NAPCOR
National Association for PET Container Resources

Life Cycle Analysis Comparing U.S. Beverage Container Systems

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BACKGROUND & SCOPE

- Authored by Franklin Associates (ERG)
- 2009 study compared PET, glass, and aluminum CSD container systems
- More recent LCIs on virgin and recycled PET resin supply chains
- New NAPCOR study considers multiple scenarios for each packaging format
- All modeling based on non-refillable beverage packaging

CONTAINER SYSTEMS STUDIED

	Size (oz)	Beverage	Average Sample Weight (g)	Recycled Content	Recycling Rate
PET Bottles	16.9	Water	11.2 (average); 8.2 (light)	10% (baseline); 0%; 25%; 50%	29.1%
	16.9	CSD	22.1		
	20	CSD	22.2		
	67.6	CSD	43.9		
Aluminum Cans	12	CSD or water	12.7	73%; 62.5%*	50.4%
	16	CSD or water	15.1		
Glass Bottles (with + without paper label)	12	CSD	208	38%	39.6%

*Two scenarios modeled for 23% postindustrial (PI) scrap recycled content in aluminum:

- 73% treats PI content equivalent to postconsumer (PC)
- 62.5% models PI recycled content as a 50/50 mix of virgin and PC

METHODOLOGY CHOICES

- System expansion (baseline)
  - System credited with avoiding virgin material production if recycling rate exceeds use of recycled content
- Cut-off (sensitivity)
  - Containers that are recycled at end of life leave the system boundaries with no burdens or credits
  - Favors systems with high recycled content

REPORT STATUS

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RESULTS

- **Pending final approval from peer review panel**
- Following slides show baseline (system expansion method) results
- Equivalent volume functional unit =1,000 gallons of delivered beverage

9% lighter weight

19% less greenhouse gas emissions

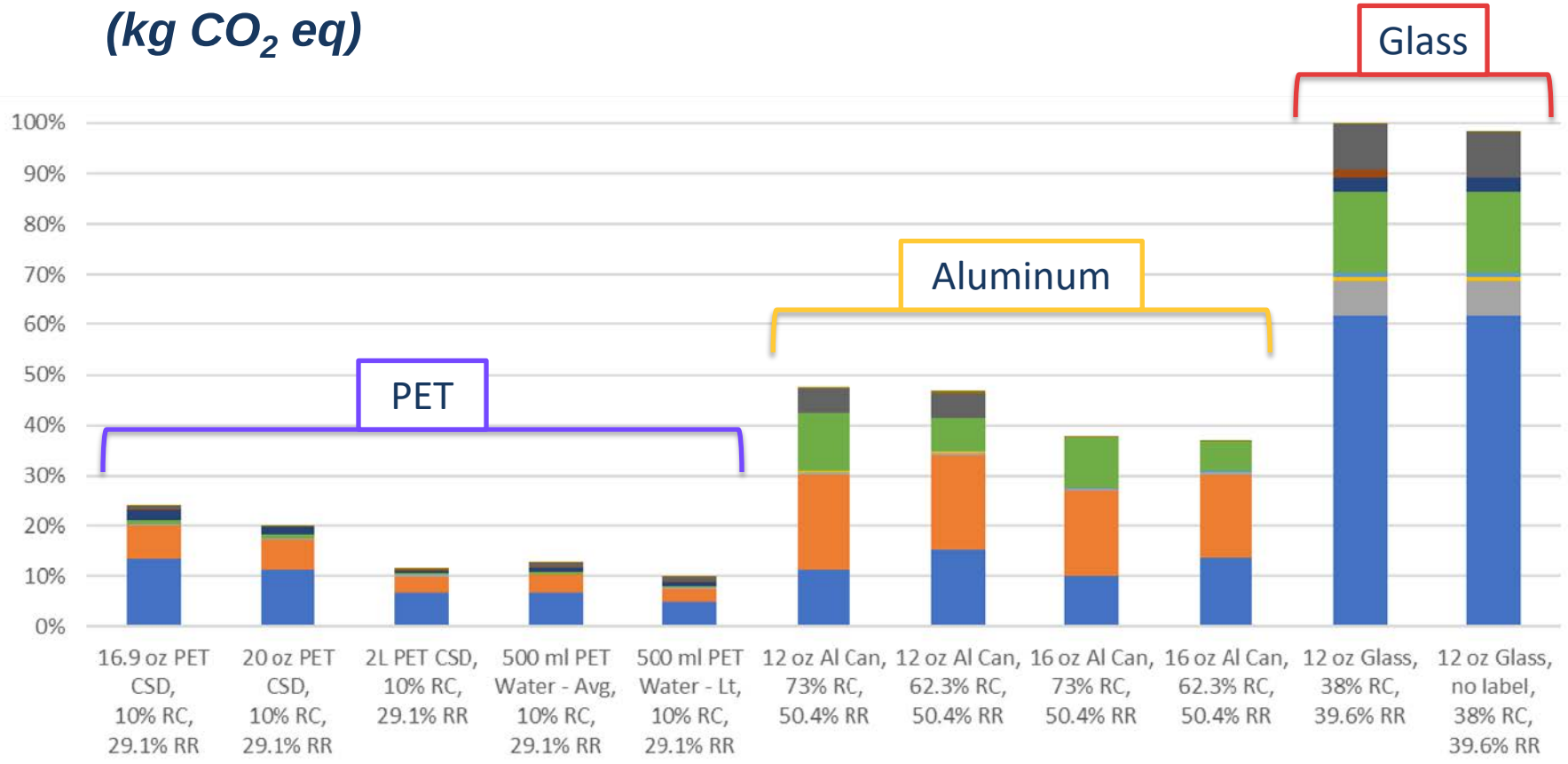
2022 VS. 2009

20 oz PET CSD bottle

31% less solid waste

25% less energy consumed

GLOBAL WARMING POTENTIAL
(kg CO_2 eq)



MEANINGFUL DIFFERENCES

- PET bottle systems *consistently* less impactful than aluminum & glass alternatives in:
  - Cumulative energy demand
  - Solid waste generation
  - Global warming potential (CO_2 eq)
  - Acidification potential (SO_2 eq)
  - Smog formation potential (O_3 eq)
- PET also beats glass in:
  - Water consumption
  - Eutrophication potential (N eq)

Average Weight 16.9 oz PET Water Bottle vs. Aluminum Cans

System Totals	% Diff Threshold	12 oz Al Can, 73% RC, 50.4% RR	12 oz Al Can, 62.3% RC, 50.4% RR	16 oz Al Can, 73% RC, 50.4% RR	16 oz Al Can, 62.3% RC, 50.4% RR
Cumulative Energy Demand	10%	-103%	-102%	-79%	-77%
Non-renewable Energy	10%	-82%	-88%	-62%	-69%
Solid Waste	25%	-132%	-131%	-113%	-111%
Water Consumption	25%	-73%	-72%	-55%	-55%
Global Warming Potential	25%	-116%	-115%	-101%	-99%
Acidification Potential	25%	-142%	-140%	-130%	-128%
Eutrophication Potential	25%	-105%	-104%	-79%	-78%
Ozone Depletion Potential	25%	117%	118%	138%	139%
Smog Formation Potential	25%	-112%	-111%	-93%	-91%

SENSITIVITY ANALYSES

Largely similar conclusions.

The most sensitive comparison is 16.9 oz PET CSD vs. 16 oz aluminum

- Cut-off methodology
- Equivalent # of containers basis
- Variations in PET recycled content (0%, 25%, 50%)
- Higher recycling rates (e.g. nationwide deposit return system)

THANK YOU

Full report will be accessible upon peer review approval

napcor.com/sustainability/life-cycle-analysis/

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