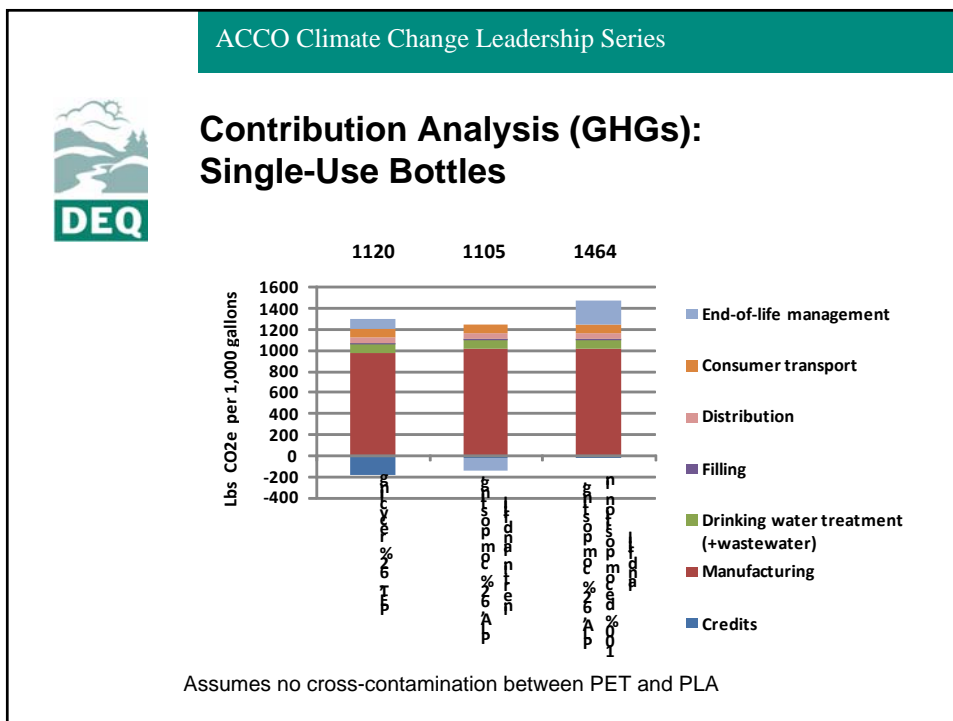
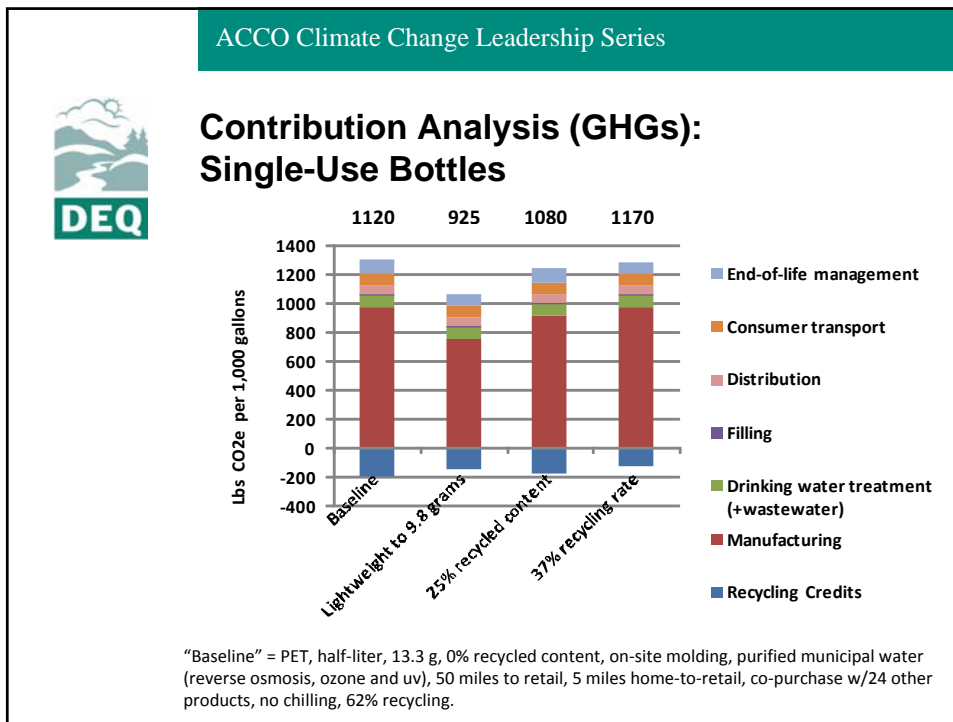


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Disposal vs. Recycling







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Residential Buildings



Note: the following results are preliminary

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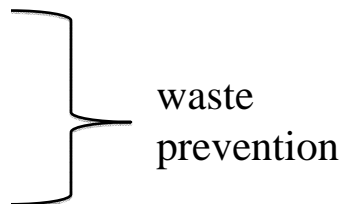


Focus Area of DEQ's Waste Prevention Strategy

Reduce

Reuse

Recycle



Initial Study Question

- Over the life of a home, how can you use fewer building materials or reuse materials?

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Waste Prevention Practices Evaluated

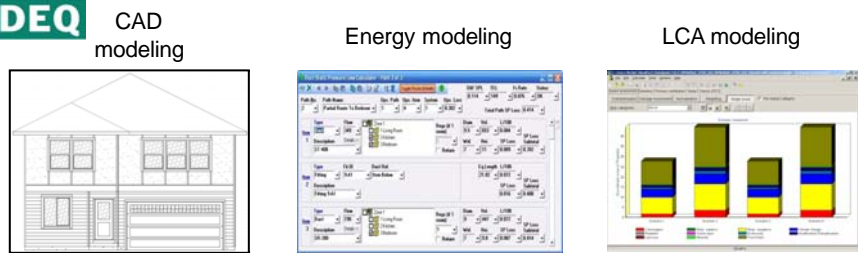
- Intermediate Framing
- Advanced Floor Framing
- Advanced Framing (w/ drywall clips)
- Smaller Homes
- Insulating Concrete Forms
- Structural Insulated Panels
- Strawbale w/ timber frame
- Adaptability: Design for Disassembly
- Adaptability: Utility Chase
- Dematerializing and Design for Simplicity
- 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

Purpose of LCA evaluation is to prioritize these practices based on environmental benefit.

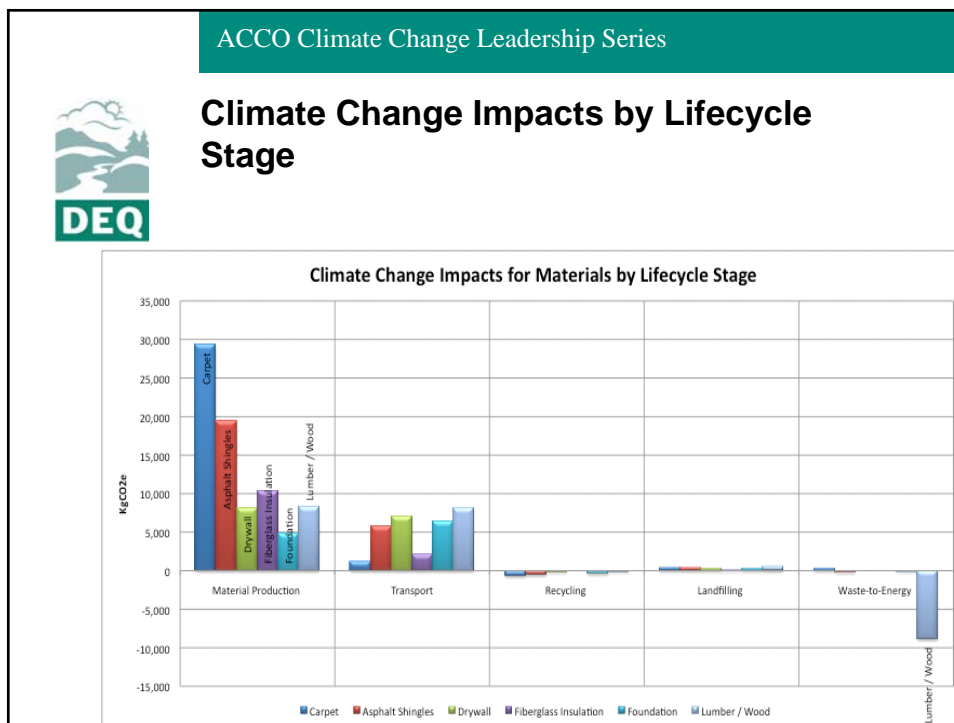
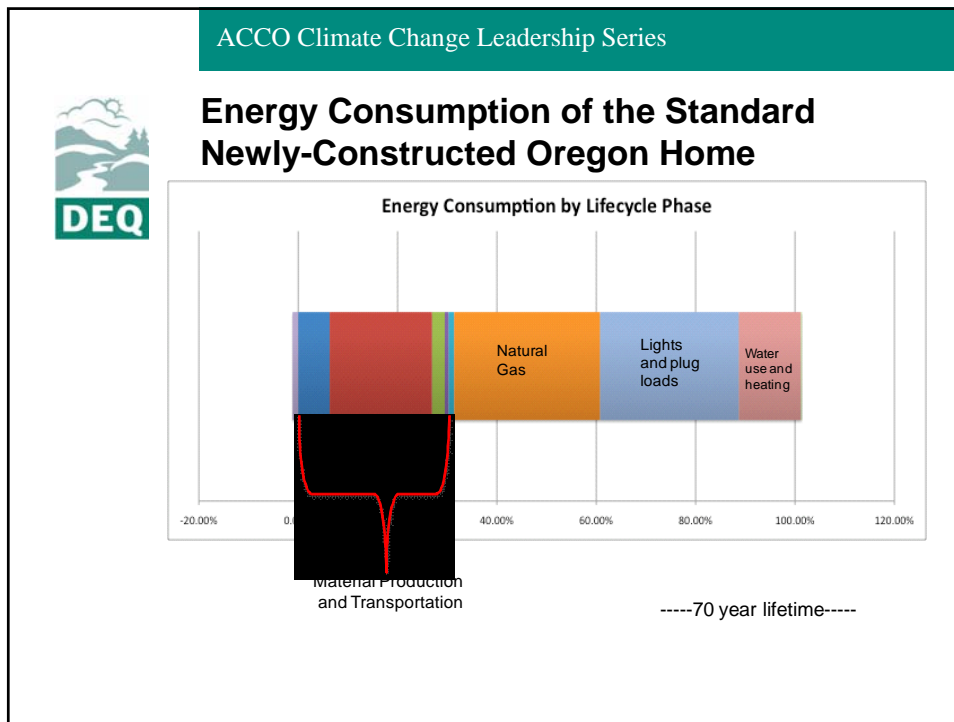
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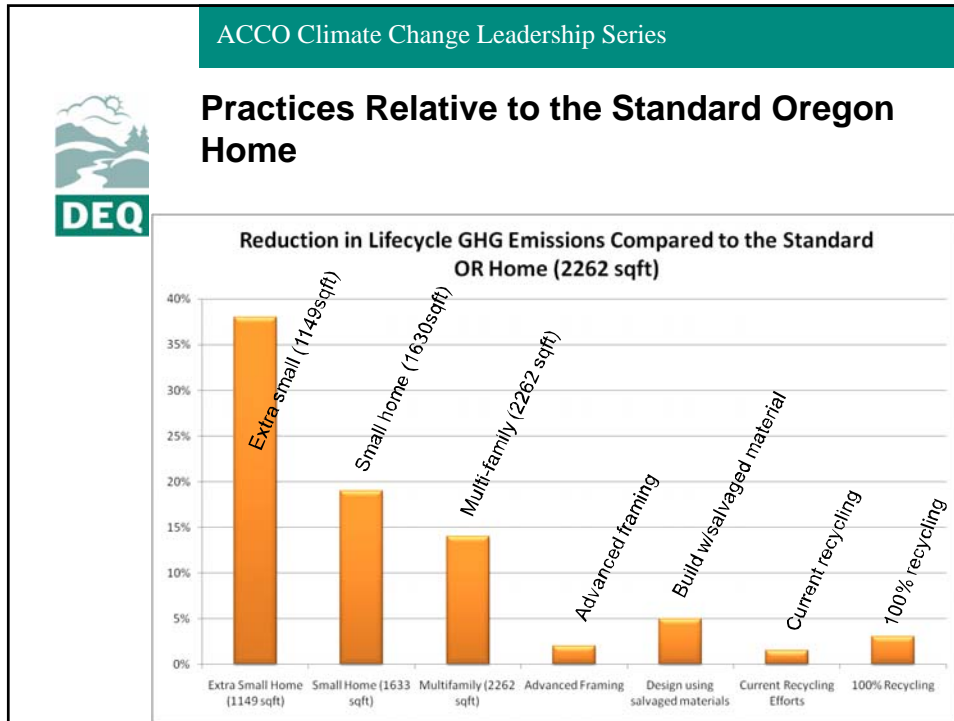


Baseline Model




Functional Unit = the provision of 70 years of single-family housing






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Durable Materials Prevent Waste, but . . .

- Evaluated
 - Asphalt vs. Metal roof
 - Fiber cement vs. Cedar
 - Carpet vs. Wood floor




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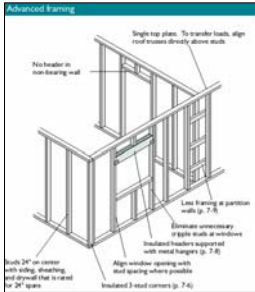


**Less is Usually Best . . .
But not always**


Standard Home
(16 in stud spacing)




Advanced Framing
(24 in stud spacing)



Double Stud Walls
(2- 24 in stud spacing walls)




Compared to the Standard Home



•Approx. 25% reduction in wood use
•3% reduction in operational energy use

•Approx. 35% increase in wood use
•11% reduction in operational energy use

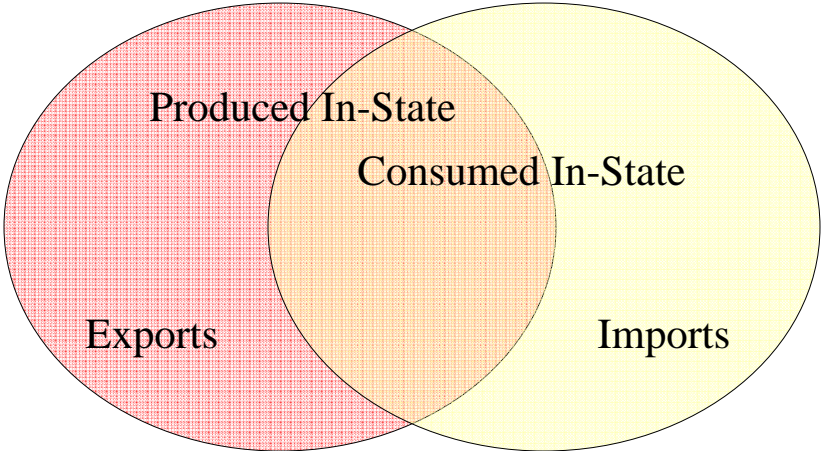
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Consumption-Based Community GHG Inventories

Geographic Inventory

Consumption Inventory



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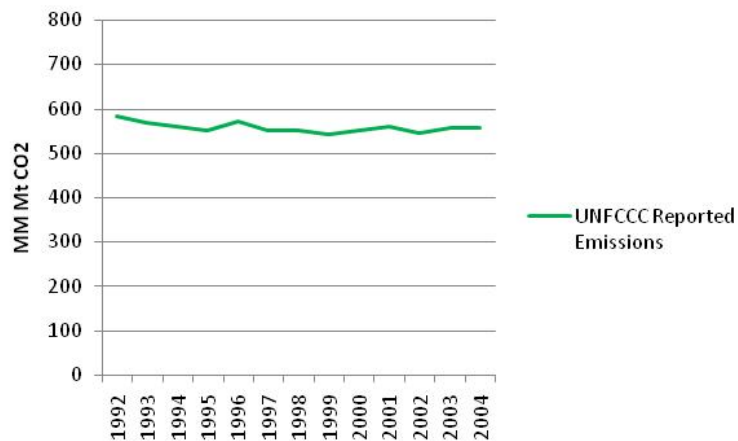
Limitations of Traditional (Geographic/Production) Inventories

- In isolation, provide an incomplete picture of how the community contributes to emissions
- Doesn't necessarily reflect root causes
- Appears to reward outsourcing of emissions

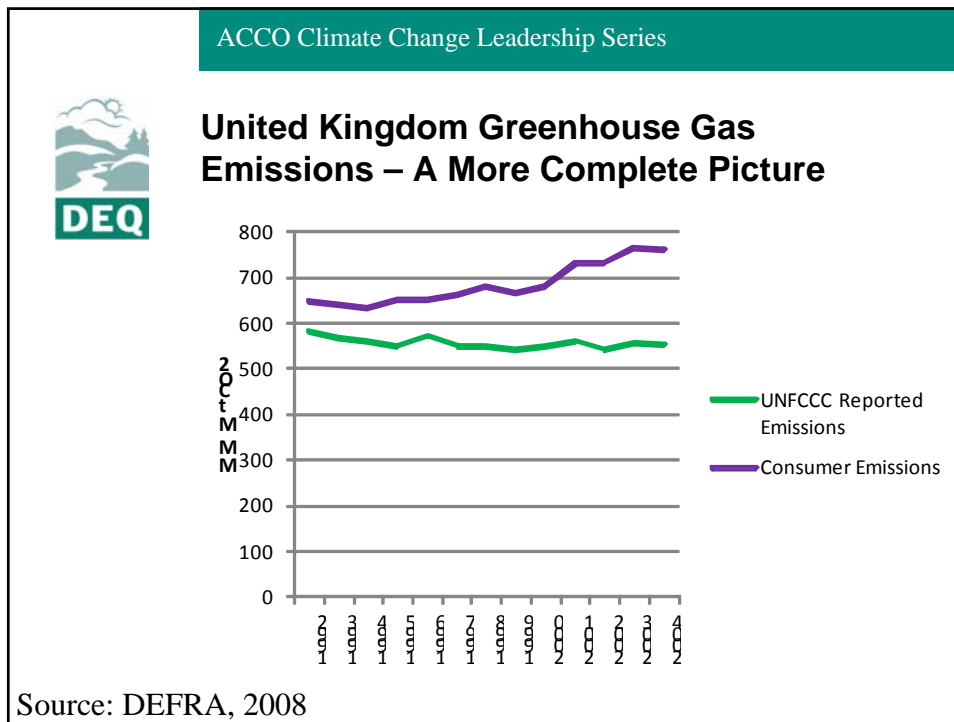
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False Positives? United Kingdom Greenhouse Gas Emissions



Source: DEFRA, 2008



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Oregon’s Consumption-Based Emissions Inventory

- Pure consumption-based emissions inventory in progress (for Oregon)
 - Will supplement (not replace) the traditional inventory
 - Oregon results (for 2005) available upon release of draft report (December 2010?)
- High-level estimates by Portland, Eugene, Metro (Portland)
- Other consumption-based inventory assessments in King County/Seattle, Denver, Europe

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Thank You!

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