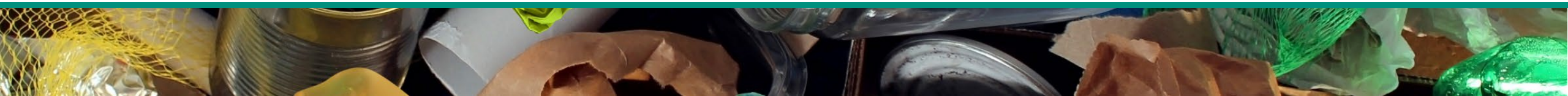
Oregon Recycling Modernization Act Technical Workgroup on Materials Lists

Meeting #5

August 23, 2022

State of Oregon
DEQ Department of Environmental Quality



Today's discussion

- Scenario modeling: baseline and potential future scenarios
- Follow-ups from 7/19 discussion:
  - Responsible end markets
  - Screening-level LCA of glass: status report
- Preliminary LCA of carton/polycoat end markets
- PRO depot collections:
  - Performance standards, convenience standards, and collection targets
- Round 2 of DEQ preliminary recommendations for placement of materials
- Public input

Recycling Scenarios: Baseline and Future

Jessica Branom-Zwick, Cascadia Consulting Group
Martin Brown, David Allaway and Justin Gast, Oregon DEQ

Technical Workgroup on Materials Lists

August 23, 2022

Baseline Model Overview

Jessica Branom-Zwick
Cascadia Consulting Group

Recycling Modernization Act
Material Lists Technical Workgroup
August 23rd, 2022

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What I hope you take away today

Scope of what the model covers

Conceptual overview of the model and baseline data sources

Intro to how to review the model (without tearing your hair out)

Scope of the model

and some definitions

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What's in the scope of the model?

In: recycling and garbage regulated by local governments

Franchised or permitted collection for:

- **Single-family residential**
- **Multifamily residential**
- **Commercial**

Self-haul by the public

- Solid waste / recycling depots

Out: everything else

- C&D debris
- Hazardous waste
- Tires, paint, e-waste, etc.
- Organics
- Motor oil
- Bottle bill recovery
- Commercial recovery not regulated by local government
  - (e.g., compacted cardboard directly marketed by business, industrial plastic scrap recovery)

** Scenarios will not change out-of-scope tons.*

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What do we mean by “baseline”?

Snapshot of 2020/2021, transported to 2026

Collection

- 2020 tonnages increased for population growth
- Current material lists
- No new customer engagement to reduce contamination

Sortation

- No MRF modernization

Costs

- Current unit costs, applied to more people and tons
- Expressed in 2021 dollars

Geographic Groupings

The model divides Oregon into four geographic groupings based on access to curbside recycling and location.

1. Metro Area

- All areas within the Metro urban growth boundary.

2. Willamette Valley, etc.

- Areas with curbside collection in most of the Willamette Valley, The Oregon Coast south to Lincoln County, Deschutes County, Hood River County, and Wasco County.

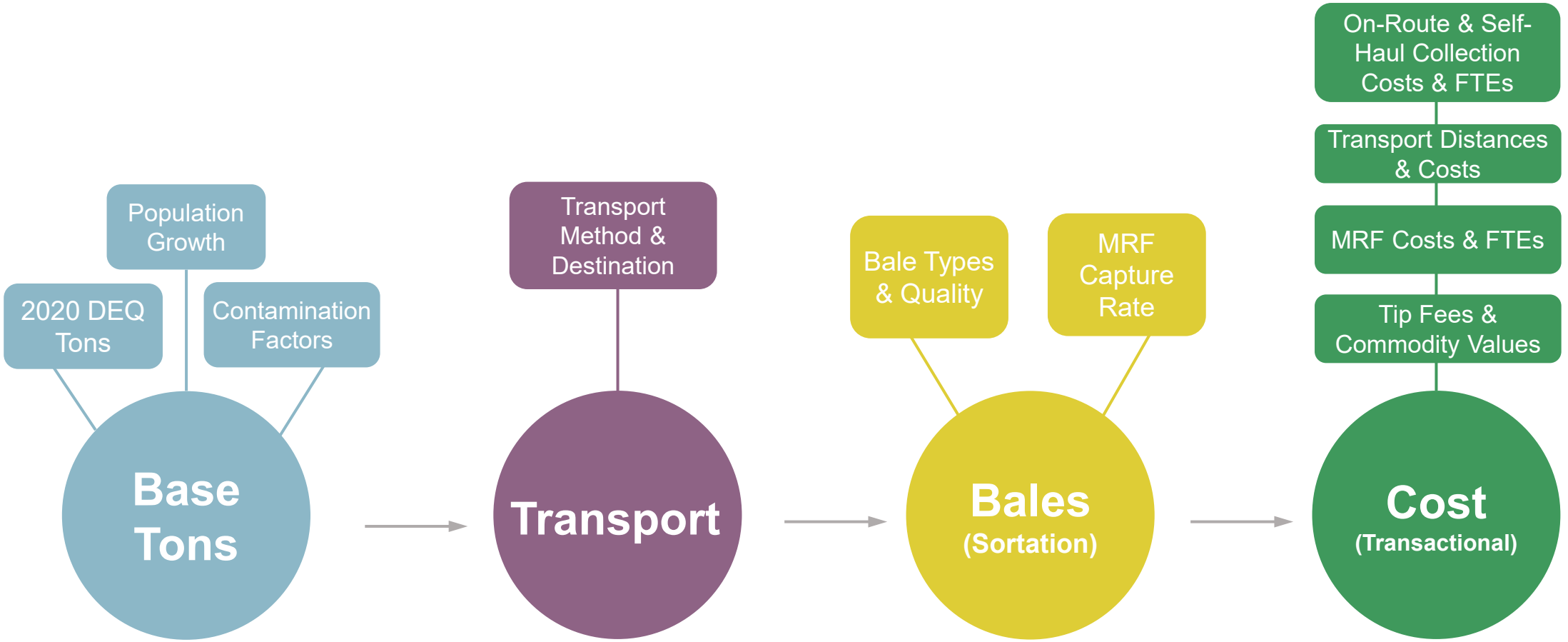
3. Other Areas with Curbside Recycling

- All other areas with curbside collection, including some small towns from areas in Category 2 if they are distant from Portland and other population centers, such as the city of Oakridge in Lane County.

4. Areas Without Curbside Recycling

- All areas without curbside collection or minimal curbside collection — served mainly by depots, if at all.

Baseline Model Outline



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* Environmental and social costs modeled separately by DEQ

Modules and data sources

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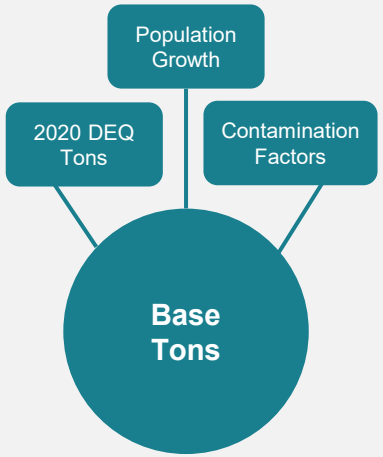
BASE TONS Module

Estimates tonnages for the baseline scenario in 2026



Baseline tonnage data from Oregon DEQ

Tons Generated in each Grouping in 2020

Disposed				Recovered			
SF Res	MF Res	Com	Self Haul	SF Res	MF Res	Com	Self Haul

Then broken down by material type

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Source: 2020 tons by grouping, sector, and material from Oregon DEQ

Growing 2020 Tons to 2026

Step 1. Calculate historic waste generated per capita.

Step 2. Use historic average per capita and projected population to estimate 2026 total tons generated

Step 3. Apply 2020 composition of waste and recycling to projected 2026 total tons.

1. In Grouping 2, single-family residents are projected to generate **485,290 tons** in 2026
2. In 2020, **6.17%** of their total generation was cardboard placed in commingled recycling.
3. So, in the 2026 baseline, we project they will send **29,961** tons (6.17% of 485,290 tons) of cardboard to commingled recycling.

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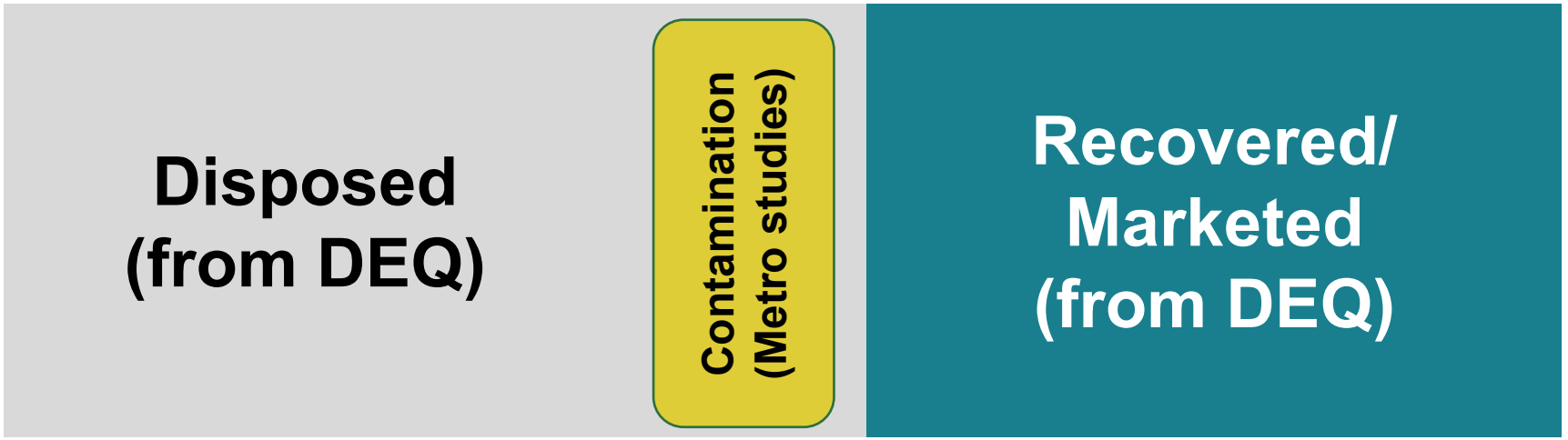
Sources: 2017 tons from previous modeling for Oregon DEQ.
Population data and projections from Portland State University (PDX)

Estimating Contamination and Tons Collected



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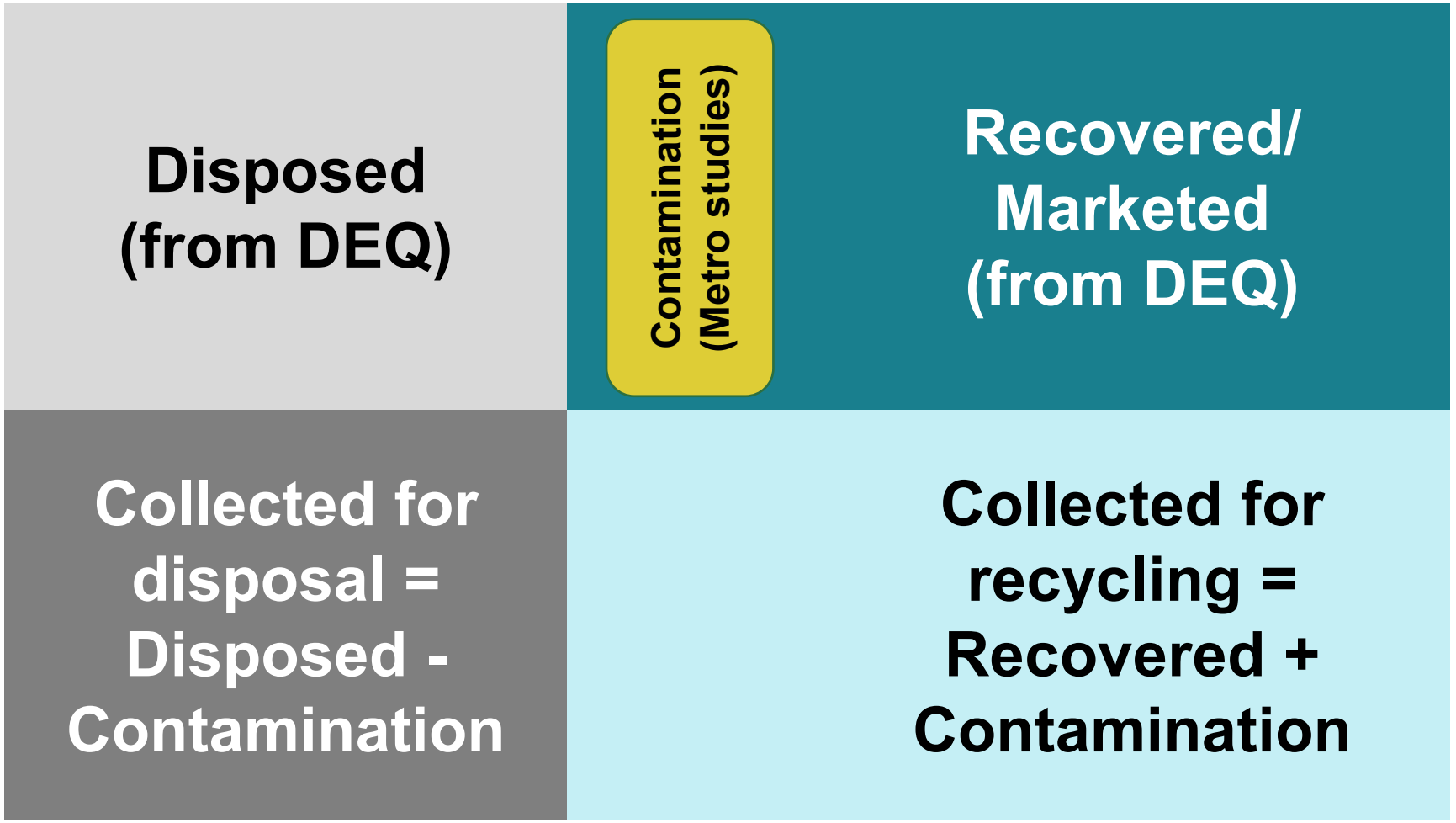
Estimating Contamination and Tons Collected



Contamination rates from studies in Metro:

- Single-family: 13.8%
- Multifamily: 21.1%
- Commercial: 13.4%
- Self-haul: 13.8%

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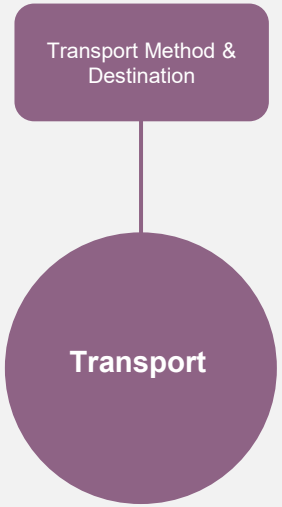
Sources: recycling contamination studies for single-family (2015 and 2020), multifamily (2017), and commercial (2020) for and in Metro.

TRANSPORT Module

Moves collected materials to the MRF, landfill, etc.



From each sector and collection stream in each grouping, such as:

- Single-family glass on-the-side from Grouping 1
- Self-haul commingled recycling from Grouping 2
- Commercial garbage from Grouping 3

To up to three destinations each:

- Percentage to each destination
- Destination (e.g., MRF type/location, landfill)
- Transport method (e.g., directly delivered, walking floor trailer)

Example:
100% of self-haul commingled from Grouping 2 modeled as going to a MRF in Salem by drop-box.

Inputs developed based on data available from haulers, MRFs, and DEQ

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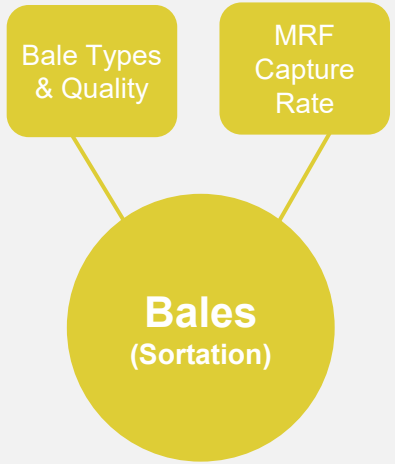
BALES Module

Sorts commingled materials into bales



Model declares

- **Bale types made**
  - What types of bales each MRF makes (e.g., cartons bale or mixed paper bale)
- **Bale definitions**
  - What materials are targeted to go into each bale type (e.g., PET bottles into the PET bottle bale)
- **Bale quality**:
  - The contamination rate for each bale type
- **MRF capture rates**
  - What percentage of targeted materials get into the proper bale (instead of landfilled residue or bale contamination)

Inputs developed based on available information about Oregon MRFs and consultant experience with MRFs

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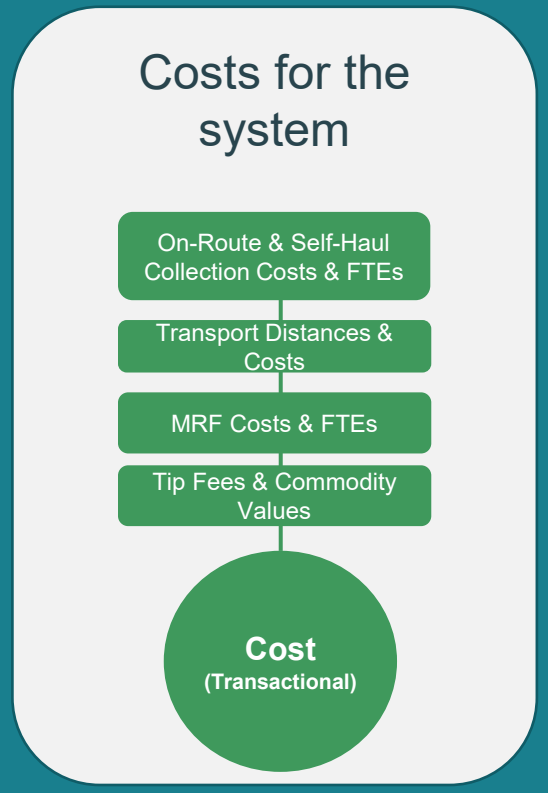
(Transactional) COST Module



- **Collection costs**: data from collectors and local government in Oregon
  - Grouping 1: 222,208 residential and 4,974 commercial/multifamily customers
  - Grouping 2: 112,340 residential and 6,899 commercial/multifamily customers.
  - Grouping 3: 3 counties and 1 coastal city with 27,018 residential and 923 commercial/multifamily customers.
  - Grouping 4: Tillamook County excluding the City of Tillamook.
  - Depot recycling: 41 depots around Oregon
- **Transport costs**: combination of actual haul costs plus rate quotes from trucking companies
- **Sortation costs**: Based on past projects calculating MRF cost of service plus input from local MRF managers.
- **Commodity values**: publicly available data, including RecyclingMarkets.net

Collection Costs

On-route cost per pick-up:

- Driver labor and benefits
- Container and truck capital costs
- Route operations and other direct costs

Multiply by est. number of customers by pick-up/lifts per year

Annual costs per customer

- Administrative costs
- Customer engagement
- Profit margin and franchise fee

Multiply by est. number of customers

Customer counts

- Ratio of customers by type to population served.
- Data from DEQ and haulers on curbside collection service provided by to each area.

Depot recycling

Total cost per recycling ton collected

- Cost allocations (percentages) for:
  - Labor
  - Capital
  - Operations
  - Transport
  - Administrative

Multiply by number of recycling tons collected (excluding metal)

Self-haul garbage costs estimated using disposal tip fees.

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Transport Costs

Developed costs per ton-mile for

- Different collection streams
  - Commingled
  - Source-separated materials
  - Garbage
- Different transport methods
  - Walking floor trailer
  - Drop box
  - And many more…

Applied costs per-ton mile to:

- Tons collected from the tonnage model
- Average miles transported by grouping

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Sortation Costs

- **Labor**: hourly rates, number of workers, & shifts
- **Capital equipment**: estimated current total value, after depreciation
- **Operations**: per-ton costs for operations, maintenance, fuel and utilities, and facility
- **Residuals & transfer costs**: per-ton costs for transport and disposal applied to tons transferred and disposed
- **Margin**: profit margin
- **Commodity values**: range of commodity prices from publicly available sources:
  - Resource Recycling, RecyclingMarkets.net, and historical sources

Snapshot of draft baseline results

But really, the tables have a lot more information

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Collected Tons

Tons	Single-Family	Multifamily	Commercial	Self-Haul	Total
Commingled	197,378	12,850	97,487	5,060	312,775
Glass-on-the-side	31,140	1,475	11,873	6,237	50,725
Other separated recycling	1,460	1,151	103,579	77,179	183,369
Organics	345,998	3,577	69,179	103,439	522,193
Garbage	836,062	295,317	934,624	761,906	2,827,909
Total	**1,412,038**	**314,370**	**1,216,742**	**953,821**	**3,896,971**

Collected Tons

Material Class	Collected in Garbage (tons)	Collected in Organics (tons)	Collected in Recycling (tons)	Percent Collected in Recycling
Paper	222,935	-	359,438	61.7%
Plastic	229,381	-	25,070	9.9%
Glass	38,506	-	55,787	59.2%
Metals	39,239	-	32,343	45.2%
Other	2,297,849	522,193	74,231	2.6%
Total	**2,827,909**	**522,193**	**546,870**	**-**

Pounds per customer	Single-Family	Multifamily	Commercial
Commingled			
Glass-on-the-side			
Garbage			

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Sorted Commingled Tons

Average residue rate: 15% of inbound

Average bale contamination: 5% of outbound

A Few Baseline Capture Rates

Material	Average Baseline MRF Capture Rates
Corrugated cardboard (OCC)	96%
Newspaper (ONP)	97%
Other printing and writing paper recyclable with newsprint	90%
Paperboard	96%
Other paper not recyclable with newspaper	90%
PET deposit bottles (BB)	85%
Other HDPE bottles & jars (no-deposit or non-beverage)	93%
HDPE tubs 6 oz to 2 gallons	83%
HDPE tubs + pails > 2 gallons to 5 gallons	64%
Deposit and accepted aluminum beverage cans	90%
Deposit and other steel cans accepted at curb	93%

Total Transactional Costs

Recycling Cost	Single-Family	Multifamily	Commercial	Self-haul	Total
Customer Engagement	$ 1,949,825	$ 1,329,136	$ 3,855,501	$ -	$ 7,134,461
Collection	$ 52,390,495	$ 13,151,484	$ 82,097,865	$ 4,174,072	$ 151,813,917
Initial Transfer Transport	$ 3,537,864	$ 175,382	$ 4,947,627	$ 5,099,385	$ 13,760,259
Sortation	$ 32,928,197	$ 2,143,753	$ 6,263,521	$ 844,220	$ 52,179,692
Total	**$ 90,806,382**	**$ 16,799,755**	**$ 107,164,514**	**$ 10,117,677**	**$ 224,888,328**

Garbage Cost	Single-Family	Multifamily	Commercial	Self-haul	Total
Admin Cost	$ 72,448,876	$ 14,424,450	$ 64,900,544	$ -	$ 51,773,870
Collection	$ 127,350,771	$ 32,678,486	$ 144,175,074	$ -	$ 304,204,331
Transfer & Transport	$ 28,284,686	$ 8,852,035	$ 29,152,596	$ 25,491,292	$ 91,780,608
Tip Fees	$ 87,130,383	$ 32,652,994	$ 100,934,039	$ 78,045,910	$ 298,763,326
Total	**$ 315,214,717**	**$ 88,607,965**	**$ 339,162,252**	**$ 103,537,202**	**$ 846,522,135**

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How to review and provide feedback

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What to review

PDF reports with modeling output

- Baseline collected tons (five file, statewide and by groupings)
- Baseline recycling and garbage costs (one report, by groupings)
- Baseline processing effectiveness (statewide only)

Excel modules with modeling inputs and calculations

- BASE TONS
- TRANSPORT
- BALES
- COST

Draft Analysis - Collection Tonnage Modeling Results

August 23, 2022

Baseline DRAFT - Statewide 2026: All In-Scope Sectors					
Material	**Generated (tons)**	**Collected for Recycling (tons)**	**Recycling Collection Rate (Inbound)**	**Directly Disposed (tons)**	**Collected for Organics (tons)**
Paper	**582,373**	359,438	61.7%	222,935	-
Corrugated cardboard (OCC)	279,188	216,928	77.7%	62,260	-
Newspaper (ONP)	33,053	16,171	48.9%	16,882	-
Other printing and writing paper recyclable with newsprint	164,734	84,969	51.6%	79,765	-
Paperboard	67,819	34,753	51.2%	33,066	-
Other paper not recyclable with newspaper	6,511	2,837	43.6%	3,674	-
Gable tops & aseptics	4,882	1,702	34.9%	3,179	-
Polycoated cups	2,276	32	1.4%	2,244	-
Shredded paper	3,277	1,135	34.6%	2,143	-
Hardcover books	2,154	284	13.2%	1,871	-
Freezer boxes & wet strength paper	7,964	275	3.5%	7,689	-
Other paper food serviceware	10,515	353	3.4%	10,162	-
Plastic	**254,451**	25,070	9.9%	229,381	-
PET deposit bottles (BB)	6,064	170	2.8%	5,894	-
Other PET bottles & jars (no-deposit or non-beverage)	10,412	3,745	36.0%	6,667	-
HDPE deposit bottles (BB)	36	-	0.0%	36	-
Other HDPE bottles & jars (no-deposit or non-beverage)	13,108	4,710	35.9%	8,399	-
PP deposit bottles (BB)	43	-	0.0%	43	-
Other PP bottles & jars (no-deposit or non-beverage)	301	108	35.9%	193	-
PET tubs 6 oz to 2 gallons	1,978	540	27.3%	1,438	-
PET thermoforms 6 oz to 2 gallons	4,603	479	10.4%	4,124	-
HDPE tubs 6 oz to 2 gallons	4,219	1,158	27.5%	3,061	-
HDPE tubs + pails > 2 gallons to 5 gallons	5,111	1,652	32.3%	3,459	-
HDPE Bulky > 5 gals for RPCs or > 2 gallons for non-RPCs (not foamed)	6,278	216	3.4%	6,061	-
PP tubs _ pails > 2 gallons to 5 gallon	854	278	32.5%	576	-
PP tubs 6 oz to 2 gallons	6,996	1,915	27.4%	5,082	-
PP Bulky > 5 gals for RPCs or > 2 gallons for non-RPCs (not foamed)	12,024	444	3.7%	11,581	-
Other PP packaging & product 6 oz to 2 gal	10,743	484	4.5%	10,259	-
PS Solid tubs 6 oz to 2 gal	495	124	24.9%	372	-
Other solid polystyrene packaging 6 oz to 2 gallons, not RPCs	5,777	199	3.4%	5,578	-
Trays, other clamshells, and other RPCs not accepted curbside	6,706	18	0.3%	6,688	-
HDPE flower pots larger than 2 gallons	184	39	20.9%	146	-
HDPE flower pots 4" to 2 gallons	618	108	17.5%	510	-
Plastic bottle caps+ flat lids < 3" in diameter	2,103	129	6.1%	1,974	-
PE film recyclable	44,247	2,176	4.9%	42,071	-
PP flower pots greater than 2 gallons	33	8	23.1%	26	-
PP flower pots 4" to 2 gallons	71	8	10.8%	64	-
Other resin flower pots 4" or larger	79	15	19.5%	64	-
Polystyrene block and transport foam	1,099	65	5.9%	1,035	-
Flat lids 3 inches diameter or larger	2,112	130	6.2%	1,982	-
Other HDPE packaging & product 6 oz to 2 gal (not foamed)	4,908	157	3.2%	4,751	-
Other deposit plastic bottles	79	-	0.0%	79	-
Other other bottles (No-deposit or non-beverage bottles)	601	216	36.0%	385	-
PS All Bulky > 2 gallons	1,877	56	3.0%	1,821	-
Other bulky rigid RPCs excluding HDPE, PP, PS > 2 gallons to 5 gallon (not foamed)	98	15	15.8%	82	-
Other accepted tubs & pails 6 oz to 2 gallons (RPCs)	598	154	25.8%	443	-
Other rigid plastic pkg + product 6 oz to 2 gal	19,169	2,459	12.8%	16,710	-
Polystyrene foam food serviceware	203	13	6.6%	189	-
Other bulky > 5 gals for RPCs or >2 gallons for non-RPCs	20,608	778	3.8%	19,830	-
Other foam plastic	621	55	8.9%	565	-
Other film	59,392	2,247	3.8%	57,145	-
Glass	**94,293**	55,787	59.2%	38,506	-
Deposit glass bottles	18,653	3,910	21.0%	14,743	-
Other container glass including no-deposit bottles	75,640	51,878	68.6%	23,762	-
Metals	**71,583**	32,343	45.2%	39,239	-
Deposit and accepted aluminum beverage cans	3,117	547	17.5%	2,570	-
Other aluminum cans accepted at curb	90	60	66.8%	30	-
Other rigid aluminum accepted at curb	1,895	1,199	63.3%	696	-
Deposit and other steel cans accepted at curb	22,562	6,080	26.9%	16,482	-
Other steel accepted at curb	37,762	21,683	57.4%	16,079	-
Other scrap metal (non-ferrous + mixed metal) accepted at curb	3,218	1,951	60.6%	1,267	-
Aluminum foil and foil-form containers	2,938	822	28.0%	2,115	-
Other	**2,894,273**	74,231		2,297,849	522,193
Other recoverables	313,842	43,684		270,158	-
Compostables	1,519,302	9,058		988,051	522,193
Other materials (non-recoverable)	1,061,129	21,489		1,039,640	-
Total	**3,896,373**	**546,870**	**14.0%**	**2,827,909**	**522,193**
Total excluding "other" materials	1,002,700	472,639	47.1%	530,061	-

Draft - Processing Modeling Results - Statewic

August 23, 2022

	Final Disposition (all materials)				Sortation (commingled only)		
Baseline	**Total Disposed: Garbage, MRF Residue, Bale Contamination (tons)**	**Total Organics (tons)**	**Total Recycled and Properly Baled (tons)**	**System-wide Capture Rate (all recycling)**	**Commingled Recycling Collected (inbound tons)**	**Properly Baled Commingled: only target materials (outbound tons)**	**MRF Capture Rate (commingled)**
Paper	**238,759**	-	**343,614**		**247,255**	**231,431**	
Corrugated cardboard (OCC)	66,782	-	212,406	76%	111,031	106,509	96%
Newspaper (ONP)	17,346	-	15,707	48%	15,454	14,991	97%
Other printing and writing paper recyclable with newsprint	87,508	-	77,226	47%	81,203	73,460	90%
Paperboard	34,332	-	33,487	49%	33,213	31,947	96%
Other paper not recyclable with newspaper	3,953	-	2,558	39%	2,711	2,433	90%
Gable tops & aseptics	3,703	-	1,179	24%	1,627	1,103	68%
Polycoated cups	2,254	-	21	1%	32	21	67%
Shredded paper	2,509	-	768	23%	1,085	718	66%
Hardcover books	2,142	-	13	1%	271	-	0%
Freezer boxes & wet strength paper	7,717	-	247	3%	275	247	90%
Other paper food serviceware	10,515	-	-	0%	353	-	0%
Plastic	**241,527**	-	**12,924**		**24,322**	**12,176**	
PET deposit bottles (BB)	5,919	-	145	2%	163	138	85%
Other PET bottles & jars (no-deposit or non-beverage)	7,163	-	3,249	31%	3,589	3,093	86%
HDPE deposit bottles (BB)	36	-	-	0%	-	-	
Other HDPE bottles & jars (no-deposit or non-beverage)	8,731	-	4,377	33%	4,514	4,181	93%
PP deposit bottles (BB)	43	-	-	0%	-	-	
Other PP bottles & jars (no-deposit or non-beverage)	243	-	58	19%	104	54	52%
PET tubs 6 oz to 2 gallons	1,878	-	100	5%	518	77	15%
PET thermoforms 6 oz to 2 gallons	4,514	-	89	2%	459	69	15%
HDPE tubs 6 oz to 2 gallons	3,251	-	968	23%	1,110	920	83%
HDPE tubs + pails > 2 gallons to 5 gallons	4,034	-	1,077	21%	1,584	1,008	64%
HDPE Bulky > 5 gals for RPCs or > 2 gallons for non-RPCs (not foamed)	6,276	-	1	0%	215	-	0%
PP tubs _ pails > 2 gallons to 5 gallon	629	-	226	26%	266	214	80%
PP tubs 6 oz to 2 gallons	5,390	-	1,606	23%	1,835	1,527	83%
PP Bulky > 5 gals for RPCs or > 2 gallons for non-RPCs (not foamed)	12,022	-	2	0%	441	-	0%
Other PP packaging & product 6 oz to 2 gal	10,326	-	418	4%	482	416	86%
PS Solid tubs 6 oz to 2 gal	462	-	33	7%	118	28	24%
Other solid polystyrene packaging 6 oz to 2 gallons, not RPCs	5,728	-	49	1%	198	48	24%
Trays, other clamshells, and other RPCs not accepted curbside	6,706	-	-	0%	18	-	0%
HDPE flower pots larger than 2 gallons	159	-	25	14%	37	24	64%
HDPE flower pots 4" to 2 gallons	515	-	102	17%	104	98	94%
Plastic bottle caps+ flat lids < 3" in diameter	2,103	-	0	0%	129	-	0%
PE film recyclable	44,155	-	92	0%	2,084	-	0%
PP flower pots greater than 2 gallons	27	-	6	19%	7	6	80%
PP flower pots 4" to 2 gallons	65	-	6	9%	7	6	83%
Other resin flower pots 4" or larger	78	-	1	1%	15	-	0%
Polystyrene block and transport foam	1,099	-	0	0%	65	-	0%
Flat lids 3 inches diameter or larger	2,112	-	0	0%	130	-	0%
Other HDPE packaging & product 6 oz to 2 gal (not foamed)	4,760	-	148	3%	156	147	94%
Other deposit plastic bottles	79	-	-	0%	-	-	
Other other bottles (No-deposit or non-beverage bottles)	592	-	9	1%	207	-	0%
PS All Bulky > 2 gallons	1,877	-	0	0%	56	-	0%
Other bulky rigid RPCs excluding HDPE, PP, PS > 2 gallons to 5 gallon (not fo	97	-	1	1%	15	-	0%
Other accepted tubs & pails 6 oz to 2 gallons (RPCs)	469	-	129	22%	148	123	83%
Other rigid plastic pkg + product 6 oz to 2 gal	19,167	-	2	0%	2,457	-	0%
Polystyrene foam food serviceware	203	-	0	0%	13	-	0%
Other bulky > 5 gals for RPCs or >2 gallons for non-RPCs	20,605	-	3	0%	775	-	0%
Other foam plastic	621	-	-	0%	55	-	0%
Other film	59,392	-	-	0%	2,247	-	0%
Glass	**44,346**	-	**49,347**		**5,840**	-	
Deposit glass bottles	15,680	-	2,773	15%	1,137	-	0%
Other container glass including no-deposit bottles	28,466	-	47,174	62%	4,703	-	0%
Metals	**40,037**	-	**31,546**		**9,955**	**9,158**	
Deposit and accepted aluminum beverage cans	2,611	-	505	16%	412	371	90%
Other aluminum cans accepted at curb	35	-	55	61%	46	40	88%
Other rigid aluminum accepted at curb	790	-	1,105	58%	854	761	89%
Deposit and other steel cans accepted at curb	16,872	-	5,690	25%	5,355	4,964	93%
Other steel accepted at curb	16,253	-	21,510	57%	2,401	2,228	93%
Other scrap metal (non-ferrous + mixed metal) accepted at curb	1,283	-	1,935	60%	216	200	93%
Aluminum foil and foil-form containers	2,192	-	746	25%	670	594	89%
Other	**2,323,251**	**522,193**	**48,828**		**25,403**	-	
Other recoverables	271,030	-	42,812		872	-	
Compostables	997,108	522,193	-		9,058	-	
Other materials (non-recoverable)	1,055,113	-	6,016		15,473	-	
Total in-scope materials	**2,887,920**	**522,193**	**486,860**		**312,775**	**252,765**	

Draft Analysis - Cost Modeling Results

DRAFT - Statewide 2026 Tables

August 23, 2022

Baseline
DRAFT - Statewide 2026

	Single-family	Multifamily	Commercial (regulated)	Self-haul (exc. bottle bill)	Total
Recycling System Costs					
Recycling Customer Engagement	$ 1,949,825	$ 1,329,136	$ 3,855,501	$ -	$ 7,134,461
Recycling Engagement	$ 1,949,825	$ 1,329,136	$ 3,855,501	$ -	$ 7,134,461
Collection	**$ 52,390,495**	**$ 13,151,484**	**$ 82,097,865**	**$ 4,174,072**	**$ 151,813,917**
Direct Collection Costs	$ 44,531,921	$ 11,178,762	$ 69,783,185	$ 3,921,250	$ 129,415,118
Collection Capital - Containers	$ 1,819,855	$ 406,548	$ 2,664,937	$ 654,512	$ 5,545,851
Collection Capital - Trucks	$ 6,103,850	$ 1,339,495	$ 8,402,017	$ -	$ 15,845,362
Collection Labor	$ 15,862,546	$ 4,903,030	$ 30,536,996	$ 1,407,532	$ 52,710,103
Collection Operations	$ 20,745,671	$ 4,529,689	$ 28,179,236	$ 1,859,206	$ 55,313,801
Indirect Collection Costs	$ 7,858,574	$ 1,972,723	$ 12,314,680	$ -	$ 22,145,977
Admin Cost	$ -	$ -	$ -	$ 252,822	$ 252,822
Collection Margin and Franchise Fee	$ 7,858,574	$ 1,972,723	$ 12,314,680	$ -	$ 22,145,977
Initial Transfer Transport	**$ 3,537,864**	**$ 175,382**	**$ 4,947,627**	**$ 5,099,385**	**$ 13,760,259**
Consolidation and Transfer to MRF	$ 3,537,864	$ 175,382	$ 4,947,627	$ 5,099,385	$ 13,760,259
Sortation	**$ 32,928,197**	**$ 2,143,753**	**$ 16,263,521**	**$ 844,220**	**$ 57,770,373**
Direct Sortation Costs	$ 25,929,591	$ 1,688,117	$ 12,806,849	$ 664,789	$ 41,089,345
Sortation Labor	$ 15,053,967	$ 980,071	$ 7,435,284	$ 385,957	$ 23,855,280
Sortation Capital	$ 246,111	$ 16,023	$ 121,556	$ 6,310	$ 390,000
Sortation Facility	$ 4,858,667	$ 316,318	$ 2,399,737	$ 124,568	$ 7,699,290
Glass and Unsorted Container Transfer	$ 745,536	$ 48,537	$ 368,227	$ 19,114	$ 1,181,414
Sortation Residual Disposal	$ 5,025,310	$ 327,167	$ 2,482,044	$ 128,840	$ 7,963,361
Indirect Sortation Costs	$ 3,528,021	$ 229,688	$ 1,742,520	$ 90,452	$ 5,590,681
Sortation Administrative & Marketing	$ 3,470,585	$ 225,949	$ 1,714,152	$ 88,980	$ 5,499,666
Sortation Margin	$ 3,528,021	$ 229,688	$ 1,742,520	$ 90,452	$ 5,590,681
Overall Recycling System Costs	**$ 90,806,382**	**$ 16,799,755**	**$ 107,164,514**	**$ 10,117,677**	**$ 224,888,328**
Garbage System Costs					
Admin Cost	**$ 72,448,876**	**$ 14,424,450**	**$ 64,900,544**	**$ -**	**$ 151,773,870**
Admin Cost	$ 72,448,876	$ 14,424,450	$ 64,900,544	$ -	$ 151,773,870
Collection	**$ 127,350,771**	**$ 32,678,486**	**$ 144,175,074**	**$ -**	**$ 304,204,331**
Direct Collection Costs	$ 108,248,156	$ 27,776,713	$ 122,548,813	$ -	$ 258,573,681
Collection Capital - Containers	$ 4,620,751	$ 1,309,840	$ 5,667,350	$ -	$ 11,597,941
Collection Capital - Trucks	$ 16,831,409	$ 3,939,200	$ 17,662,729	$ -	$ 38,433,339
Collection Labor	$ 49,115,468	$ 11,706,568	$ 52,169,099	$ -	$ 112,991,135
Collection Operations	$ 37,680,528	$ 10,821,105	$ 47,049,634	$ -	$ 95,551,267
Indirect Collection Costs	$ 19,102,616	$ 4,901,773	$ 21,626,261	$ -	$ 45,630,650
Collection Margin and Franchise Fee	$ 19,102,616	$ 4,901,773	$ 21,626,261	$ -	$ 45,630,650
Transfer & Transport	**$ 28,284,686**	**$ 8,852,035**	**$ 29,152,596**	**$ 25,491,292**	**$ 91,780,608**
Consolidation and Transfer to Disposal Site	$ 28,284,686	$ 8,852,035	$ 29,152,596	$ 25,491,292	$ 91,780,608
Tip Fees	**$ 87,130,383**	**$ 32,652,994**	**$ 100,934,039**	**$ 78,045,910**	**$ 298,763,326**
Tip Fee	$ 87,130,383	$ 32,652,994	$ 100,934,039	$ 78,045,910	$ 298,763,326
Overall Garbage System Costs	**$ 315,214,717**	**$ 88,607,965**	**$ 339,162,252**	**$ 103,537,202**	**$ 846,522,135**
Total Garbage and Recycling System Costs	**$ 406,021,098**	**$ 105,407,719**	**$ 446,326,766**	**$ 113,654,880**	**$ 1,071,410,464**

Draft Analysis - Cost Modeling Results

DRAFT - Statewide 2026 Tables

August 23, 2022

Baseline
DRAFT - Statewide 2026

	Single-family	Multifamily	Commercial (regulated)	Self-haul (exc. bottle bill)	Total
System Cost per Ton of Recycling (excluding commodity revenues)					
Tons Collected for Recycling	229,978	15,476	212,939	88,477	546,870
Tons Collected Commingled	197,378	12,850	97,487	5,060	312,775
Tons Collected Source-Separated	32,600	2,626	115,452	83,416	234,095
Tons Marketed	199,945	13,521	198,105	87,707	499,278
Tons Marketed (excluding bale contamination)	192,108	13,011	194,235	87,506	486,859
Total Recycling Cost per Recycle Ton Collected	$ 395	$ 1,086	$ 503	$ 114	$ 411
Total Recycling Cost per Recycle Ton Marketed	$ 473	$ 1,291	$ 552	$ 116	$ 462
On-Route Recycling Customers	786,037	15,564	98,444	-	-
Annual Recycling Pounds per Customer	585	1,989	4,326	NA	NA
Total System Cost per Recycle Ton Collected	$ 1,765	$ 6,811	$ 2,096	$ 1,285	$ 1,959
Total System Cost per Recycle Ton Marketed	$ 2,114	$ 8,102	$ 2,298	$ 1,299	$ 2,201
Sensitivity Analysis of Recycling System Dollar Costs					
Lower Range	**$ 78,432,924**	**$ 14,905,404**	**$ 94,821,711**	**$ 9,021,488**	**$ 197,181,526**
Customer Engagement Costs	$ 1,754,842	$ 1,196,222	$ 3,469,951	$ -	$ 6,421,015
Collection	$ 47,151,446	$ 11,836,336	$ 73,888,079	$ 3,756,664	$ 136,632,525
Initial Transfer Transport	$ 3,184,078	$ 157,844	$ 4,452,864	$ 4,589,447	$ 12,384,233
Sortation	$ 26,342,558	$ 1,715,002	$ 13,010,817	$ 675,376	$ 41,743,753
Upper Range	**$ 103,179,840**	**$ 18,694,106**	**$ 119,507,318**	**$ 11,213,867**	**$ 252,595,130**
Customer Engagement Costs	$ 2,144,807	$ 1,462,049	$ 4,241,051	$ -	$ 7,847,907
Collection	$ 57,629,545	$ 14,466,633	$ 90,307,652	$ 4,591,479	$ 166,995,308
Initial Transfer Transport	$ 3,891,651	$ 192,920	$ 5,442,390	$ 5,609,324	$ 15,136,285
Sortation	$ 39,513,837	$ 2,572,503	$ 19,516,225	$ 1,013,065	$ 62,615,630
Commodity Revenues					
Commodity Revenues					
Commodity Sales (lower range)	$ 2,309,408	$ 177,553	$ 4,285,102	$ 1,683,852	$ 8,455,915
Commodity Sales (mid-point)	$ 12,381,672	$ 898,687	$ 15,298,284	$ 3,734,544	$ 32,313,187
Commodity Sales (upper range)	$ 22,453,936	$ 1,619,821	$ 26,311,466	$ 5,785,236	$ 56,170,459
Sensitivity Analysis of Garbage System Dollar Costs					
Lower Range	**$ 274,980,207**	**$ 76,481,869**	**$ 295,152,623**	**$ 85,378,891**	**$ 731,993,589**
Admin Cost	$ 65,203,989	$ 12,982,005	$ 58,410,489	$ -	$ 136,596,483
Collection	$ 114,615,694	$ 29,410,637	$ 129,757,566	$ -	$ 273,783,898
Transfer & Transport	$ 25,456,217	$ 7,966,832	$ 26,237,336	$ 22,942,163	$ 82,602,548
Tip Fees	$ 69,704,307	$ 26,122,395	$ 80,747,231	$ 62,436,728	$ 239,010,661
Upper Range	**$ 355,449,227**	**$ 100,734,061**	**$ 383,171,881**	**$ 121,695,513**	**$ 961,050,682**
Admin Cost	$ 79,693,764	$ 15,866,895	$ 71,390,598	$ -	$ 166,951,257
Collection	$ 140,085,849	$ 35,946,334	$ 158,592,581	$ -	$ 334,624,764
Transfer & Transport	$ 31,113,154	$ 9,737,239	$ 32,067,855	$ 28,040,421	$ 100,958,669
Tip Fees	$ 104,556,460	$ 39,183,593	$ 121,120,847	$ 93,655,092	$ 358,515,991

	Single-family	Multifamily	Commercial (regulated)	Self-haul (exc. bottle bill)	Total
Recycling Full-Time Equivalent (FTE) Employment					
Recycling Customer Engagement	**15**	**15**	**43**	**-**	**73**
Recycling Engagement FTEs	15	15	43	-	73
Recycling Collection	**452**	**91**	**582**	**19**	**1,144**
Route Drivers and Operations	452	91	582	19	1,144
Sortation	**308**	**20**	**152**	**8**	**487**
Sorting Labor	188	12	93	5	298
Equipment Operators, Supervisors, Maintenance	92	6	46	2	146
Admininstrative and Marketing	27	2	13	1	43
Overall Recycling System FTEs	**775**	**126**	**777**	**26**	**1,705**
Garbage Full-Time Equivalent (FTE) Employment					
Garbage Collection	**1,198**	**196**	**859**	**-**	**2,253**
Route Drivers and Operations	967	190	840	-	1,997
Administrative and Management	231	7	19	-	256
Overall Garbage System FTEs	**1,198**	**196**	**859**	**-**	**2,253**
Total System FTEs	**1,972**	**323**	**1,637**	**26**	**3,958**

ReadMe Tab

the reviewer's friend

Introduction and Overview

Model Objectives: Calculate the cost of recycling and garbage in Oregon, using inputs from previous modules and unit cost factors.

Guide to cell styles	
Input cell (focus on these)	Input cell (focus on these)
Note	Notes regarding inputs
Linked Data	Data linking from elsewhere in the model
Calculation	Interim calculations within a table
Output	Output of a table for review or used elsewhere
Labels	Human-readable labels for items such as MRFs, submaterials, collection streams, etc.
KeyIndex	Computer-readable inputs for items such as MRFs, submaterials, collection streams, etc.
CHECK	Check cells

Step 1. Establish 2021 on-route collection baseline costs

Input Tabs

CollectionLabor	Estimates and inputs used in the COST Module around labor collection costs, capital costs, other operational expenses, annual indirect costs, and full-time equivalent employees (e.g., customers served per FTE, single-family, multifamily, and commercial collection and transfer FTEs). **Sample size of data coming from confidential sources:** --Metro is five composite cities with 222,208 customers using a cart and 4,974 commercial customers using a container for recycling --Willamette Valley is the composite cost of Eugene, Salem, Marion Urban, and McMinnville with 112,340 residential and 6,899 commercial container customers. --The rural area is three counties and one coastal city that has 27,018 residential customers and 923 commercial customers. Costs and operations for areas without recycling is the composite of Tillamook County without the City of Tillamook. --Depot costs are from recycling activities at Tillamook and Lane Counties, Astoria and McMinnville, Rogue Disposal, and 34 depots operated by Waste Connections
CollectionCapital	
CollectionOps	
CollectionIndirect	
CollectionCustomers	

Calculation Tab

CollectionTotal	Combines inputs from prior tabs to calculate on-route collection costs per scenario, grouping, sector, and collection frequency.
Collection_FTE_2026	Combines estimated customers and lifts per week from previous tabs to calculate the annual on-route, engagement, and hauler administrative FTEs.

Reviewing: cost module example

Guide to cell styles	
Input cell (focus on these)	Input cell (focus on these)
Note	Notes regarding inputs
Linked Data	Data linking from elsewhere in the model
Calculation	Interim calculations within a table
Output	Output of a table for review or used elsewhere
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KeyIndex	Computer-readable inputs for items such as MRFs, submaterials, collection streams, etc.
CHECK	Check cells

Grouping_Name	Sector_Name	CollectionStream_Name	Collection_Frequency	OnRoute_Lifts_Per_FTE_Per_Hour	OnRoute_Labor_Cost_Per_Lift	Benefits_Ratio	OnRoute_Benefits_Per_Lift	Labor_Cost_Per_Lift	Average_Lifts_Per_Customer_Per_Week	Weeks_Per_Year	Annual_Labor_Cost_Per_Customer
1 - Metro Area	SF Res. (on-route)	Commingled	Every other week	76	$ 0.32	49.8%	$ 0.16	$ 0.48	0.50	52	**$ 12.40**
1 - Metro Area	SF Res. (on-route)	Commingled	Weekly	85	$ 0.25	46.9%	$ 0.12	$ 0.37	1.00	52	**$ 19.16**
1 - Metro Area	MF Res. (on-route)	Commingled	Varies by customer ne	12	$ 2.72	48.9%	$ 1.33	$ 4.05	1.74	52	**$ 365.93**
1 - Metro Area	Commercial (all garbage,	Commingled	Varies by customer ne	12	$ 2.72	48.9%	$ 1.33	$ 4.05	1.74	52	**$ 365.93**
2 - Willamette Valley, etc.	SF Res. (on-route)	Commingled	Every other week	82	$ 0.22	38.8%	$ 0.08	$ 0.30	0.50	52	**$ 7.89**
2 - Willamette Valley, etc.	SF Res. (on-route)	Commingled	Weekly	77	$ 0.29	38.8%	$ 0.11	$ 0.40	1.00	52	**$ 20.82**
2 - Willamette Valley, etc.	MF Res. (on-route)	Commingled	Varies by customer ne	10	$ 3.00	41.7%	$ 1.25	$ 4.25	1.08	52	**$ 239.54**
2 - Willamette Valley, etc.	Commercial (all garbage,	Commingled	Varies by customer ne	10	$ 3.00	41.7%	$ 1.25	$ 4.25	1.08	52	**$ 239.54**
3 - Other Areas with Curb	SF Res. (on-route)	Commingled	Every other week	54	$ 0.35	33.2%	$ 0.12	$ 0.47	0.50	52	**$ 12.15**
3 - Other Areas with Curb	SF Res. (on-route)	Commingled	Weekly	52	$ 0.25	47.7%	$ 0.12	$ 0.37	1.00	52	**$ 19.11**
3 - Other Areas with Curb	MF Res. (on-route)	Commingled	Varies by customer ne	7	$ 3.93	37.2%	$ 1.46	$ 5.39	0.98	52	**$ 275.85**
3 - Other Areas with Curb	Commercial (all garbage,	Commingled	Varies by customer ne	7	$ 3.93	37.2%	$ 1.46	$ 5.39	0.98	52	**$ 275.85**

CASCADIA CONSULTING GROUP Bell & Associates Circular Matters

Where and how to review

Where to review?

Online – easiest to download

https://cascadiainc-my.sharepoint.com/:f:/g/personal/jessica_cascadiaconsulting_com/EjI5MNCZI3VIrRJBPhAZIN4Bm1-lh09WPw1NHNsT2SUn4A?e=lYpgbf

How to provide feedback?

- Use the Excel feedback form in the folder
- Provide your name, organization, and contact information
- Request for feedback includes additional data to revise inputs
  - You can send it separately by email.

CASCADIA CONSULTING GROUP Bell & Associates Circular Matters

Thank you!

Jessica Branom-Zwick, Cascadia Consulting Group

Carolina Paez Jimenez, Cascadia Consulting Group

Chris Bell, Bell & Associates

Tim Buwalda, Circular Matters

Calculating net costs for “materials list” scenarios

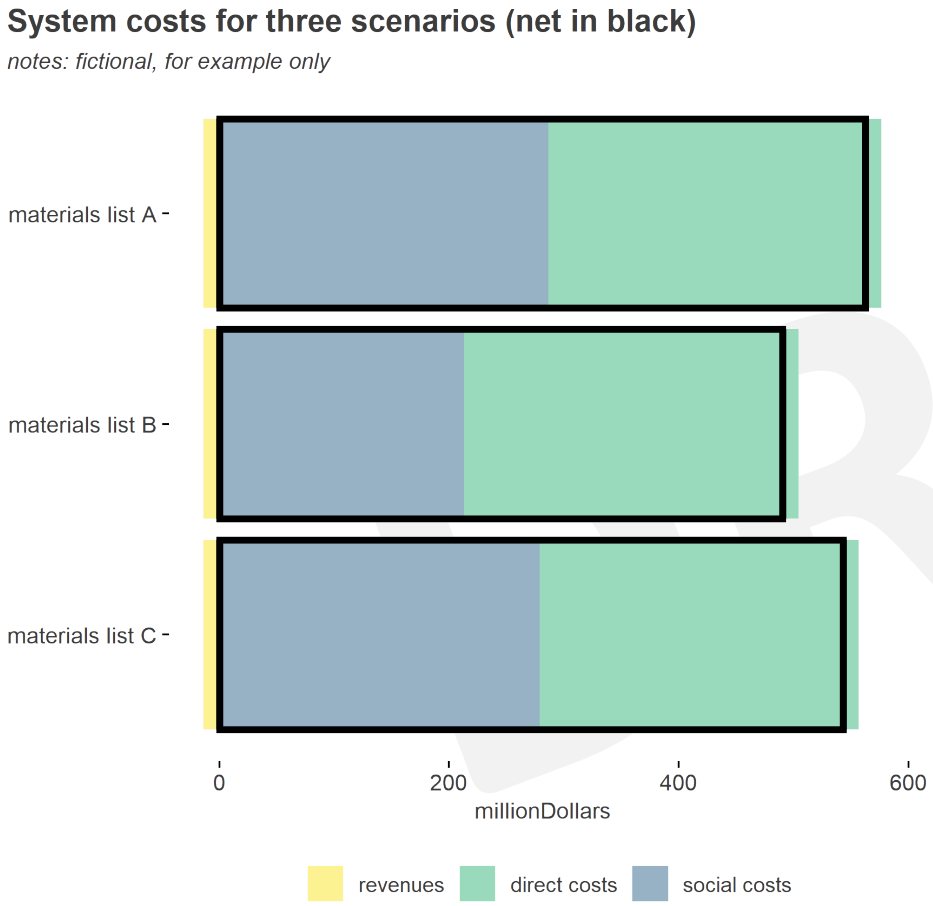
8/23/2022

Martin J. Brown | Oregon Department of Environmental Quality

Notes and disclaimers

- We've explored full system costs before, back in the 2020 recycling steering committee. https://www.oregon.gov/deq/recycling/Documents/rscEnvCostsSocImp.pdf
- This really is a draft. Results will change, but the basic logic should remain the same.
- Goal is to inform you, and get your questions and feedback

Our ultimate goal: to *compare* net costs



Components of the net cost formula

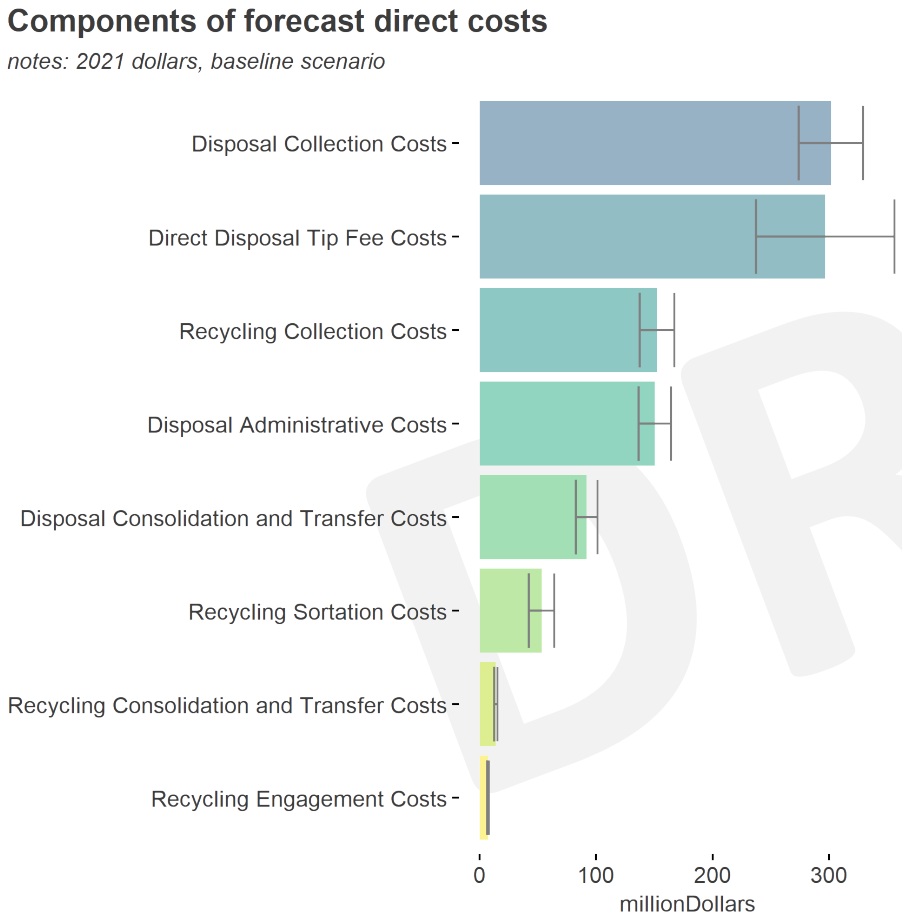
Simple

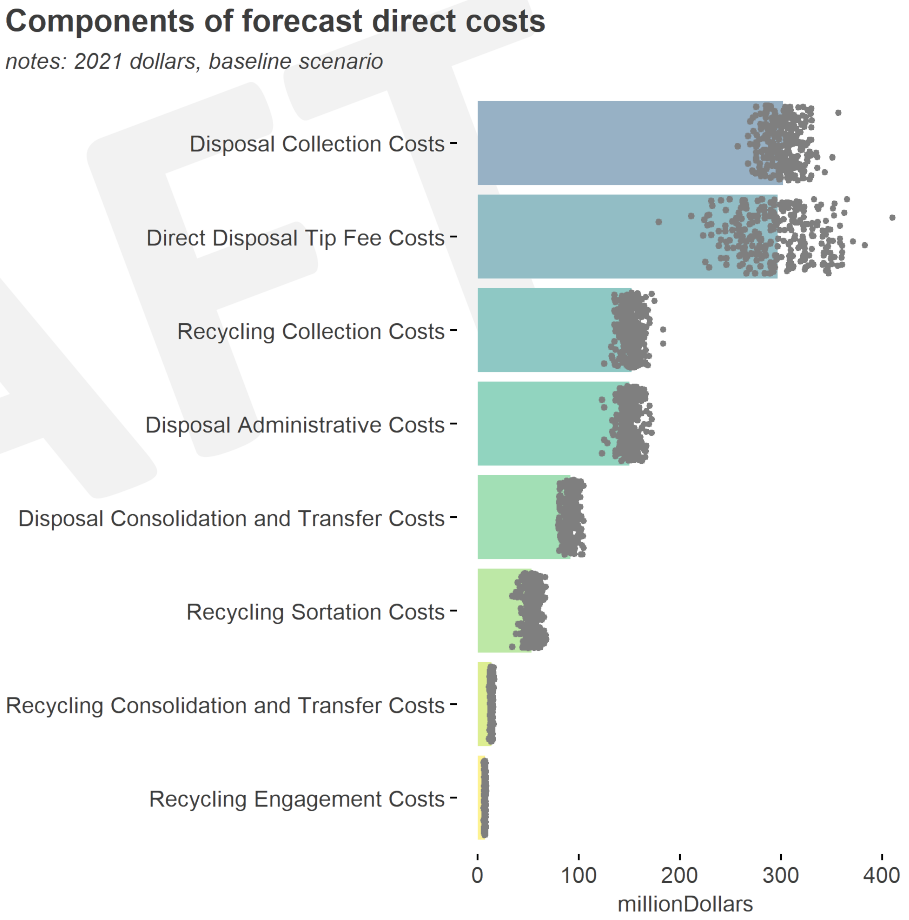
- Net = (revenues) + direct costs + social costs

Not so simple…

- Net = (*revenues*) + (*direct costs of several types*) + (a complex function of material choice, disposition, number of tons, *environmental impact factors in 13 categories*, *social cost factors in 13 categories*, and *related transportation effects*)
- Items in *italics* have uncertainty ranges

Direct costs: an example of uncertainty

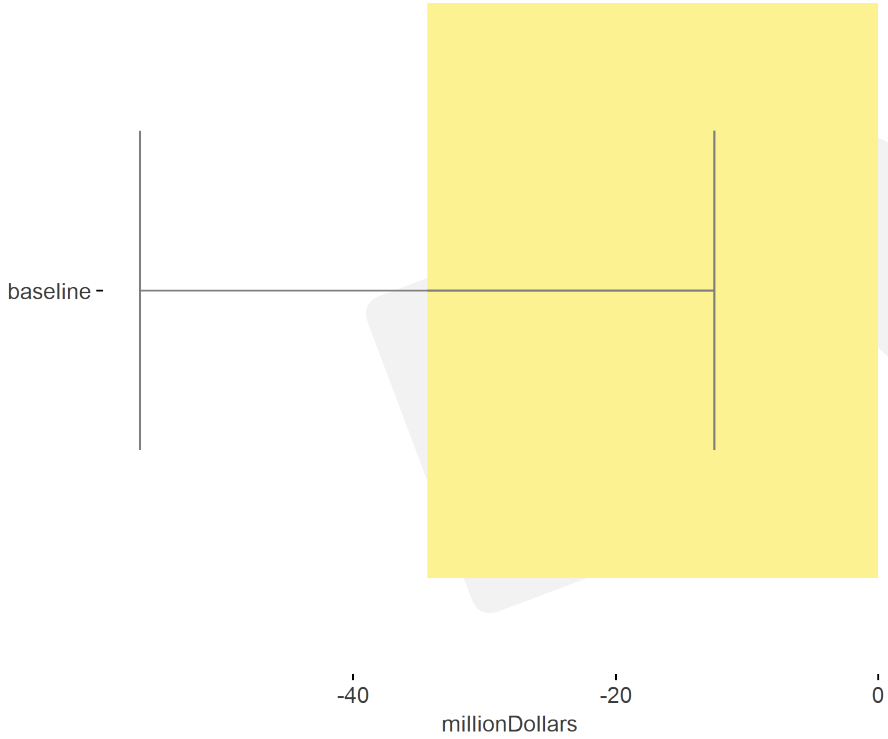




Revenue: another area of uncertainty

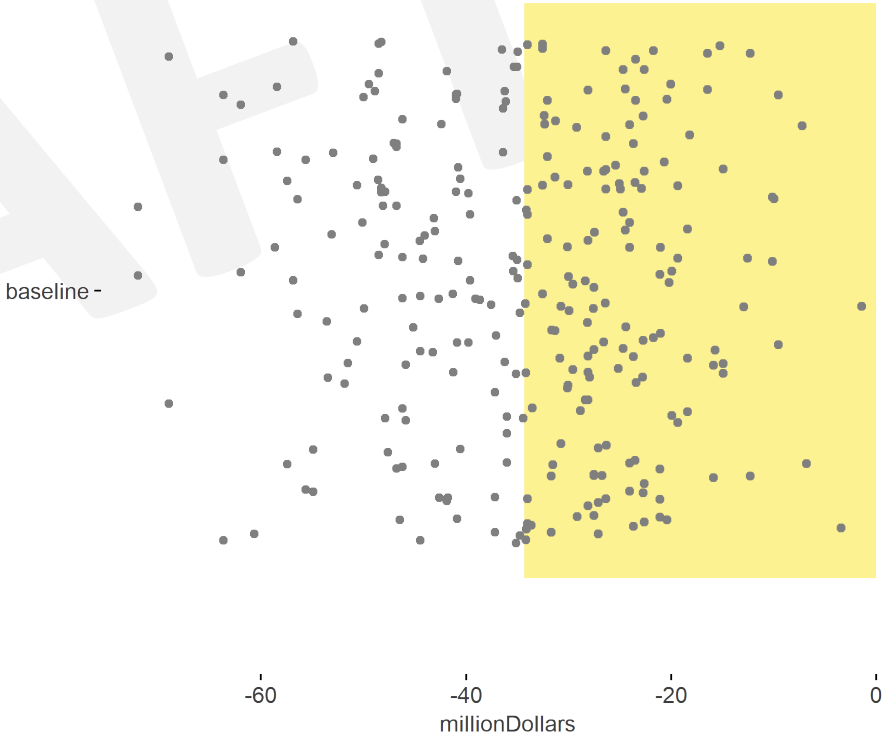
Variation in forecast revenue, with error bar

notes: 2021 dollars



Variation in forecast revenue, with pseudosamples

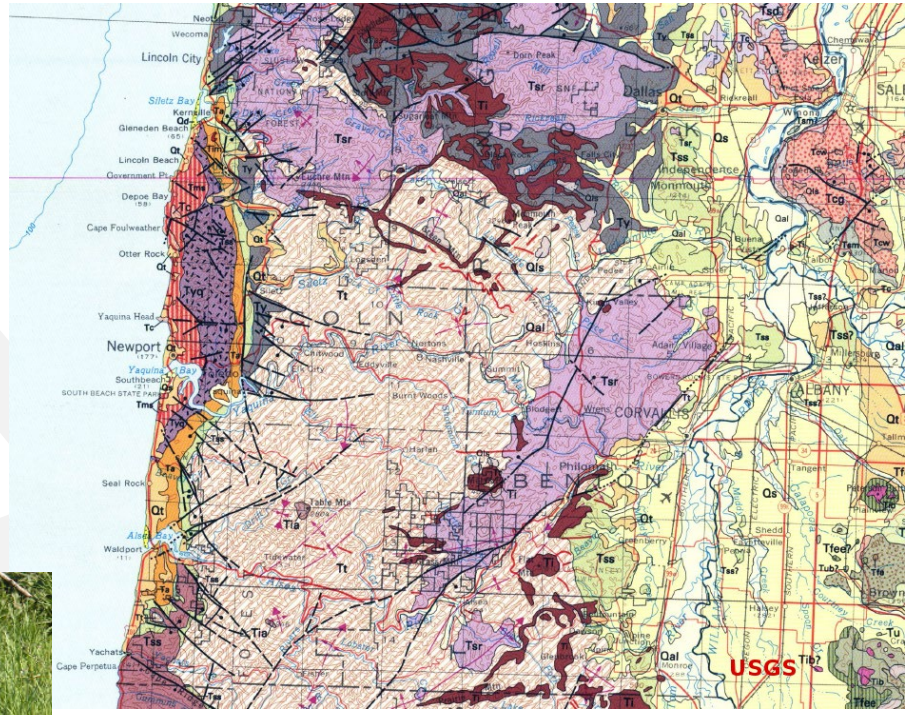
notes: 2021 dollars



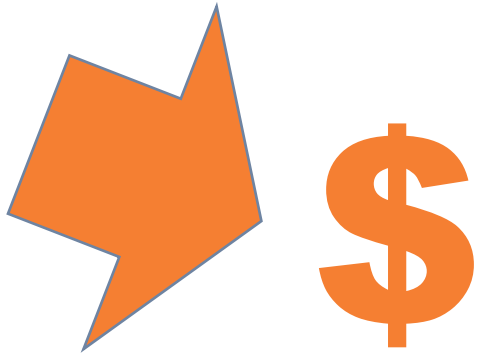
Social costs: based in the life cycle and impacts

Social costs: based in the life cycle and impacts

Social costs: based in the life cycle and impacts

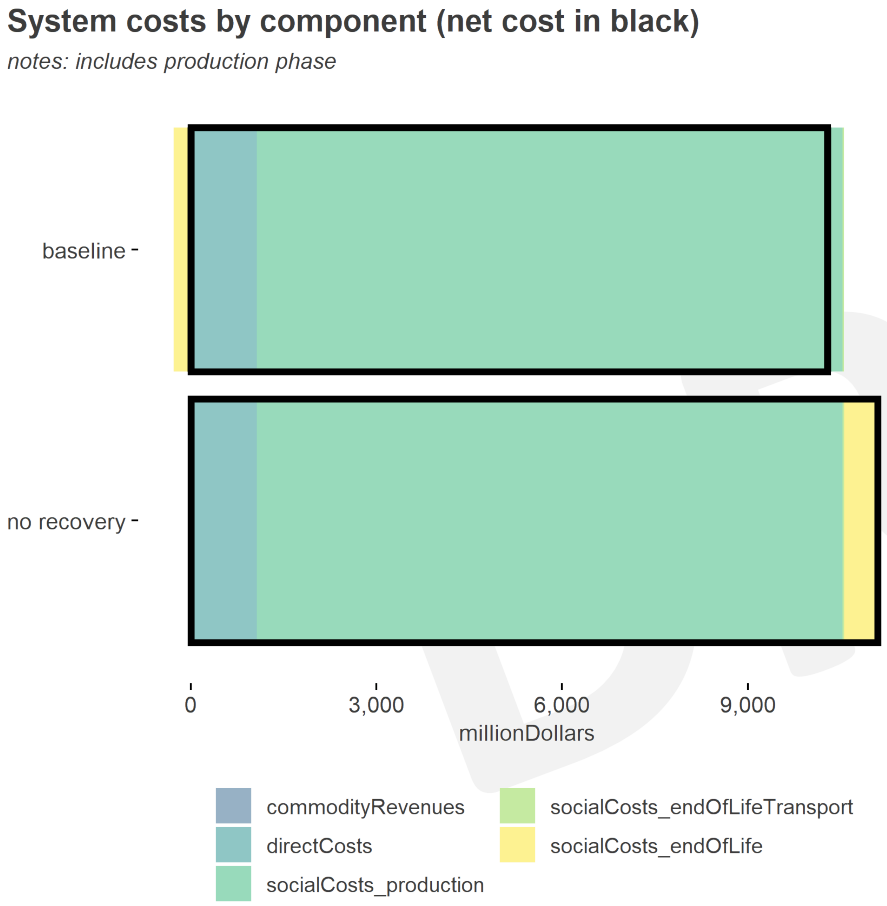


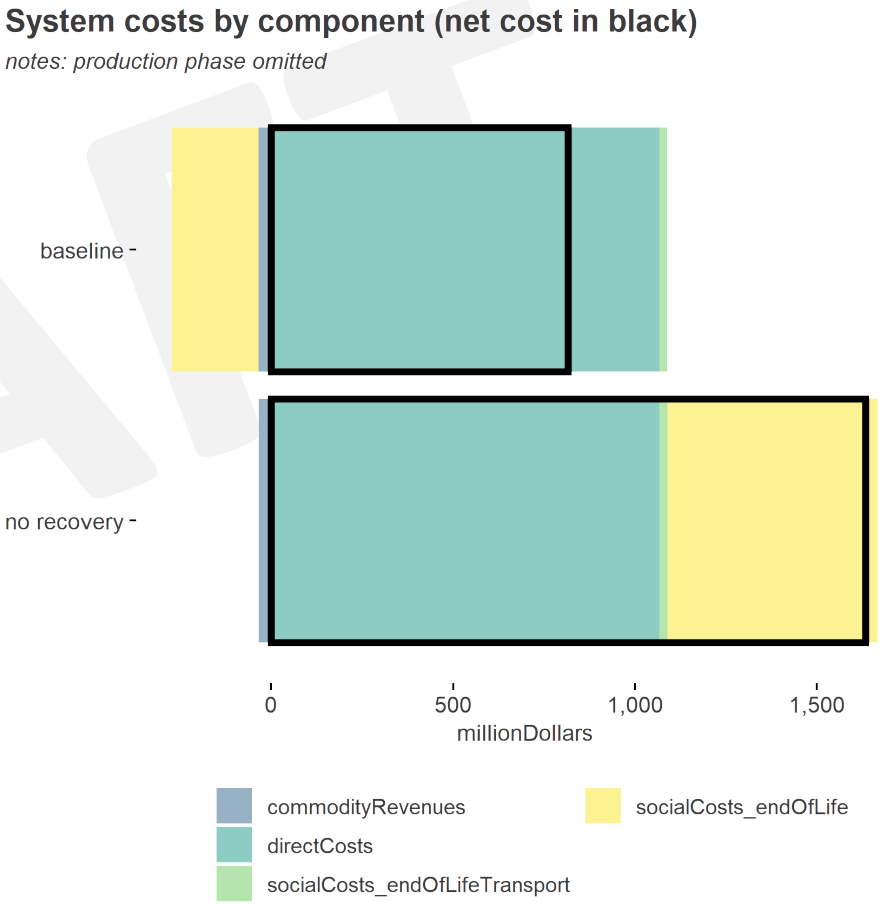
Pics courtesy of Bigstock Photos



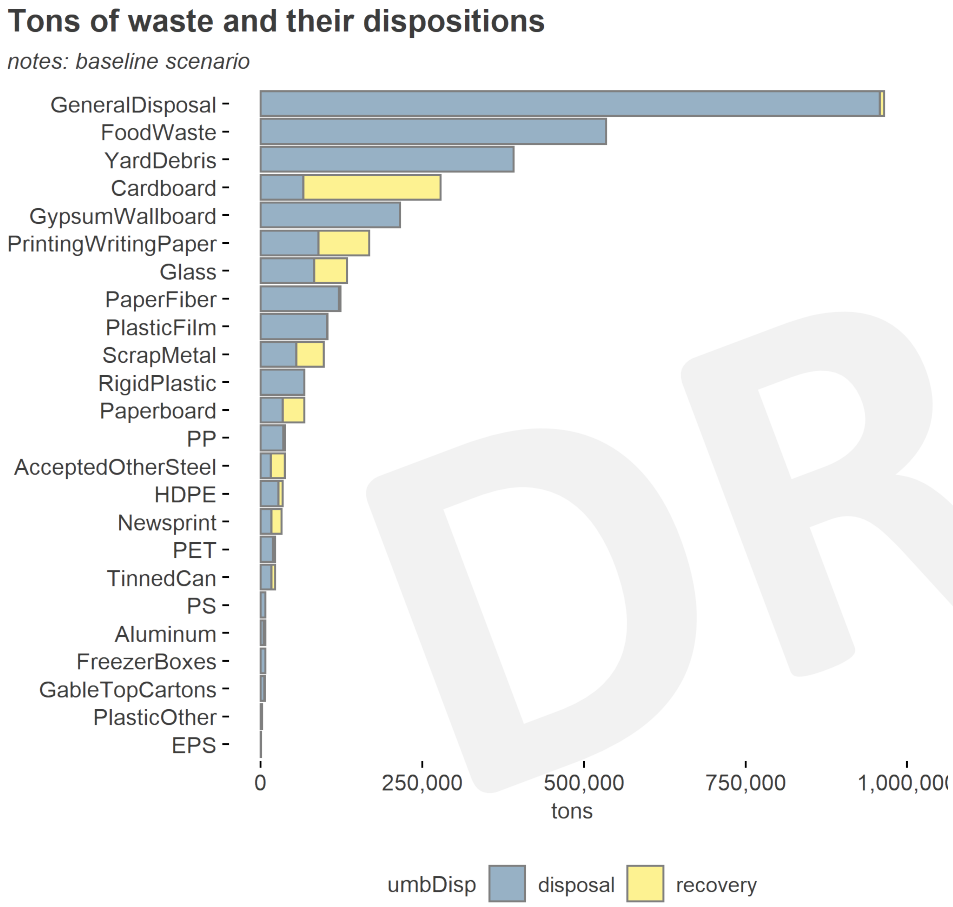
Pause for questions before seeing results

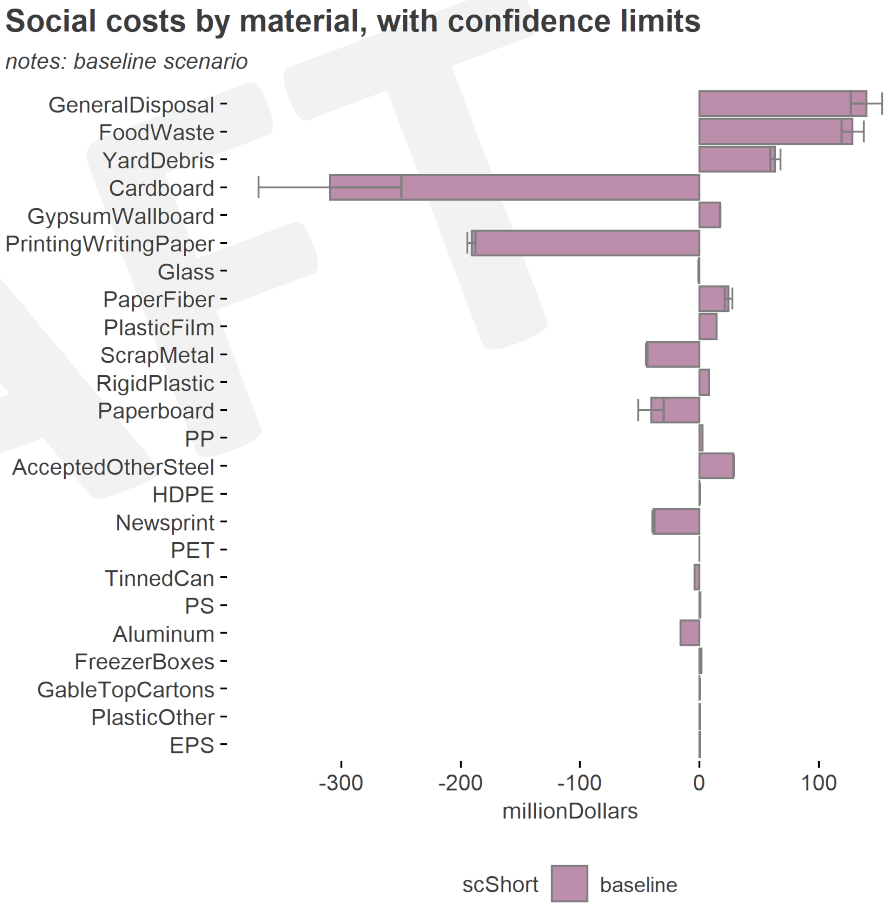
Net costs and the role of production





Materials as sources of social costs & benefits

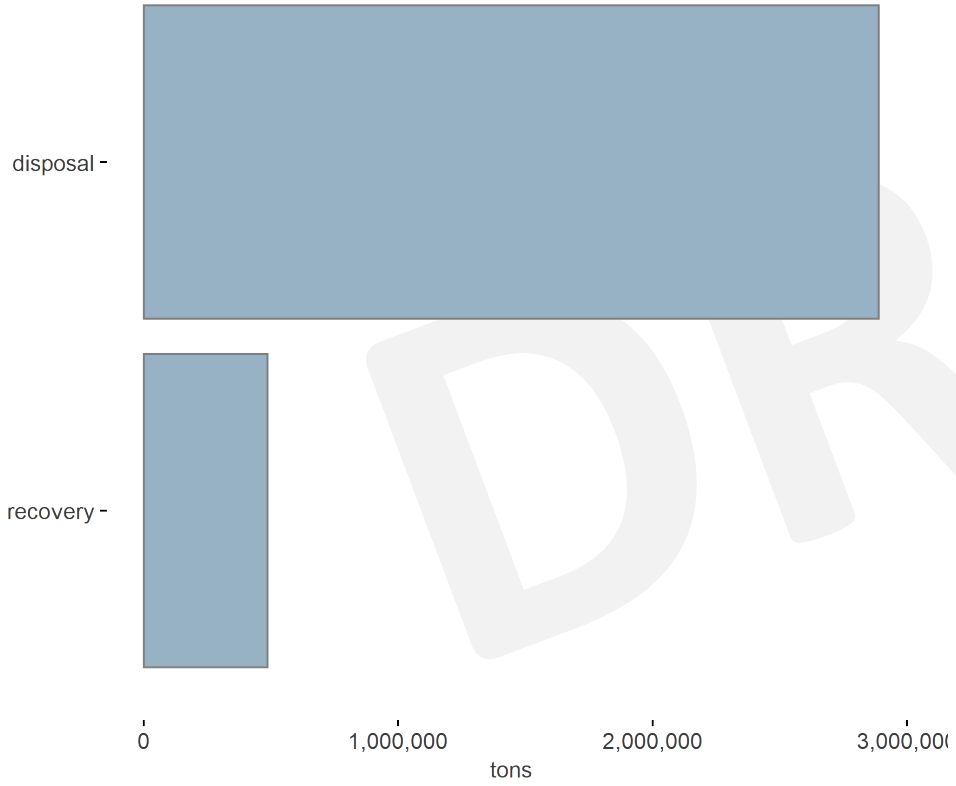




Disposal and recovery as sources

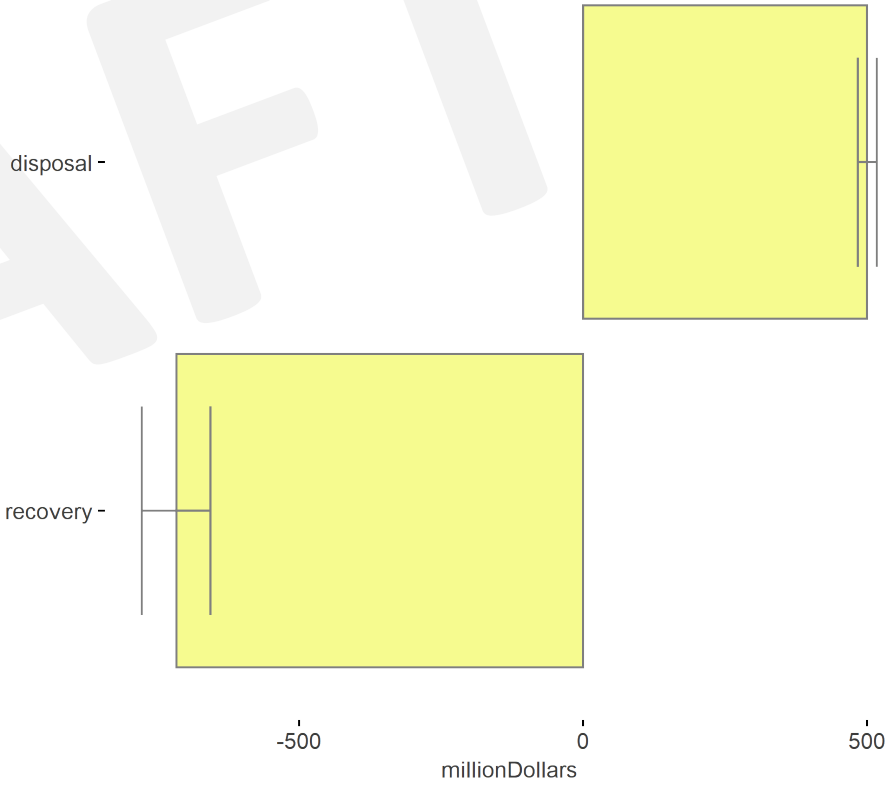
Tons of waste by umbrella disposition

notes: baseline scenario



Social costs by umbrella disposition, with confidence limits

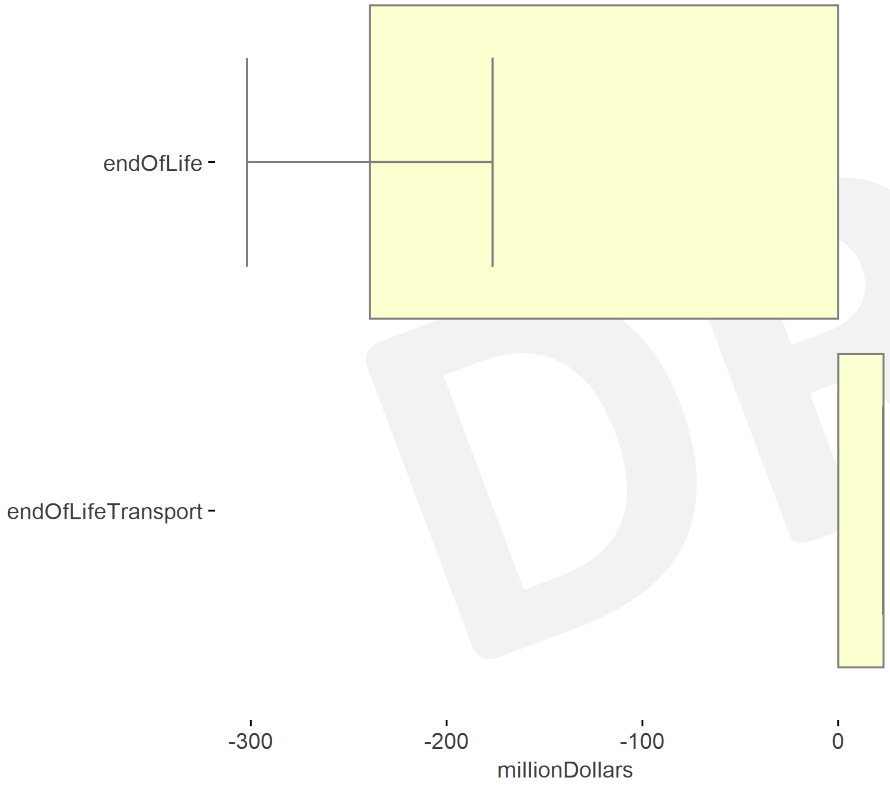
notes: baseline scenario



Life cycle stages and impact categories as sources

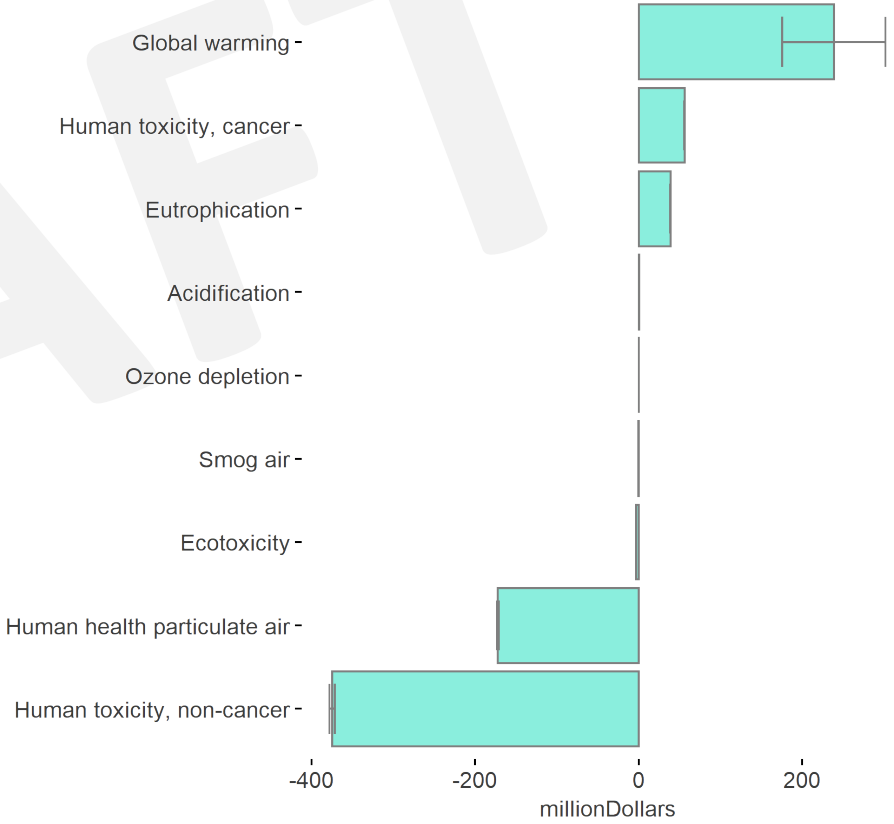
Social costs by life cycle stage, with confidence limits

notes: baseline scenario



Social costs by impact category, with confidence limits

notes: baseline scenario



Tentative findings about social costs

Take home notes

These are all draft results. But so far:

- *Production of waste materials is the biggest source of social costs*
- *But when production cannot be changed, recovery can reduce social costs*
- *So far, transportation is not a large source of social cost**
- *Social costs and benefits are dominated by:*
  - a few materials (food, cardboard, paper)
  - a few impact types (GHG & Human toxicity, non-cancer)

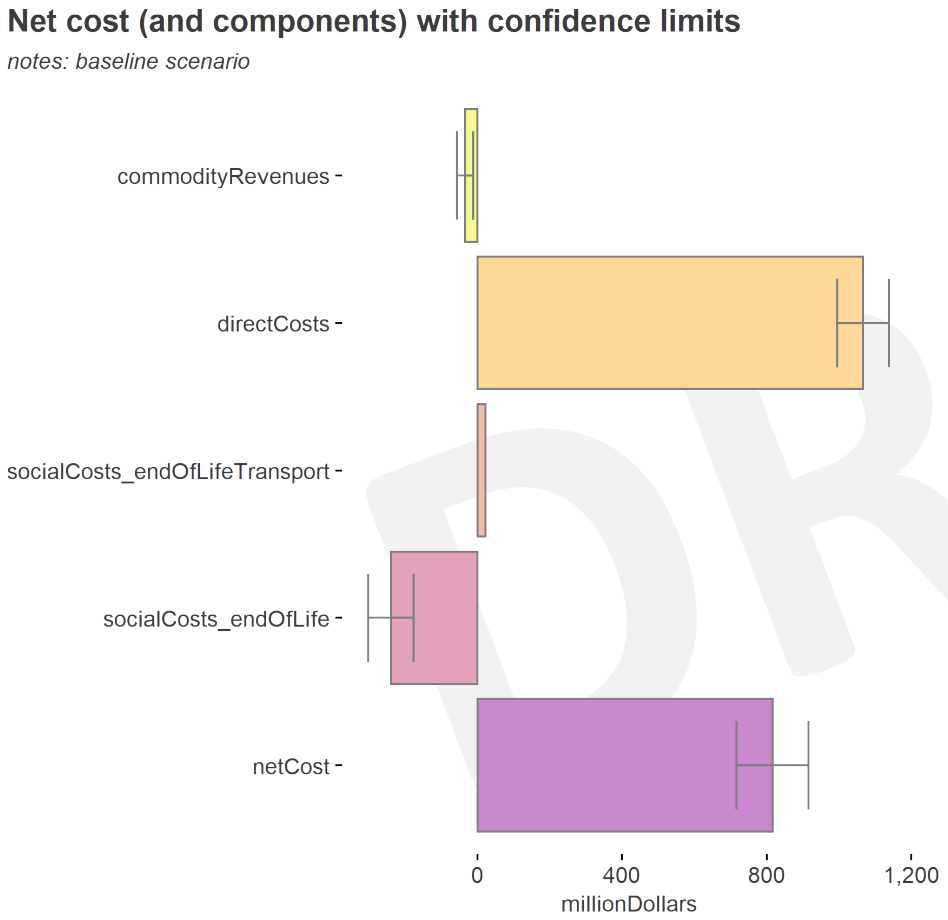
Upcoming improvements

Currently analysis:

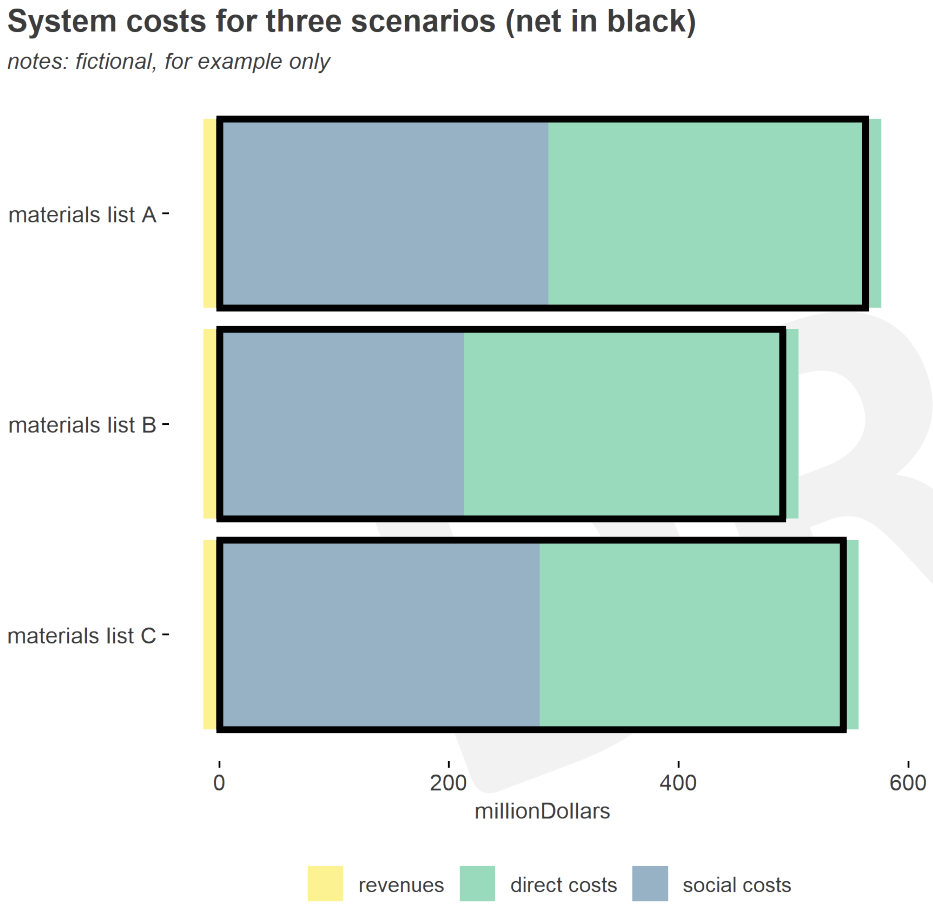
- Doesn't include impact of resource depletion
- Doesn't include impact of personal transportation used for self-haul recycling
- May have slightly different scope boundaries for materials than direct costs

When we fix these things, social costs will probably go up.

Means and uncertainties for the baseline scenario



Next meeting: comparing net costs



Thanks! Questions?

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Future scenarios

- Currently under evaluation – to be shared @ 9/20 meeting
- Will help DEQ evaluate "economic" and "environmental" considerations and prepare fiscal impact statement for rules
- 17 scenarios designed primarily to *answer questions* and *provide insight* . . .
- *. . . Not* a "horse race" from which one "winner" will be chosen
- All results are preliminary and review will be encouraged . . .
  - ➢ . . . but quick turn-around will be requested for review
- A second phase of evaluation is planned for this fall

Scenario Overview

69
materials

4
ways to collect

3
depot densities

17
scenarios

1 goal
determine **what** and **how** it makes the most sense to recycle.

Collection Methods and Depot Densities

4 Ways to Collect

USCL
commingled collected on-route and at depots

OTS
glass collected on-the-side (on-route)

Glass-only PRO depots
producer-funded depots collecting only glass

PRO depots
producer-funded depots collecting several materials (may also collect glass)

3 Depot Densities

- High density
- Medium density
- Low density

Materials groupings: "Core" Uniform Statewide Collection List

Recycled in USCL in all scenarios:

- Recyclable OCC & Kraft paper
- Office paper, printing/writing paper, newsprint, magazines, phone books, paperback books
- Non-polycoated paperboard and molded pulp (excluding food serviceware), e.g., cracker boxes and egg cartons
- Packaging tissue paper and non-metalized gift wrap
- Aluminum/steel cans and small scrap metal*
- PET, HDPE, and PP bottles and jars*

**Excludes items less than 6 ounces or 3" in two directions*

Materials groupings: Uniform Statewide Collection List Additions

- "PET, HDPE, PP other packaging"*
  - Tubs, clamshells (including thermoforms)
  - Excludes food serviceware
- "HDPE, PP, PET pails/nursery/cups"*
  - Pails and buckets 2 – 5 gallons
  - Nursery containers
  - Clear cups
  - LDPE bottles and tubs
- "Bulky HDPE, PP products"
- "Polycoated cartons and cups"
- "Aerosols, rigid PS and food serviceware"*
  - Aerosol cans
  - LDPE and PS nursery containers
  - PS packaging and cups
  - All other plastic food serviceware (excluding cups)

**Excludes items less than 6 ounces or 3" in two directions*

Materials groupings: other materials

- Glass bottles and jars
- “Lids, film, foil, shred paper”
  - Tub and container lids
  - HDPE 6-pack carriers*
  - PE film/wrap
  - Aluminum foil and pressed foil products
  - Shredded paper
- Block, uncolored EPS

**Might move to USCL options pending favorable information on 2D/3D sortation*

17 Scenarios

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

Comparisons: baseline vs. 17 scenarios

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

Comparison: step-wise expansion of USCL

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

Comparison: Moderate USCL only vs. Moderate USCL + PRO depots

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

Comparison: glass on vs. off the curb, replace with Rogue Disposal-style depots

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

Comparison: glass off the curb, replace with PRO depots (medium density)

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

Comparison: glass off the curb, replace with PRO depots (low and high density)

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

Comparison: evaluation of changing depot density (without glass)

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

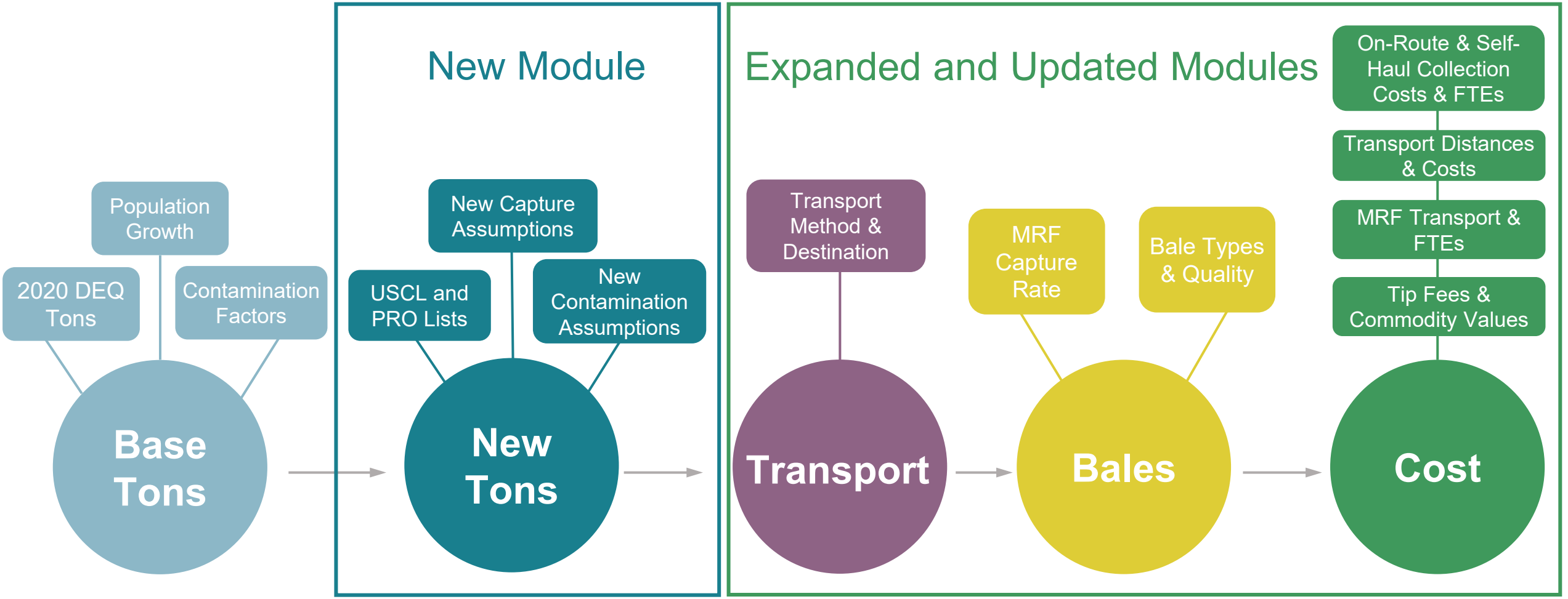
Comparison: evaluation of changing depot density (including glass)

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

Comparison: more vs. less extensive depot collections

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

Scenario Modeling



17 Scenarios: Questions?

	S00	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S13	S14	S15	S16	S17
Core USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL
Glass	OTS	OTS	OTS	OTS	OTS /PRO	PRO	OTS	OTS	OTS	OTS /PRO	OTS /PRO	OTS /PRO	OTS	OTS	OTS	OTS	OTS	OTS
PET, HDPE, PP packaging	Varies	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	PRO	PRO	USCL	USCL
Polycoat cartons & cups	Varies	Not	Not	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	USCL	PRO	PRO	Not	PRO	USCL	USCL
HDPE, PP, PET pails/nursery/cups	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	USCL	USCL
Aerosols, rigid PS, FSW	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	Not	USCL	USCL
Bulky HDPE, PP products	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	Not	USCL	USCL
Lids, film, foil, shred paper	Varies	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	PRO	PRO	PRO	PRO	Not	PRO
Block EPS	Not	Not	Not	Not	Not	Not	PRO	PRO Low	PRO High	PRO	PRO Low	PRO High	Not	PRO	PRO	PRO	Not	PRO

MRF Contamination

Pic courtesy of Justin Gast

Outthrow – Non-target material that degrades the quality and yield of a bale of recyclable material; a category of market residue.

- For example, paperboard in a sorted office paper bale.

Prohibitive – Material that may render a bale or shipment of material unusable (e.g., food waste, hoses, general garbage, etc.);

MRF Capture Rates

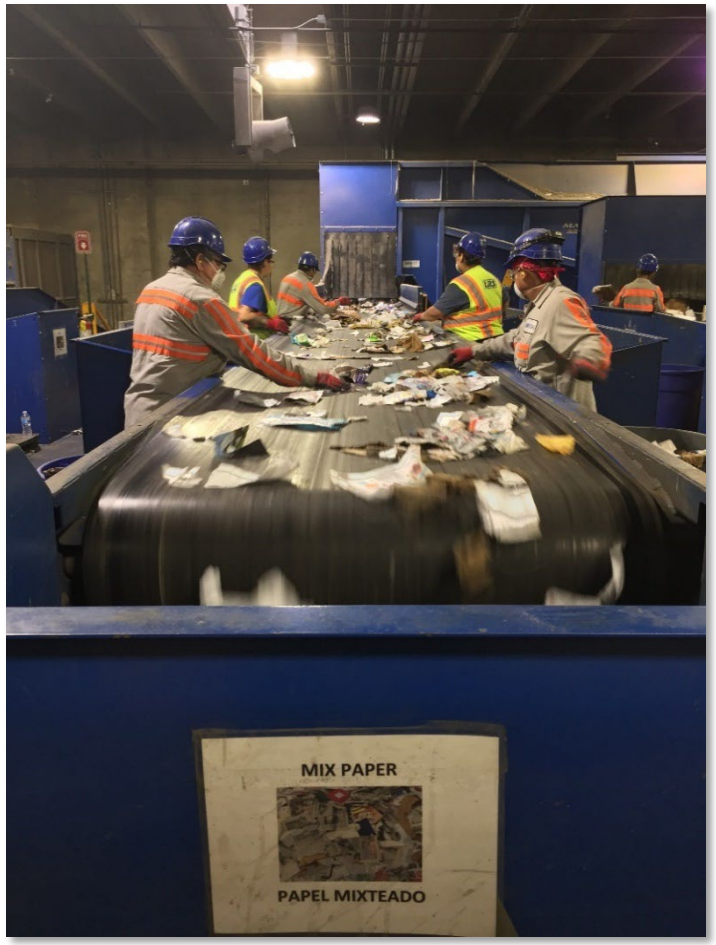
What's a capture rate?

The proportion of incoming recyclable material that is shipped to a responsible and proper end-market relative to the quantity of recyclable material that is received by the MRF. The rate may be specific to a commodity or the stream as a whole.

- Essentially, this measurement tells us how well a MRF performs the core function of sorting recyclable materials into commodities.

Pic courtesy of Justin Gast

MRF Capture Rates



Pic courtesy of Justin Gast

ORS 459A.955 (RMA Section 37)

(2) A disposal site permit issued to a commingled recycling processing facility must require the facility to:

(a) Sort all materials collected from the public so that materials do not become contaminants in other waste streams;

Draft-Processing Modeling Results-Statewide

Commodity	Baseline Rate	Future Rate
Paper		
OCC	96%	97%
ONP	97%	97%
Other printing and writing paper w/ONP	90%	92%
Paperboard	96%	94%
Cartons	68%	92%
Polycoated cups	67%	92%
Shredded paper	66%	-

Draft-Processing Modeling Results-Statewide

Commodity	Baseline Rate	Future Rate
Plastic		
PET Bottles (BB)	85%	85%
Other PET bottles and jars (non-deposit and non-beverage)	86%	93%
Other HDPE bottles and jars (non-deposit and non-beverage)	93%	92%
Other PP bottles and jars (non-deposit and non-beverage)	52%	92%
PET tubs 6oz to 2 gallons	15%	94%
PET thermoforms 6oz to 2 gallons	15%	95%
HDPE tubs 6oz to 2 gallons	83%	94%
HDPE tubs + pails > 2 to 5 gallons	64%	90%
PP tubs _ pails > 2 to 5 gallons	80%	94%

Draft-Processing Modeling Results-Statewide

Commodity	Baseline Rate	Future Rate
Plastic		
PP tubs 6 oz to 2 gallons	83%	94%
Other PP packaging & product 6 oz to 2 gal	86%	86%
PS Solid tubs 6 oz to 2 gallons	24%	89%
Other solid PS packaging 6 oz to 2 gallons, not RPCs	24%	79%
HDPE flower pots larger than 2 gal	64%	91%
HDPE flower pots 4" to 2 gallons	94%	94%
PP flower pots greater than 2 gallons	80%	94%
Other HDPE packaging & product 6 oz to 2 gal (not foamed)	94%	93%
Other accepted tubs & pails 6 oz to 2 gallons (RPCs)	83%	-

Draft-Processing Modeling Results-Statewide

Commodity	Baseline Rate	Future Rate
Metals		
Deposit and accepted aluminum beverage cans	90%	96%
Other aluminum cans accepted at curb	88%	95%
Other rigid aluminum accepted at curb	89%	89%
Deposit and other steel cans accepted at curb	93%	98%
Other steel accepted at curb	93%	98%
Other scrap metal (non-ferrous + mixed metal) accepted at curb	93%	98%

Short Break

The meeting will resume within five minutes

Responsible End Markets: Follow-Up to 7/19 Discussions

David Allaway and Nicole Portley
Oregon DEQ Materials Management Program

Technical Workgroup on Materials Lists

August 23, 2022

PRO obligations are “to the extent practicable”

ORS 459A.896(2):

“A producer responsibility organization, shall, *to the extent practicable*, ensure that covered products collected in this state for the purpose of recovery and described in ORS 459A.869(7) will be:

(a) Delivered to responsible end markets;

(b) Managed according to the hierarchy of materials management options under ORS 459.015(2); and

(c) Managed in an environmentally protective way through to final disposition.”

Proposed definition of “practicable”

1. Provide examples:
   i. Provide financial support to help a market change operations
   ii. Provide financial support to redirect materials to a different end market
   iii. Re-direct disposition (for materials under PRO’s direct control)
   iv. Offer to buy or take ownership of materials (to bring them into direct control)
   v. Develop new markets
2. “Impracticable” requires technical barriers that cannot be overcome or transactional costs that aren’t justified (given resulting societal benefits)
3. For all claims involving responsible end markets not being practicable, require critical review by DEQ . . . and initiate review of material acceptance lists if agreed

Evaluating cost effectiveness?

- Requires estimates of both “cost” and “benefits”
  - Costs are relatively easy to estimate
  - Benefits, less so
- Possible solution: Require PRO to estimate costs and then either:
  - Compare those costs against a fixed benchmark
    - Established in rule
    - Adjusted for inflation
  - Or compare against benefits estimated by the PRO
    - Subject to review by Recycling Council and approval by DEQ

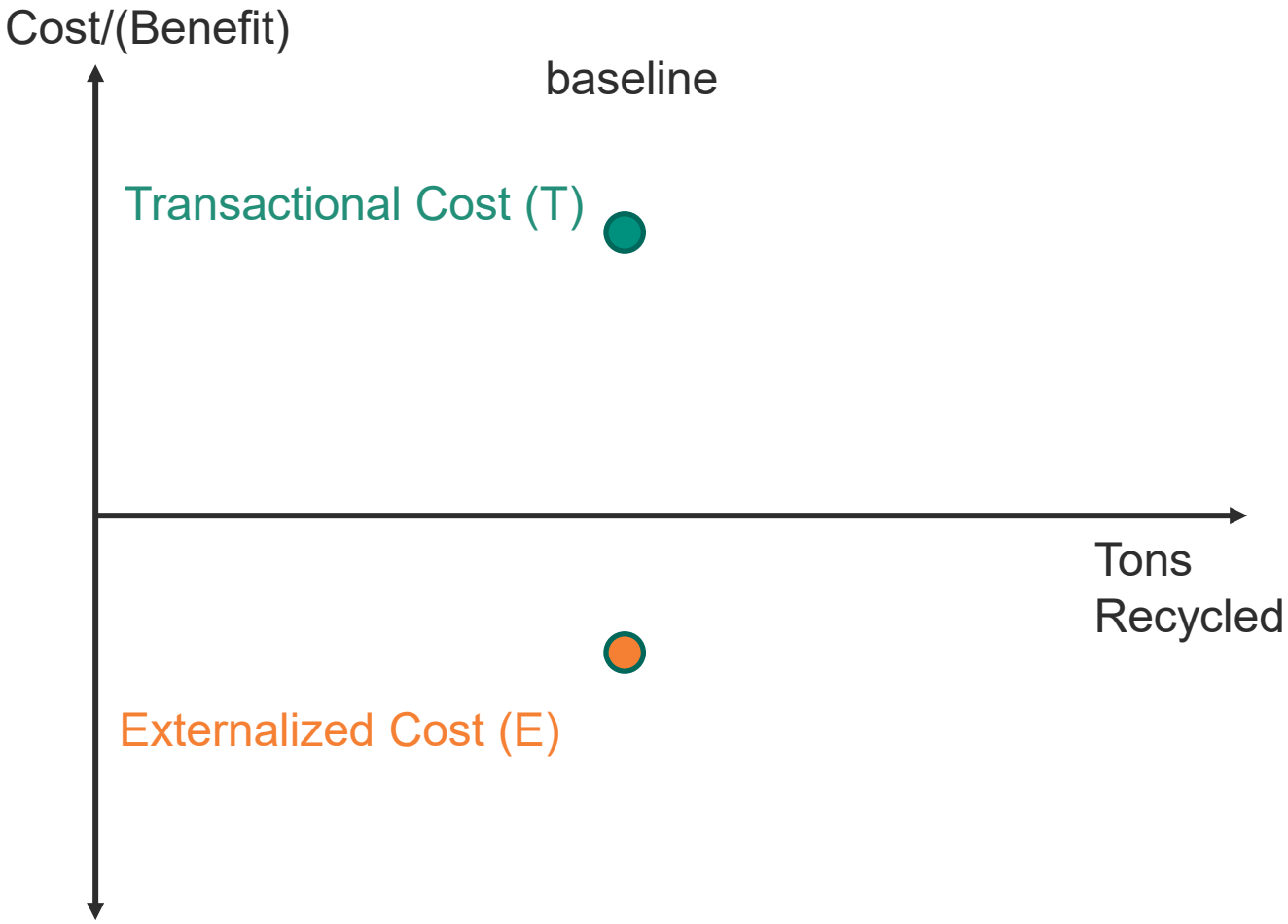
Question: What to use for a benchmark?

Cost/Benefit Comparison

A theoretical example (figures not to scale)

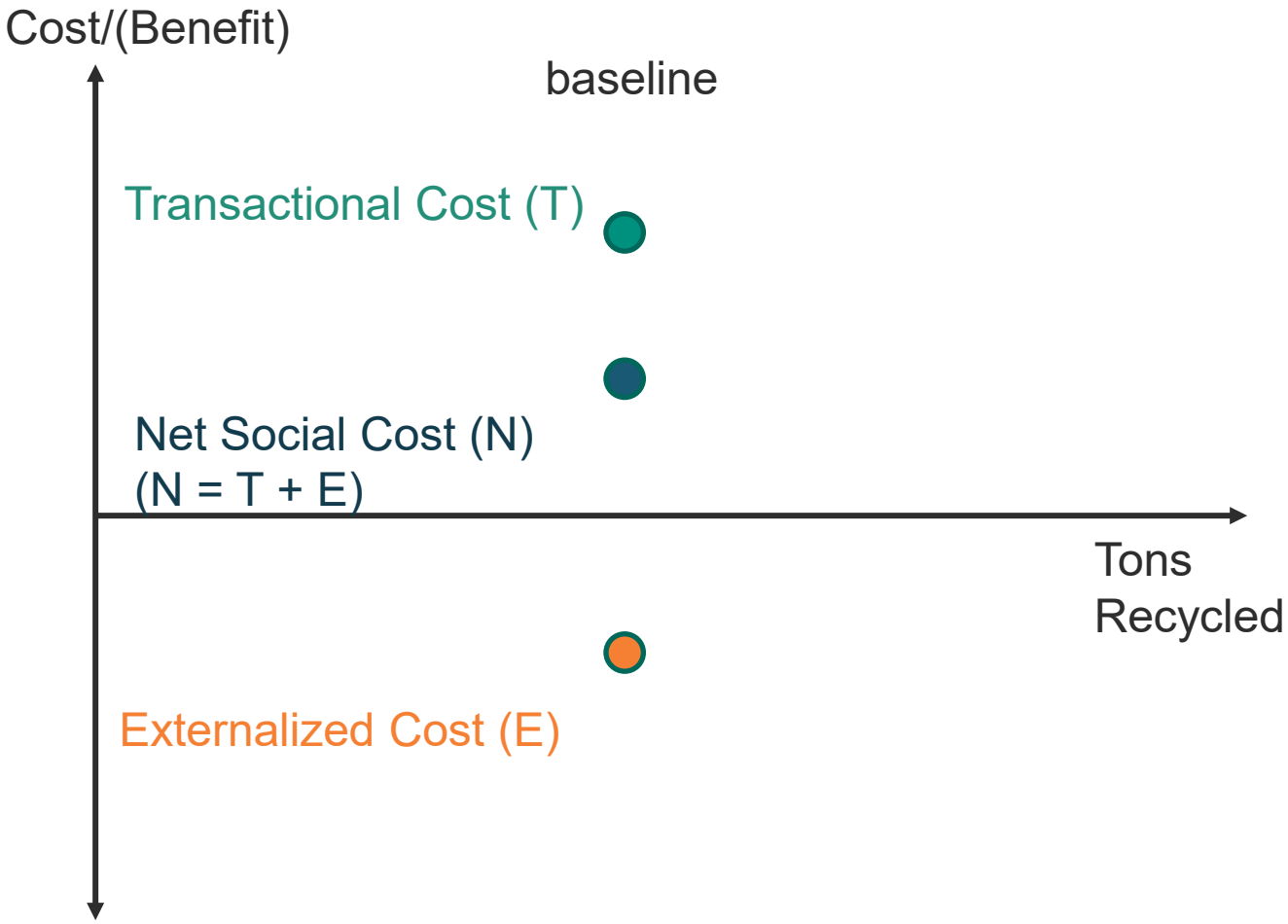
Cost/Benefit Comparison

A theoretical example (figures not to scale)



Cost/Benefit Comparison

A theoretical example (figures not to scale)



Cost/Benefit Comparison

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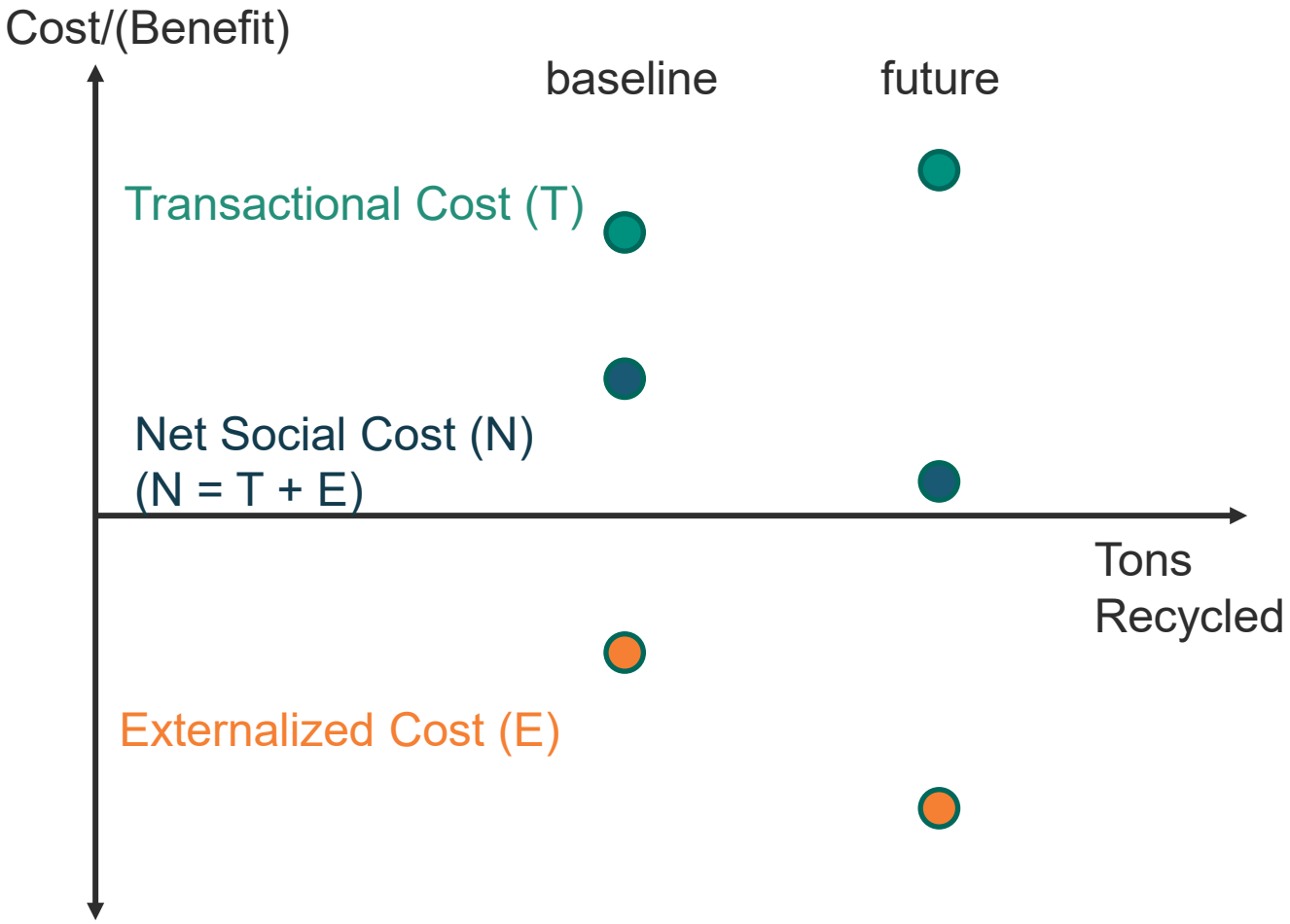
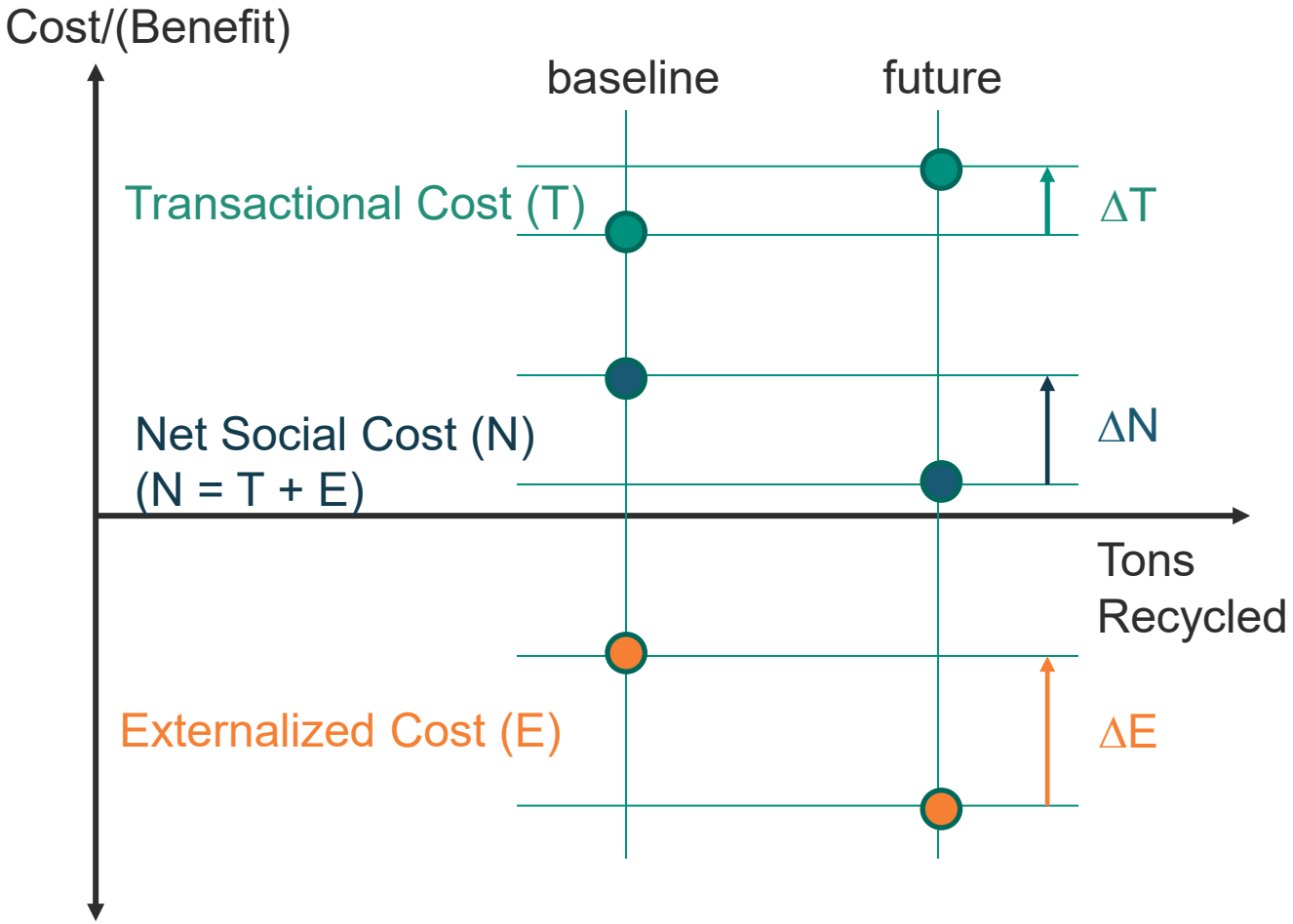


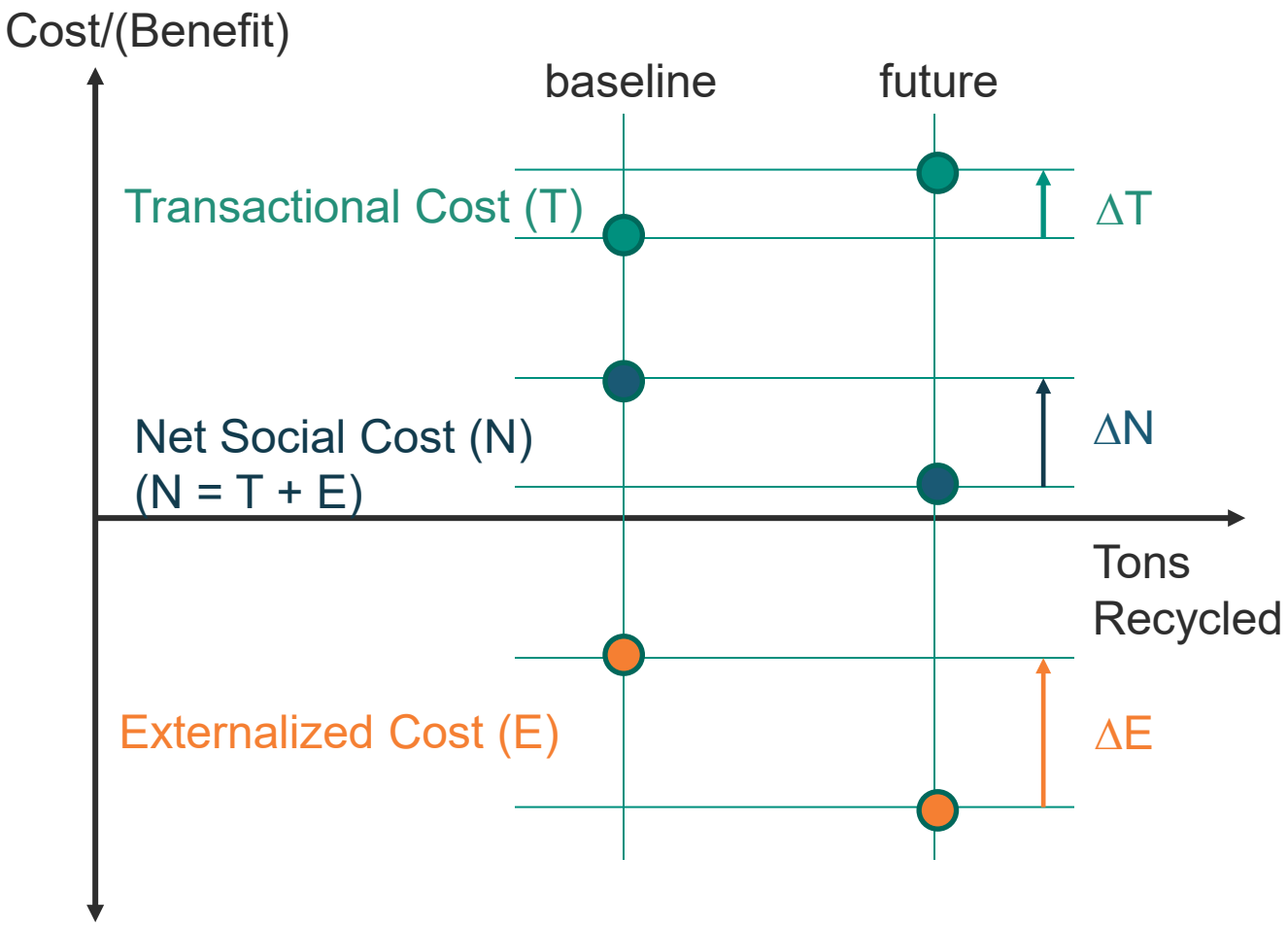
Cost/Benefit Comparison

A theoretical example (figures not to scale)



Cost/Benefit Comparison

A theoretical example (figures not to scale)

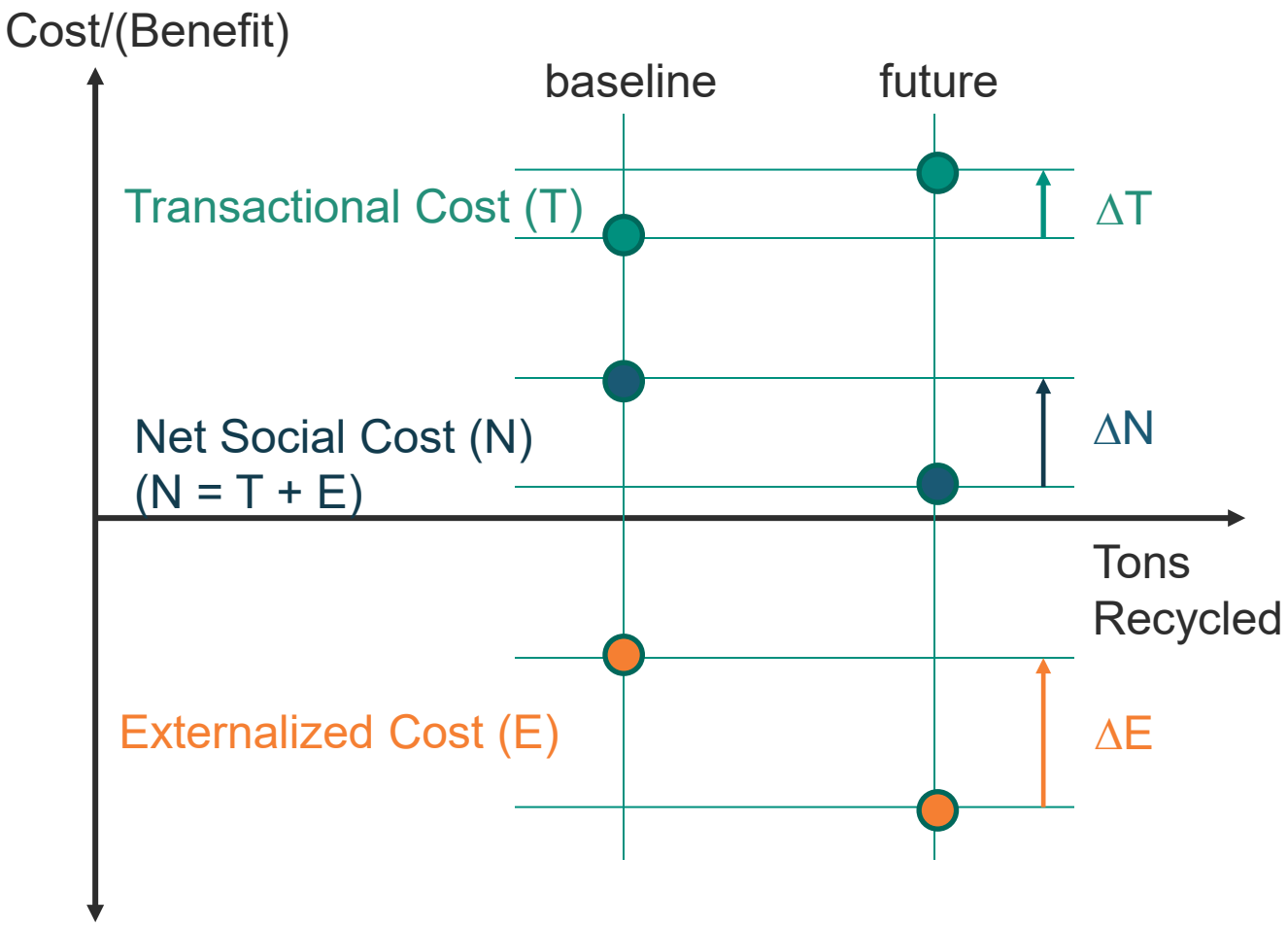


How much should an "economically rational" society be willing to pay (in transactional costs) to go from baseline scenario to future scenario?

ΔE

Cost/Benefit Comparison

A theoretical example (figures not to scale)



How much should an "economically rational" society be willing to pay (in transactional costs) to go from baseline scenario to future scenario?

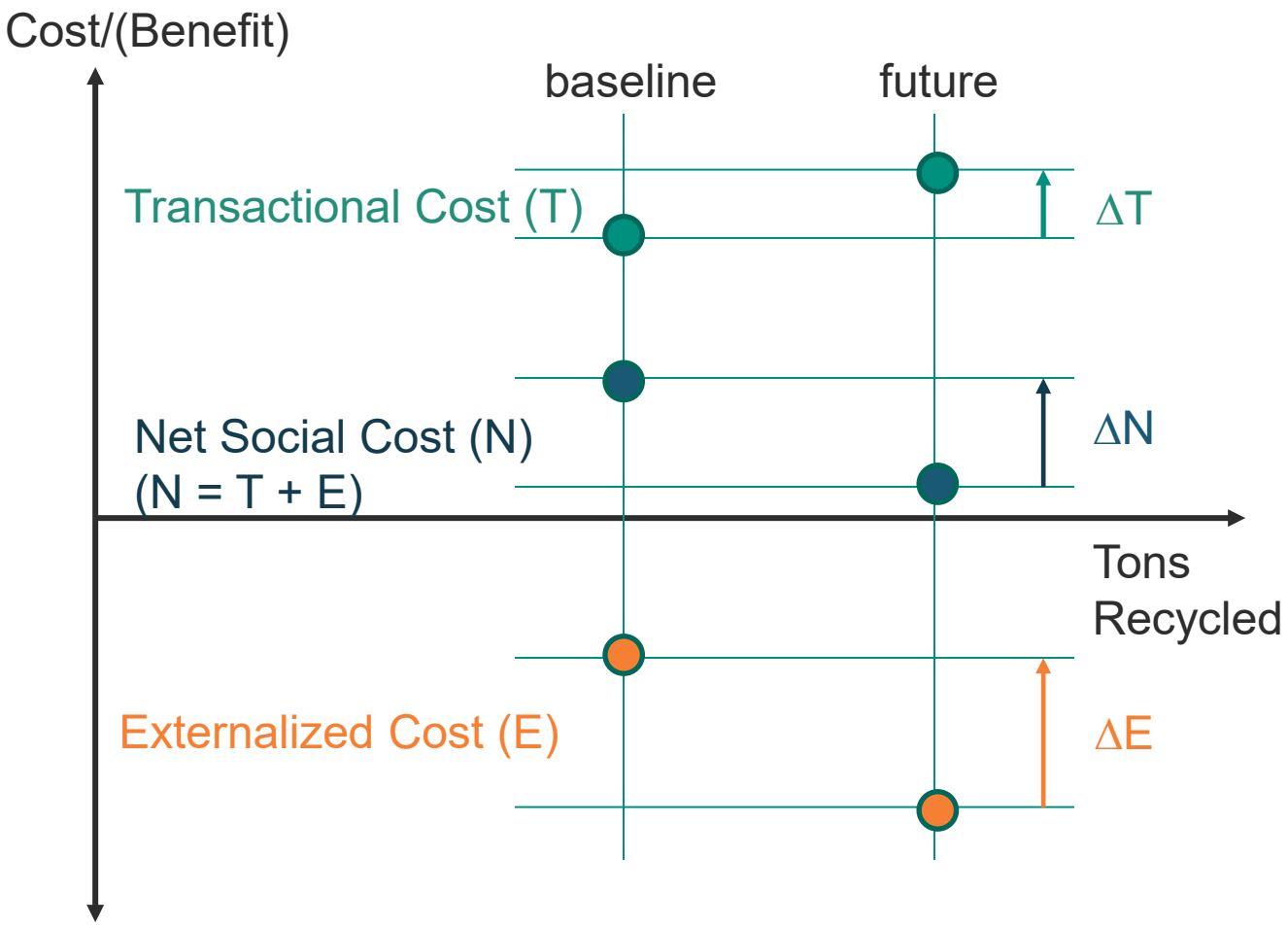
ΔE

How much do we actually expect society to pay?

ΔT

Cost/Benefit Comparison

A theoretical example (figures not to scale)



How much should an "economically rational" society be willing to pay (in transactional costs) to go from baseline scenario to future scenario?

ΔE

How much do we actually expect society to pay?

ΔT

How much *additional* should society be willing to pay?

ΔN
Or, on a per-ton basis, ΔN / ΔTons

Responsible End Markets: Updating Rule Concepts

<u>Possible Rule Concept Updates Currently Under Consideration</u>

- Numeric threshold for practicability cost-benefit analysis (as presented by David)
- Explicit inclusion of labor law in compliance element of “responsible”
- Outline example implementation pathways in rule—certification, 2-step verification
- Guidance on enforcement

Chain of Custody Certifications

Multi-material

1. Recycled Claim Standard (RCS)
2. Global Recycle Standard (GRS)

Fiber

1. Forest Stewardship Council (FSC)
2. Sustainable Forestry Initiative (SFI)

Plastics

1. Recycled Material Standard (RMS)
2. UL Environmental Claim Validation Procedure for Recycled Content
3. SCS Global Recycled Content Standard V7.0
4. ISCC+

Aluminum

1. Aluminum Stewardship Initiative (ASI) Chain of Custody Standard

Responsible End Markets

Follow-Up on TWG Questions

- What about brokers?
- Should the end market definition be aligned with product categories of the Food, Drug & Cosmetic Act?
- What about recycling yield thresholds for non-mechanical recycling?
- Will there be a list of approved markets?
- Why are landfills included in the definition of “disposition” in the responsible end markets definition?

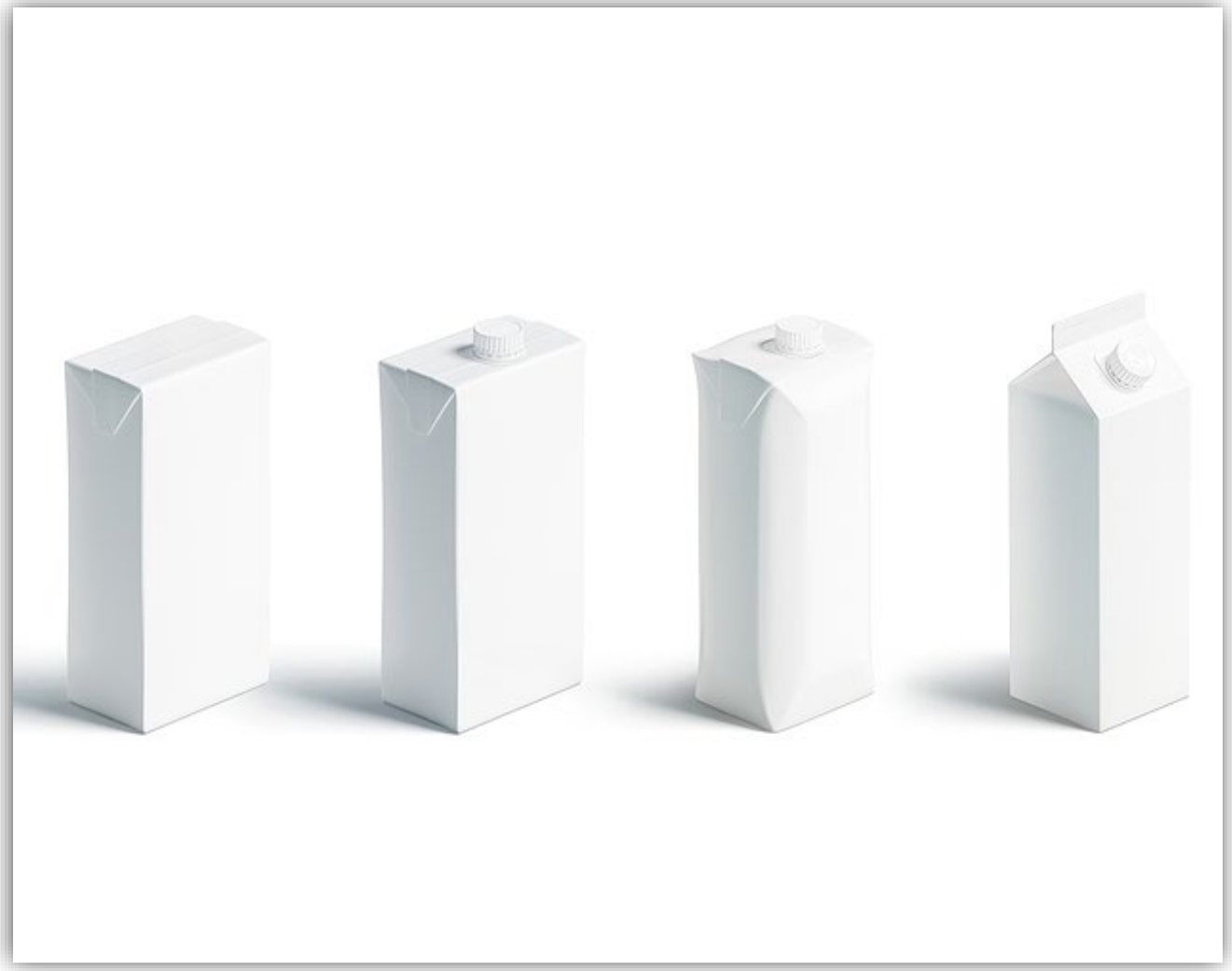
Comparative Life Cycle Assessment of Aseptic Packaging/Cartons

Materials Management

August 23, 2022
Material Lists Technical Workgroup Meeting #5

Agenda

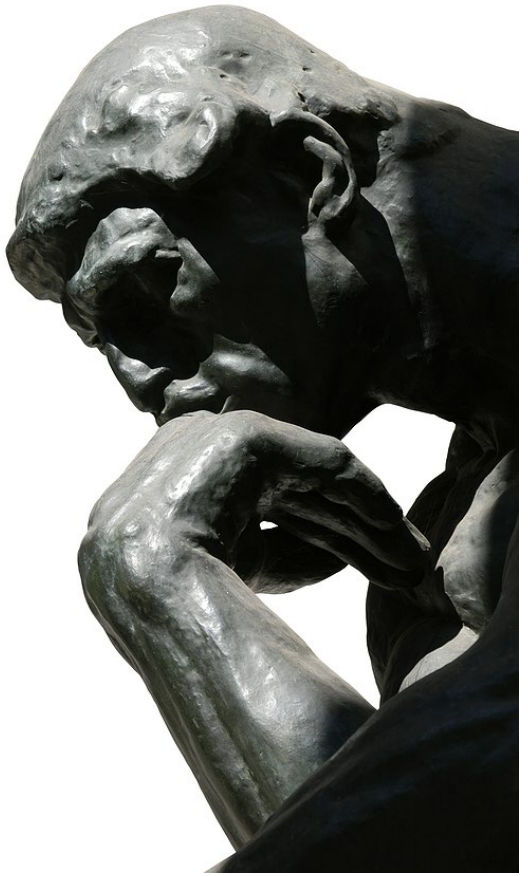
- Goal and Scope
- Results
- Interpretation and Limitations



Goal and Scope

Project Goals/Objectives

- Using Comparative Life Cycle Assessment
  - Quantify the environmental impacts of different end of life management scenarios for Cartons and Aseptic packaging to identify trade-offs and key variables across end markets.



Scope – Functional (Declared) Unit

- **Function:** Disposition of aseptic packaging (Grade #52) through different end of life pathways
- **Magnitude/unit:** 1 us ton (short ton)

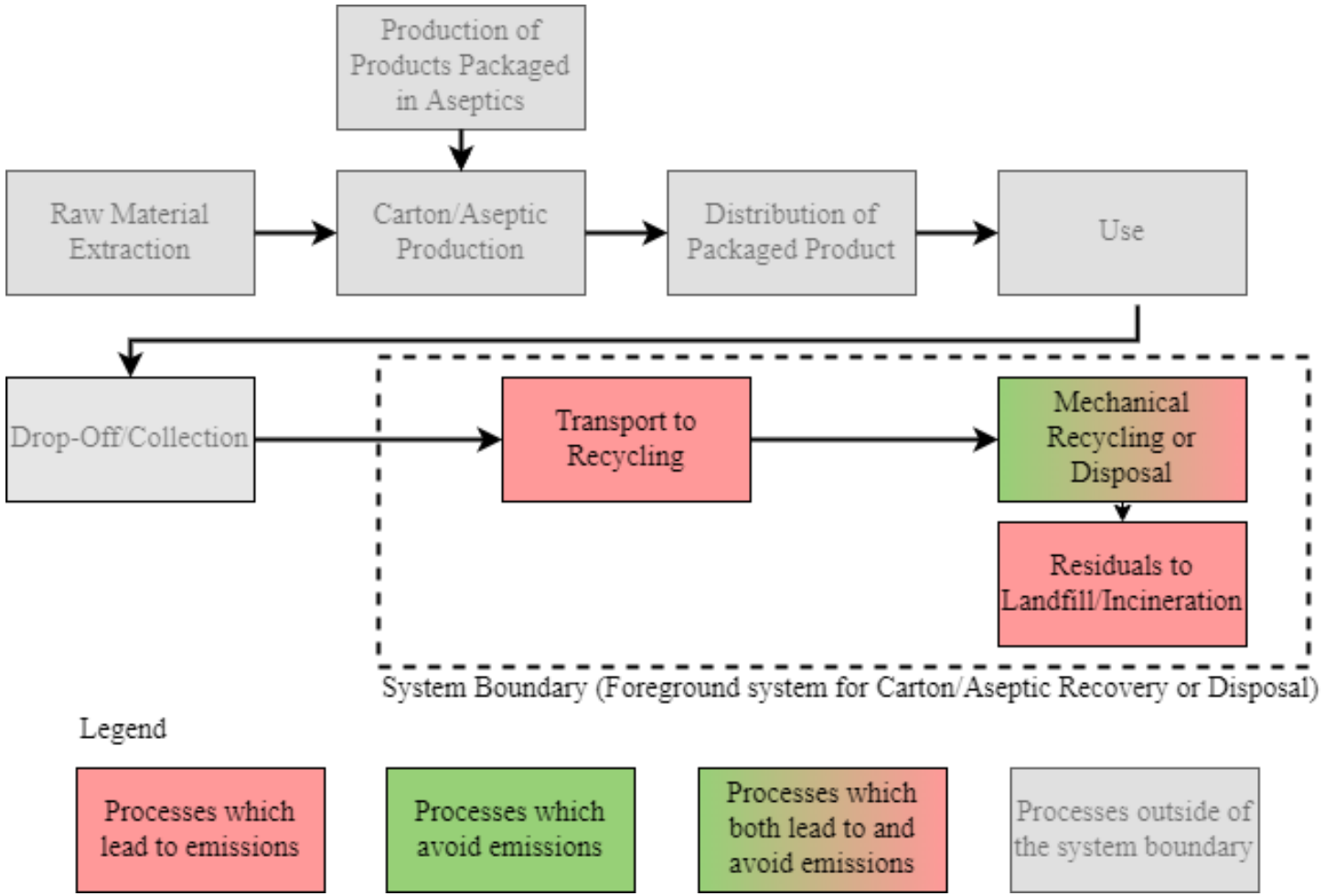
Scope – Key Variables Evaluated

- **End of Life Dispositions/End Markets** – Mechanical Recycling (Roof Coverboard), Mechanical Recycling (Tissue) vs Mechanical Recycling (Pulp/Packaging) vs. Local Landfilling/Incineration (e.g. average MSW)
- **Fiber Yields** – 100% to 65%
- **Residual Disposal** – Landfilling vs. Incineration for end markets that generate residual PolyCoat/Aluminum waste.

Scenarios Evaluated

Scenario Number	Recycling Fiber Use/Yield	Residual Disposition	Final Disposition/End Market
S1	100% (no loss)	n/a	Roofing Cover Board (Des Moines, IA)
S2	87.5%	Landfill	Tissue/Toweling (Mexico)
S3	87.5%	Incineration	Tissue/Toweling (Mexico)
S4	87.5%	Landfill	De-Ink Pulp to Packaging (Green Bay, WI)
S5	87.5%	Incineration	De-Ink Pulp to Packaging (Green Bay, WI)
S6	65%	Landfill	De-Ink Pulp to Packaging (Longview, WA)
S7	80%	Landfill	De-Ink Pulp to Packaging (Longview, WA)
S8	n/a	n/a	Landfill/Incineration (Local)

Scope – System Boundary



Scope – System Boundary

- **Temporal Coverage** – 2016-2022
- **Geographical Coverage** – Oregon
- **Technological Coverage** – This study is intended to represent materials management options for aseptic packaging and cartons, the foreground system covers technology and processes related to transport of aseptics to end markets, mechanical recycling for different secondary products, disposal of residuals, and/or dispositions via a combination of landfilling/incineration. The background system includes electricity, thermal energy, and energy carriers (e.g. fuels).

Scope – Data Sources

- Primary Data Sources
  - Mechanical Recycling into Roof Coverboard – Continuous Materials Environmental Product Declaration for Everboard
  - Usage/Yield Rates for Paper Fiber – Carton Council
  - Ratio of MSW Disposal – US EPA Facts and Figures
- Secondary Data Sources
  - Truck Emissions – GaBi Database
  - Ship Emissions – GaBi Database
  - Fuels (Diesel or Gasoline) – GaBi Database
  - Mechanical Recycling for Pulp/Packaging – GaBi Database
  - Mechanical Recycling for Tissue/Toweling – Ecoinvent Database
  - Landfilling / Incineration – GaBi Database
  - Production Emissions for Displaced Materials (Tissue Production) – Ecoinvent Database
  - Production Emissions for Displaced Materials (De-Ink Production) – GaBi Database
  - Production Emissions for Displaced Materials (Gypsum Board Production) GaBi Database

Scope – Selected Impact Categories and Indicators

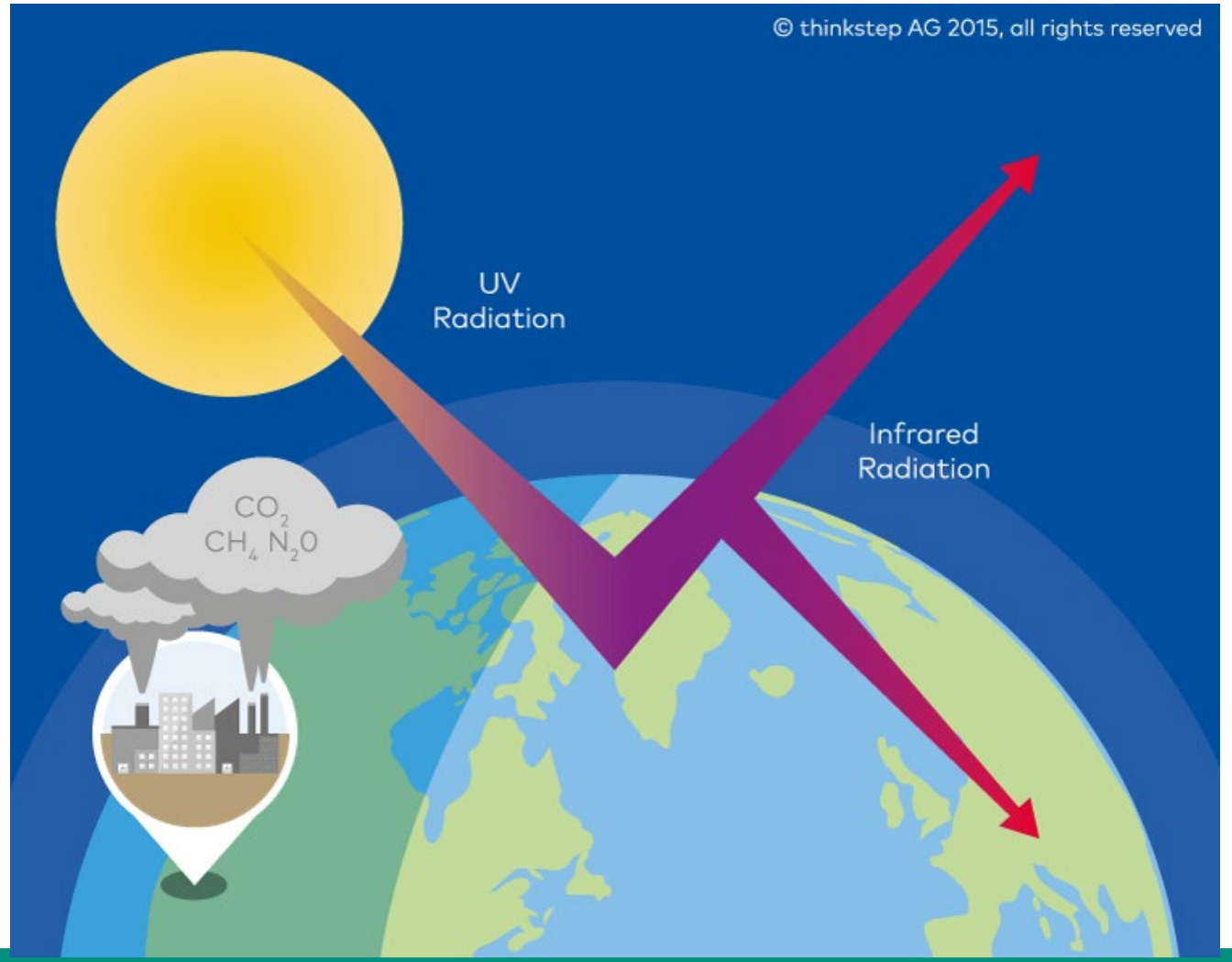
TRACI 2.1 LCIA Categories

- Acidification Potential (AP)
- Eutrophication Potential (EP)
- Ecotoxicity (ETP)
- Global Warming Potential (GWP100)
- Particulate Matter (PM2.5) Potential
- Human Toxicity Potential (HTP) – Cancer
- Human Toxicity Potential (HTP) – NonCancer
- Ozone Depletion Potential (ODP)
- Smog Formation Potential (SFP)

Environmental Indicators

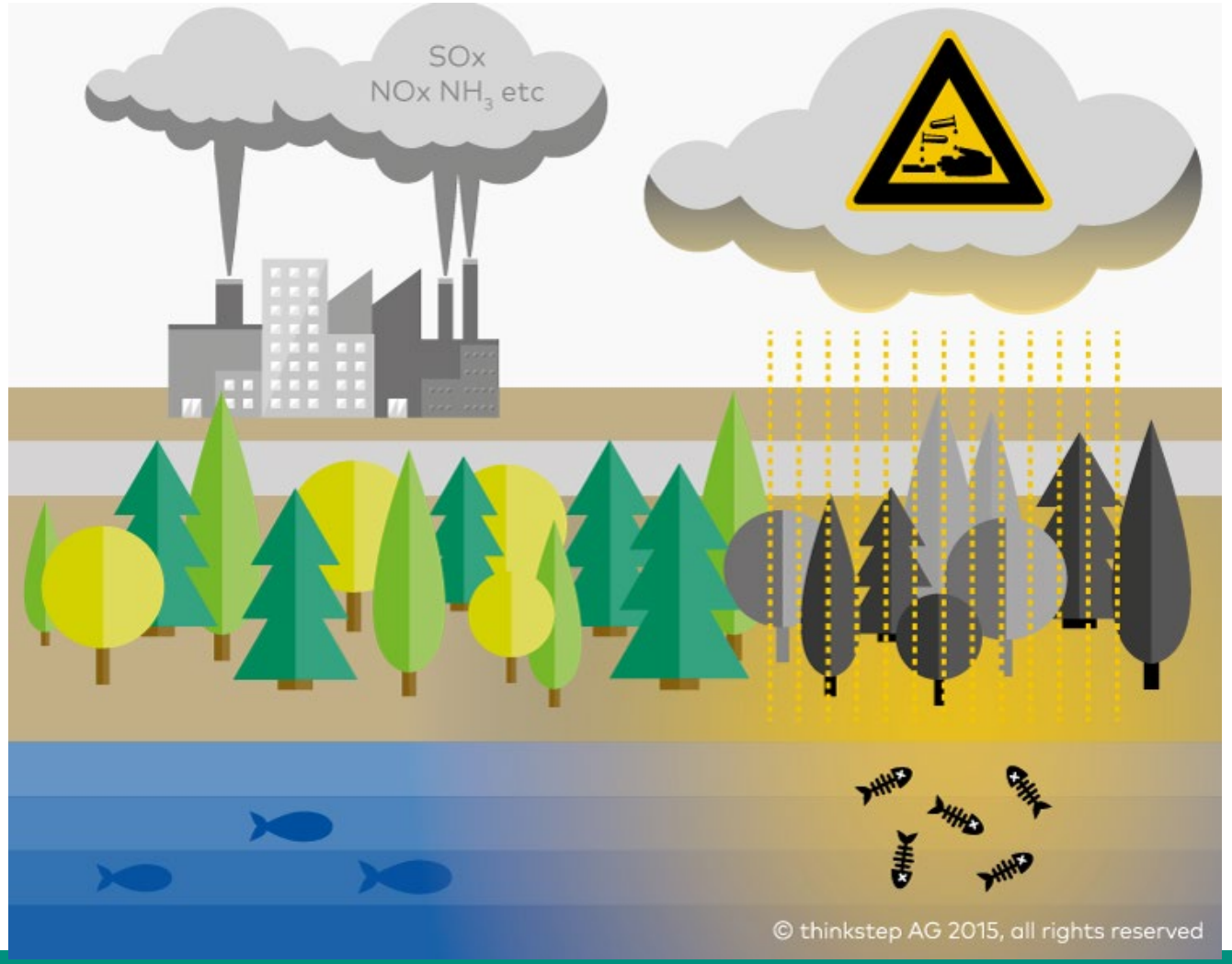
- Fossil Resource use
- Water Consumption
- Primary Energy Demand

Global Warming Potential



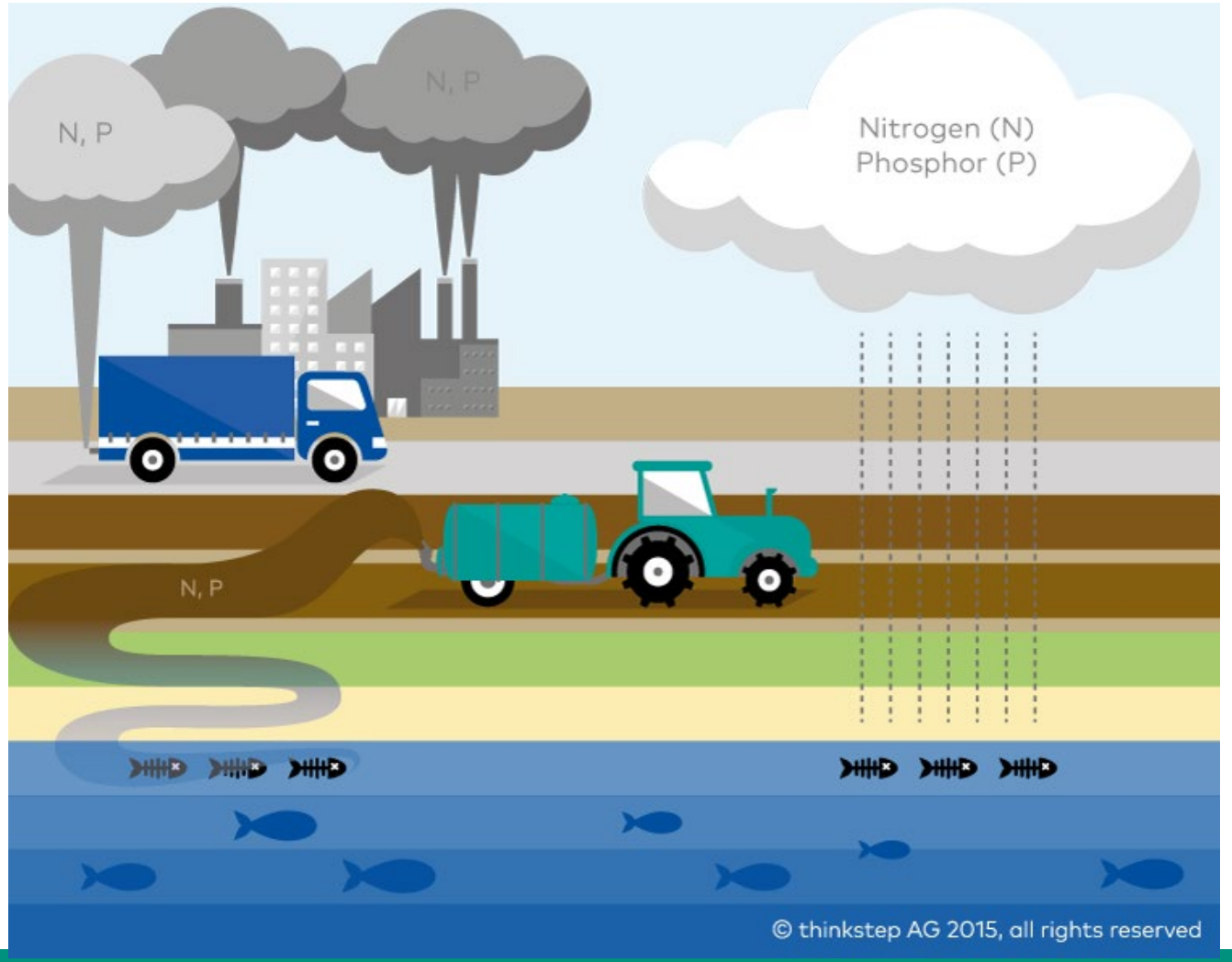
Source: thinkstep, used with permission

Acidification Potential



Source: thinkstep, used with permission

Eutrophication Potential

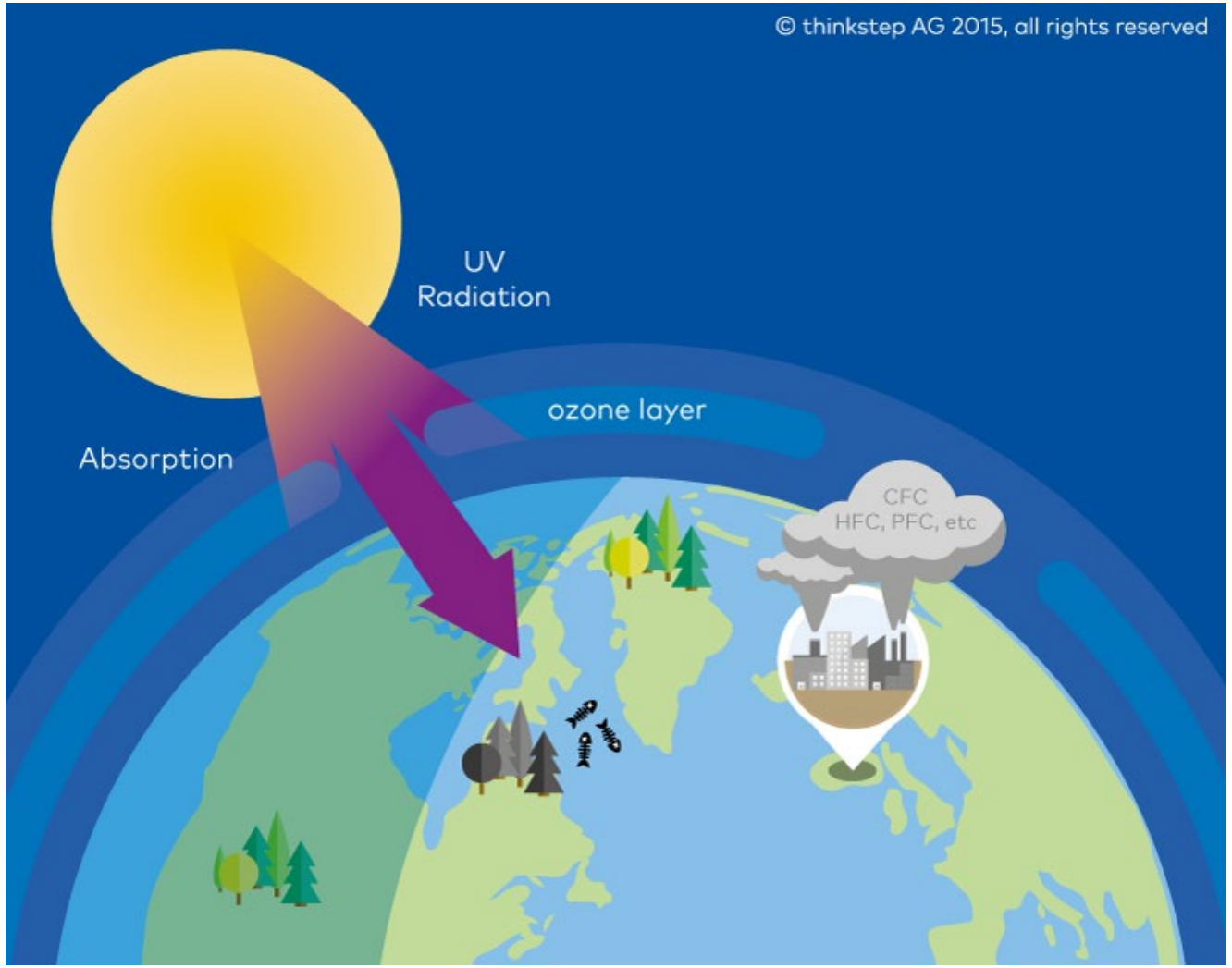


Source: thinkstep, used with permission

Smog Formation Potential

Source: thinkstep, used with permission

Ozone Depletion Potential



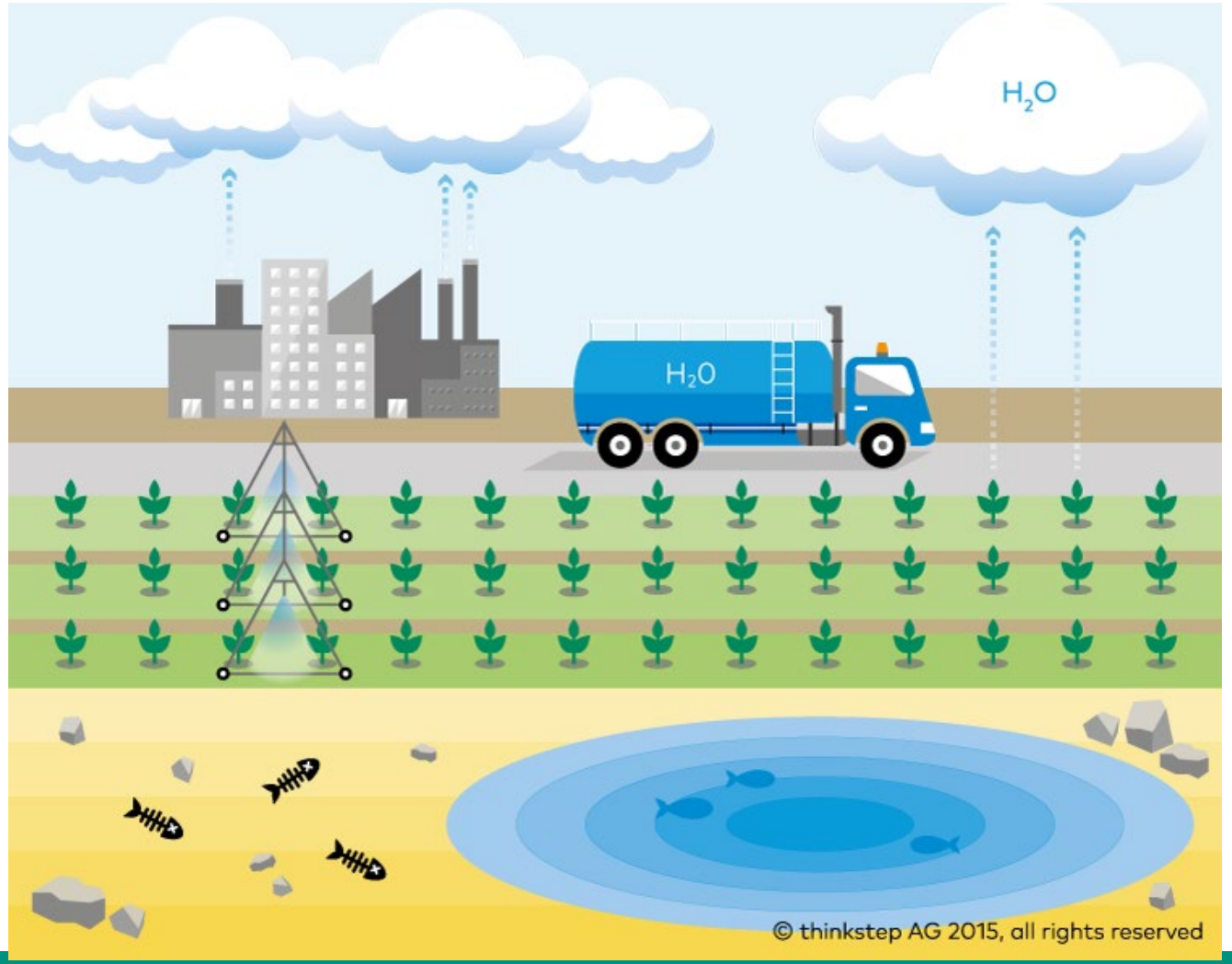
Source: thinkstep, used with permission

Primary Energy Demand

+

Source: thinkstep, used with permission and iStockphoto.com/DrAfter123

Freshwater Consumption



Source: thinkstep, used with permission

Preliminary Results

Life Cycle Impact Assessment (LCIA) and Indicators

Scenarios Evaluated

Scenario Number	Recycling Fiber Use/Yield	Residual Disposition	Final Disposition/End Market
S1	100% (no loss)	n/a	Roofing Cover Board (Des Moines, IA)
S2	87.5%	Landfill	Tissue/Toweling (Mexico)
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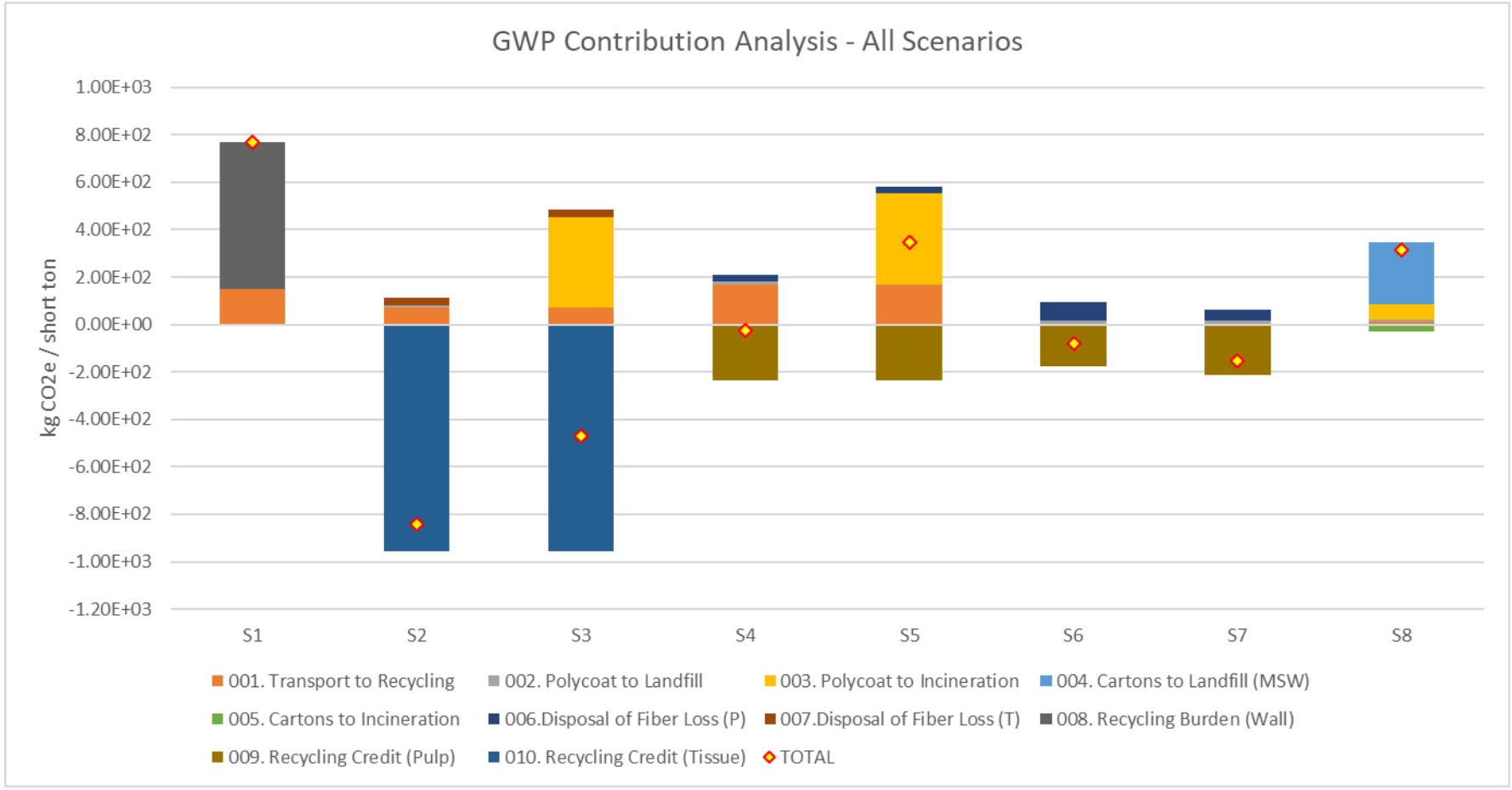
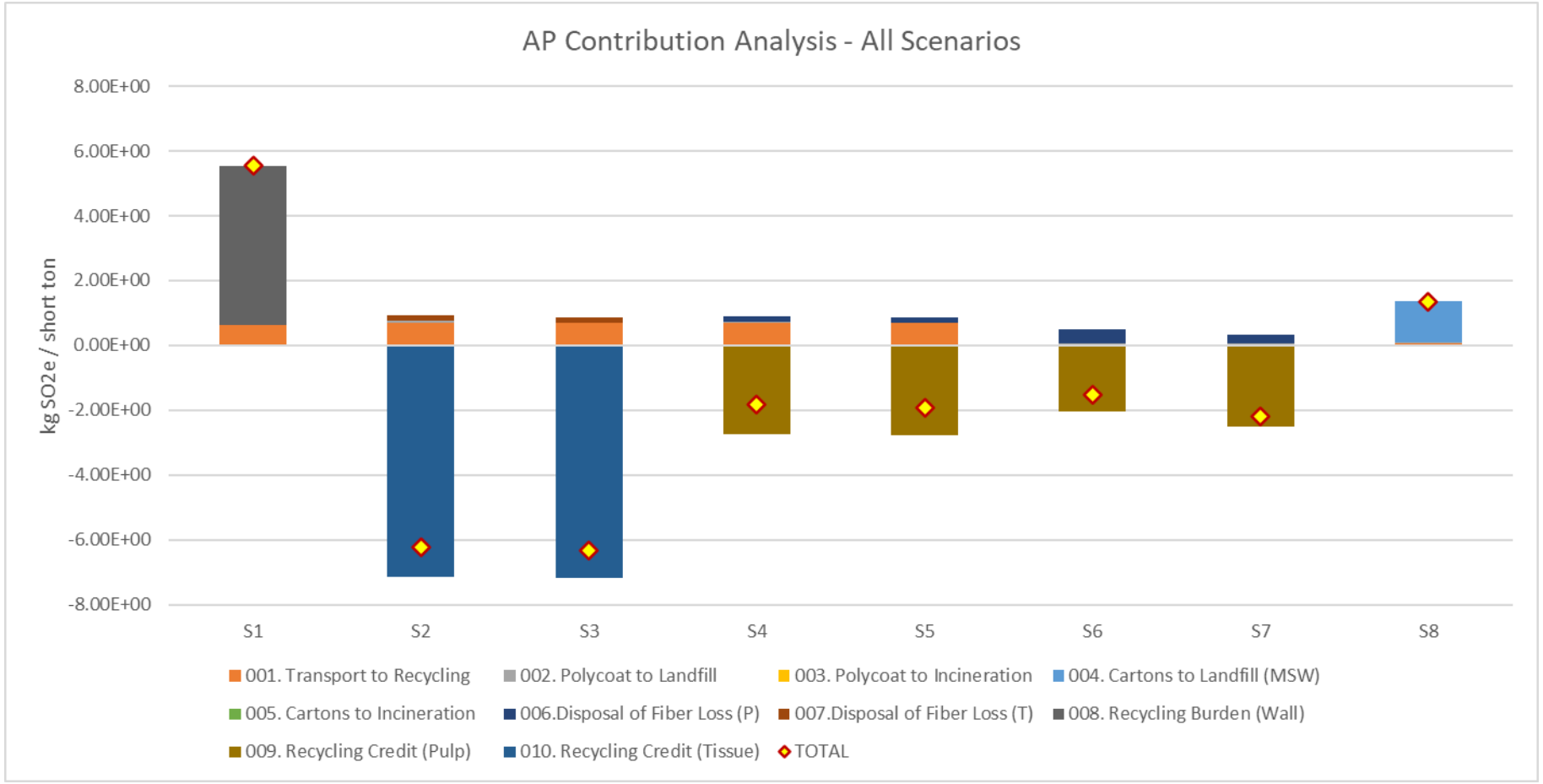
S6	65%	Landfill	De-Ink Pulp to Packaging (Longview, WA)
S7	80%	Landfill	De-Ink Pulp to Packaging (Longview, WA)
S8	n/a	n/a	Landfill/Incineration (Local)

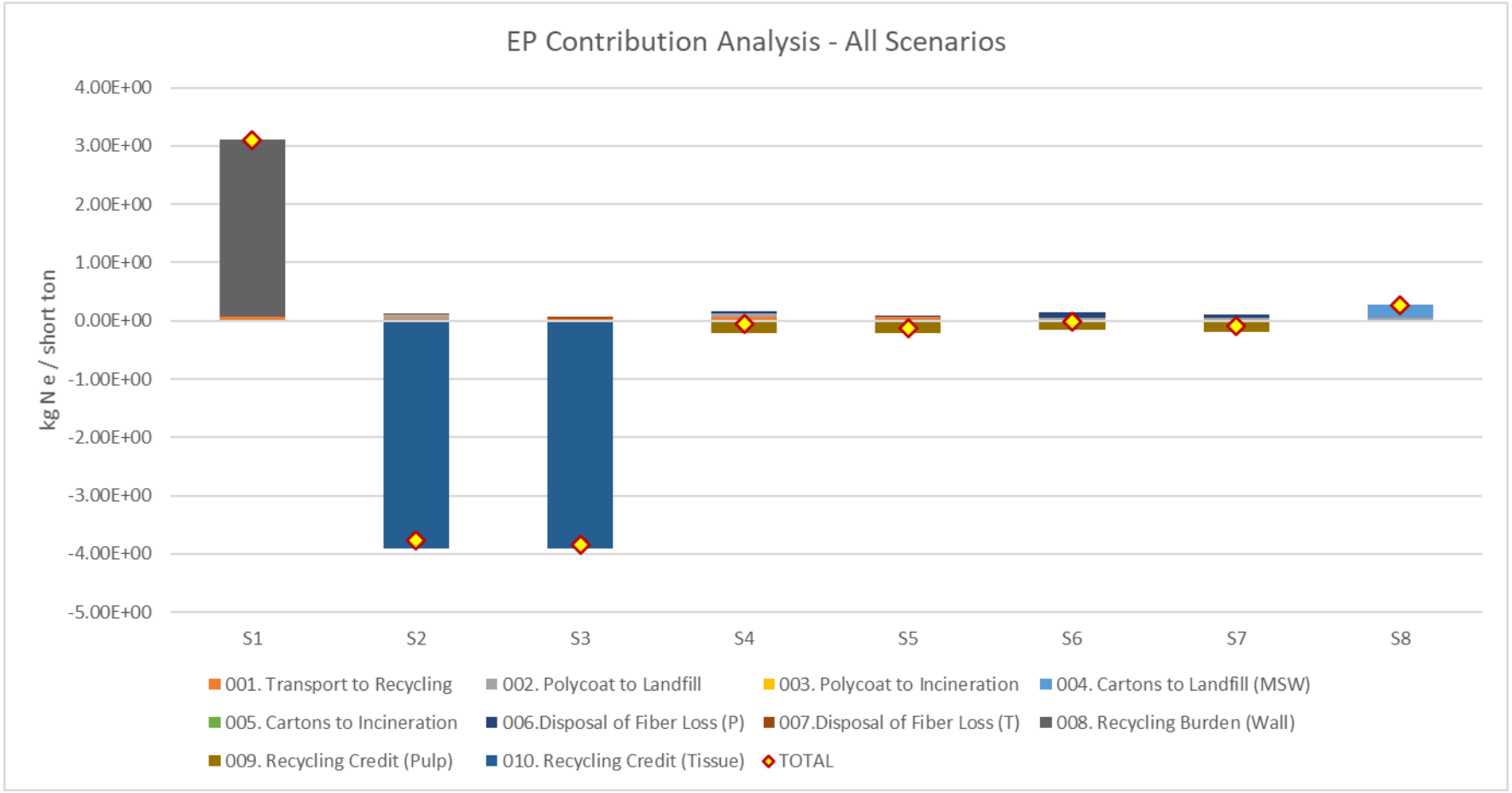
LCIA Results – Global Warming Potential (GWP)



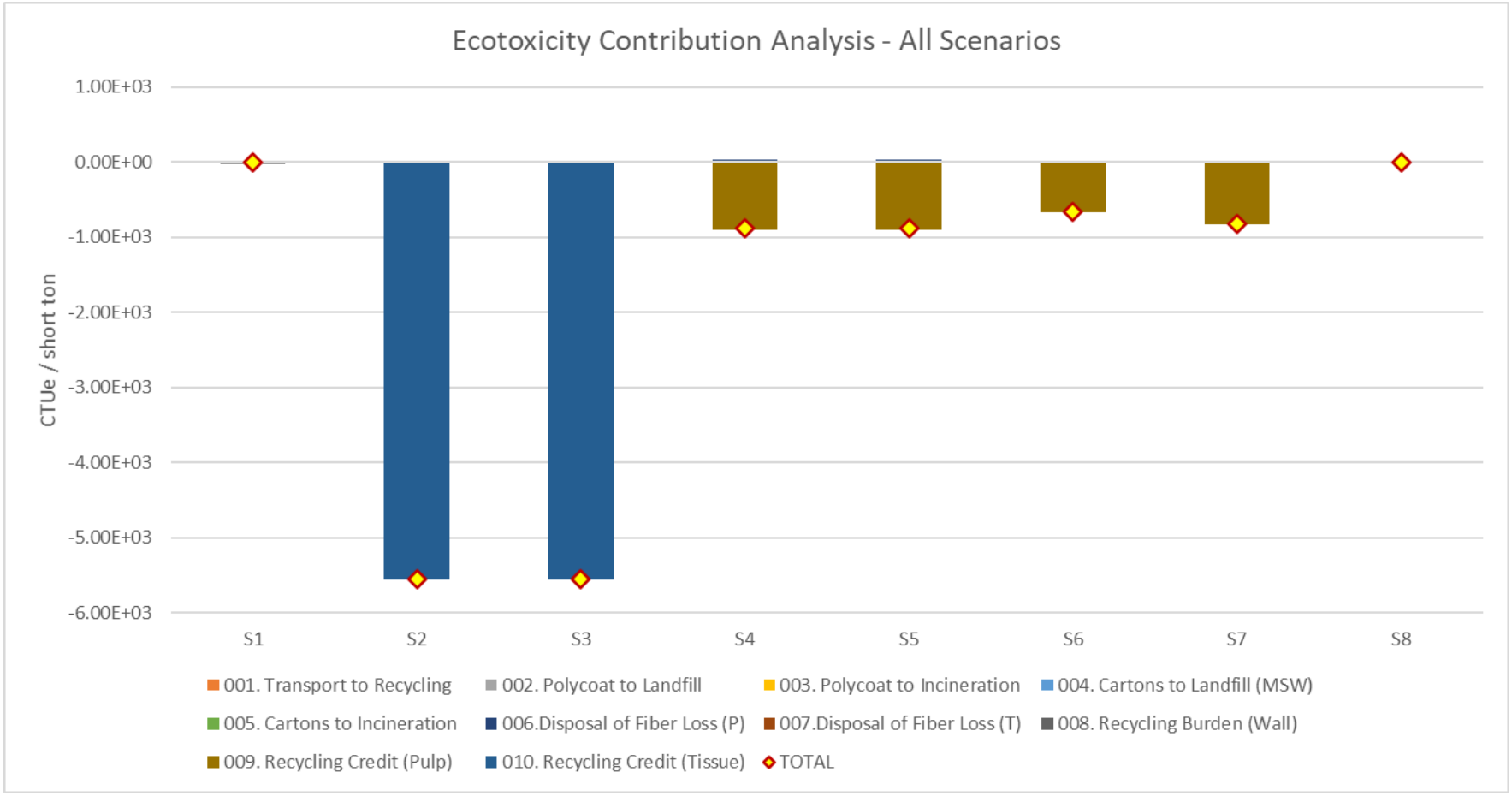
LCIA Results – Acidification Potential (AP)



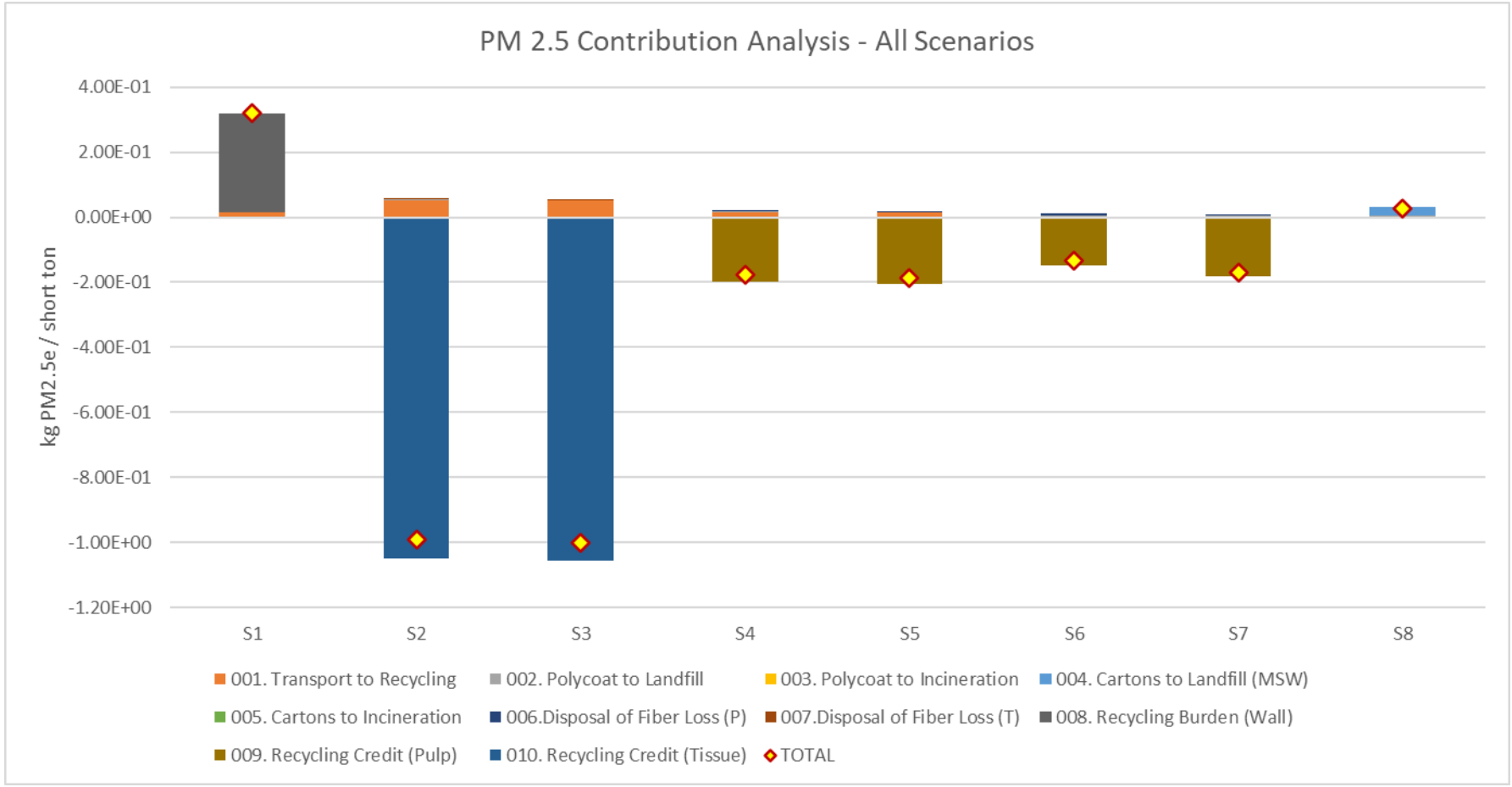
LCIA Results – Eutrophication Potential (EP)



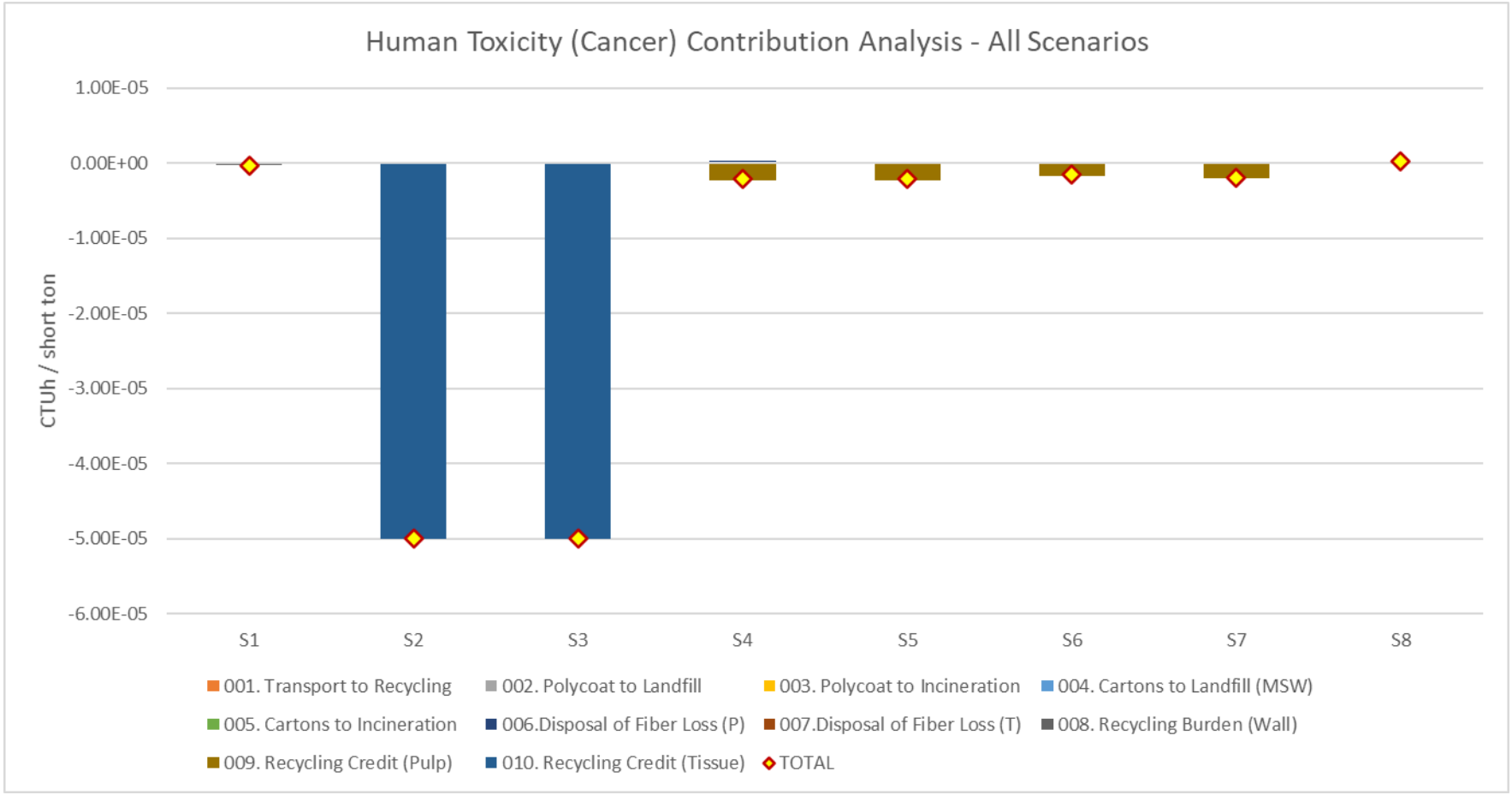
LCIA Results – Ecotoxicity Potential (ETP)



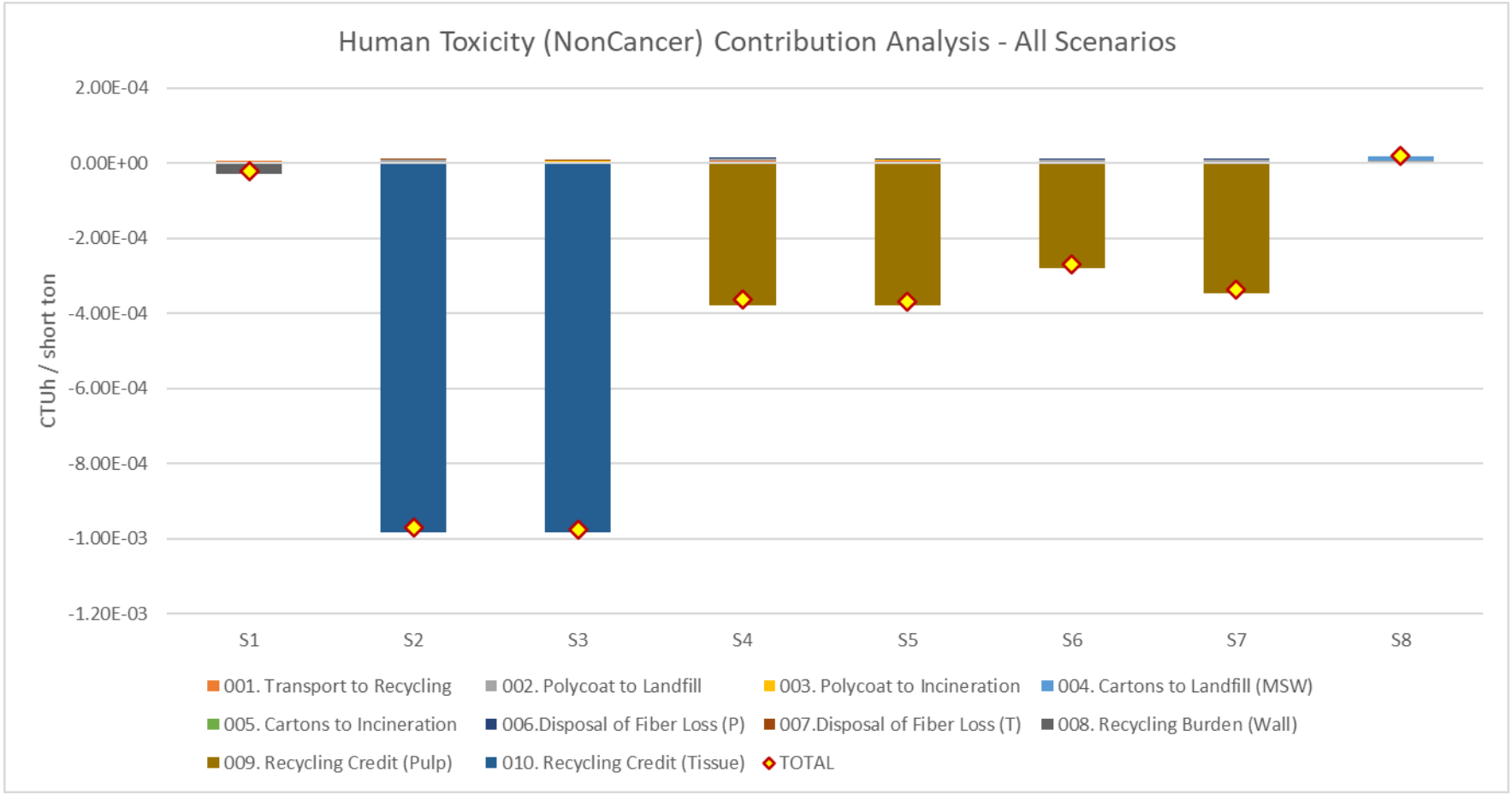
LCIA Results – Particulate Matter (PM 2.5)



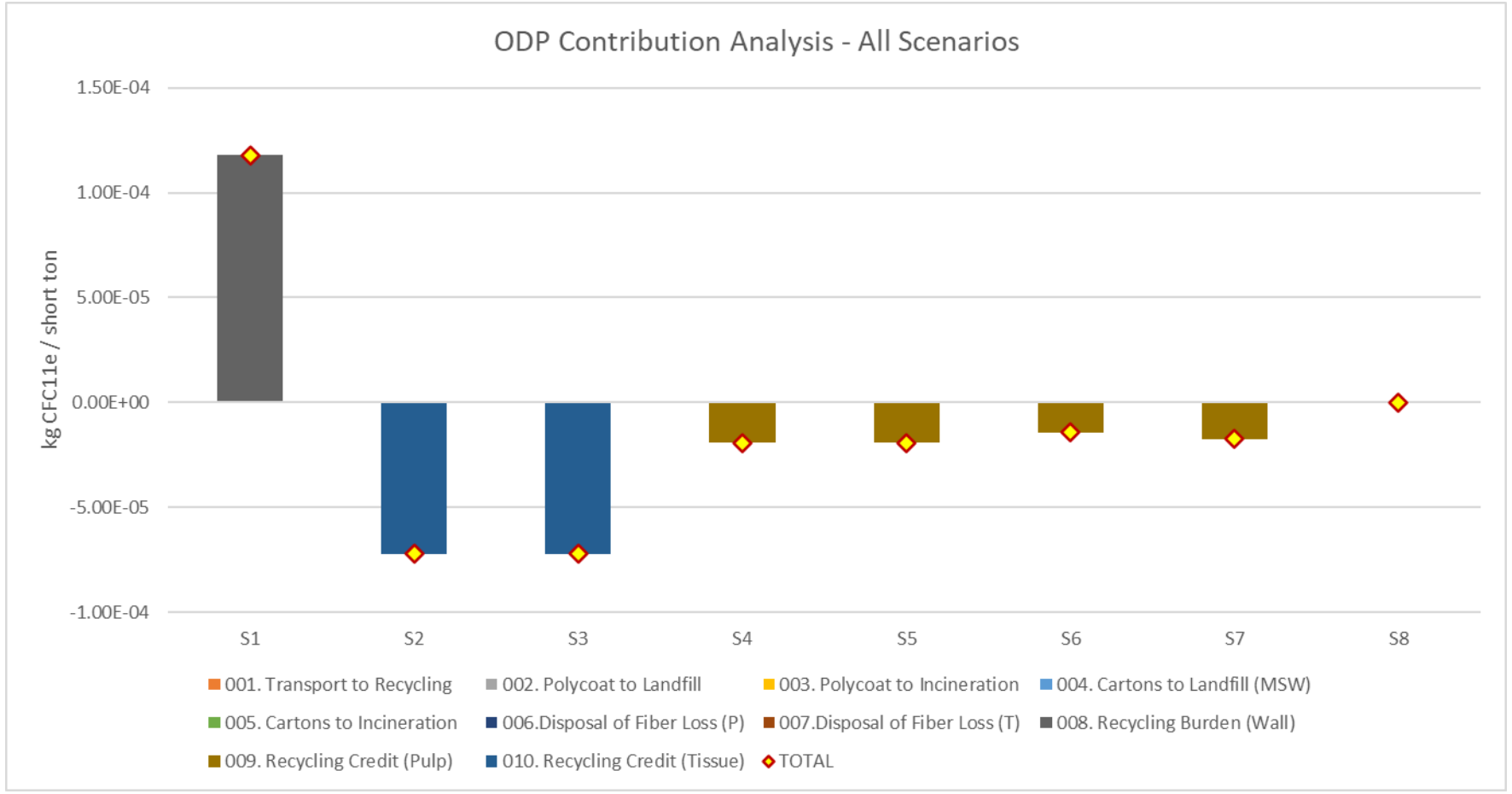
LCIA Results – Human Toxicity Potential (Cancer)



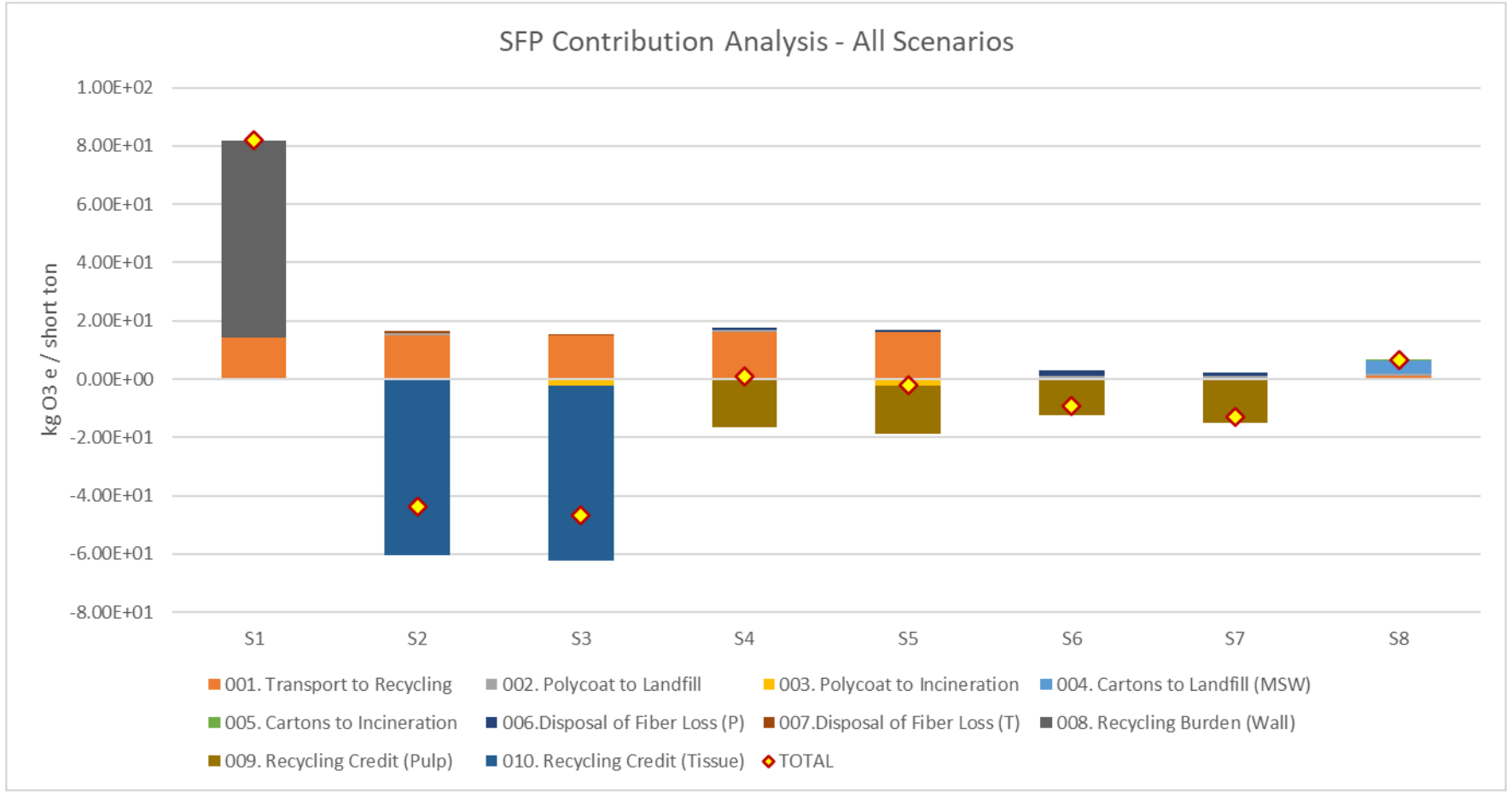
LCIA Results - Human Toxicity Potential (NonCancer)



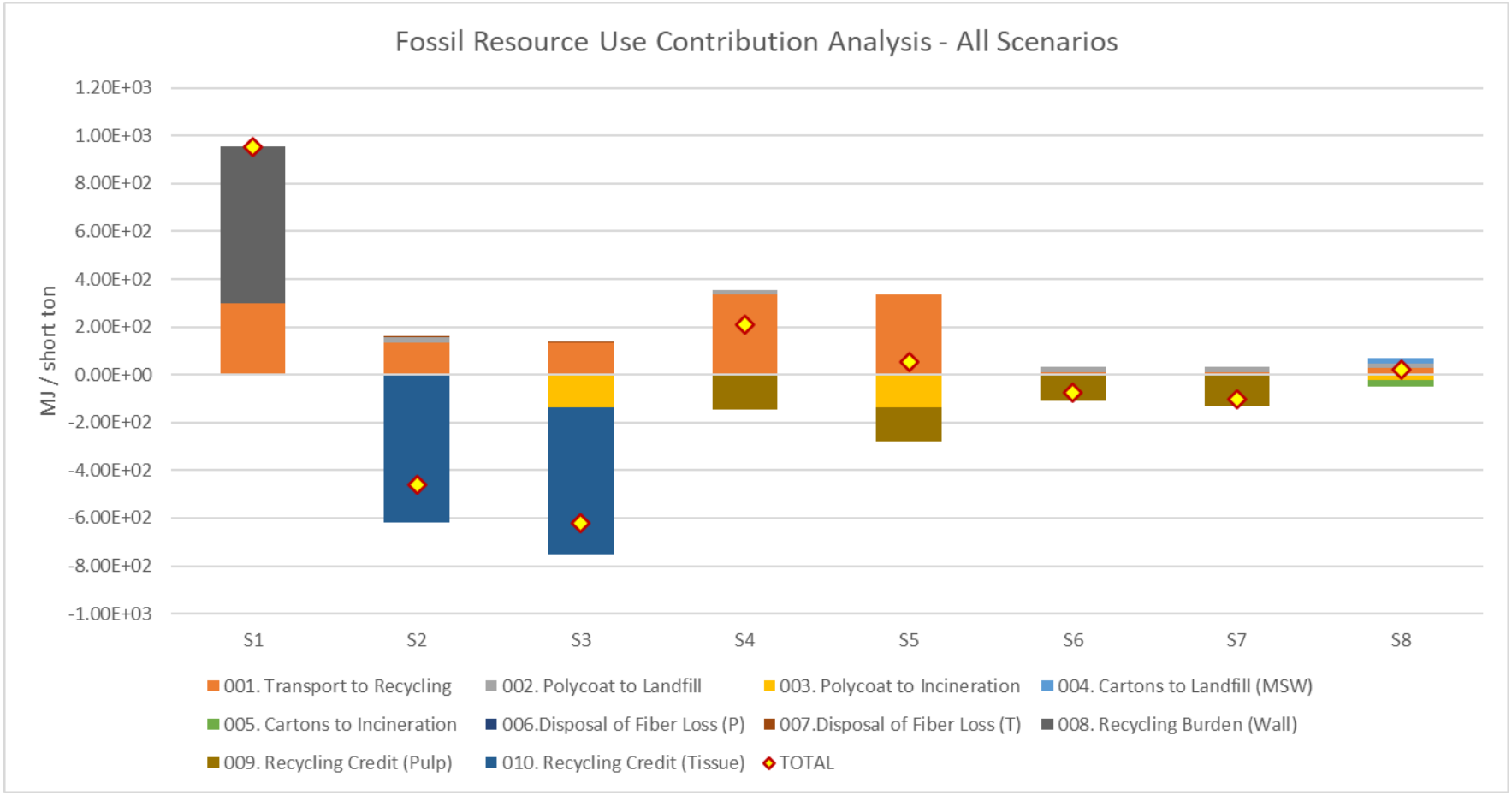
LCIA Results – Ozone Depletion Potential (ODP)



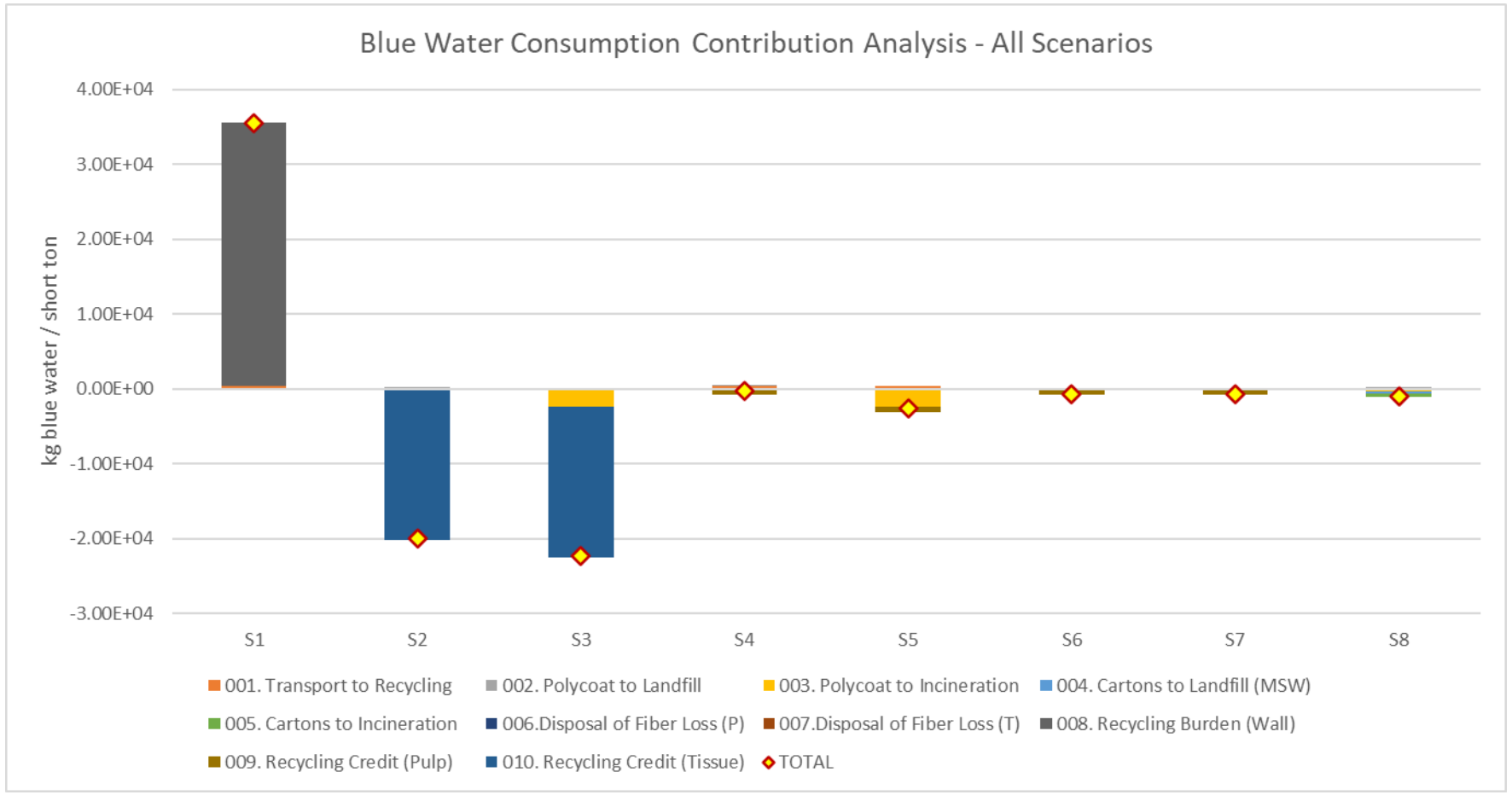
LCIA Results – Smog Formation Potential (SFP)



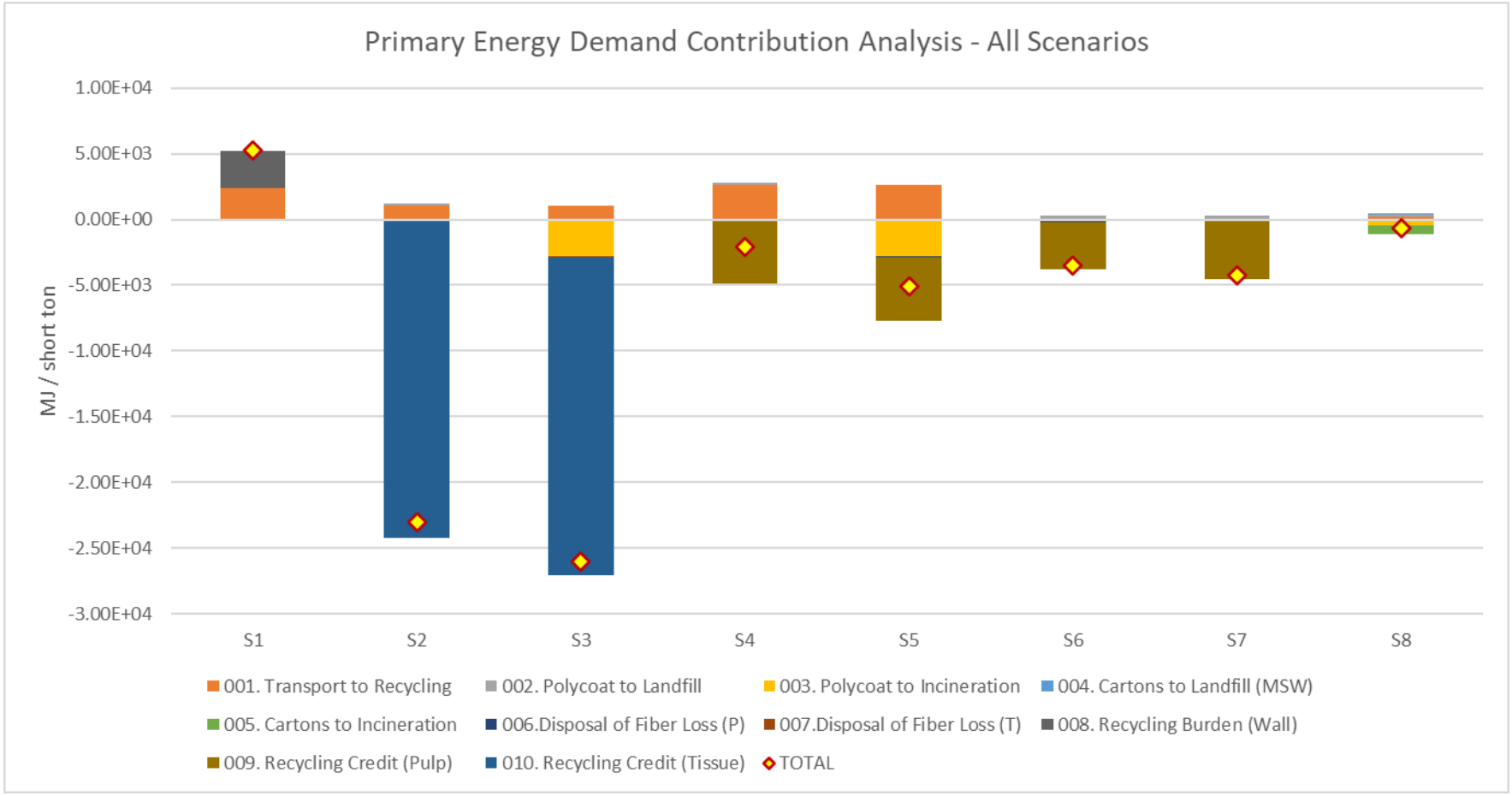
Indicator Results – Fossil Resource Use



Indicator Results – Bluewater Consumption

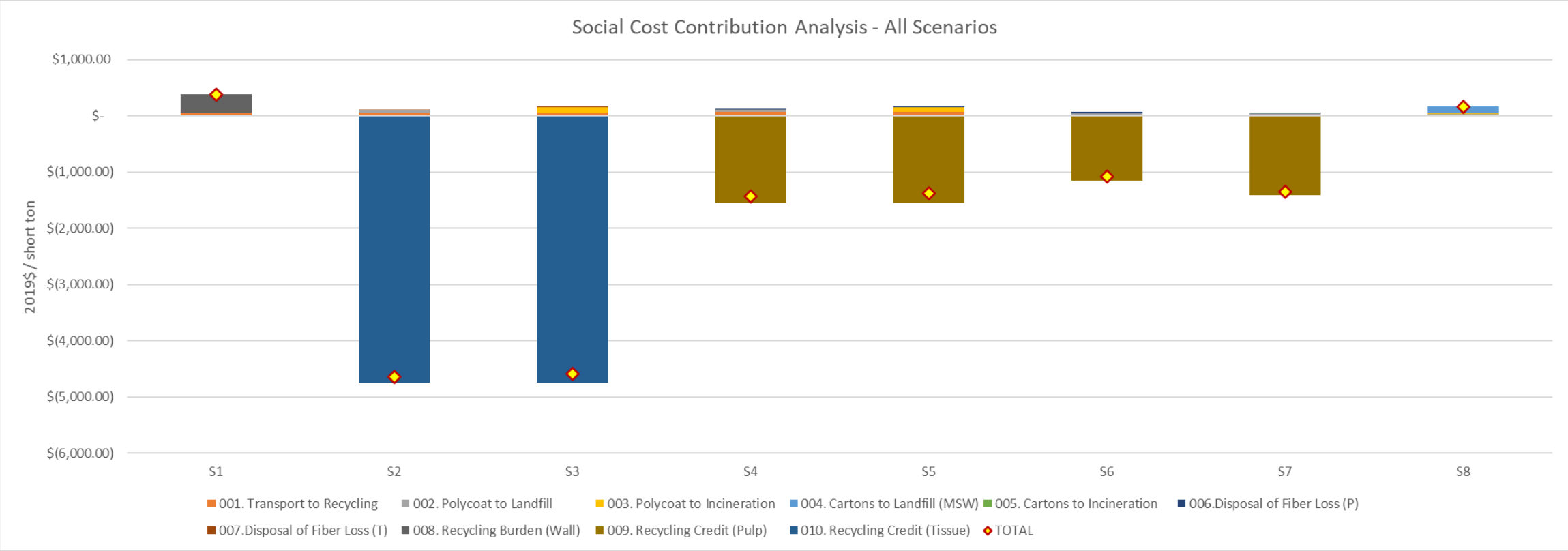


Indicator Results – Primary Energy Demand (PED)

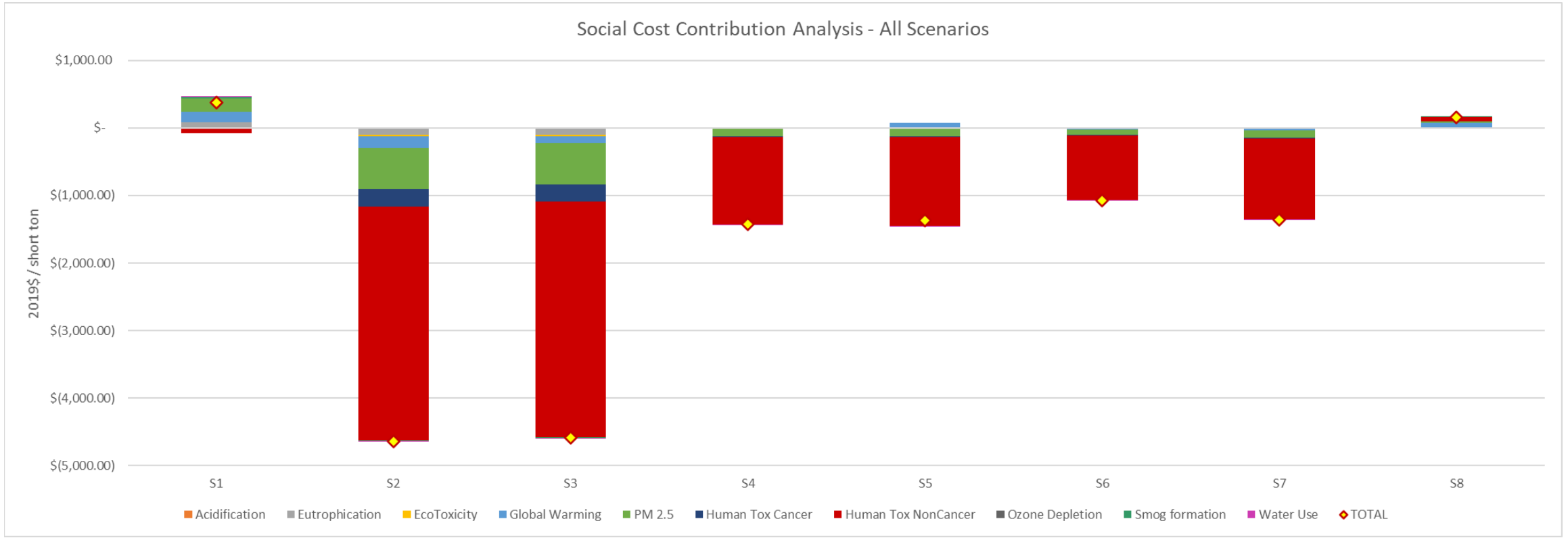


Damage Costs

Damage Costs by Life Cycle Stage



Damage Costs by Impact Category



Interpretation

Key Findings

Pic courtesy of Bigstock Photos

- **End Markets matter (maybe)**
  - Recycling to tissue or de-ink pulp leads to **net emission reductions at end of life** when compared to landfilling
  - Recycling into roofing coverboard leads to **net emission increases** at end of life when compared to landfilling.
- **Domestic end markets** do not necessarily lead to better environmental outcomes
- **Increased fiber yield** does not necessarily correlate with better environmental outcomes.
- **Method of residual disposal** effects results (e.g. incineration least preferred).
- **Transportation impacts** are influenced by distance and mode, but are **relatively small**

Assumptions and Limitations

Assumptions

- Roof coverboard end market assumes that gypsum board is substituted in coverboard application.
- Transport to landfill or incineration is by truck
- Transport to mechanical recycling in Mexico is a combination of transport by truck and ocean ship
- Transport to mechanical recycling in either Longview, WA, Des Moines, IA or Green Bay, WI is by truck
- Model assumes 1:1 substitution for primary material production as a recycling credit, but only for the roof coverboard end market. In other words, for each unit of aseptics recovered (after losses are accounted for) an equivalent unit of primary production is avoided (e.g. gypsum board).
- Model assumes 1:0.7 substitution for primary material production as a recycling credit for the tissue/toweling and de-ink pulp end markets. In other words, for each unit of aseptics recovered (after losses), a fractional unit of primary paper production is avoided (e.g. tissue or de-ink pulp). This is because of the polycoat and aluminum residuals that are part of the composition of an average grade #52 bale.

Assumptions and Limitations (cont.)

Limitations

- The system boundary does not include the full life cycle, so the net negative results for end of life management only show part of the material life cycle for aseptics.
- Emissions for roofing cover board recycling are taken from an EPD which included fewer impact categories than this study, so not all impact categories displayed here contain results for this end market.
- Domestic and international recycling processes are modeled using the same underlying data. As such, no regional variations in recycling technology, environmental laws, or energy systems are accounted for. It's possible that these differences, should they exist, could affect the recycling process emissions profile.
- The effects of mismanagement of these materials (e.g. litter) are not accounted for in the model or impact results.
- No direct human health exposures are accounted for by processors of this material (e.g. those handling EPS at the recycling facility)
- Paper mill emissions are based on secondary data and are regional averages. Primary data from paper mill operations could improve the model precision.

Feedback and/or Questions

Thank You!

Peter Canepa (peter.canepa@state.or.us)

Lunch Break

The meeting will resume at approximately 12:40p PDT

PRO Collections: Performance Standards, Convenience Standards, and Collection Targets

Gretchen Sandau and David Allaway
Oregon DEQ Materials Management Program

Technical Workgroup on Materials Lists

August 23, 2022

Examples of *Possible* PRO Materials

- Shredded paper
- Polycoated cartons (milk and aseptic cartons) and polycoated paper cups (e.g., coffee cups)
- Aerosol cans
- Aluminum foil and pressed foil products, such as roasting pans
- Polyethylene film, such as product overwrap and other plastic bags
- White block expanded polystyrene foam
- Plastic nursery containers (such as pots and trays)
- Plastic tubs, jars and other non-bottle plastic packaging
- Lids of tubs and containers, such as yogurt and cottage cheese
- Plastic pails and buckets
- Plastic cups
- Plastic food serviceware
- Glass bottles and jars

Convenience Standards: Less Prescriptive

1. Conveniently *distributed across* the state
2. Conveniently *located within* communities
3. X permanent facilities distributed throughout the state
4. Y permanent facilities distributed throughout region 1, Z in region 2, etc.

Convenience Standards: Based on Local Government Populations

5. Every county with population > X must have at least one permanent depot (X could be zero)
6. Every city with population > X must have at least one permanent depot (X could be zero)
7. Every “populated area” with population > X must have at least one permanent depot (X could be zero)
8. Every resident in a “populated area” with population > X must be within N miles of a permanent depot

To any the above add:

A. 1 additional facility for each Y residents above population Z (Y is constant)
B. 1 additional facility for each Y residents above population Z (Y is higher for higher-density urban areas)
C. Different performance standards (hours/days) for urban vs. rural depots

Convenience Standards: Parallel Construction with Opportunity to Recycle

9. Parallel opportunity to recycle standard for disposal sites: every disposal site that accepts garbage from the public must have a co-located depot or a depot at a location that is more convenient to the population being served

Convenience Standards: Requiring Use of GIS Modeling

10. X% of Oregon residents must live within Y miles of a permanent facility
11. As above with supplement: X% of Oregon residents must live within Y miles of a permanent facility, other residents are to be served by at least one-day collection events distributed across Z sites (1- 4 events per site per year)
12. Modified GIS approach: X% of Oregon residents must be provided with "service". "Service" is defined as:
    - a permanent facility located within Y miles, or
    - in smaller (TBD) communities, a series of one-day collection events that are located within Z miles, and made available at least N times per year per community.

Convenience Standards: Conclusion

- Options listed above can also be combined with each other
- Questions:
  - Are there other ideas for convenience standards DEQ should consider?
  - Do you have questions or feedback regarding the options listed?
- Reminder: September 20th meeting will include an evaluation of trade-offs between transactional costs and environmental benefits (social costs) for low/medium/high density scenarios

Collection Targets

Proposed Guiding Principles (Draft):

1. Collection targets should be expressed as a % of generation, not absolute weights
2. The PRO(s) should be responsible for estimating generation, subject to review and approval by DEQ
3. Only materials targeted for collection should count towards targets (not contamination)

Collection Targets

Questions:

1. What are reasonable targets? (20 percent? 50 percent?)
2. Should targets ramp up over time?
3. Should targets apply to:
    a. Individual types of materials? (e.g., plastic lids vs. bulky plastic packaging)
    b. “Families” of similar materials? (e.g., any materials that might be collected together, or “all plastics”)
    c. All PRO materials?
4. Are there other issues we should consider?

Framework for Recycling Acceptance Lists and Initial DEQ Recommendations (second batch)

David Allaway
Oregon DEQ Materials Management Program

Technical Workgroup on Materials Lists

August 23rd, 2022

Framework

Material	Opportunity to Recycle Obligation			PRO collection	No mandate
	Depot	On-route	Uniform statewide collection list		

New DEQ recommendations

Material	Opportunity to Recycle Obligation			PRO collection	No mandate
	Depot	On-route	Uniform statewide collection list		
Polycoated packaging *other than* beverage cartons/aseptics (e.g., freezer boxes)					✓
Paper (polycoated, molded pulp) food serviceware *other than* cups (e.g., clamshells, food boats)					✓
Hardcover books					✓
Scrap metal *below* size and weight threshold	✓	✓	✓ (on-route)		
Scrap metal *above* size and weight threshold (including appliances)	✓*				

*"Disposal-site" depots only, not expanded community depots

New DEQ recommendations

Material	Opportunity to Recycle Obligation			PRO collection	No mandate
	Depot	On-route	Uniform statewide collection list		
Large-format HDPE and PP packaging (e.g., buckets, pails, bins) *below* a volume threshold	✓	✓	✓		
Larger-format HDPE and PP packaging (e.g., buckets, pails, bins) (upper bound TBD)				✓	
Squeezable plastic tubes					✓
Motor oil	✓*				
Other materials TBD					

*"Disposal-site" depots only, not expanded community depots