



# Products, Environmental Impacts, and Opportunities to Reduce Environmental Impacts

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Oregon Product Stewardship Stakeholder Group



## Overview

- How products impact the environment
- How product changes might reduce environmental impacts
- Inform your discussions:
  - “Upstream” design changes (today’s meeting)
  - Criteria for product selection (July meeting)



## Environmental Impacts

- Toxics
- Global warming
- Everything else (!)



# DEQ Priority Toxics Focus List

			Lead	Ammonia	Dioxins & Furans	
		Naphthalenes	PAHs	Ethylbenzene		
		Nonyphenol, 4- (& ethoxylates)		Malathion		Trichloroethylene
Phthalates	Tetrachloroethylene	Toluene	Hexachlorocyclohexane (HCH), gamma- (Lindane)			
	Benzene	Dichlorobenzene, 1,4- (Dichlorobenzene-p)		Chlorothalonil		Pentachlorophenol
PBDEs	Formaldehyde	Manganese	Copper	Arsenic	Trifluralin	Diazinon
	2,4-D	Mercury (and methylmercury)			Pendamethalin	Chlorpyrifos
Bisphenol A		Carbaryl	Permethrin	Cadmium	Silver	Diuron
		Glyphosate				Atrazine
	Triclosan		Propoxur (Baygon)	Chromium	Nickel	
	Diethyltoluamide, N, N- (DEET)					Dieldrin
						Methoxychlor
					Hexachlorocyclohexane, beta- (beta-BHC)	
PCBs		Aldrin	Hexachlorobenzene	Heptachlor (& Heptachlor epoxide)		
		Chlordane (and metabolites)		Hexachlorocyclohexane, alpha- (alpha-BHC)		
			DDT (and metabolites)	Trichlorophenol, 2,4,5- (2,4,5-T)		



# DEQ Priority Toxics Focus List

Toxic Chemicals In Current Consumer Products

- Lead
- Ammonia
- Dioxins & Furans
- Naphthalenes
- PAHs
- Ethylbenzene
- Nonyphenol, 4- (& ethoxylates)
- Malathion
- Trichloroethylene
- Phthalates
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- Toluene
- Hexachlorocyclohexane (HCH), gamma- (Lindane)
- Pentachlorophenol
- PBDEs
- Benzene
- Dichlorobenzene, 1,4- (Dichlorobenzene-p)
- Chlorothalonil
- Formaldehyde
- Manganese
- Copper
- Arsenic
- Trifluralin
- Mercury (and methylmercury)
- Pendamethalin
- Chlorpyrifos
- Bisphenol A
- 2,4-D
- Carbaryl
- Permethrin
- Cadmium
- Silver
- Diuron
- Atrazine
- Glyphosate
- Triclosan
- Propoxur (Baygon)
- Chromium
- Nickel
- Dieldrin
- Diethyltoluamide, N, N- (DEET)
- Methoxychlor
- PCBs
- Aldrin
- Hexachlorobenzene
- Heptachlor (& Heptachlor epoxide)
- Hexachlorocyclohexane, beta- (beta-BHC)
- Chlordane (and metabolites)
- Hexachlorocyclohexane, alpha- (alpha-BHC)
- DDT (and metabolites)
- Trichlorophenol, 2,4,5- (2,4,5-T)



# DEQ Priority Toxics Focus List

**Other Product-Related Toxics**



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- Lead
- Ammonia
- Dioxins & Furans
- Naphthalenes
- PAHs
- Ethylbenzene
- Nonyphenol, 4- (& ethoxylates)
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- Trichloroethylene
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- Dieldrin

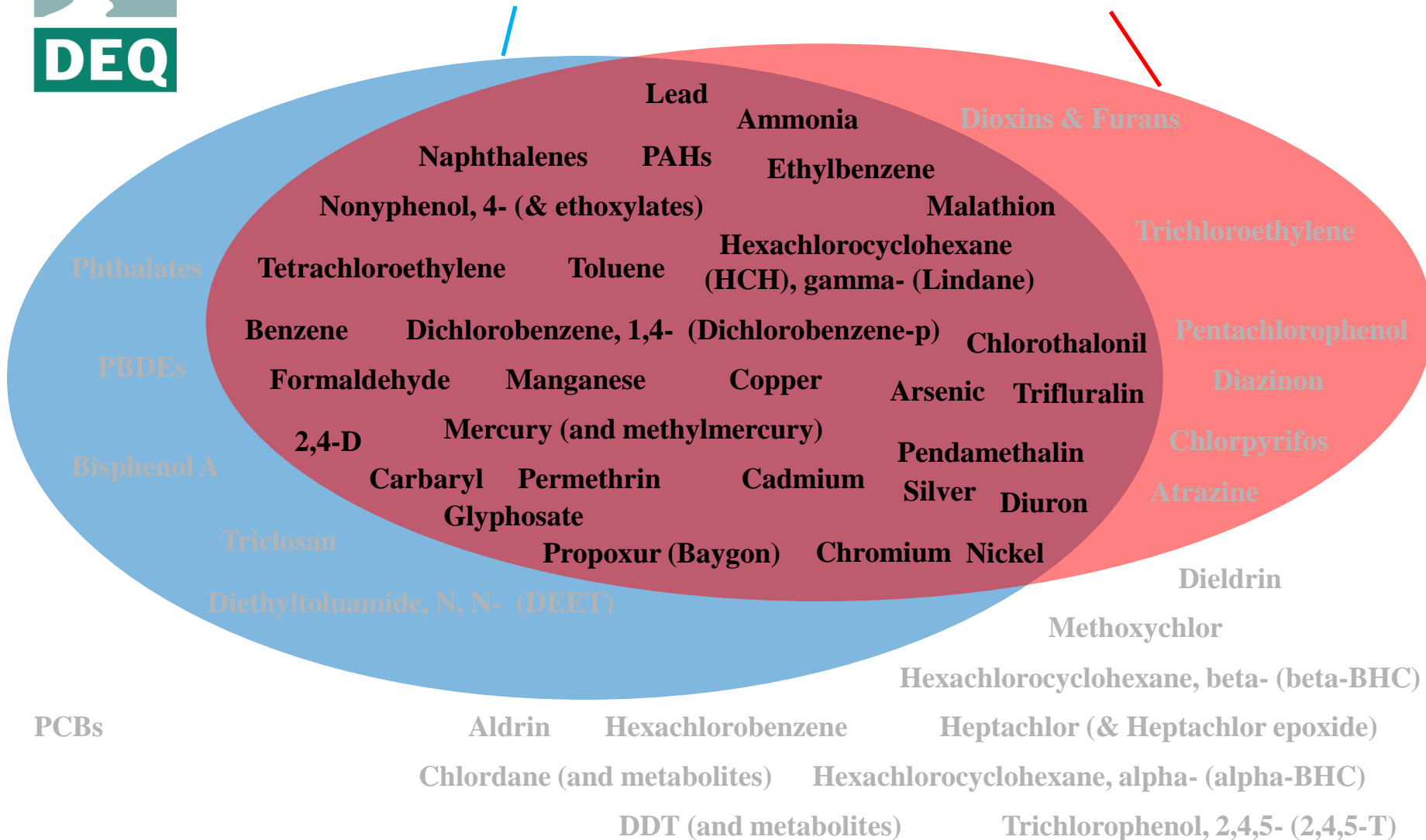
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# DEQ Priority Toxics Focus List

Toxic Chemicals In Current Consumer Products

Other Product-Related Toxics

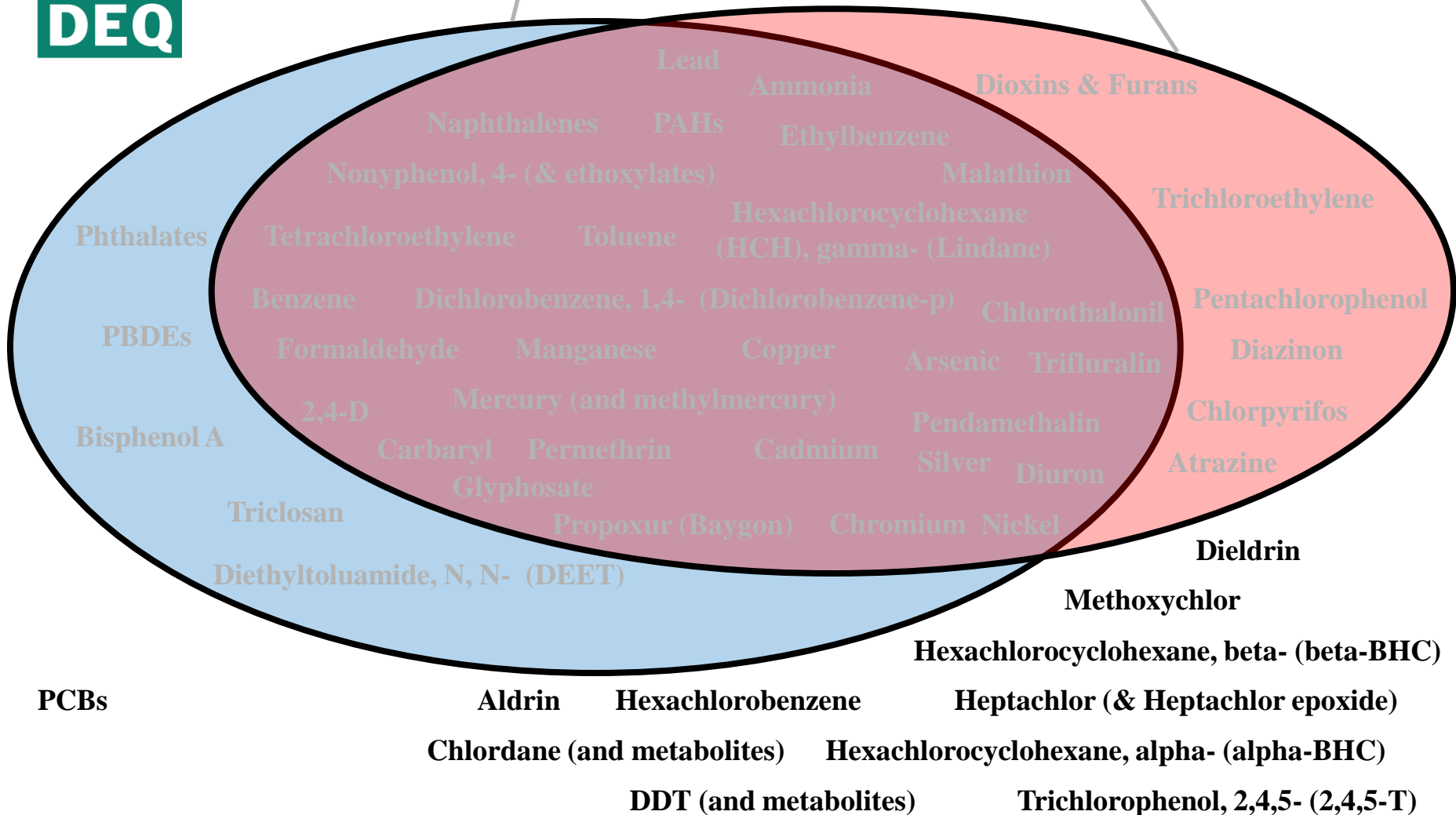




# DEQ Priority Toxics Focus List

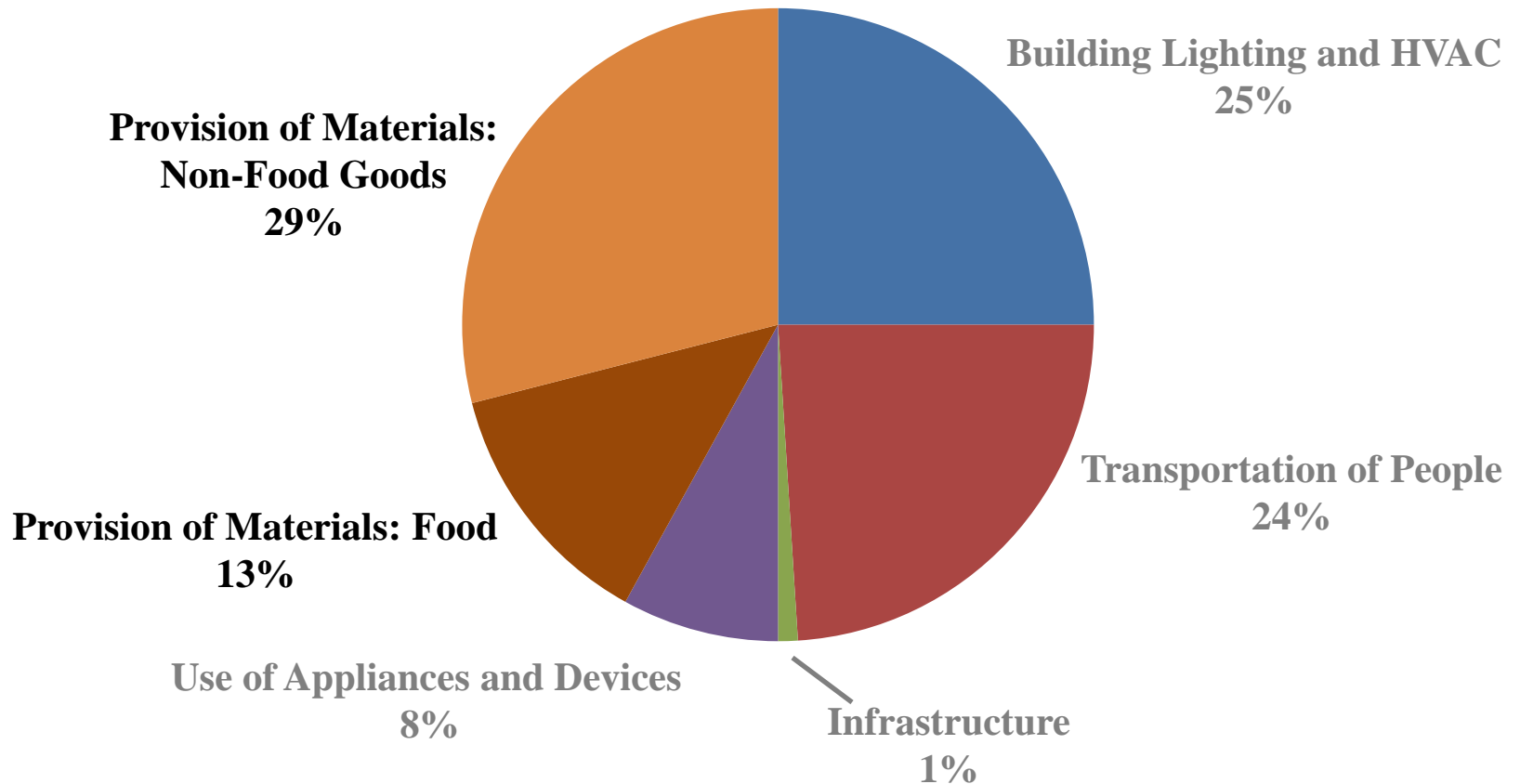
Toxic Chemicals In Current Consumer Products

Other Product-Related Toxics



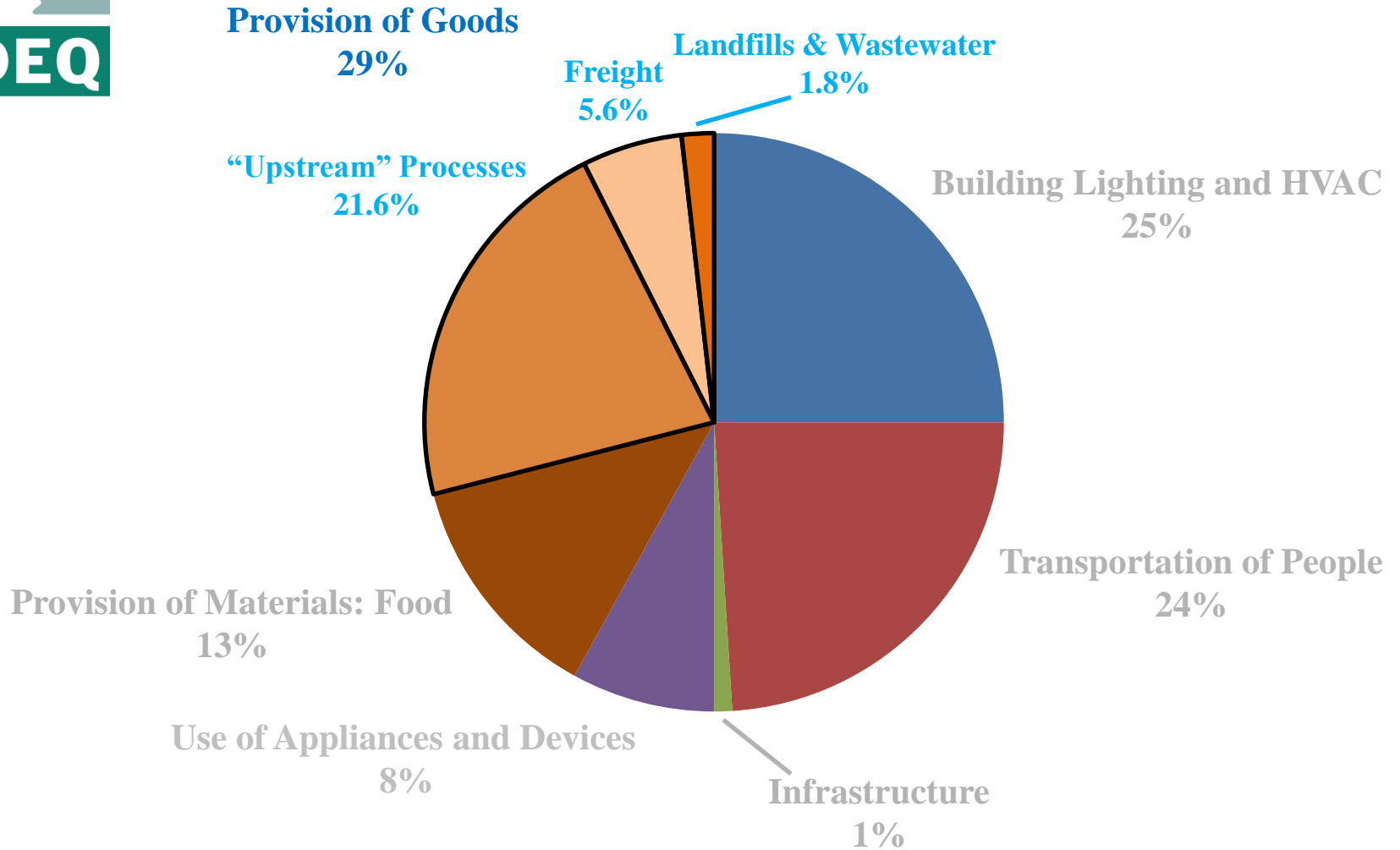


## Materials Matter: Systems-Based Geographic Emissions Inventory (2006)





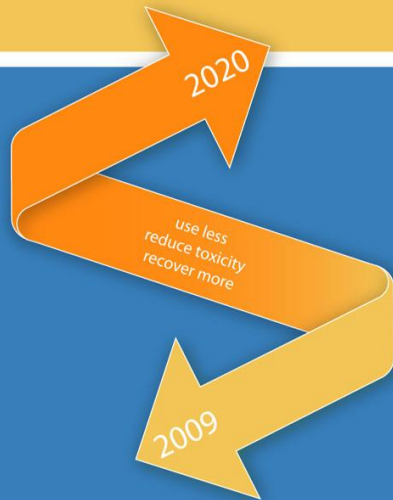
## For Goods, “Upstream” Emissions Dominate





## Other Environmental Impacts

Sustainable Materials  
Management:  
THE ROAD AHEAD



Products/services where “final consumption” contributes to high **GHG emissions** tend to be the same products/services with high impacts in these categories:

- Human, marine aquatic, and freshwater sedimental toxicity potentials (upstream only)
- Smog potential
- Acidification potential
- Eutrophication potential



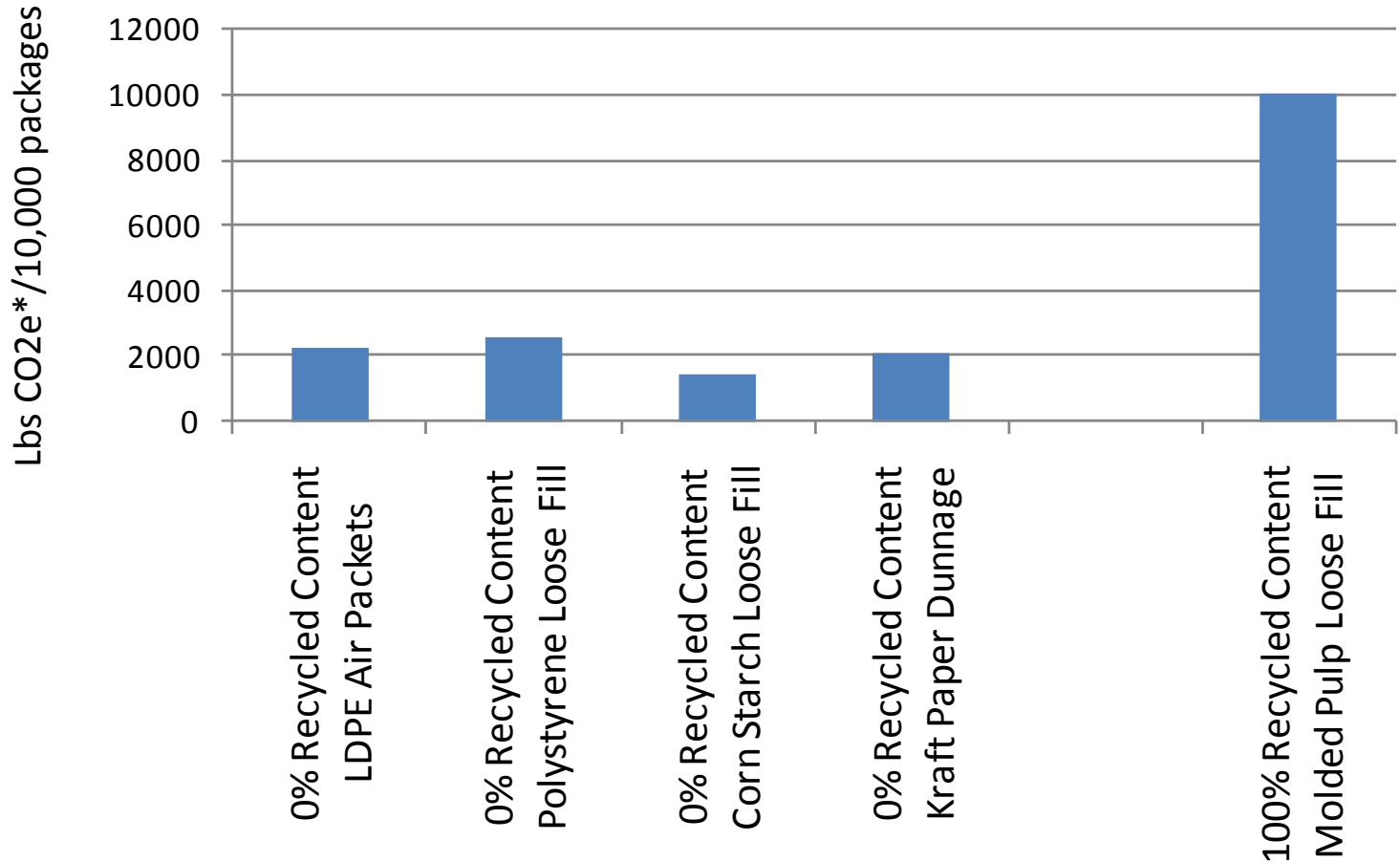
## Impacts vs. Attributes

Examples of Impacts	Examples of Attributes
•Emissions of VOCs	•Recyclability
•GHG emissions	•% recycled content
•Use of non-renewable resources	•Biodegradable

- Impacts are more challenging to evaluate
- But do attributes correlate well with (reduced) impacts?



## Attributes and Impacts - An Example: Void Fills in E-Commerce Packaging (Boxes)



\*on a cradle-to-distribution center basis

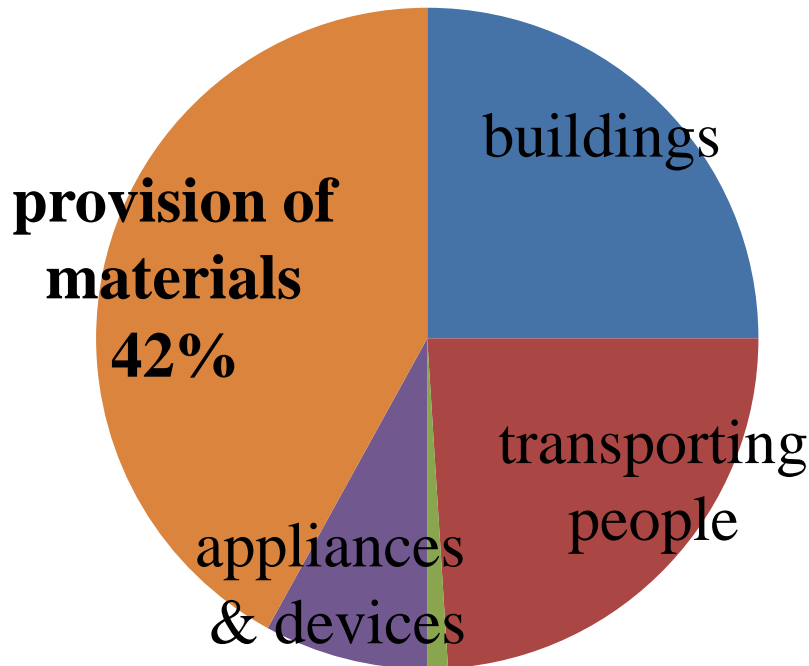


## Environmental Benefits of Recycling

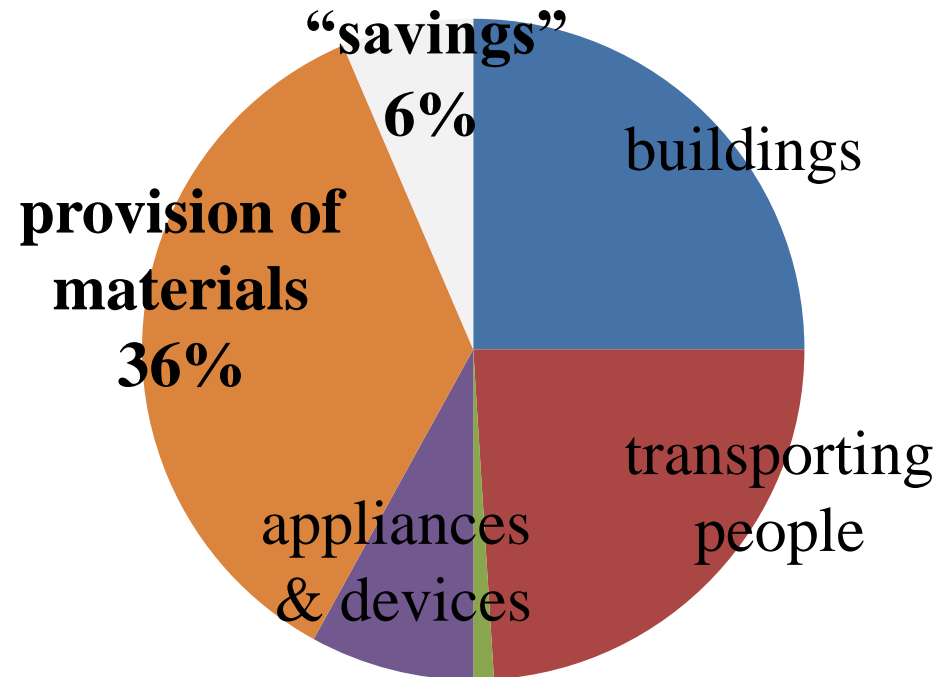
- Recycling in Oregon in 2008:
  - Saved ~30 trillion BTUs of energy
  - Reduced GHG emissions ~3.3 MMTCO<sub>2e</sub>
- Meta-analysis of recycling LCAs (UK WRAP):
  - Traditional recyclables (papers, plastics, steel, aluminum, glass)
  - Recycling almost always preferable to landfilling



## The importance . . . and limitations . . . of recovery



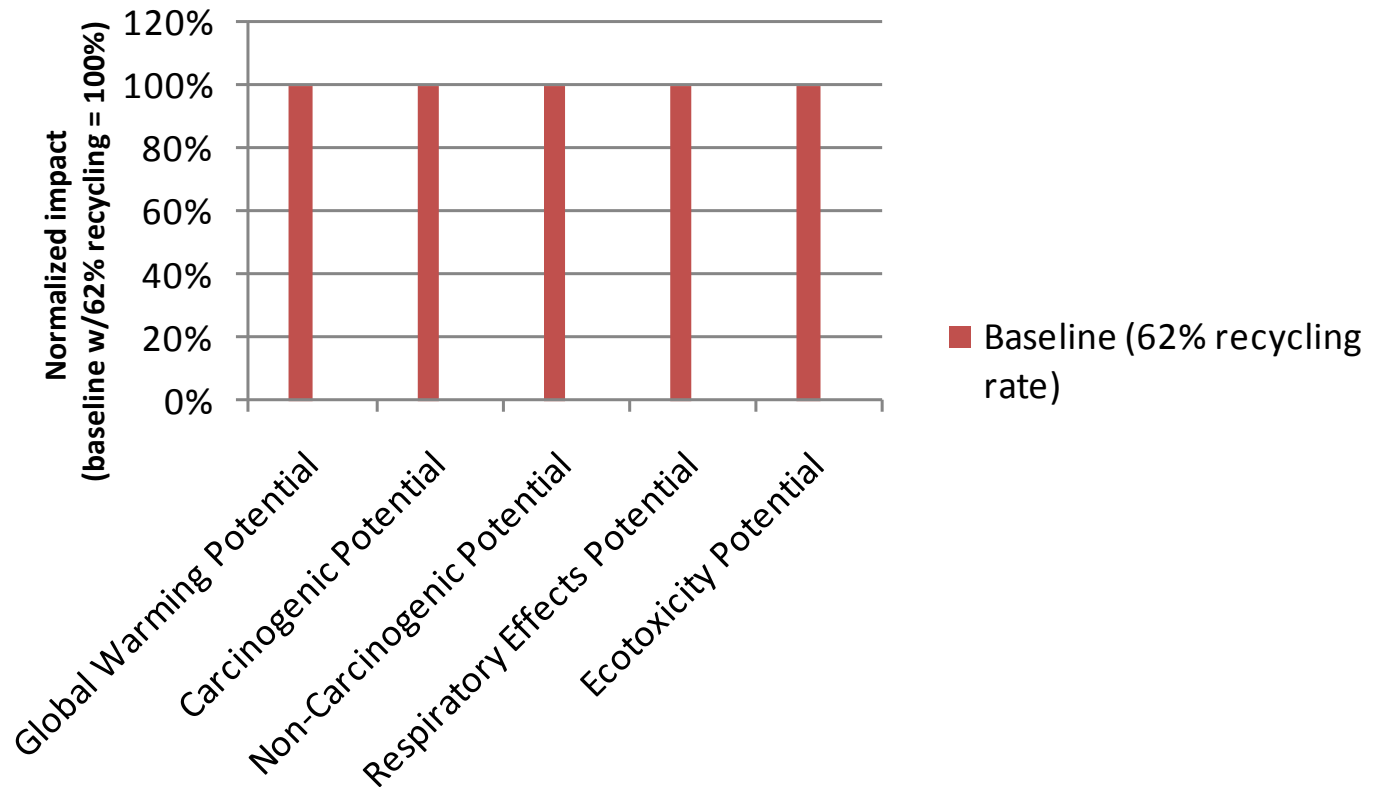
*2006 U.S. GHG inventory  
with 32% recovery  
(MSW)*



*2006 U.S. GHG inventory with  
maximum potential recovery rate  
(~95% MSW + >70% C&D)*



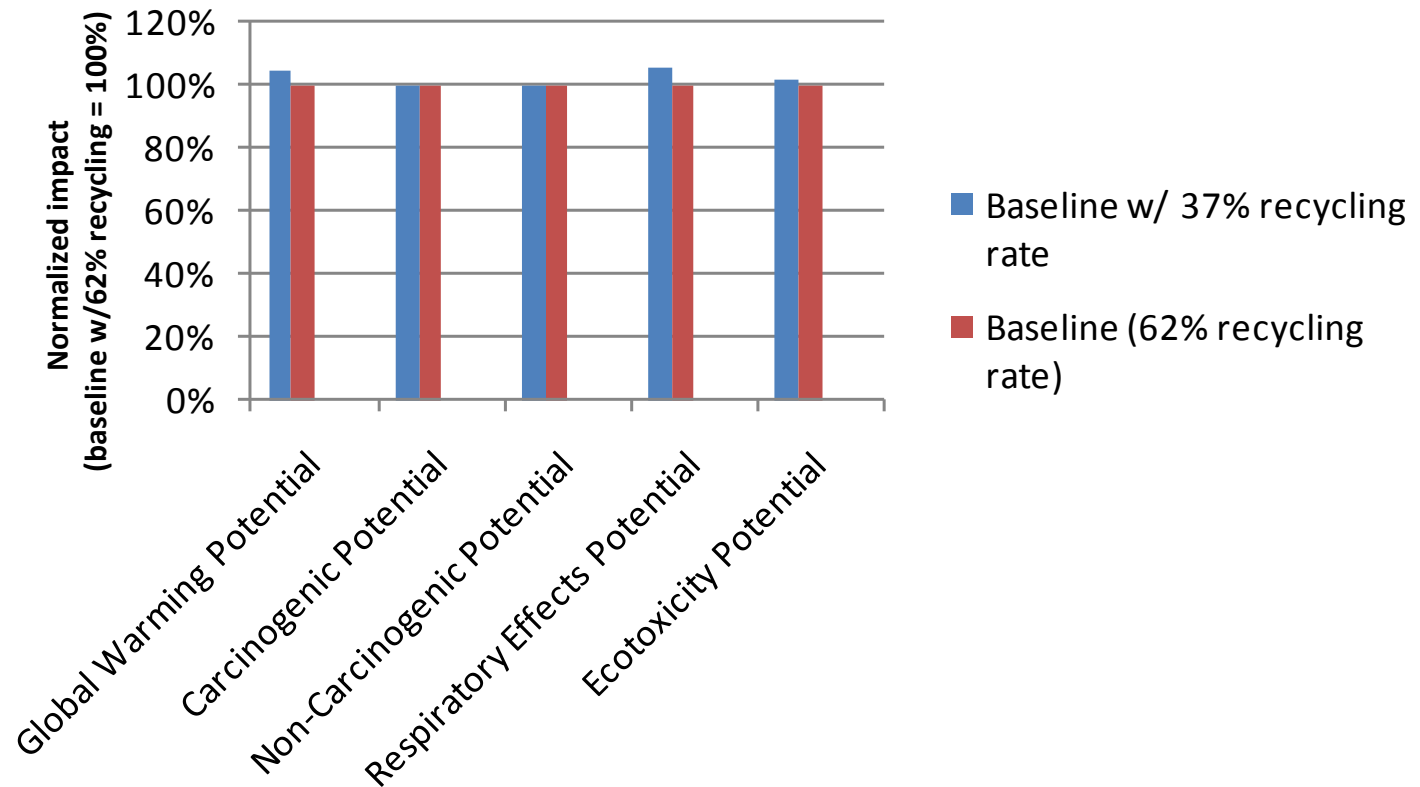
## Recycling, Recycled Content, and Lightweighting Example: PET Water Bottles



“Baseline” = PET, half-liter, **13.3 grams**, **0% post-consumer recycled content (PCR)**, 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 rate**.



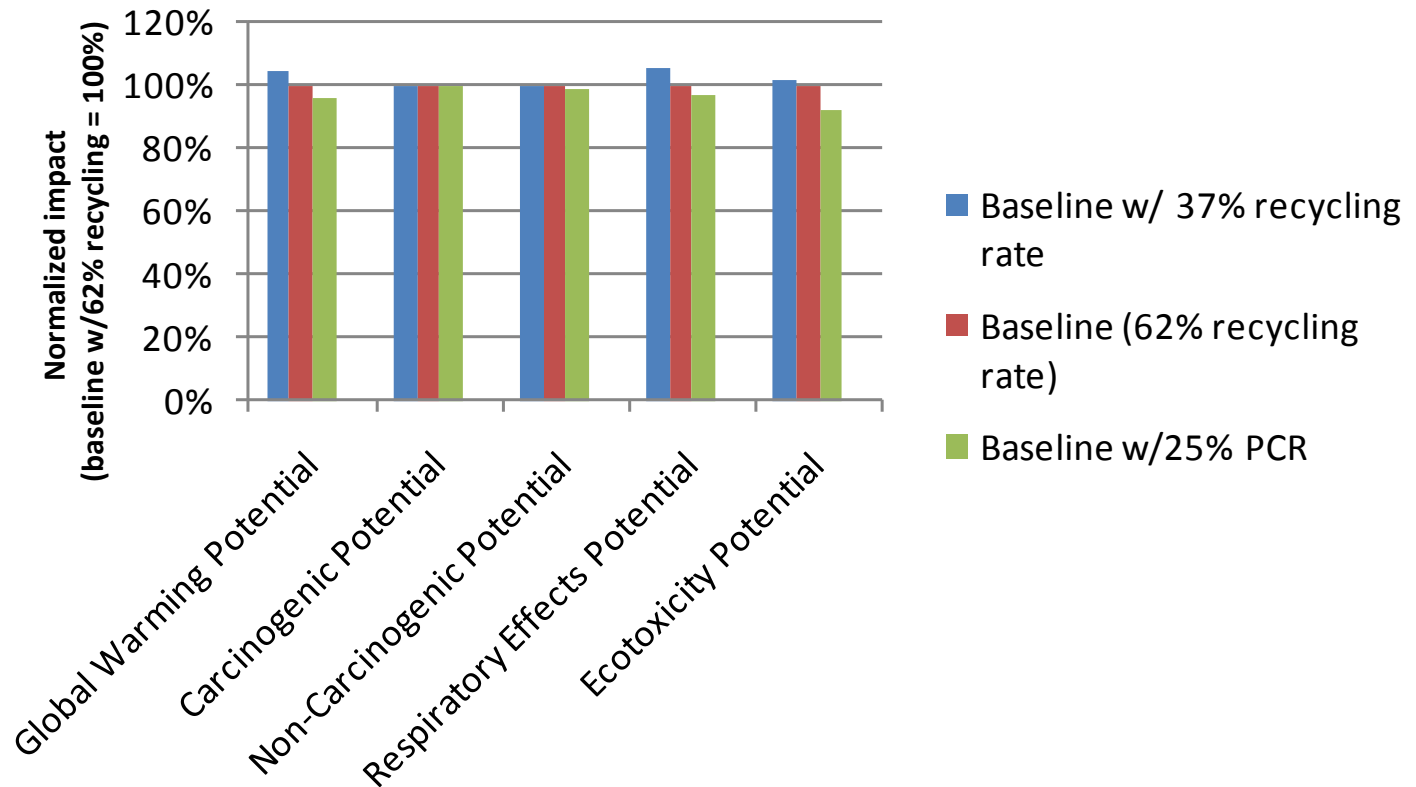
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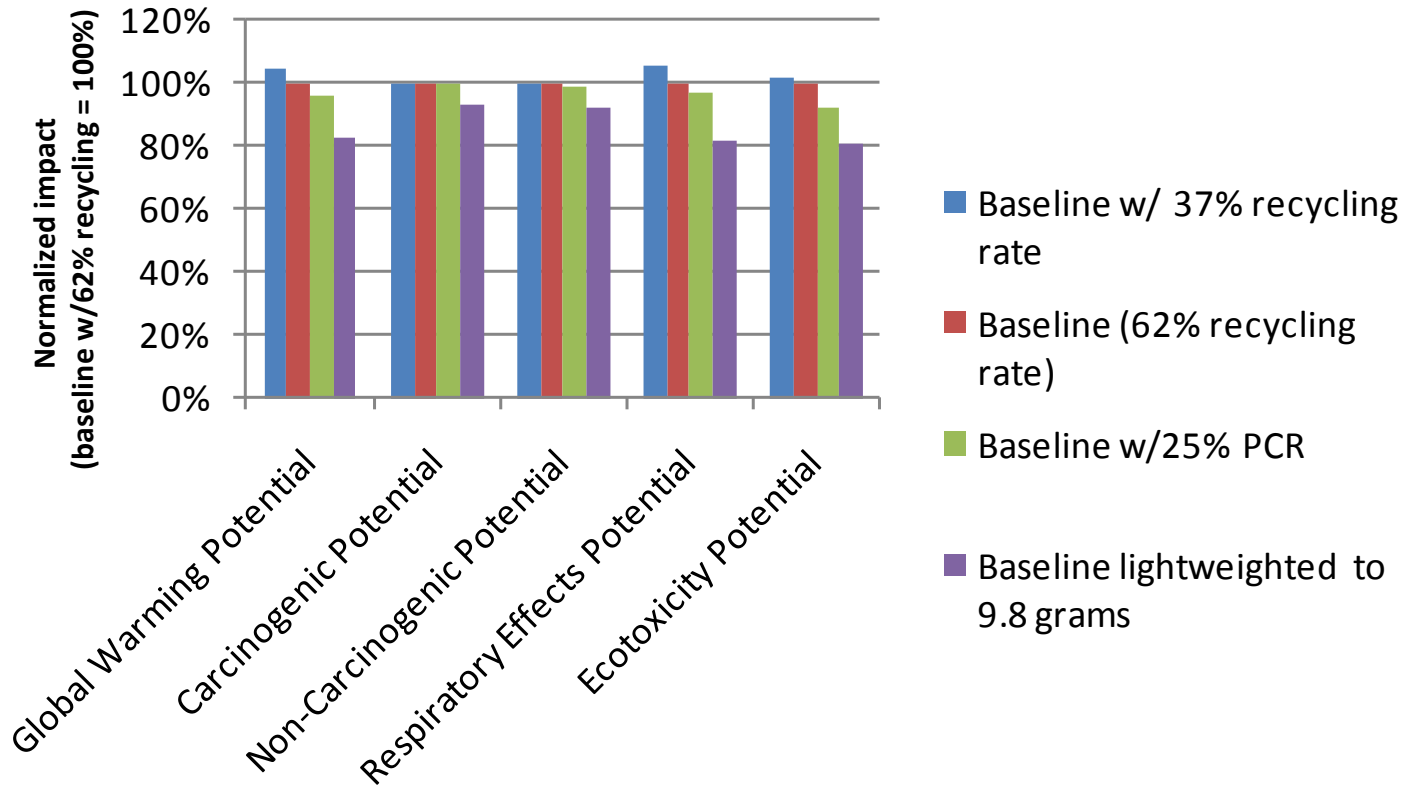
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## Waste Prevention (Using Less)

- Ton-for-ton, typically leads to greater environmental benefit than recycling
  - Prevention + Recycling is often the optimal combination
- Often goes unmeasured by the public sector
  - Reduces, but doesn't shift, the cost burden on local government
- Oregon solid waste policy recognizes both prevention and recovery



## Summary

- Products – *when viewed over their entire life cycle* – contribute significantly to local and global environmental impacts
  - End-of-life impacts are often (but not always) small relative to use and upstream
  - By extension, internalizing *only* end-of-life costs sends an incomplete signal to producers
- Attributes don't always correlate with impacts
- Recycling has benefits, but a recycling-only strategy is likely sub-optimal
  - Energy efficiency, waste prevention, and other design changes may be of greater importance

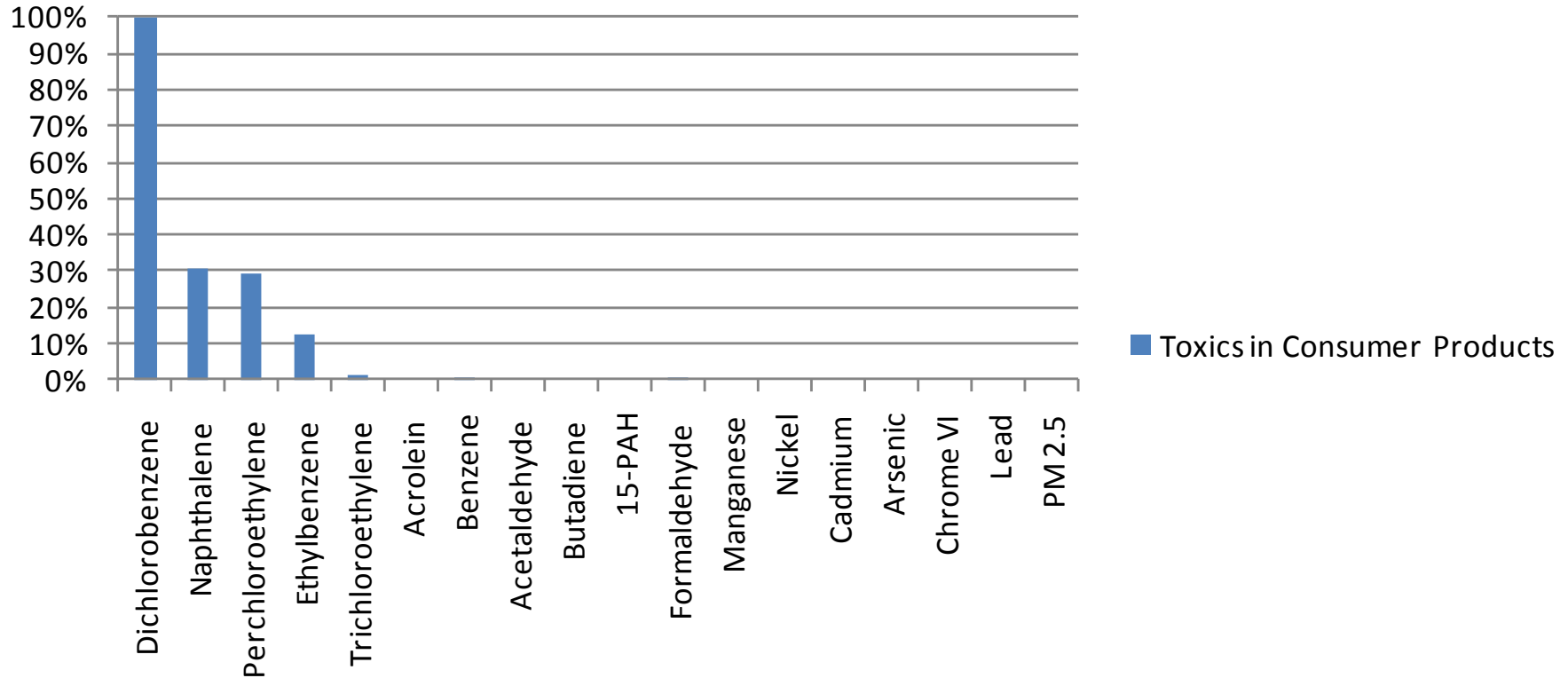


## **Supplemental Materials (Air Toxics)**

For discussion if Stakeholder Group members are interested.

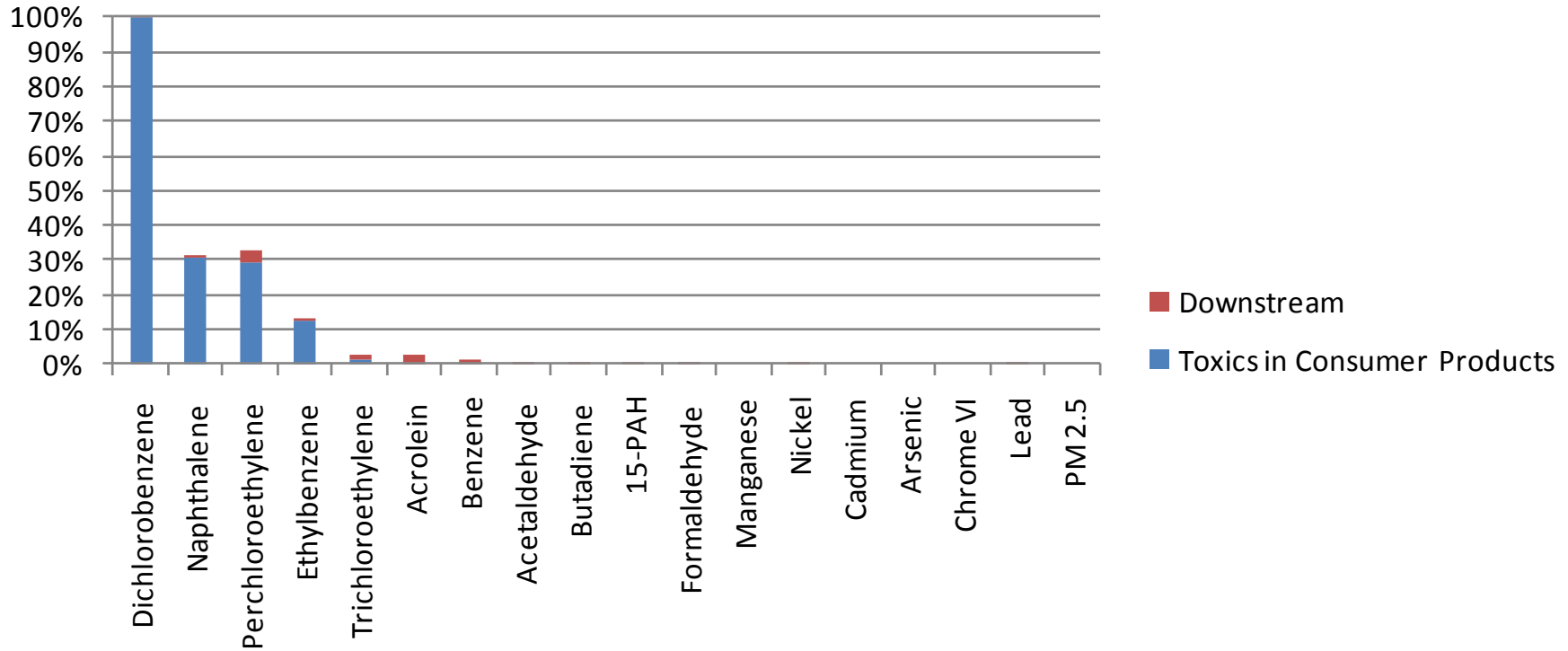


## Portland Air Toxics Inventory (2005): Sources of Toxics



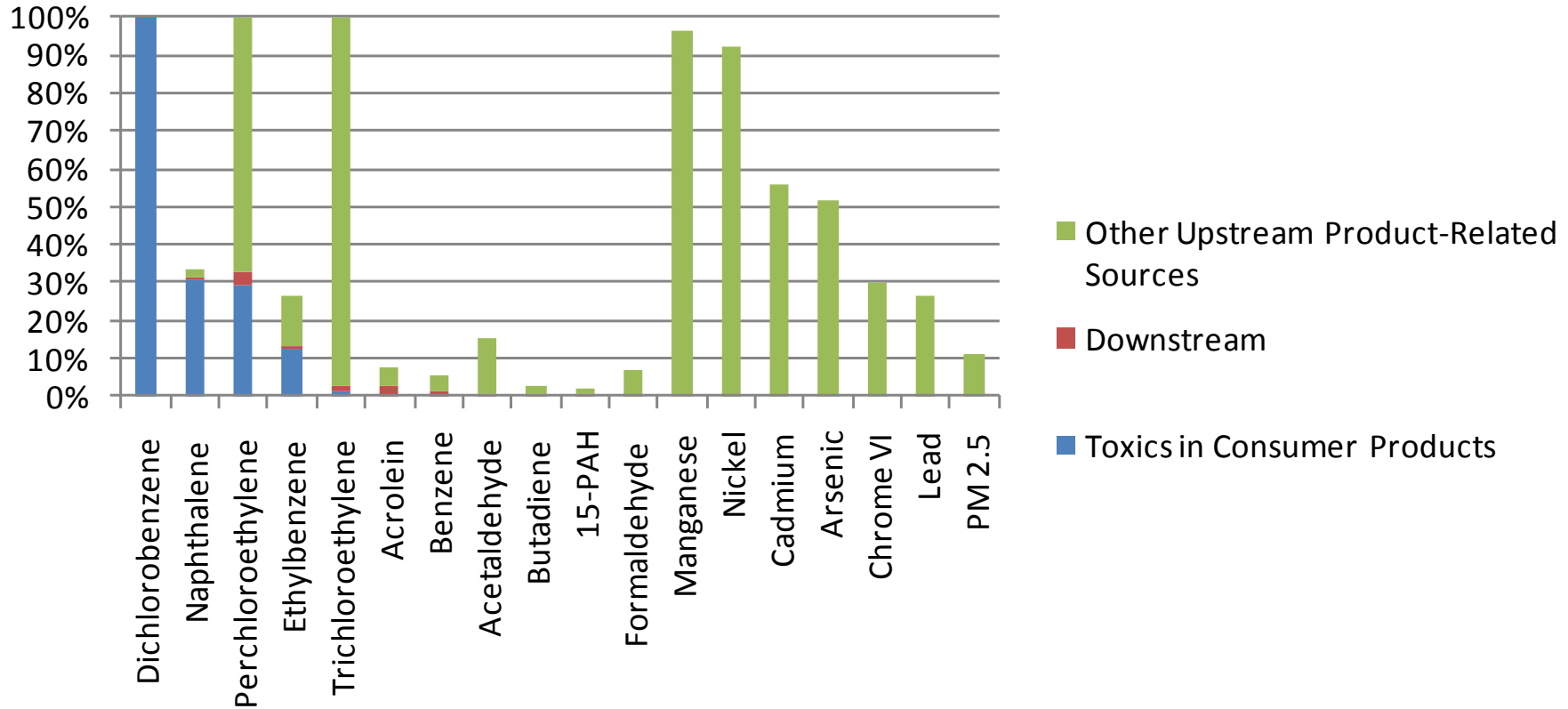


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