# Rethinking Recycling

Northeast Recycling Council

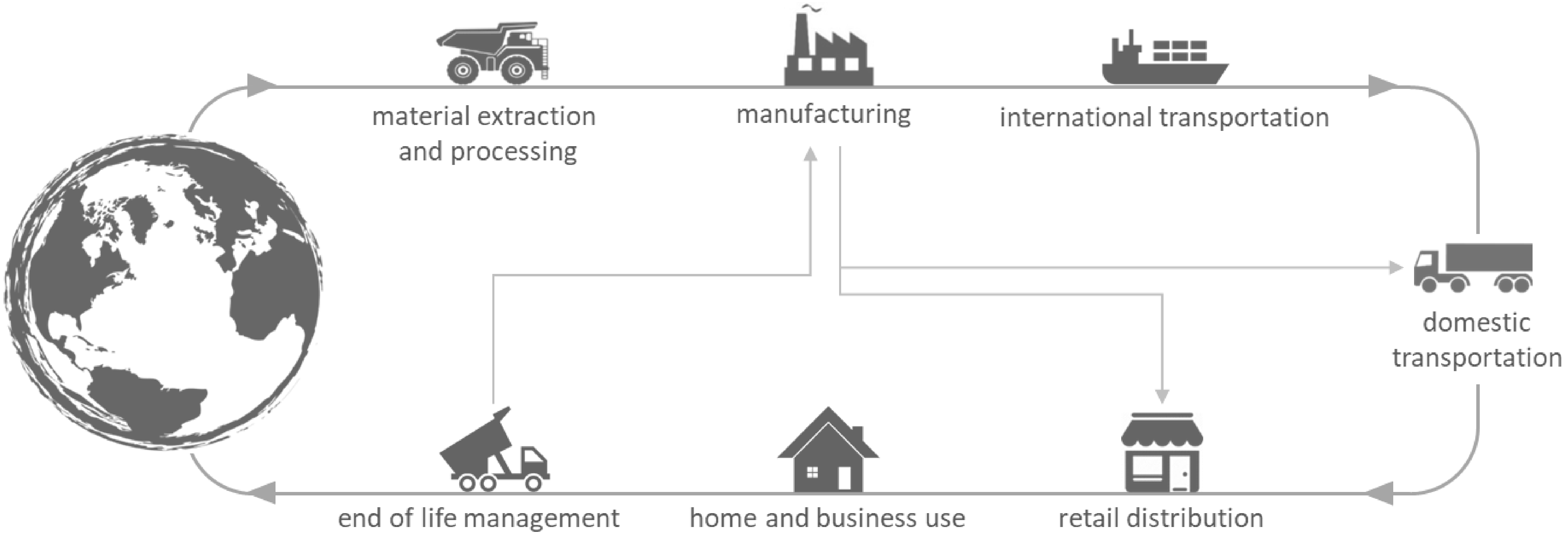
19 March 2020

David Allaway | Oregon Department of Environmental Quality

# overview of today's webinar

- Review of environmental conditions and the overarching challenge
- Benefits – and limitations – of recycling and composting
- Alternatives: waste prevention and reuse
- Zero Waste and Circular Economy
- The limitations of "disposal aversion"
- A modest proposal

# the materials "life cycle"



# eutrophication (excess nutrients)

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

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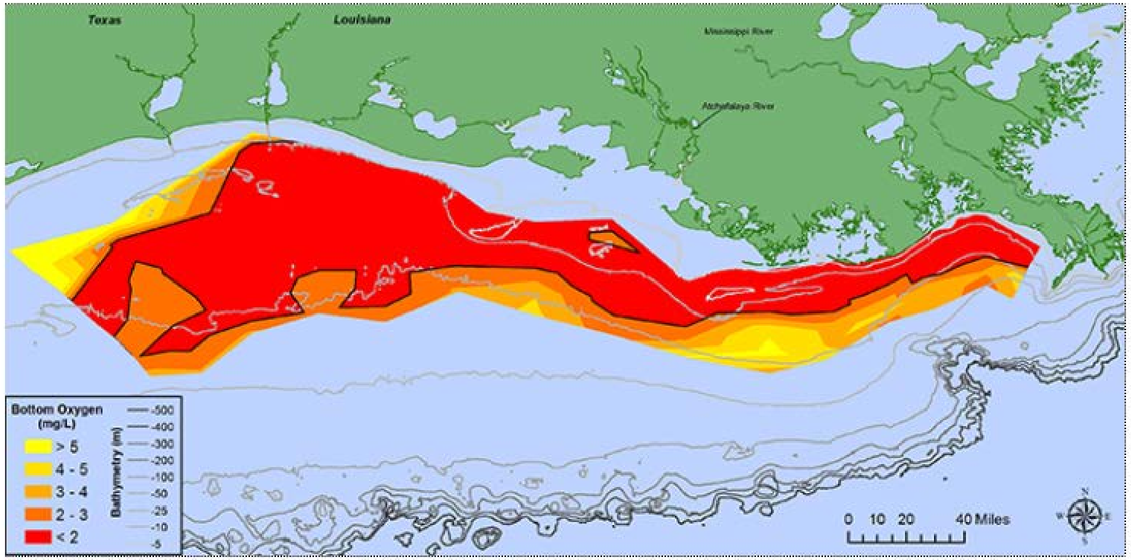
## Gulf of Mexico 'dead zone' is the largest ever measured

**June outlook foretold New Jersey-sized area of low oxygen**

Oceans & Coasts | Gulf of Mexico hypoxia

SHA

August 2, 2017 —




**Gulf of Mexico dead zone in July 2017**

At 8,776 square miles, this year's dead zone in the Gulf of Mexico is the largest ever measured. (Courtesy of N. Rabalais, LSU/LUMCON)

Download Image

# toxic chemicals

# habitat and species loss

*The Aggie Transcript; University of California, Davis*

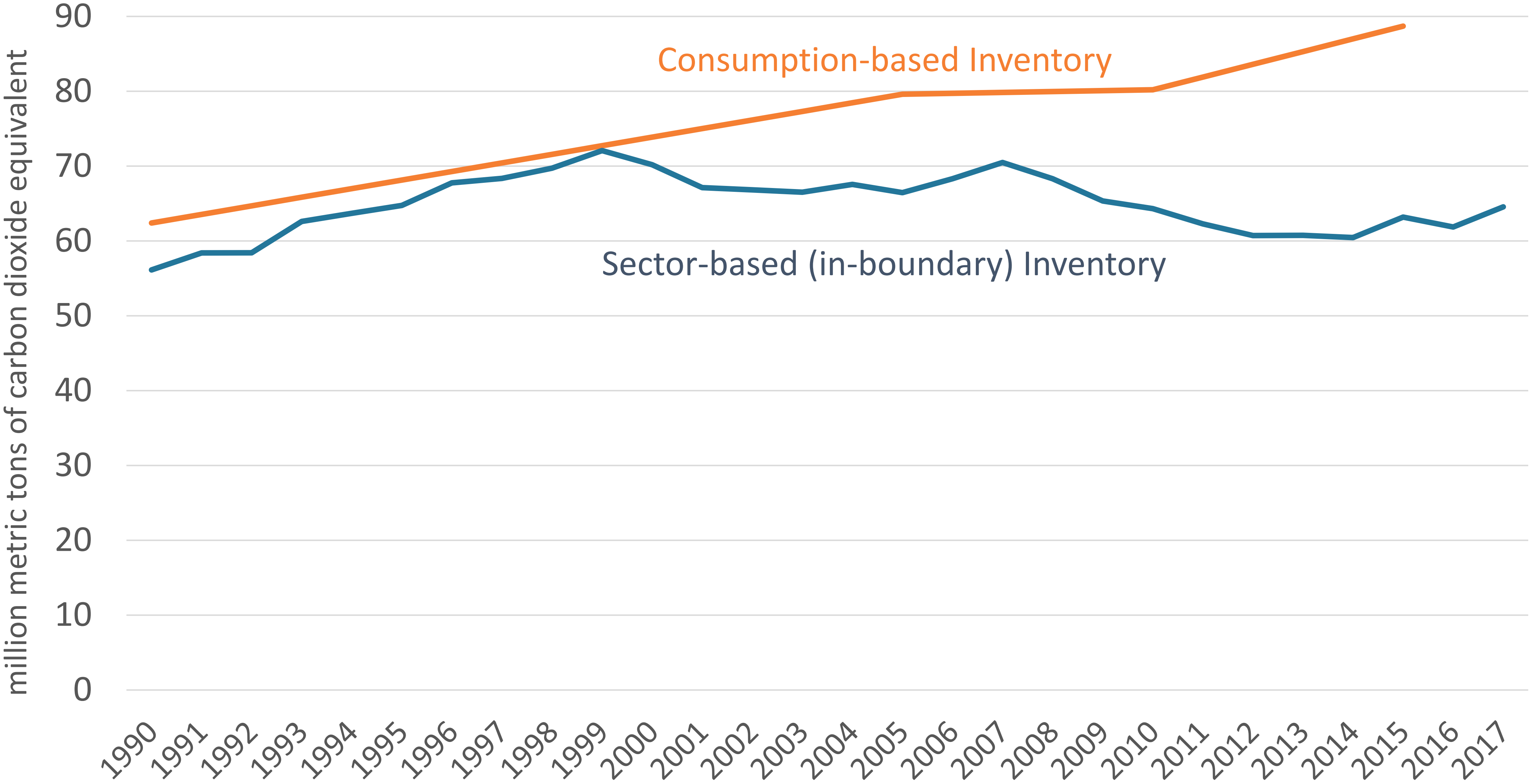
# climate change


# problem statement

1. We need to use resources below a level that our planet can provide in perpetuity.

2. We need to emit wastes below the level(s) that our planet can safely absorb/metabolize in perpetuity.

# Oregon’s contribution to climate change 1990 – 2017



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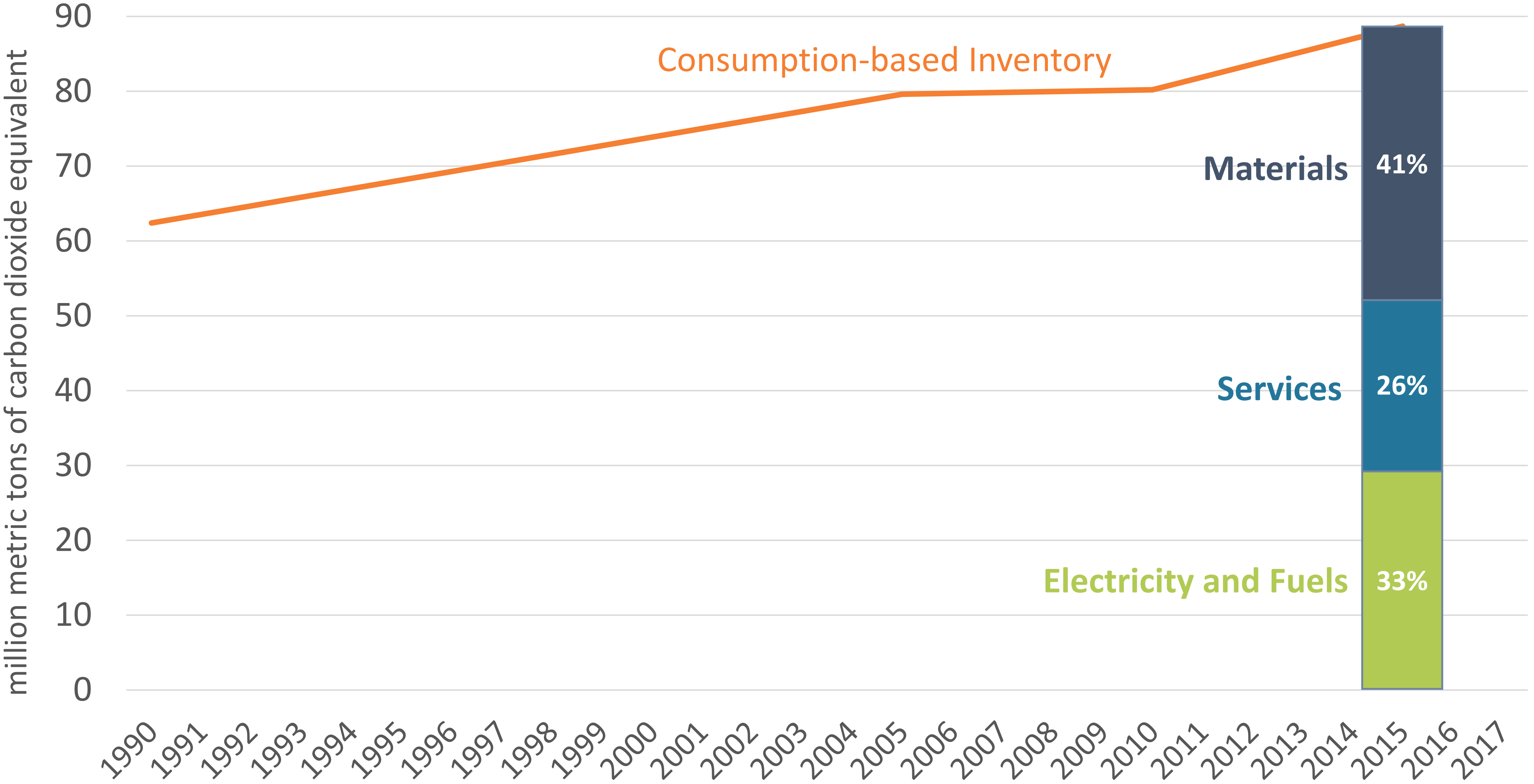
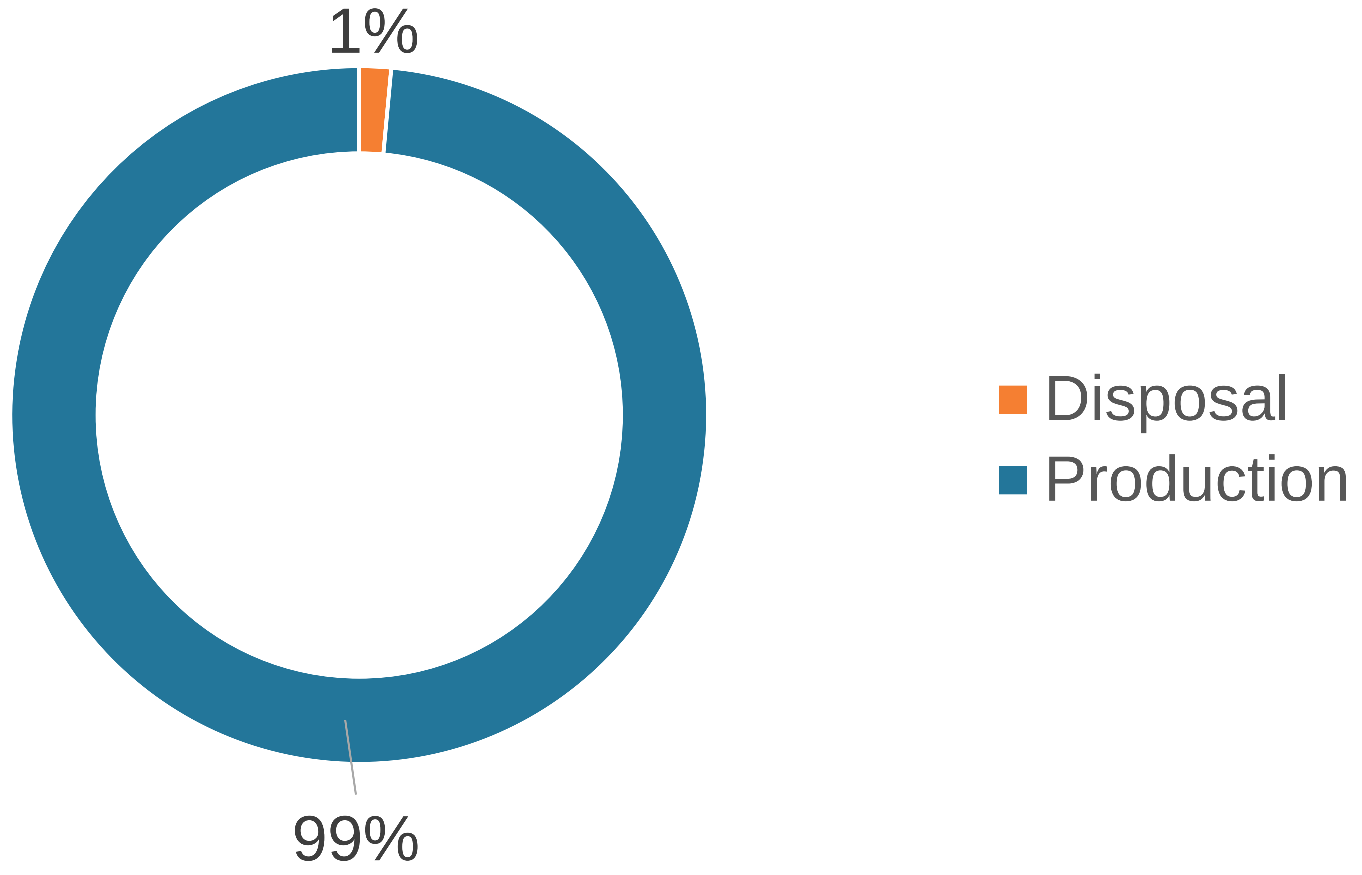


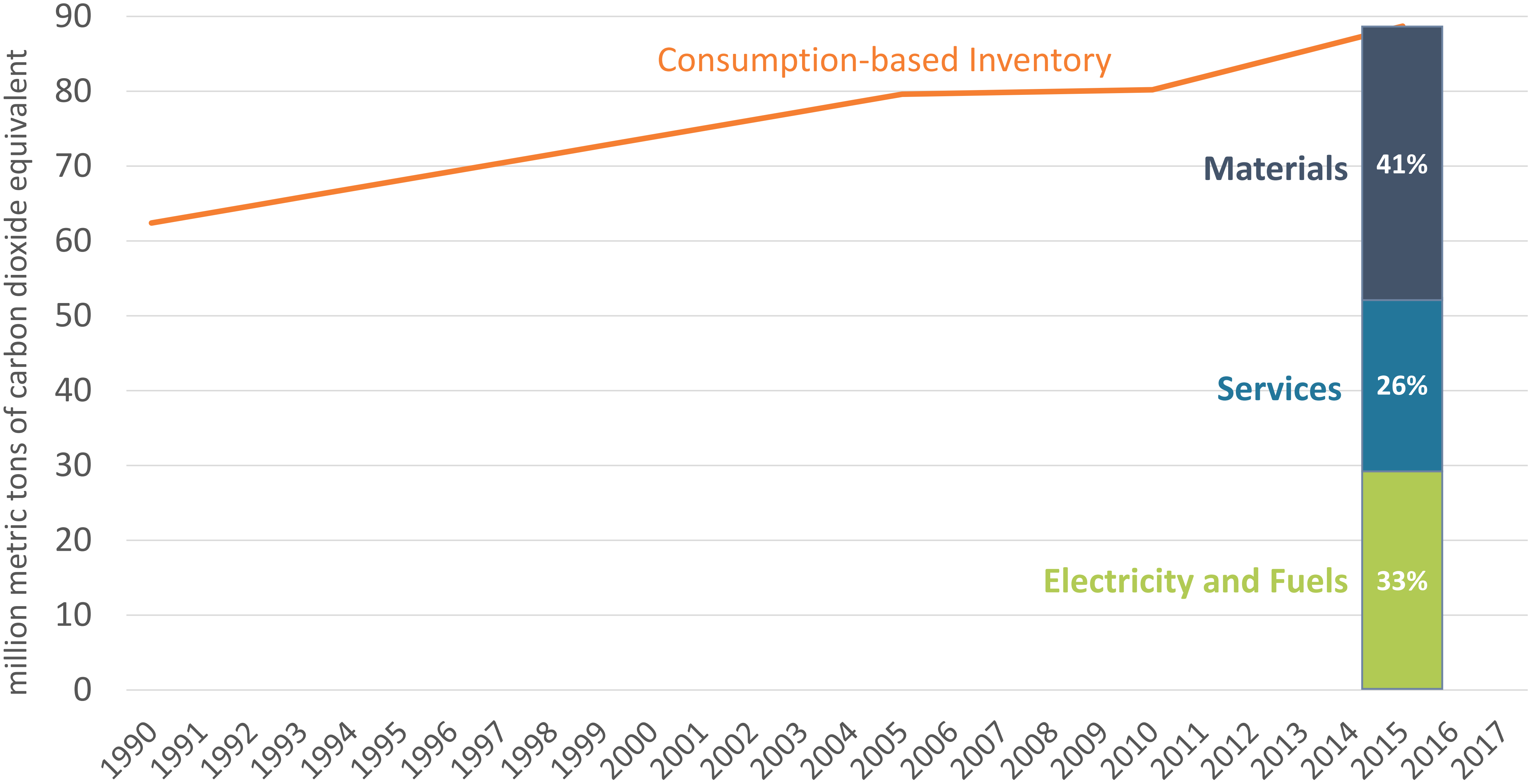
# Oregon's 2015 consumption-based GHG emissions – materials only



# energy and greenhouse gas benefits of recycling

- Recycling in Oregon in 2016 saved ~27 trillion BTUs of energy
    - ~2.8% of total statewide use
    - Equivalent of ~220 million gallons of gasoline
- Recovery in Oregon in 2016 reduced greenhouse gas emissions by ~2.9 million metric tons of $CO_2e$
    - ~4.7% of total statewide emissions
    - Equivalent of 690,000 “average” passenger cars
    - Most benefits are upstream, not downstream


# Oregon's contribution to climate change 1990 – 2017



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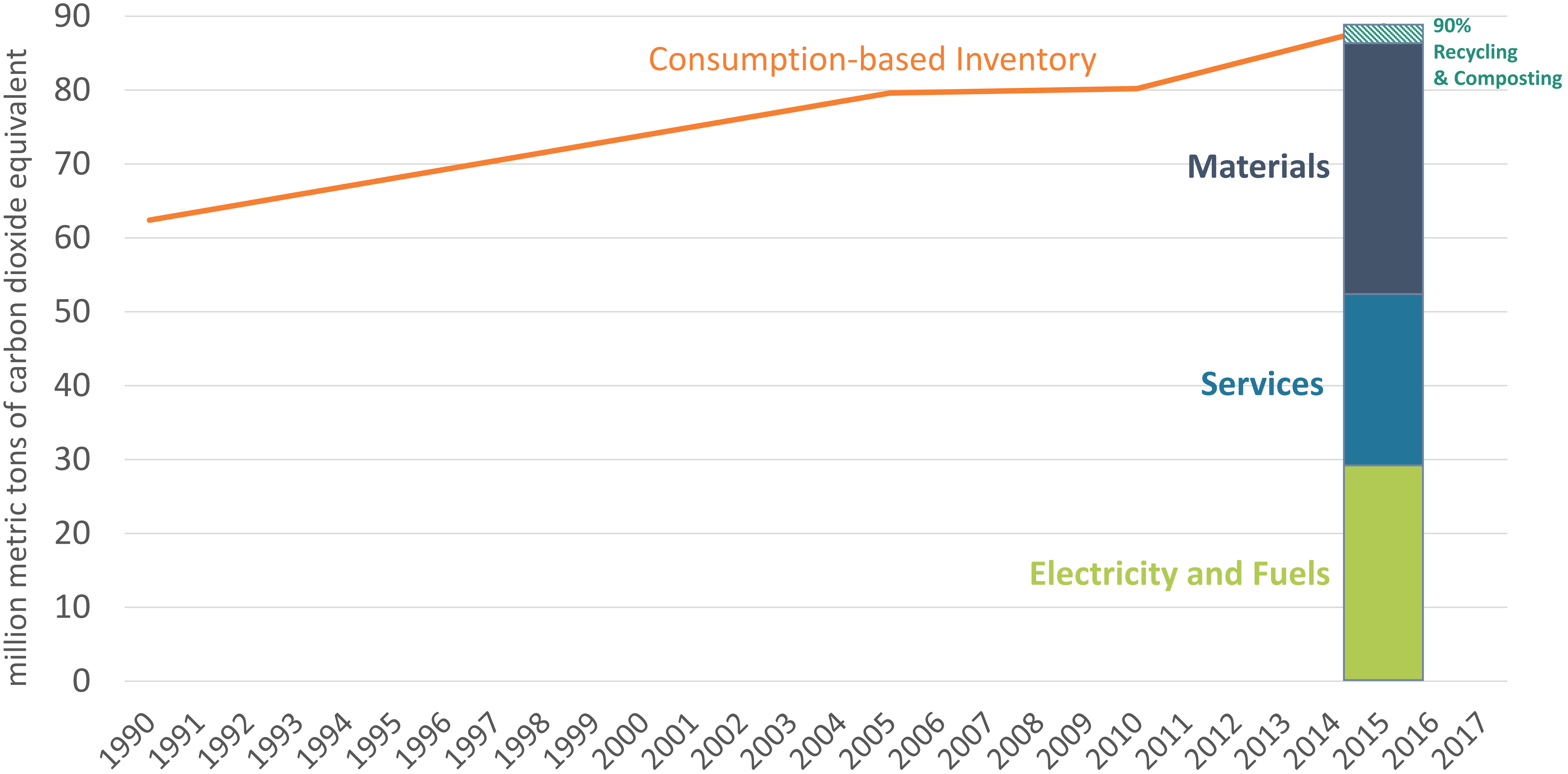
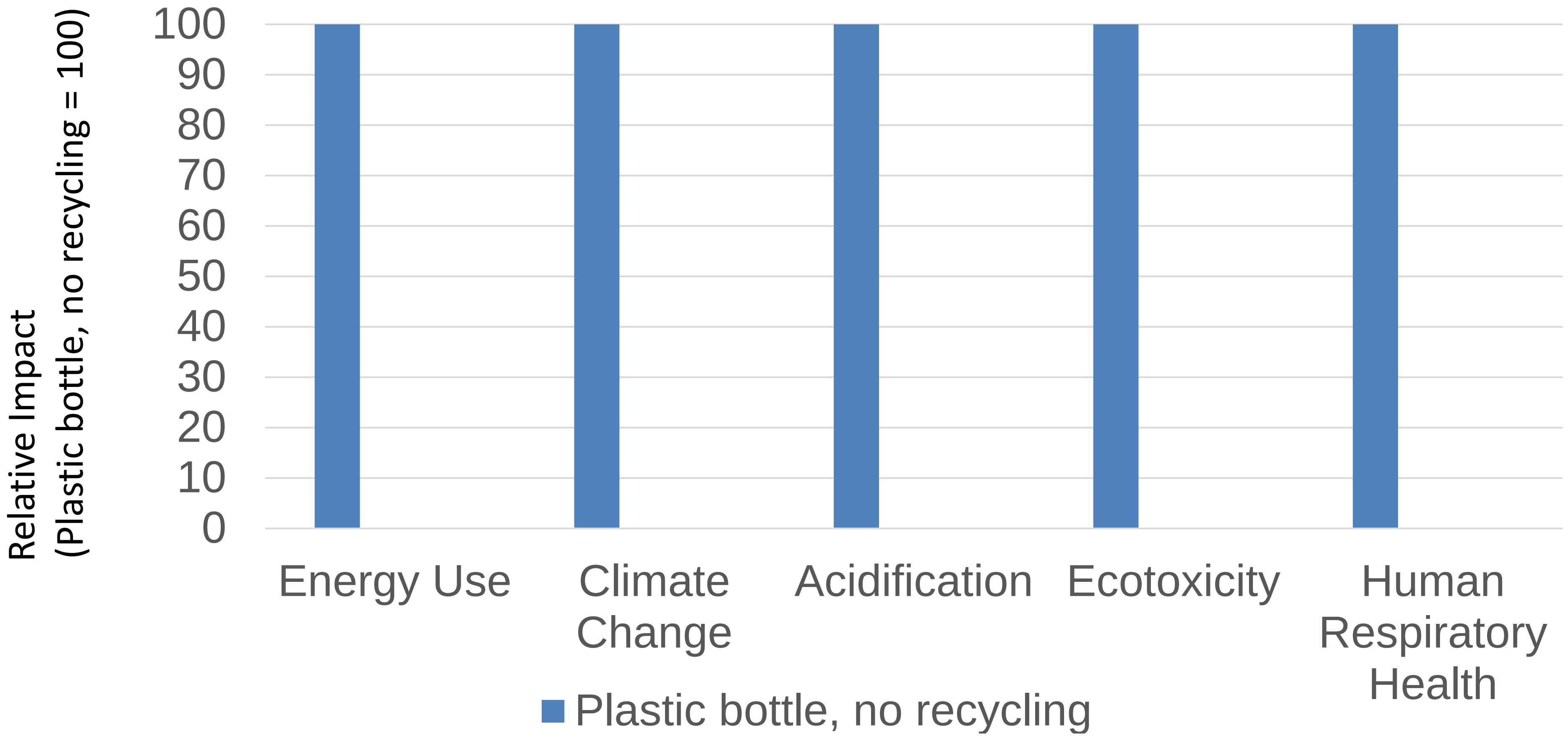
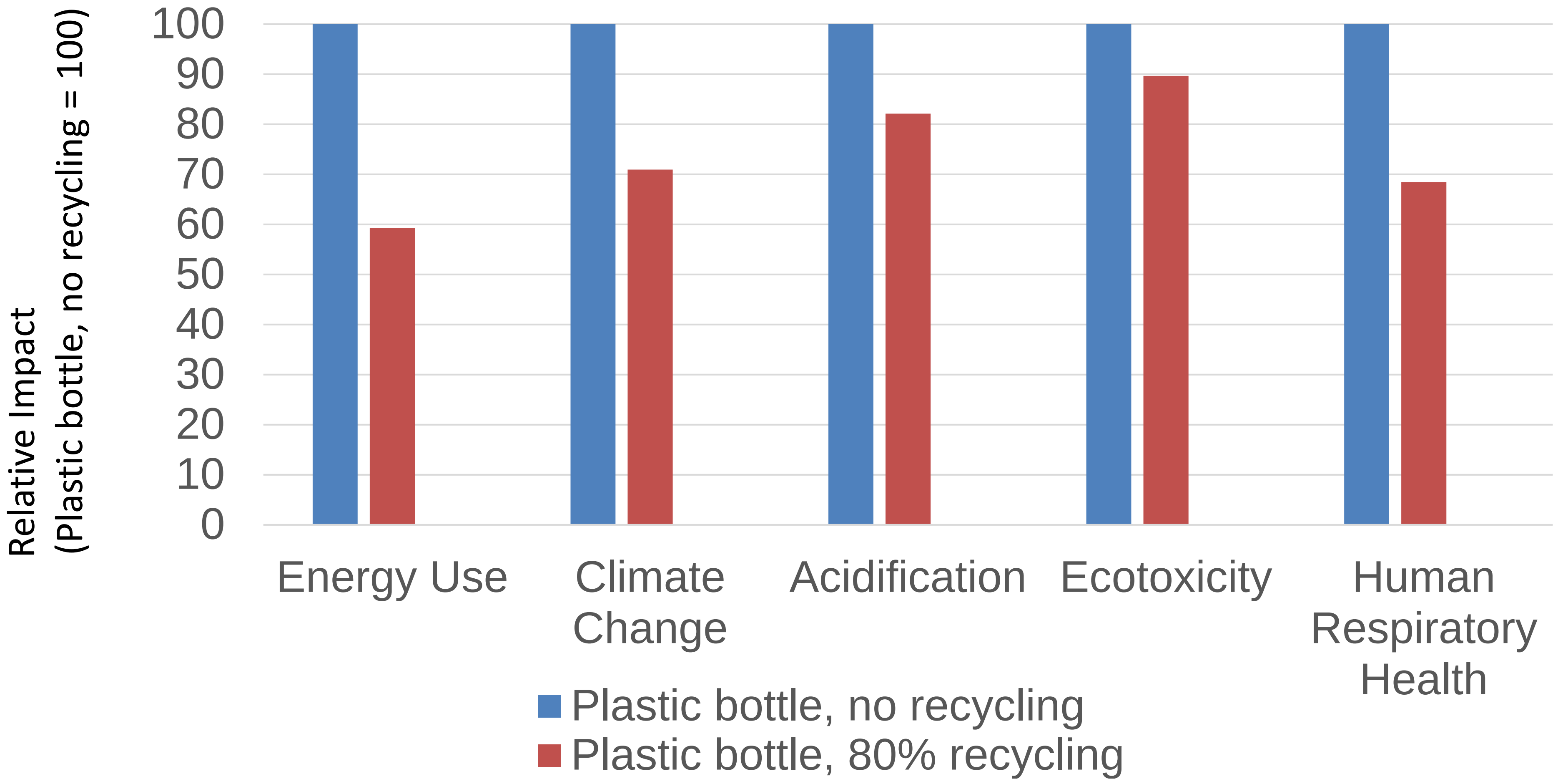


# Drinking water options: dispose, recycle, or reduce?




Source: Oregon DEQ

# Drinking water options: dispose, recycle, or reduce?




Source: Oregon DEQ

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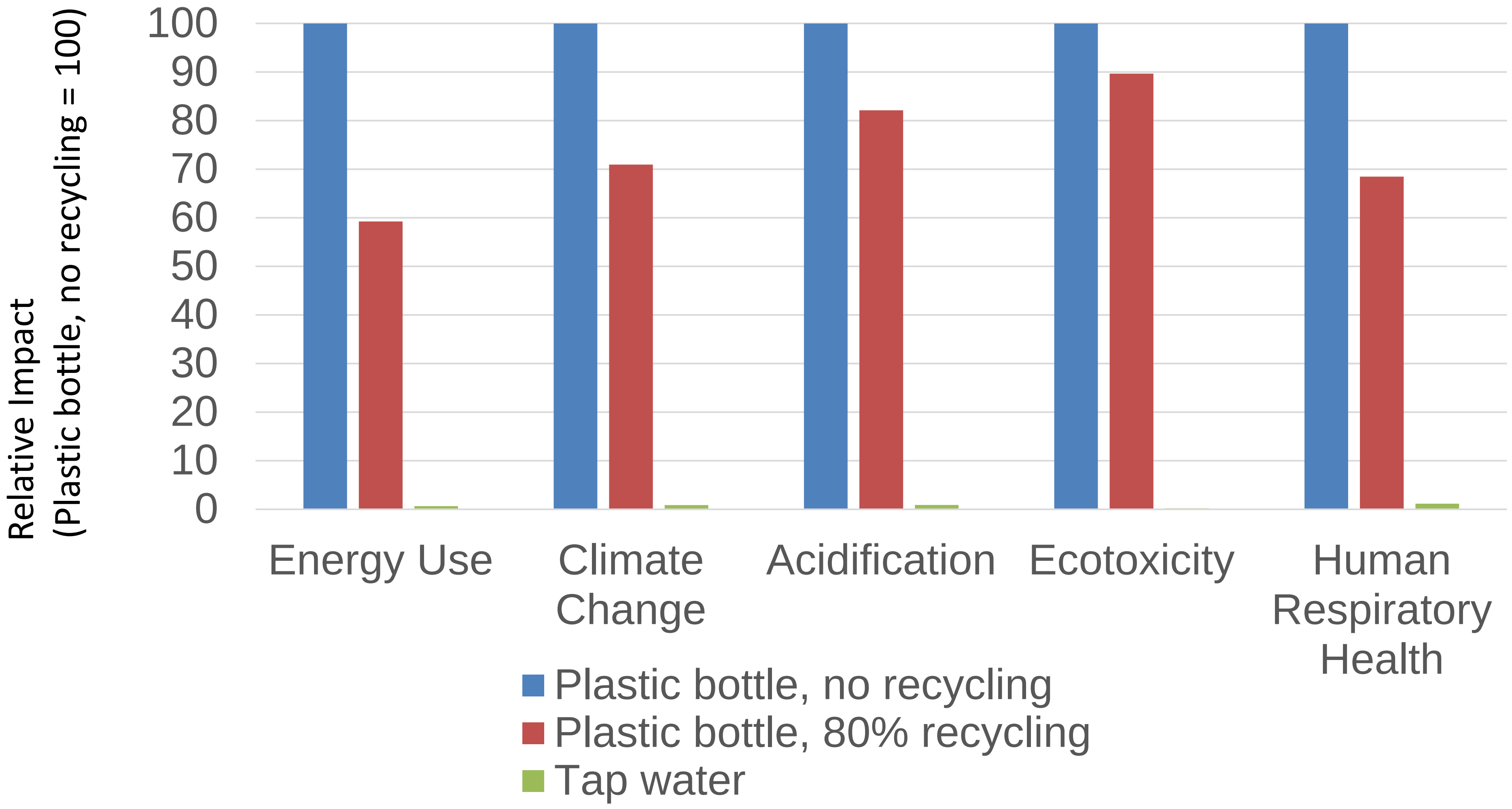
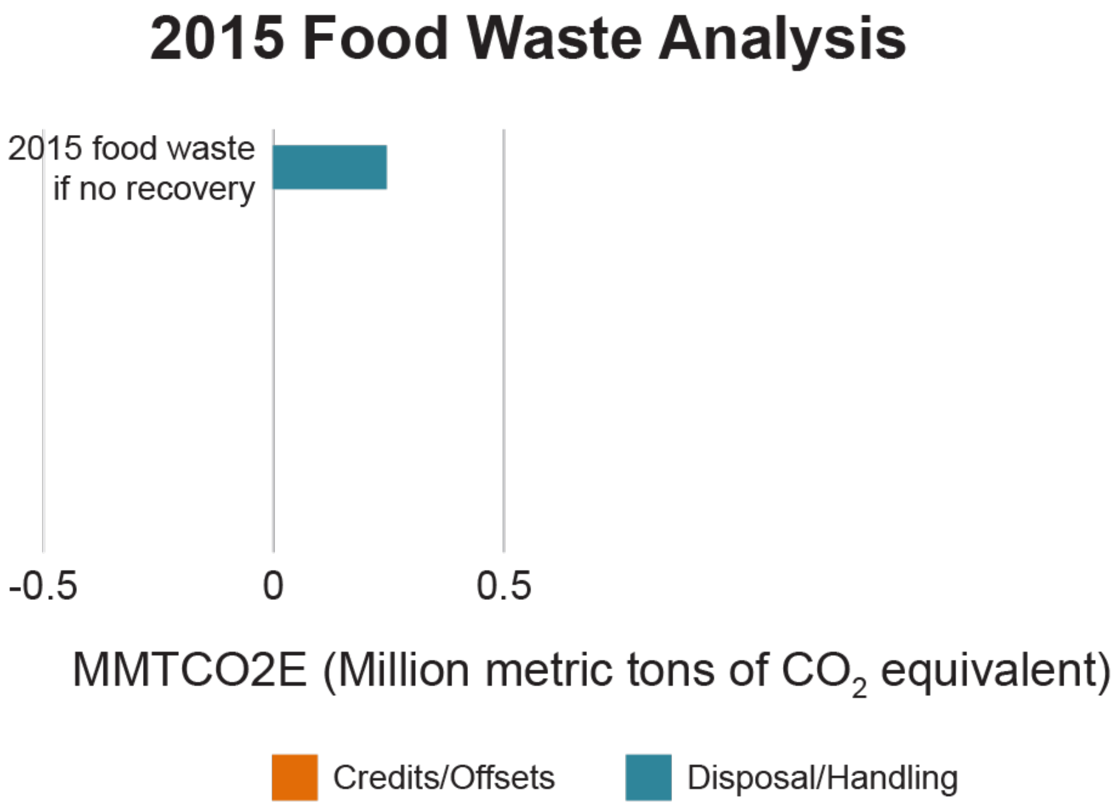



Source: Oregon DEQ

# food waste (Oregon)



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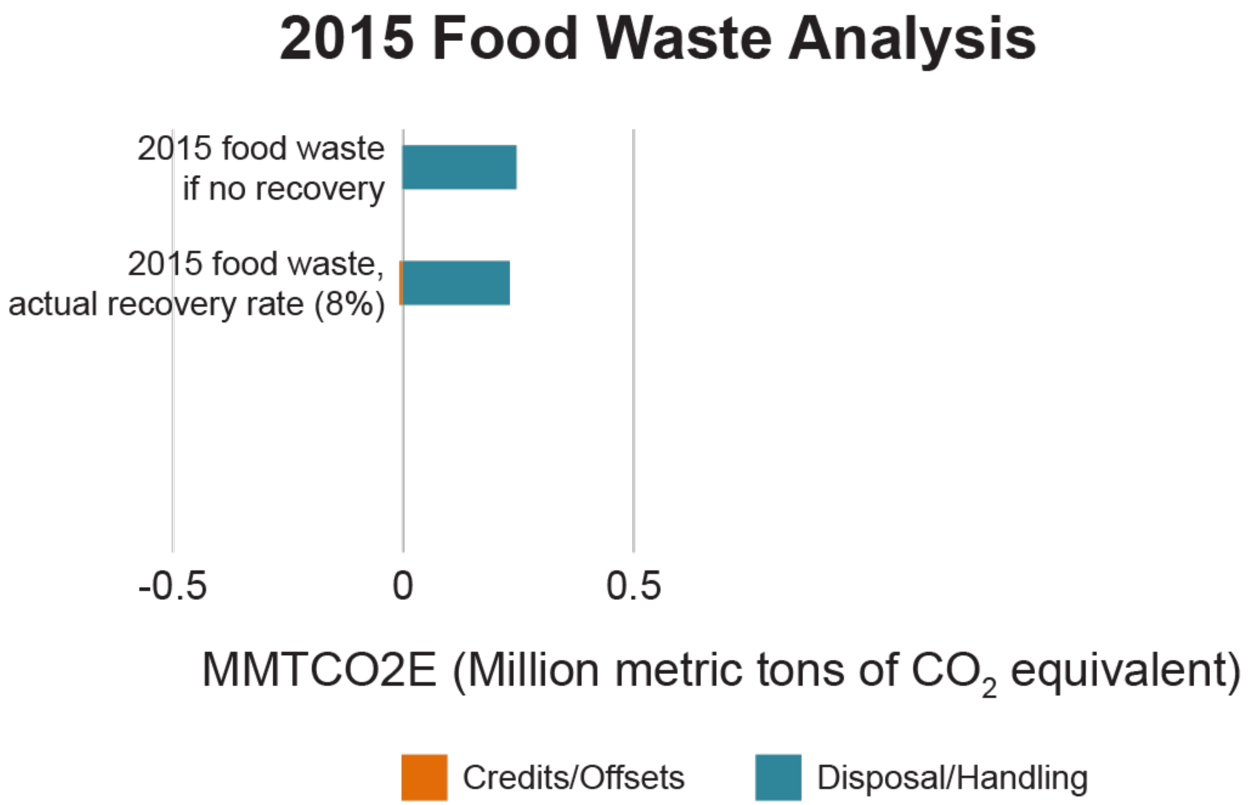

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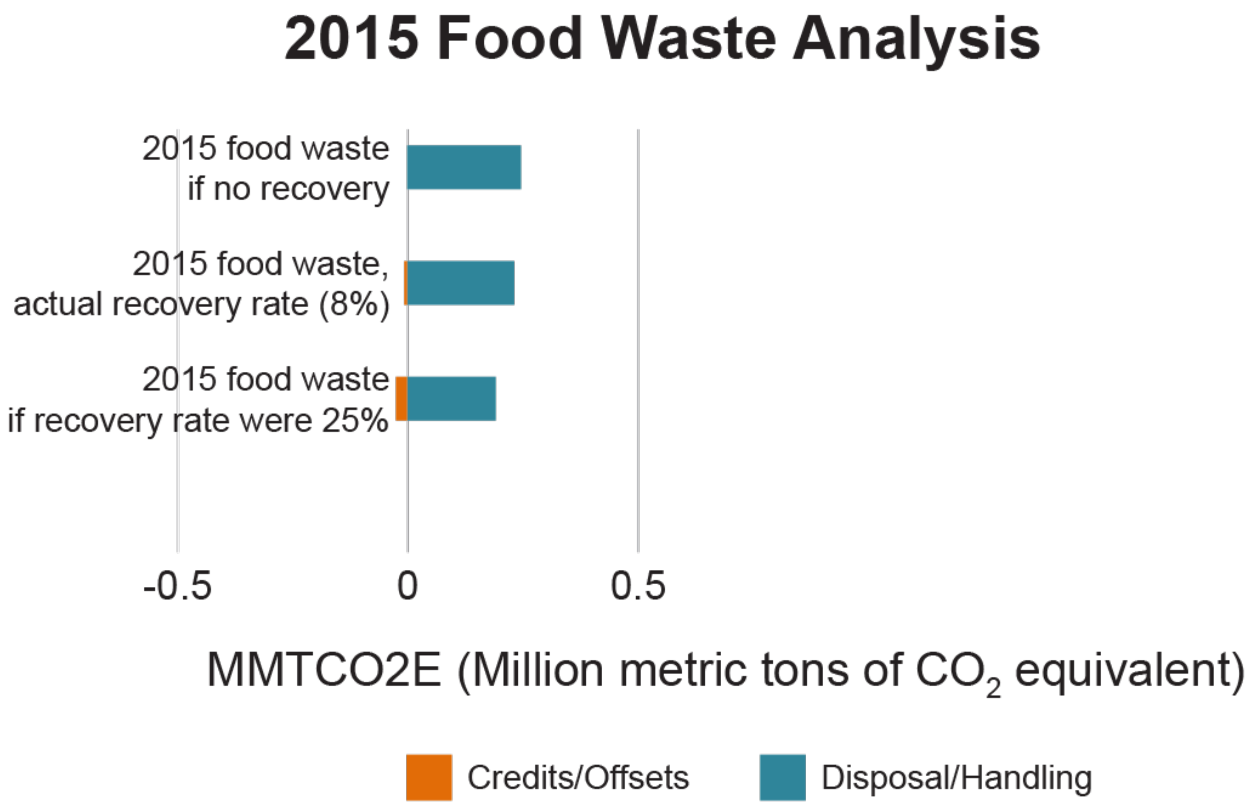

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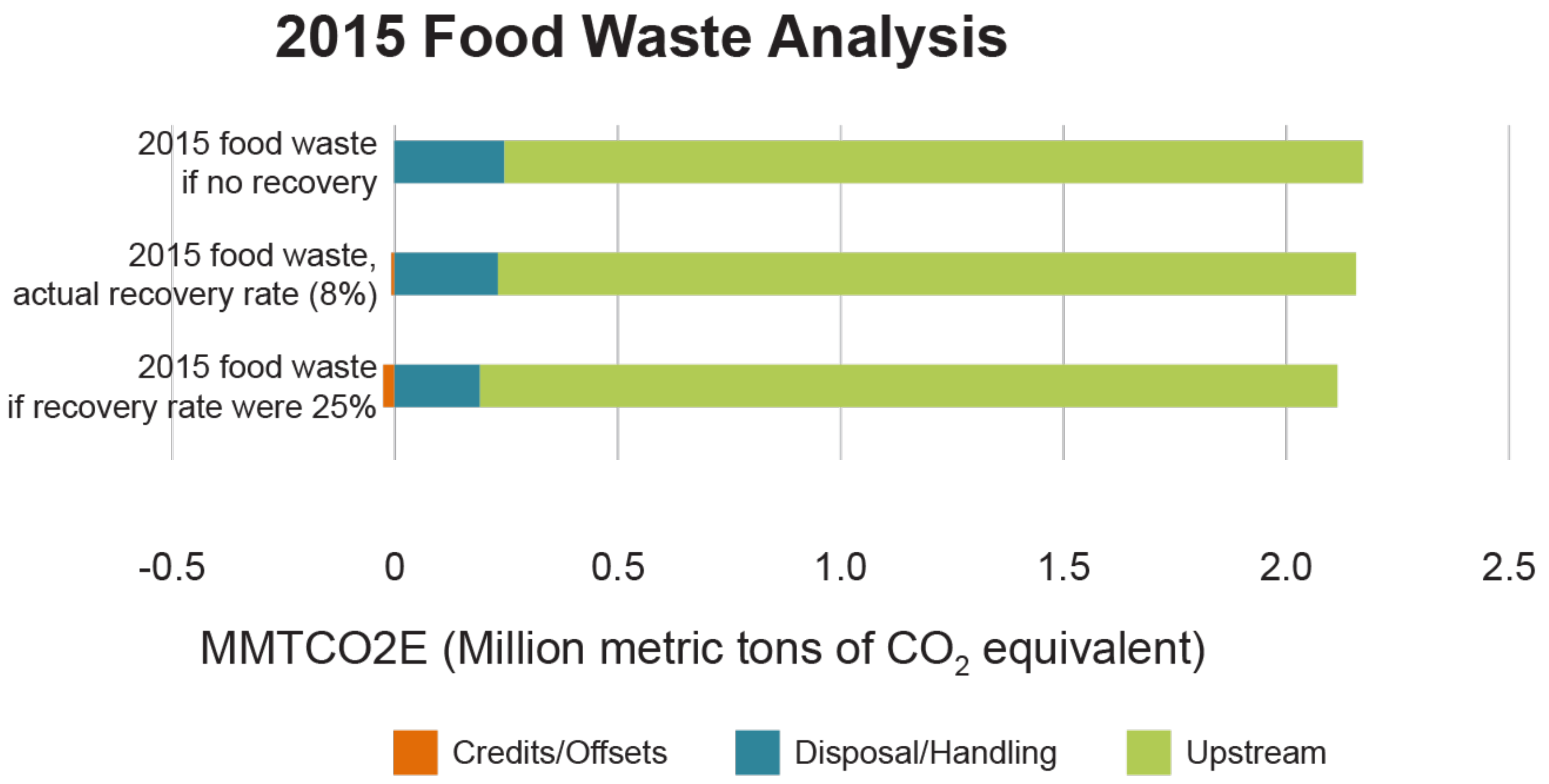

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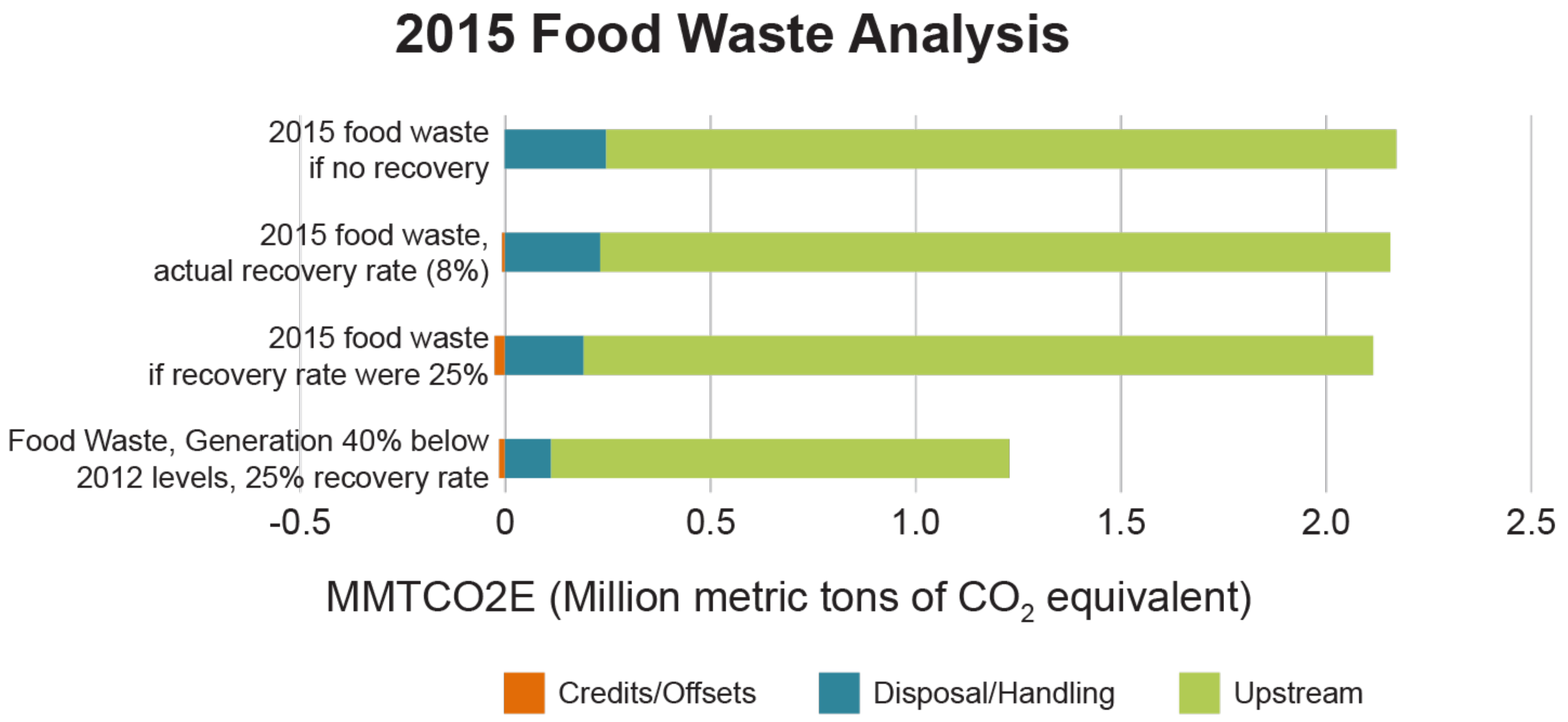


# “zero waste” and “circular economy”


Zero Wastes, or Zero Waste?

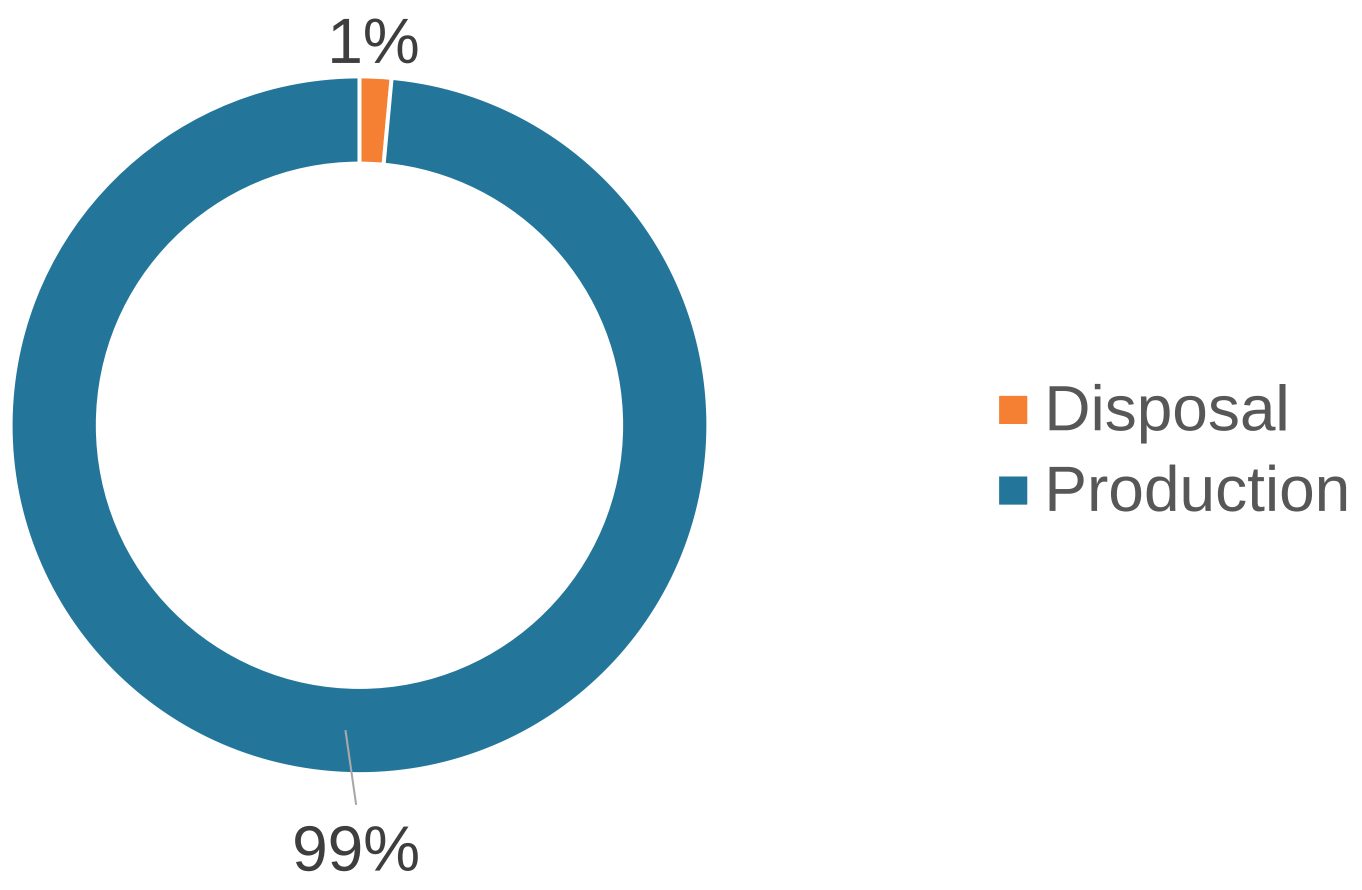
All Wastes, or just Solid Waste?

# circular economy

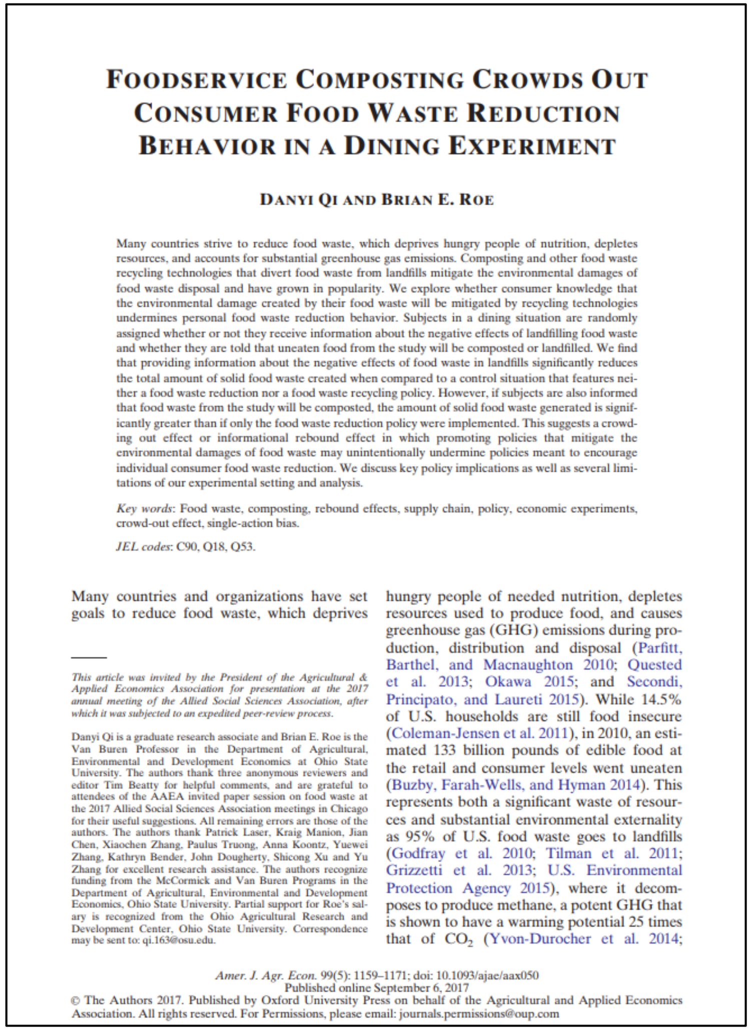
# challenges of “landfill aversion”

1. Frames the problem as a “waste” problem
2. Appears to deactivate/undermine solutions in the upper tiers of the hierarchy
3. Contributes to “wishful recycling” (= contamination)
4. Encourages “design for recovery” at the (potential) expense of “design for environment”

# the "disposal problem" is much smaller than the "production-consumption" problem



# Potential to undermine/disactivate other solutions



## Foodservice Composting Crowds Out Consumer Food Waste Reduction Behavior in a Dining Experiment

**Danyi Qi and Brian E. Roe**

Many countries strive to reduce food waste, which deprives hungry people of nutrition, depletes resources, and accounts for substantial greenhouse gas emissions. Composting and other food waste recycling technologies that divert food waste from landfills mitigate the environmental damages of food waste disposal and have grown in popularity. We explore whether consumer knowledge that the environmental damage created by their food waste will be mitigated by recycling technologies undermines personal food waste reduction behavior. Subjects in a dining situation are randomly assigned whether or not they receive information about the negative effects of landfilling food waste and whether they are told that uneaten food from the study will be composted or landfilled. We find that providing information about the negative effects of food waste in landfills significantly reduces the total amount of solid food waste created when compared to a control situation that features neither a food waste reduction nor a food waste recycling policy. However, if subjects are also informed that food waste from the study will be composted, the amount of solid food waste generated is significantly greater than if only the food waste reduction policy were implemented. This suggests a crowding out effect or informational rebound effect in which promoting policies that mitigate the environmental damages of food waste may unintentionally undermine policies meant to encourage individual consumer food waste reduction. We discuss key policy implications as well as several limitations of our experimental setting and analysis.

*Key words*: Food waste, composting, rebound effects, supply chain, policy, economic experiments, crowd-out effect, single-action bias.

*JEL codes*: C90, Q18, Q53.

Many countries and organizations have set goals to reduce food waste, which deprives hungry people of needed nutrition, depletes resources used to produce food, and causes greenhouse gas (GHG) emissions during production, distribution and disposal (Parfitt, Barthel, and Macnaughton 2010; Quested et al. 2013; Okawa 2015; and Secondi, Principato, and Laureti 2015). While 14.5% of U.S. households are still food insecure (Coleman-Jensen et al. 2011), in 2010, an estimated 133 billion pounds of edible food at the retail and consumer levels went uneaten (Buzby, Farah-Wells, and Hyman 2014). This represents both a significant waste of resources and substantial environmental externality as 95% of U.S. food waste goes to landfills (Godfray et al. 2010; Tilman et al. 2011; Grizzetti et al. 2013; U.S. Environmental Protection Agency 2015), where it decomposes to produce methane, a potent GHG that is shown to have a warming potential 25 times that of $CO_2$ (Yvon-Durocher et al. 2014;

*This article was invited by the President of the Agricultural & Applied Economics Association for presentation at the 2017 annual meeting of the Allied Social Sciences Association, after which it was subjected to an expedited peer-review process.*

Danyi Qi is a graduate research associate and Brian E. Roe is the Van Buren Professor in the Department of Agricultural, Environmental and Development Economics at Ohio State University. The authors thank three anonymous reviewers and editor Tim Beatty for helpful comments, and are grateful to attendees of the AAEA invited paper session on food waste at the 2017 Allied Social Sciences Association meetings in Chicago for their useful suggestions. All remaining errors are those of the authors. The authors thank Patrick Laser, Kraig Manion, Jian Chen, Xiaochen Zhang, Paulus Truong, Anna Koontz, Yuewei Zhang, Kathryn Bender, John Dougherty, Shicong Xu and Yu Zhang for excellent research assistance. The authors recognize funding from the McCormick and Van Buren Programs in the Department of Agricultural, Environmental and Development Economics, Ohio State University. Partial support for Roe's salary is recognized from the Ohio Agricultural Research and Development Center, Ohio State University. Correspondence may be sent to: qi.163@osu.edu.

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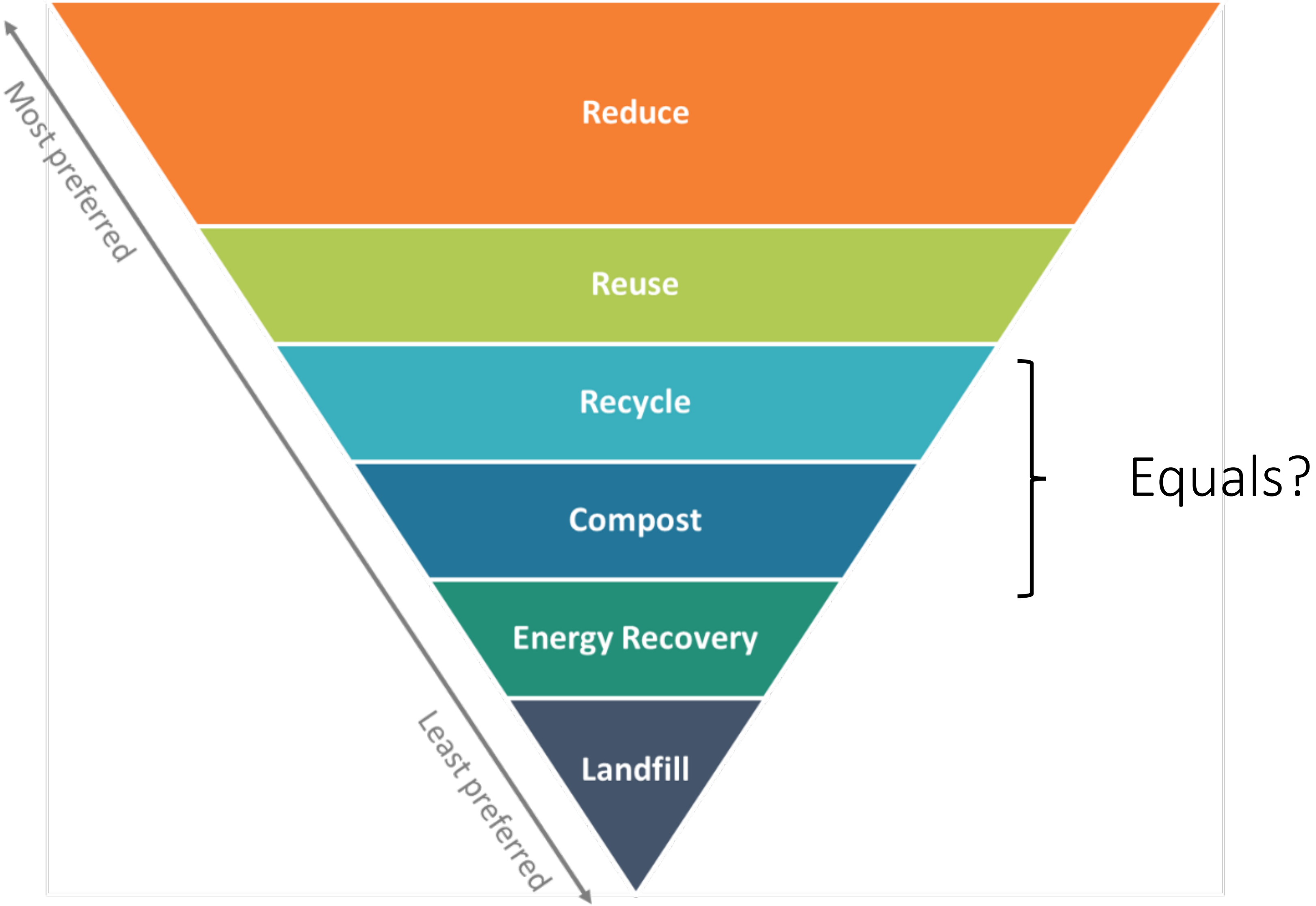
Conahan for Oregon Business    The Wastrel

# the "waste management" hierarchy



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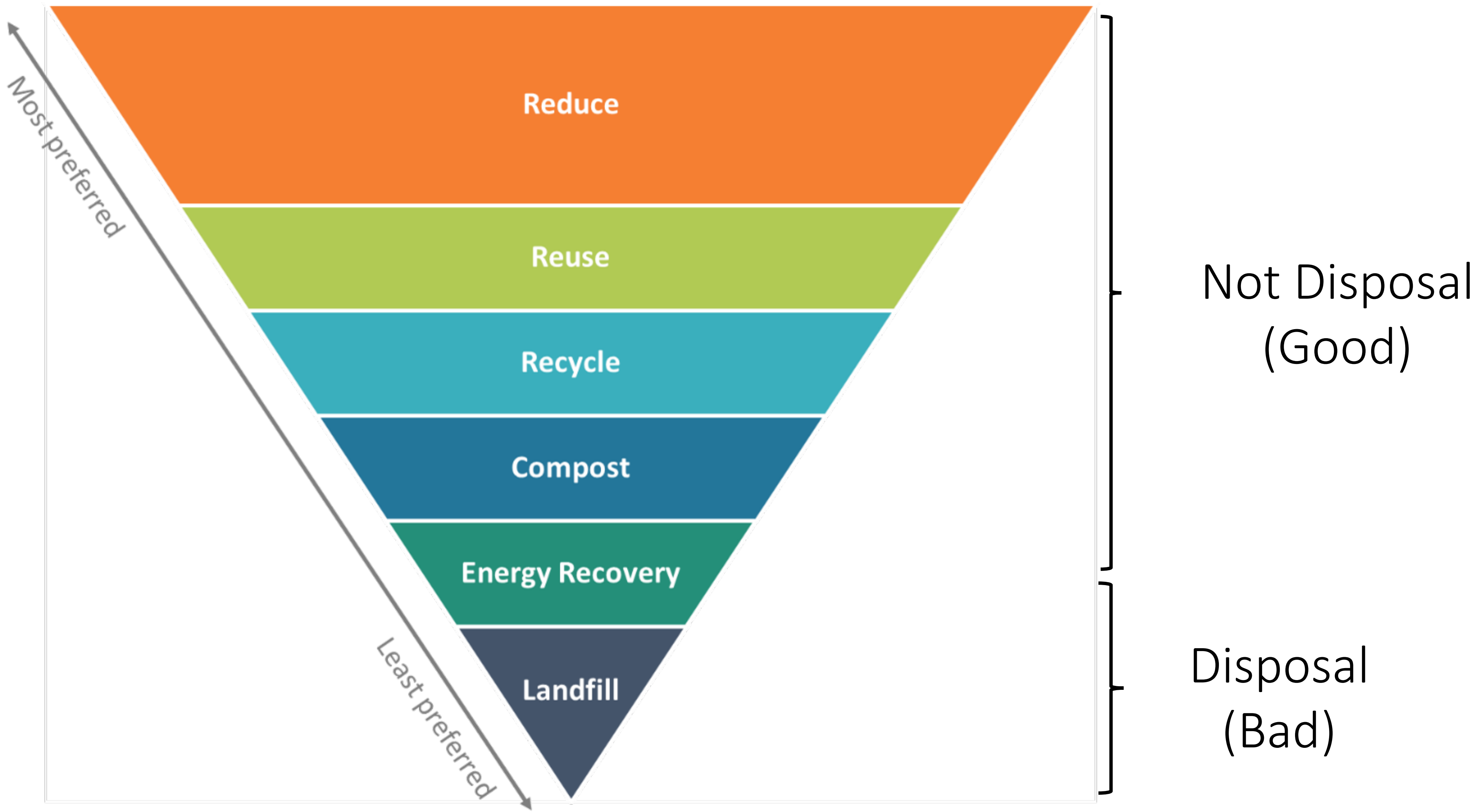
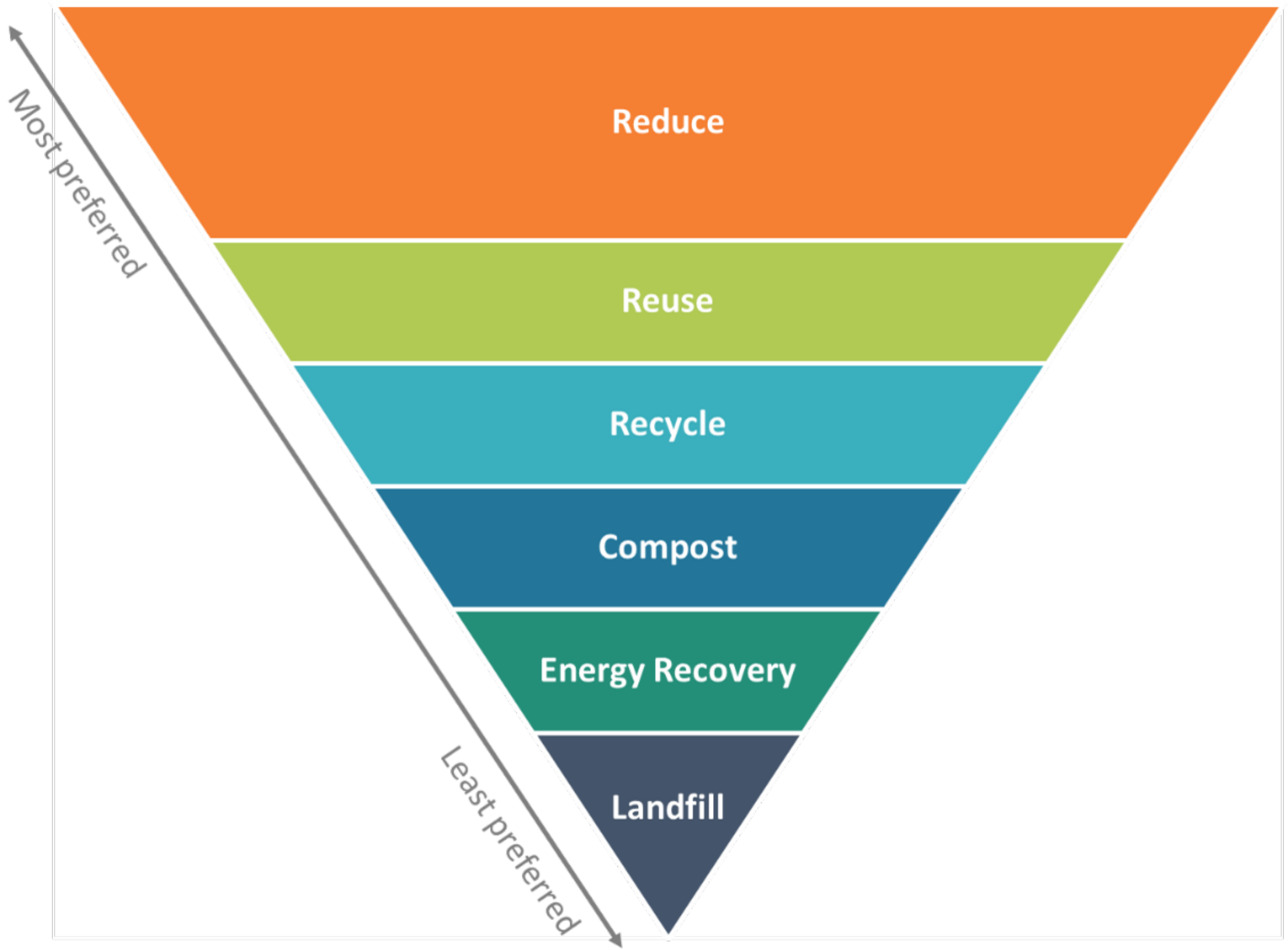


# Oregon's approach (goals)



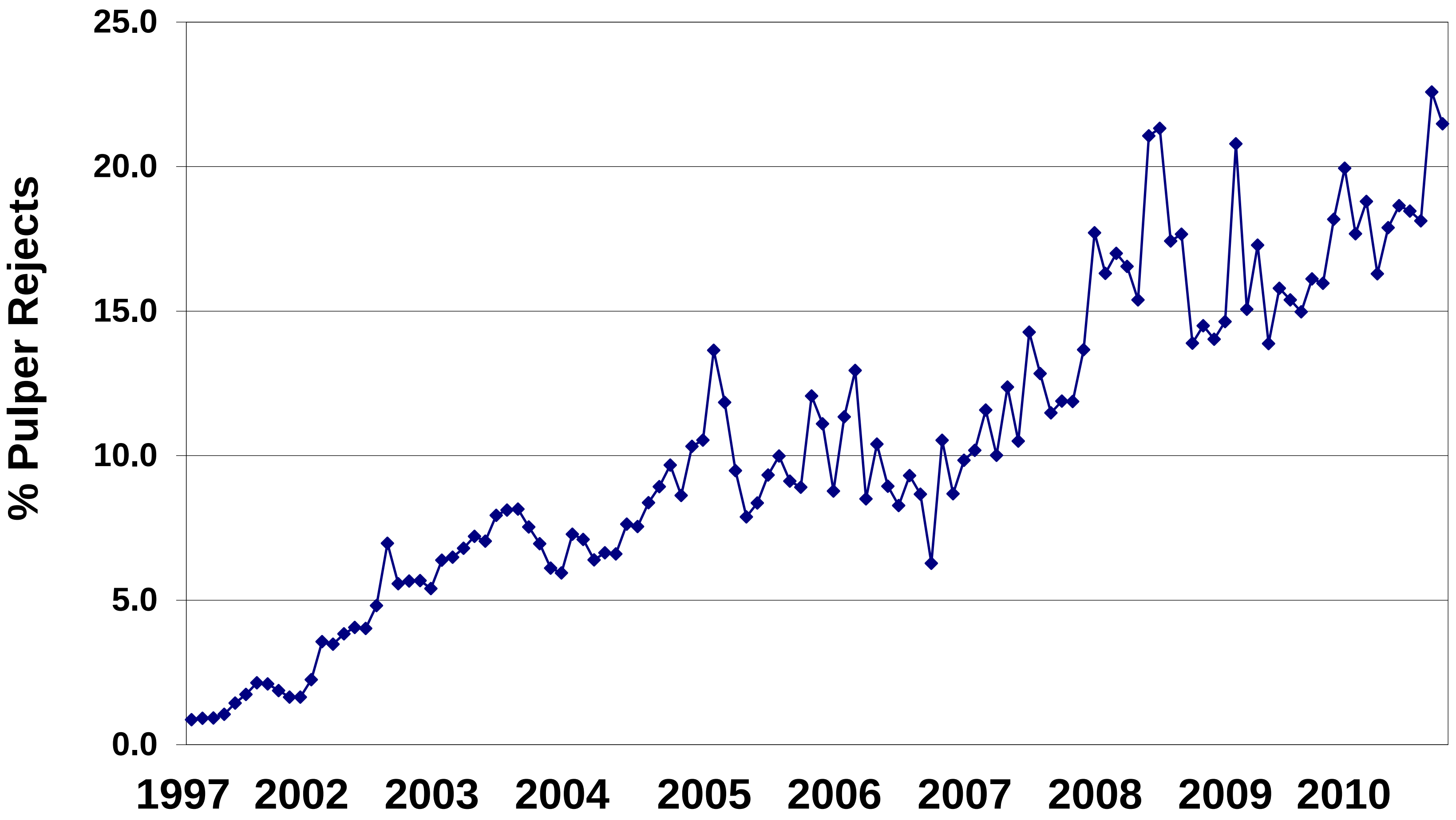

Reduce Generation (Reduce, Reuse)

Increase Recovery (Recycle, Compost, limited energy recovery)

# landfill aversion → contamination

# NORPAC, Longview

# NORPAC (Longview) pulper rejects as suppliers switched to commingled collection



# Recycling, if not done well, can cause harm

*Photos: Megan Ponder*

# “Recyclable” not always lowest impact


# life cycle assessment

Life Cycle Assessment is

"the compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle."

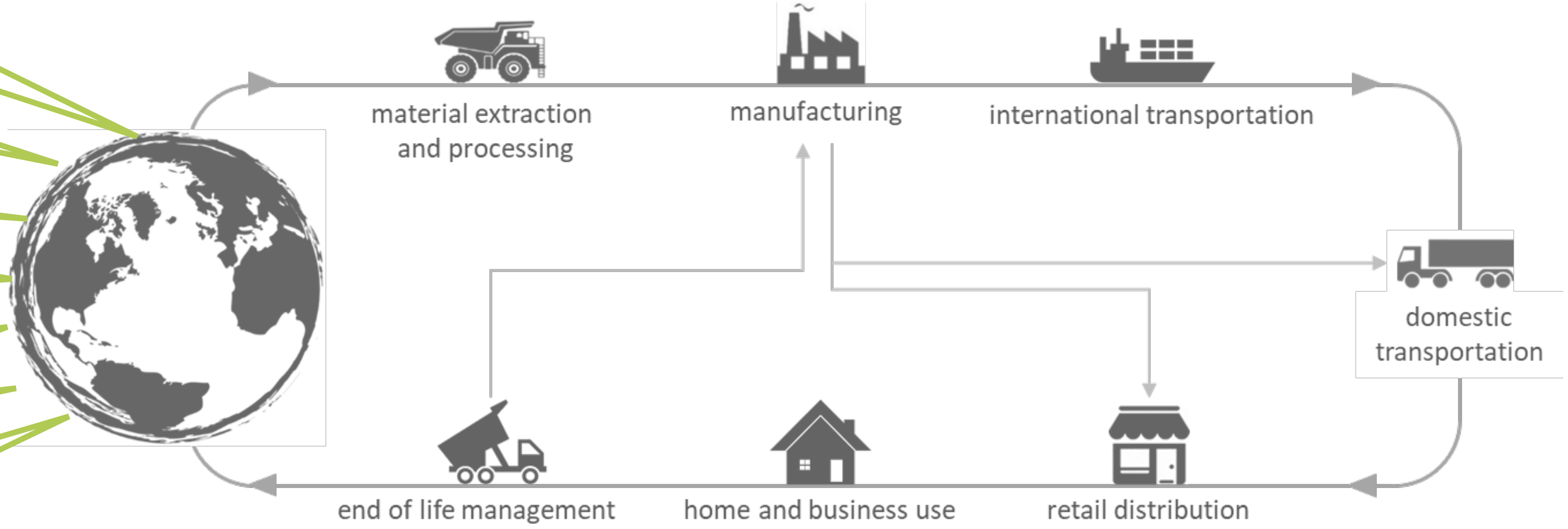
# US EPA coffee study

| Coffee Packaging (11.5 oz product) | Recyclable postconsumer? | Energy Consumption (MJ/11.5 oz.) | CO2 eq Emissions (lbs/11.5 oz) | MSW Waste Generated (lbs./ 100,000 oz. of product) |
|---|---|---|---|---|
|  | Steel can – yes<br>Plastic lid – no | 4.21 | 0.33 | 1,305 |
|  | Plastic container – yes<br>Plastic lid - no | 5.18 | 0.17 | 847 |
|  | Flexible pouch - no | 1.14 | 0.04 | 176 |

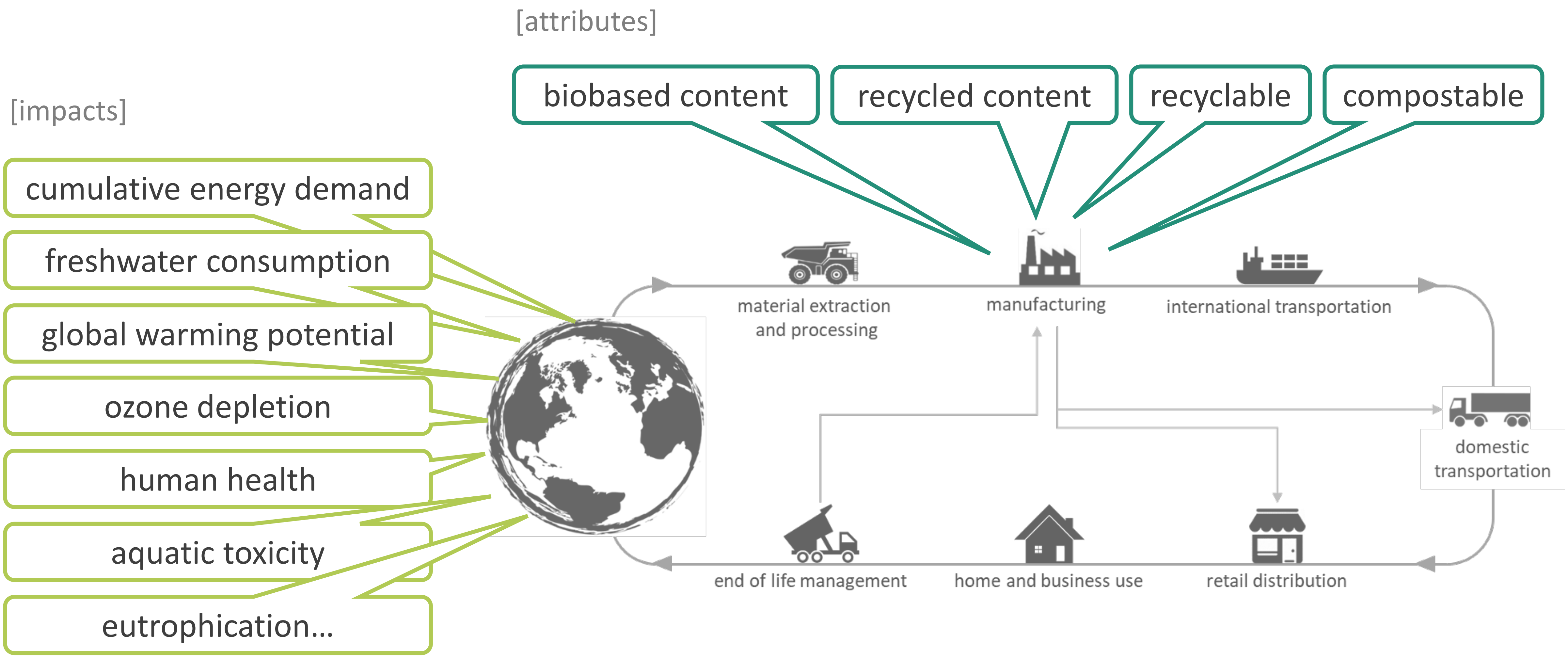
# life cycle impacts

[impacts]

- cumulative energy demand
- freshwater consumption
- global warming potential
- ozone depletion
- human health
- aquatic toxicity
- eutrophication…



# life cycle impacts and material attributes

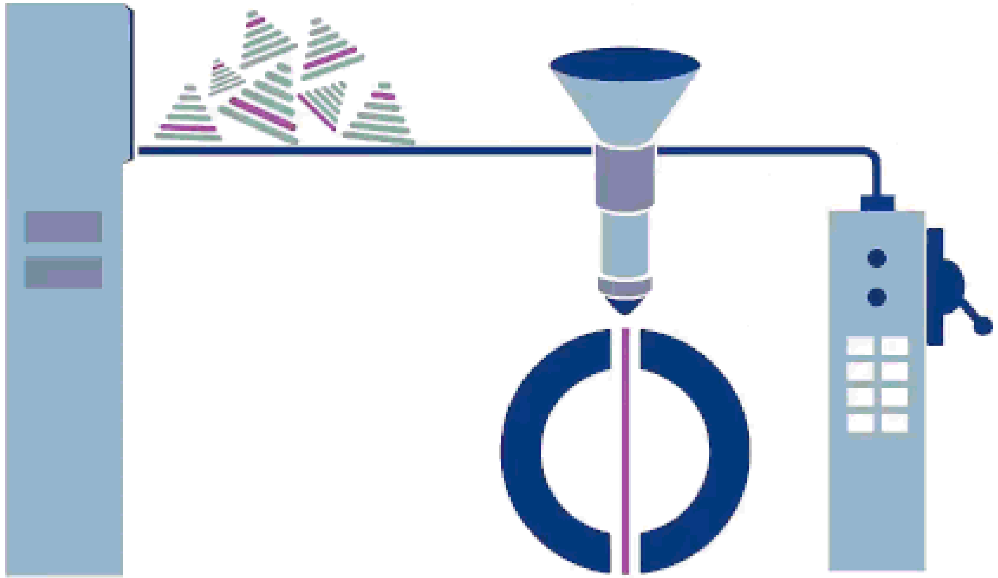


# DEQ attributes study (2017 – 2018)

## Research question:

How well (and when) do popular material attributes correlate with reduced environmental impacts?

# material attributes: research approach



Source:*http://cccrg.cochrane.org/*

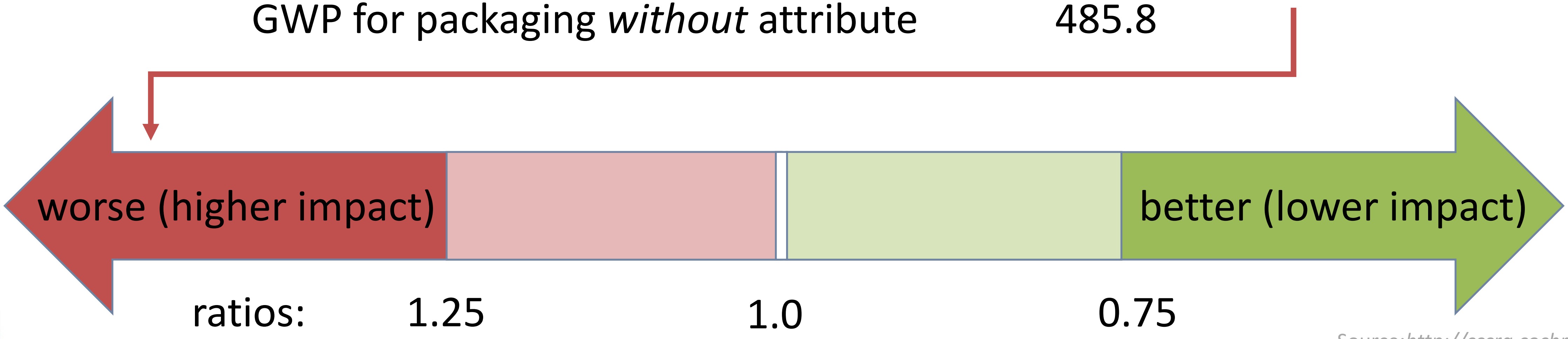
# evaluation: an example

**Reported GWP (global warming potential) Value**
(lb CO2e per 100,000 oz)


12 oz. steel can with recyclable — 1946.8


12 oz. laminate pouch not recyclable — 485.8

$$\frac{\text{GWP for packaging } \textit{with} \text{ attribute}}{\text{GWP for packaging } \textit{without} \text{ attribute}} = \frac{1946.8}{485.8} = \mathbf{4.01}$$



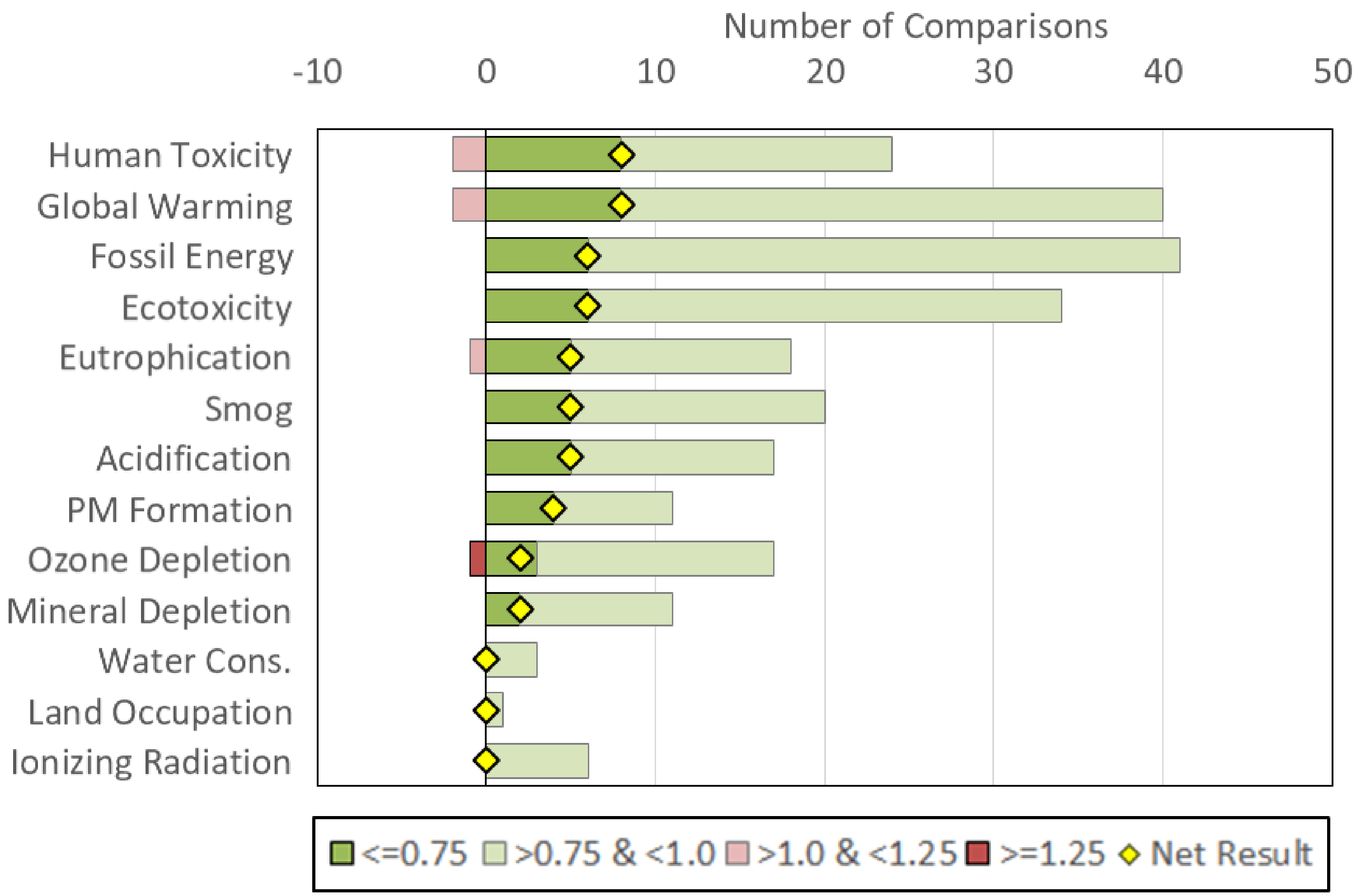

Source: *http://cccrg.cochrane.org/*

# evaluation framework

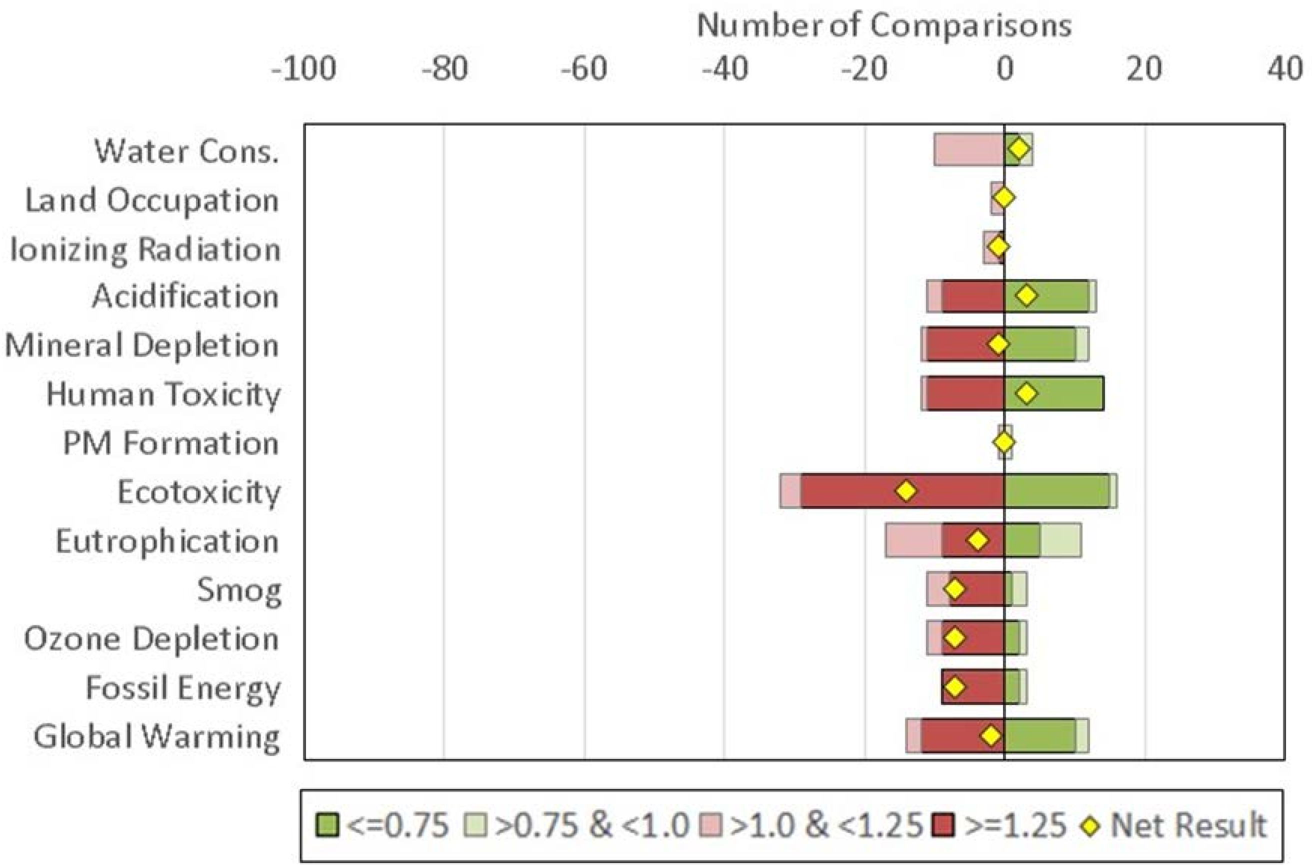
| *Ratio = Impact result with attribute A ÷ Impact result without attribute A* | | |
|---|---|---|
| **Category** | **Ratio** | **Interpretation** |
| Meaningfully Lower Life Cycle Impact | <0.75 | Suggests the attribute is potentially a good indicator of environmental performance |
| Marginally Lower Life Cycle Impact | ≥0.75 and <1.0 | Marginal difference |
| No difference | 1.0 | No difference |
| Marginally Higher Life Cycle Impact | >1.0 and ≤1.25 | Marginal difference |
| Meaningfully Higher Life Cycle Impact | >1.25 | Attribute is potentially not a good indicator of environmental performance |

The lower the ratio value, the lower the environmental impact of the material(s) being evaluated (*with* the attribute) compared to the equivalent material *without* the attribute.

# *same* packaging material with higher PCR vs. lower PCR



# comparing *different* packages based on PCR

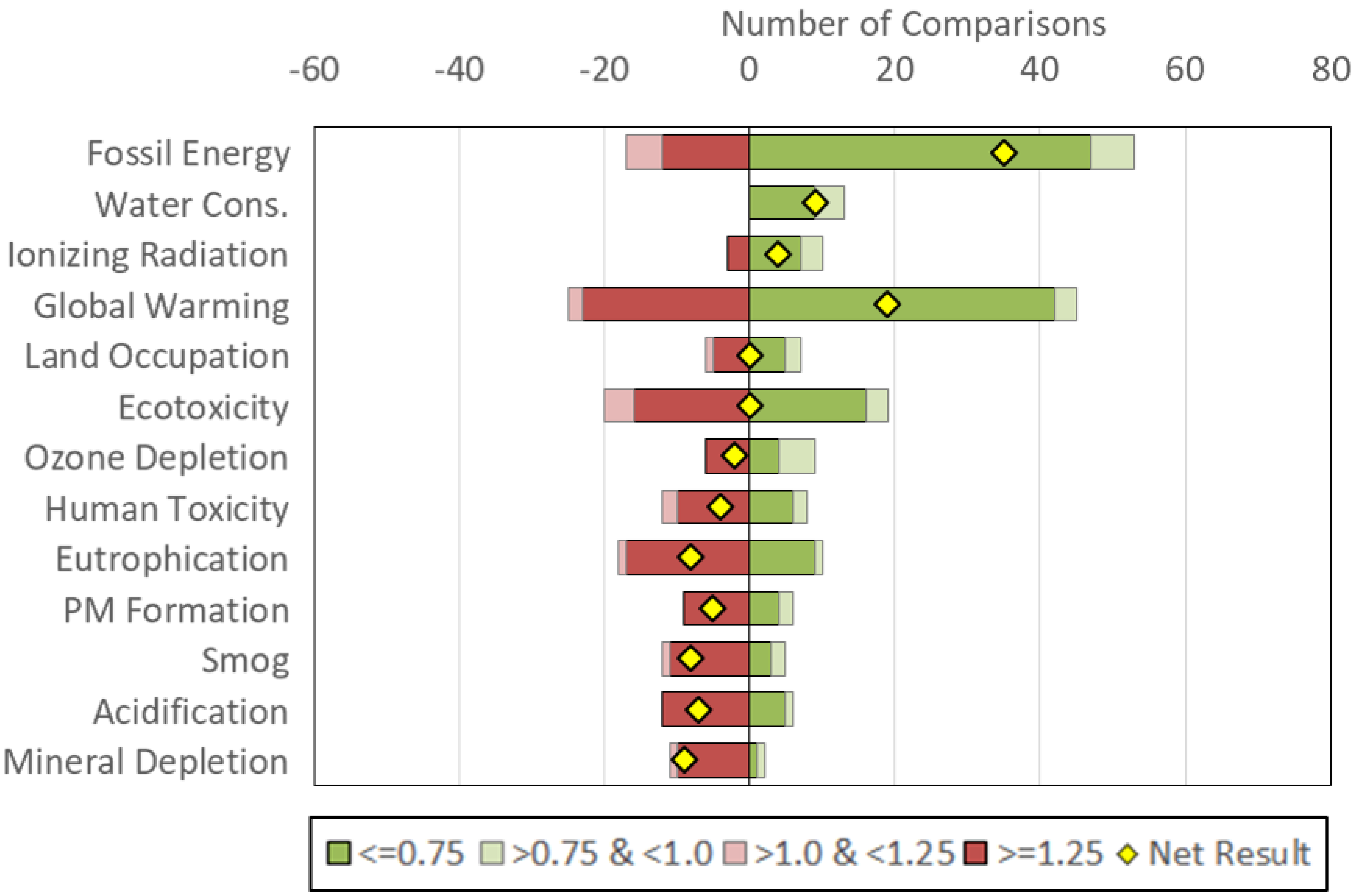


# “recycling” ≠ “recyclability”

**Recycle** \rē’-si-kəl\ *vt*  1: to collect and treat used objects and materials that are ready to be thrown out in order to produce materials that can be used again

**Recyclable** \rē’-si-klə-bəl\ *adj*  1: able to be recycled

# comparing different packages based on recyclability



# popular attributes

# LCA “what if” scenario assessment: coffee packaging

- Lightweight, non-recyclable plastic-foil bag

- Compare against 4 “recyclable” containers


Steel Can

Plastic Tub

Plastic “Jar”

Paper “Can”

# LCA "what if" scenario assessment: coffee packaging

- Bias study to favor recyclable containers
  - Recyclables:
    - Assume that all components will be separated and recovered with no additional effort
    - Assume that all components will be recovered at the same rate
    - Assume that very high recovery rates will be achieved with no increase in contamination or marginal increases in inputs (energy, water, time, etc.)
    - Assume that all recovered material will displace virgin material at a ratio of 1-to-1
  - Assume no recycling, recovery or other improvements for the flexible bag
- Consider variable recycling rates (0 – 100%)
  - Calculate the "break-even" point where recyclable/recycled has equal (or lower) impact as the non-recyclable bag

# recovery rates where recyclables “break even” with non-recyclable coffee bag (environmental impacts)

| | Steel Can | Plastic Tub | Plastic Jar | Paper Can |
|---|---|---|---|---|
| Blue water consumption | 13% | <0% | <0% | |
| Primary energy, nonrenewable (net cal. value) | | | | |
| Acidification | | | | |
| Ecotoxicity | | | | |
| Eutrophication | | | | |
| Global warming (excluding biogenic) | | | | |
| Human toxicity, cancer | 33% | | | |
| Human toxicity, non-cancer | 64% | | | |
| Smog | | | | |

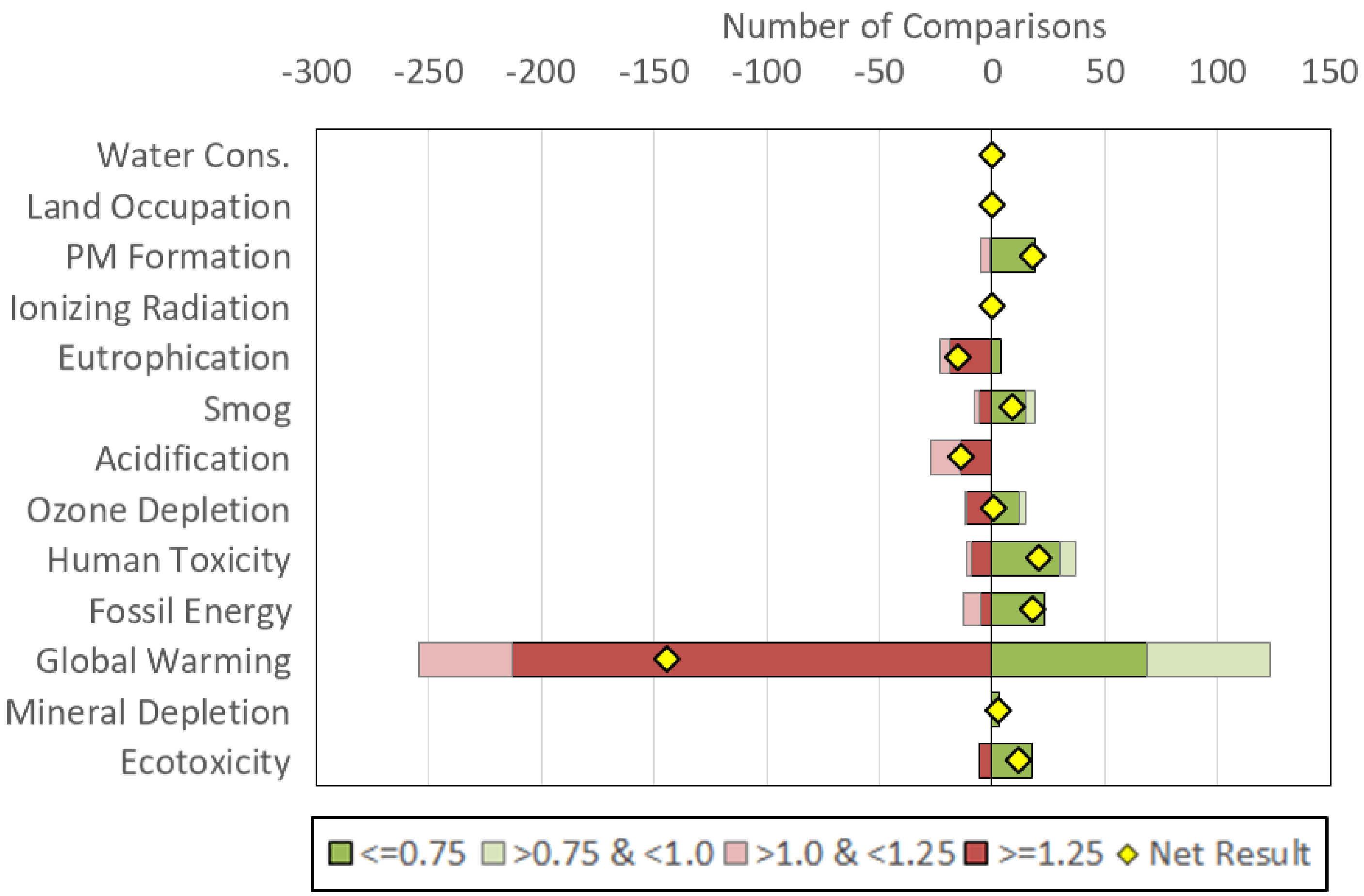
recovery rates where recyclables "break even" with non-recyclable coffee bag (environmental impacts)

| | Steel Can | Plastic Tub | Plastic Jar | Paper Can |
|---|---|---|---|---|
| Blue water consumption | 13% | <0% | <0% | 73% |
| Primary energy, nonrenewable (net cal. value) | | | | 71% |
| Acidification | | | | 99% |
| Ecotoxicity | | | | |
| Eutrophication | | | | |
| Global warming (excluding biogenic) | | | | |
| Human toxicity, cancer | 33% | | | 79% |
| Human toxicity, non-cancer | 64% | 74% | | 85% |
| Smog | | | | |

# recovery rates where recyclables "break even" with non-recyclable coffee bag (environmental impacts)

| | Steel Can | Plastic Tub | Plastic Jar | Paper Can |
|---|---|---|---|---|
| Blue water consumption | 13% | <0% | <0% | 73% |
| Primary energy, nonrenewable (net cal. value) | >100% | >100% | >100% | 71% |
| Acidification | >100% | >100% | >100% | 99% |
| Ecotoxicity | >100% | >100% | >100% | >100% |
| Eutrophication | >100% | >100% | >100% | >100% |
| Global warming (excluding biogenic) | >100% | >100% | >100% | >100% |
| Human toxicity, cancer | 33% | >100% | >100% | 79% |
| Human toxicity, non-cancer | 64% | 74% | >100% | 85% |
| Smog | >100% | >100% | >100% | >100% |

# compostable packaging vs. non- compostable packaging



# Oregon composters' statement

## A Message from Composters Serving Oregon:

### Why We Don't Want Compostable Packaging and Serviceware

Every year, the Pacific Northwest's compost industry turns hundreds of thousands of tons of yard and food wastes into nutrient-rich compost for agriculture, nurseries, landscaping businesses and home gardens.The quality compost products that we create develop healthier and more resilient soil, reduce greenhouse gas emissions, recycle nutrients, conserve water, and may reduce the use of synthetic fertilizers, pesticides and herbicides.

"Compostable" packaging and serviceware items have been on the rise for the past decade and they are increasingly ending up in our facilities. These materials compromise our composting programs and limit many of the environmental benefits of successful composting.

**Here are nine reasons why we don't want "compostable" packaging or serviceware delivered to our facilities:**

1 **They don't always compost:** Not all 'certified' compostable items will actually compost (break down) as fully or quickly as we need them to. This is because certification standards test compostability based on laboratory conditions. Those conditions are not always replicated in the real world (our facilities) which means that some "compostable" items don't fully compost. The result is a finished compost that is contaminated with bits of partially degraded "compostable" material.

2 **Contamination happens:** As a consumer, you may sort properly – but your neighbor might not. When collection programs accept compostable products, non-compostable look-alike items inevitably end up in the mix. These materials then must be removed, either at the start (when we receive them) or at the end (as pieces of garbage mixed in with finished compost). Either way, this contamination increases our operating costs and degrades the quality of our product, which makes the compost industry less economically viable.

3 **They hurt resale quality:** We don't want to produce finished compost that is contaminated with fragments of packaging and serviceware, and our consumers won't purchase contaminated material. Contamination lowers the value of our product, making it difficult and sometimes impossible to sell. When fewer people use compost, its environmental benefits aren't realized.

4 **We can't sell to organic farmers:** Farmers often use compost in the production of certified organic foods. National standards prohibit the use of many different packaging materials when making compost used to grow crops certified as "USDA Organic". Accepting packaging and serviceware at our facilities hinders our ability to provide finished compost to organic farmers.

5 **They may threaten human and environmental health:** Packaging designed for water and grease resistance as well as other consumer packaging may contain chemicals that can transfer into finished compost. From the compost, these chemicals may then transfer to ground and surface waters, be taken up by plants, and lead to negative health impacts. While some chemicals of concern are being voluntarily phased out by some packaging producers, not all have been outlawed, and alternatives are not always guaranteed to be safe. Separately, non-degraded fragments of plastic packaging can contaminate finished compost, intensifying environmental health concerns when it is used by buyers. We want to keep our compost clean and safe for all.

6 **It increases our costs and makes our job harder:** Some of us have accepted compostable packaging in the past, and found that loads of compostable packaging require us to change our processes, adding water, using more energy and spending additional resources to produce finished compost. Some types of compostable packaging mostly degrade into carbon dioxide and water and leave behind little of value for all of the extra effort required.

7 **Just because something is compostable doesn't mean it's better for the environment.** Oregon DEQ has found that compostable serviceware often has a larger (life time) environmental footprint than non-compostable items*. For example, compostable materials may require more fossil energy use, release more greenhouse gases, or result in more ecological toxins than their non-compostable counterparts, mostly due to how they're made. The research confirms what scientists already know: that *what materials are made of, and how they're made, may be more significant than whether they're composted vs. landfilled*. "Composting" and "compostable" are not the same idea. Composting is a beneficial treatment option for organic wastes, but "compostable" is not a guarantee of low impact.

8 **In some cases, the benefits of recycling surpass those of composting.** Some items, like paper bags, can be either composted or recycled. Generally speaking, the recycling of manufactured materials (such as packaging) back into new products or packaging can provide greater overall environmental benefits than composting does.

9 **Good intentions aren't being realized.** Compostable items often cost more – sometimes up to five times as much as non-compostable alternatives. That's a lot of money spent on products that might not actually help the environment – money that could be spent in more productive and beneficial ways.

Not only do compostable products often cost more to purchase, they also drive up the costs to operate our facilities and impede our ability to sell finished compost. Compostable packaging is promoted as a means of achieving "zero waste" goals but it burdens composters (and recyclers) with materials that harm our ability to efficiently process recovered materials. Reusable dishware is almost always a better choice for the environment. If you must use single-use items, please don't put them in your compost bin.

We need to focus on recycling organic wastes, such as food and yard trimmings, into high-quality compost products that can be used with confidence to restore soils and conserve resources. Compostable packaging doesn't help us to achieve these goals. We need clean feedstocks in order to produce quality compost.

Please help us protect the environment and create high quality compost products by keeping "compostable" packaging and serviceware out of the compost bin.

Thanks for your cooperation!

REXIUS COMPOST & ORGANICS · Dirt Hugger · Recology ORGANICS OREGON · REPUBLIC SERVICES Pacific Region Compost · LANE FOREST PRODUCTS The company to grow with · Deschutes Recycling Compost Facility · Pendleton Sanitary Service, Inc. · Rogue Compost · WASTE PRO

*See https://www.oregon.gov/deq/FilterDocs/compostable.pdf

See www.dirthugger.com/organics-recycling/

# unsustainable circularity?


# a modest proposal

1. Adopt better goals and metrics

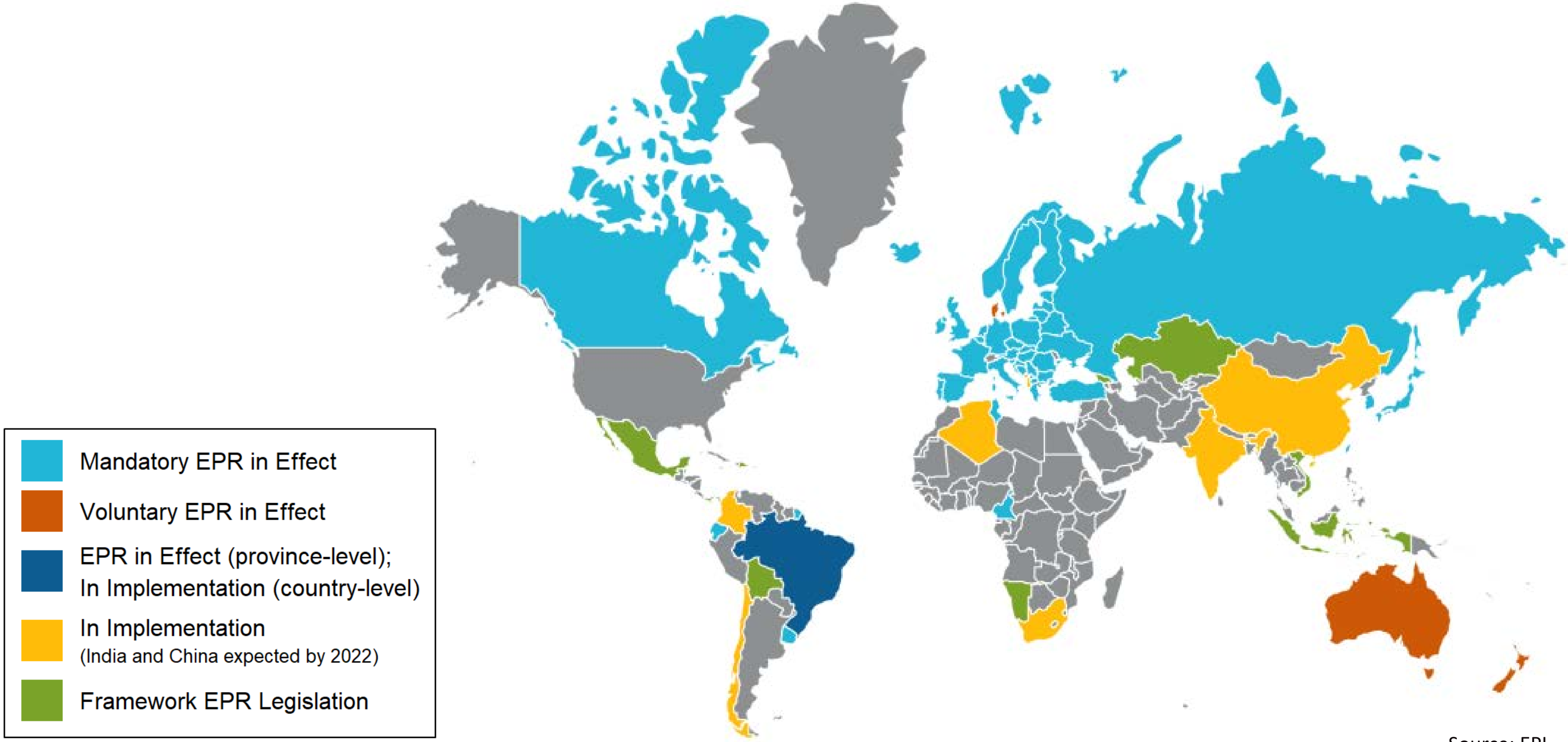
*capture and recovery rates; generation rates; actual environmental impacts*

2. Drop the "landfill" frame in public messaging

3. Align collection with markets

*focus on quality; treat recyclables as commodities; design collection as a supplier would; require industry involvement*

# packaging extended producer responsibility (EPR)




Source: EPI

# a modest proposal (continued)

4. Expand our toolbox

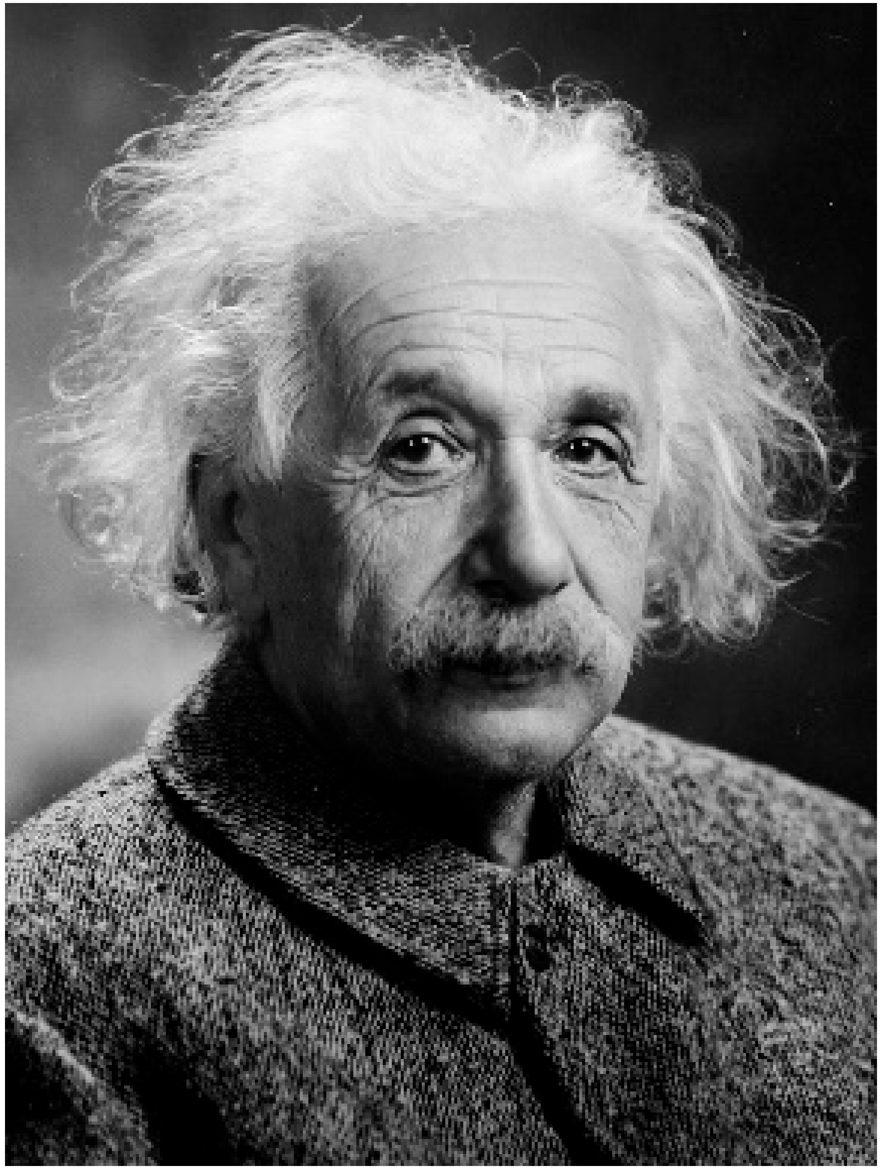
*waste prevention; reuse; sustainable production and consumption*

5. Design for environment

*not only design for recycling and composting*

6. Build internal capacity to understand environmental impacts

7. Maintain recycling and composting as a *means* to an end



“We cannot solve our problems with the same thinking we used when we created them.”

- Albert Einstein

# materials management

*conserving resources · protecting the environment · living well*

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