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CONGRESSIONAL BRIEFING

The Climate Consequences of Plastics
Briefing Series: Reduce and Reuse
How to Cut Greenhouse Gas Emissions of Building Materials, Plastics, and Food

Thursday, December 09, 2021

About EESI...

EESI
Environmental and Energy Study Institute

NON-PROFIT

Founded in 1984 by a bipartisan Congressional caucus as an independent (i.e., not federally-funded) non-profit organization

NON-PARTISAN

Source of non-partisan information on environmental, energy, and climate policies

DIRECT ASSISTANCE

In addition to a full portfolio of federal policy work, EESI provides direct assistance to utilities to develop “on-bill financing” programs

SUSTAINABLE SOCIETIES

Focused on win-win solutions to make our energy, buildings, and transportation sectors sustainable, resilient, and more equitable

Policymaker Education

Briefings and Webcasts

Live, in-person and online public briefings, archived webcasts, and written summaries

Climate Change Solutions

Bi-weekly newsletter with everything policymakers and concerned citizens need to know, including a legislation and hearings tracker

Fact Sheets and Issue Briefs

Timely, objective coverage of environmental, clean energy, and climate change topics

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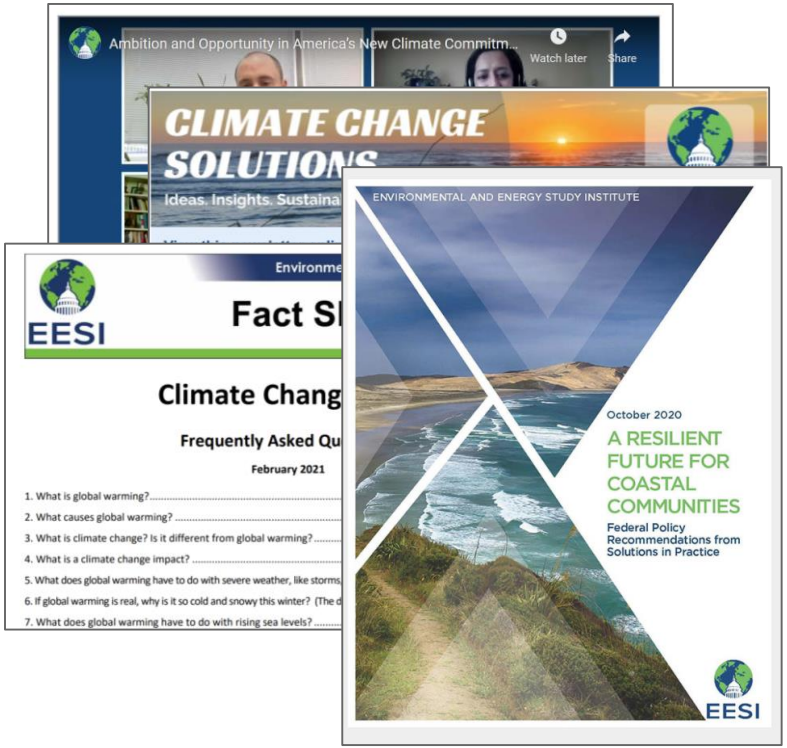

“Reduce and Reuse” Briefing Series

EESI
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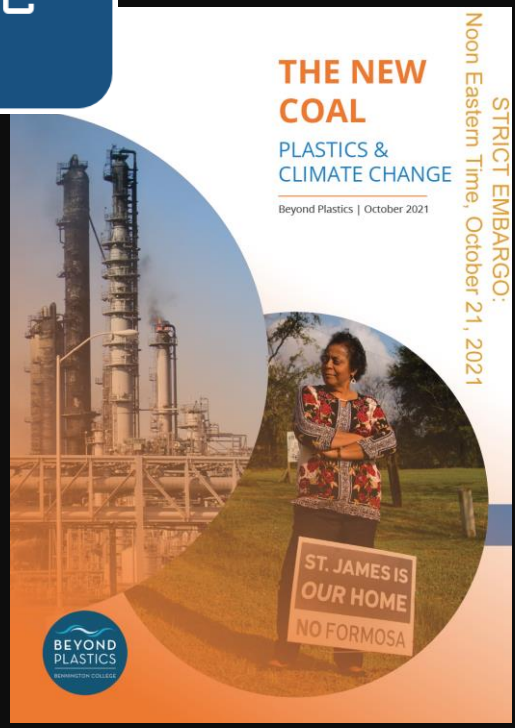
- **December 08** **Building Materials: From Production to Reuse**
- **December 09** **The Climate Consequences of Plastics**
- **December 10** **Reducing Emissions by Reducing Food Waste**

Sign up for the Full Series: https://www.eesi.org/1221waste

Jim Vallette, lead researcher and author, president of Material Research, L3C

MATERIAL RESEARCH L3C



BEYOND PLASTICS

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THE NEW COAL: PLASTICS AND CLIMATE CHANGE

The New Coal: Plastics and Climate Change is a comprehensive account of the United States plastics industry's significant, yet rarely acknowledged contributions to the climate crisis. Using coal-fired power plants as a benchmark, the report examines ten stages in the creation, usage, and disposal of plastics: fracking for plastics, transporting and processing fossil fuels, gas crackers, other plastics feedstock manufacturing, polymers and additives production, exports and imports, foamed plastic insulation, "chemical recycling", municipal waste incineration, and plastics in the water.

As of 2020, the U.S. plastics industry is responsible for at least 232 million tons of CO2e gas emissions per year. This amount is equivalent to the average emissions from 116 average-sized (500-megawatt) coal-fired power plants.

The U.S. plastics industry's contribution to climate change is on track to exceed that of coal-fired power in this country by 2030. At least 42 plastics facilities have opened since 2019, are under construction, or are in the permitting process. If they become fully operational, these new plastics plants could release an additional 55 million tons of greenhouse gases—the equivalent of another 27 average-sized coal plants. The health impacts of these emissions are disproportionately borne by low-income communities and communities of color, making this a major environmental justice issue.

Plastics are the new coal.

Although the plastics industry has long touted plastic's recyclability, in truth, less than 9% of plastics

BEYOND PLASTICS

Appendix 1: Plastics & Climate CO2e Data

Facility	City/Town	County/ Parish	Stage	Facility reported emissions, CO2e 2020 (U.S. tons)	Potential Emissions (U.S. tons)	New Capacity (2019 to future)	2020 CO2e reports (U.S. tons) except power plants	Power plant nar
U.S. Total			**U.S.**	**114,377,574**	**56,897,105**	**42 stes**	**101,694,576**	
HARRIS COUNTY/CHAMBERS COUNTY, TEXAS			**TOTAL COMMUNITY**	20,213,955				
ExxonMobil Chemical	Baytown	Harris County, Texas	3. Gas Cracker	1,237,866			1,237,866	ExxonMobil Bayt
ChevronPhillips Chemical Company LP (CPChem, Cedar Bayou)	Baytown	Harris County, Texas	3. Gas Cracker	2,416,224			2,416,224	
Covestro	Baytown	Harris County, Texas	5a. Polymers, Resins	62,640			62,640	Baytown Energy
Channelview Complex (LyondellBasell/Equistar)	Channelview	Harris County, Texas	3. Gas Cracker	3,899,841	907,132	2022	2,274,153	Two: Optim Ene
Shell Chemical	Deer Park	Harris County, Texas	3. Gas Cracker	458,713			458,713	Shell Deer Park
TPC Group LLC (SK Capital)	Deer Park	Harris County, Texas	5a. Polymers, Resins	60,173	302,575	2020+	60,173	
Occidental	Deer Park	Harris County, Texas	4. Other feedstoc	145,767			145,767	
Flint Hills Resources - Houston								

SECTION 1

FRACKING FOR PLASTICS

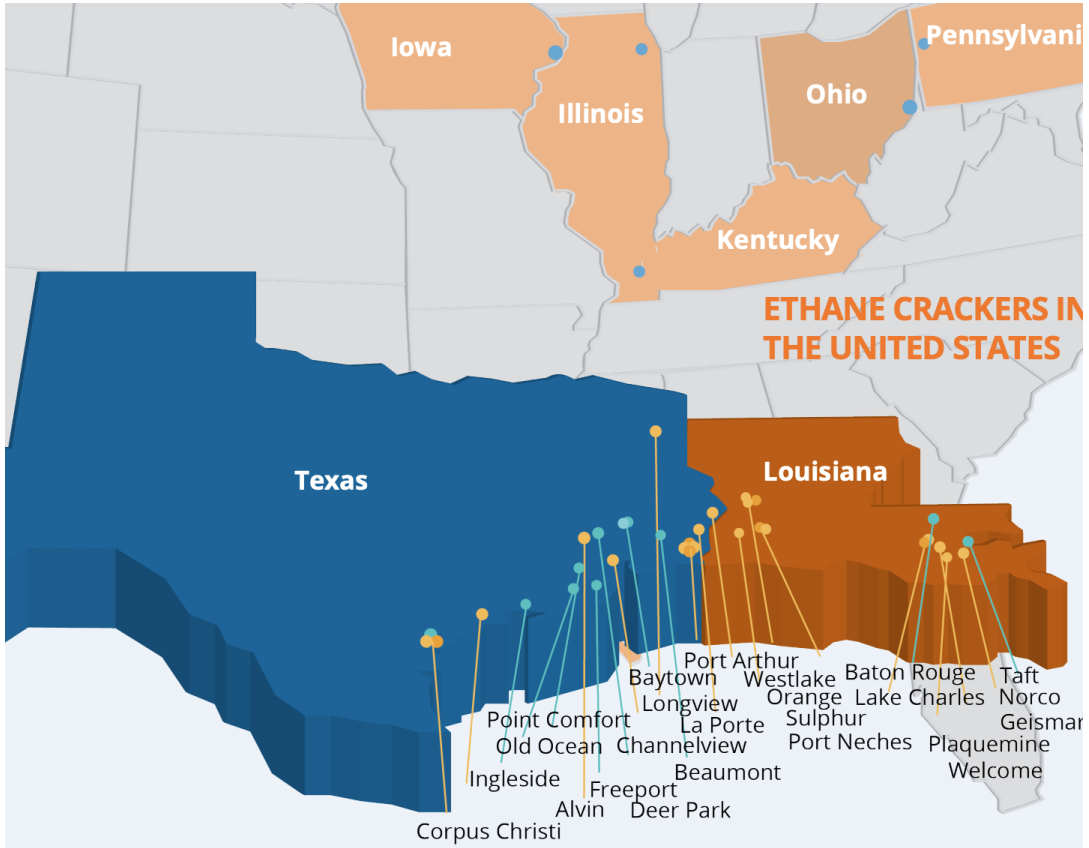
In the 1990s, geological engineers in the United States perfected methods that coax natural gas and petroleum out of bedrock formations. This achievement touched off the largest energy boom the country has ever seen. Oil and gas producers have become adroit at drawing hydrocarbons to the surface by injecting high-pressure streams of "fracking fluid" (primarily water, containing sand and small ceramic balls suspended with the aid of chemicals) and "fracturing" the natural pressure contained within the rock. Since the turn of this century, petrochemical companies have drilled more than 1 million new oil and gas wells using this technique, called hydraulic fracturing[9].

Fracking profoundly reduced the cost of oil and gas, and increased its environmental impacts. Numerous sources have documented serious contamination of

This stage of plastics production – fracking in the United States for gases – releases an estimated 36 million tons of CO_2e gases per year. This amount is roughly equivalent to the releases of eighteen average sized (500-megawatt) coal-fired power plants in 2020. Expansion in the U.S. and demand from overseas plastics manufacturers for gas obtained by hydraulic fracturing has the potential to cause the release of an additional 6 million tons CO_2e, equal to three additional power plants.

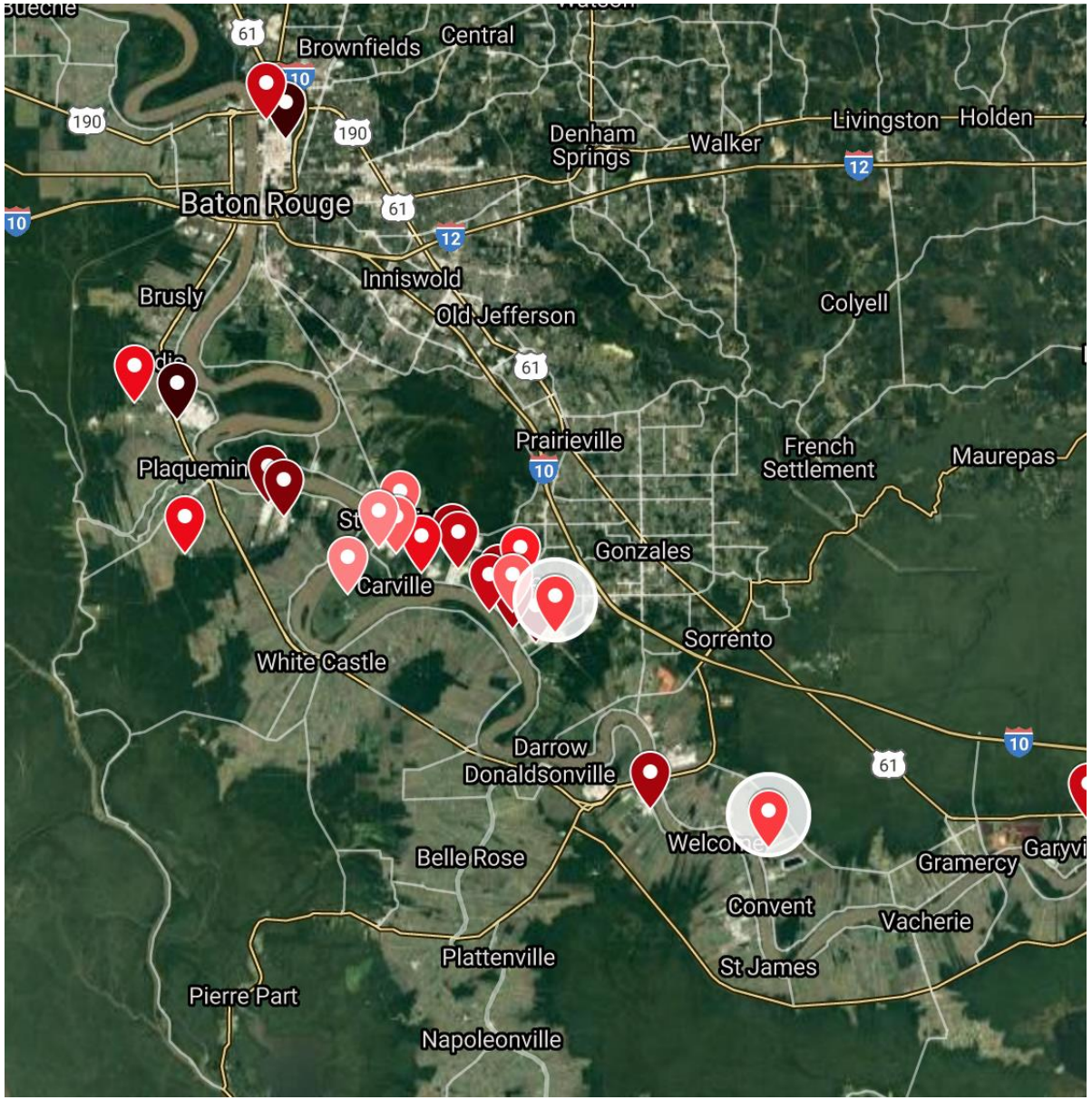
term, methane has 84 times the climate impact of carbon dioxide.

A recent review by scientists at Cornell and Stanford Universities found that on average, 2.6% of the methane produced at each wellhead passes directly into the atmosphere. The plastics industry consumes more than 1.5 billion U.S. tons of fracked gases annually[11]. At a



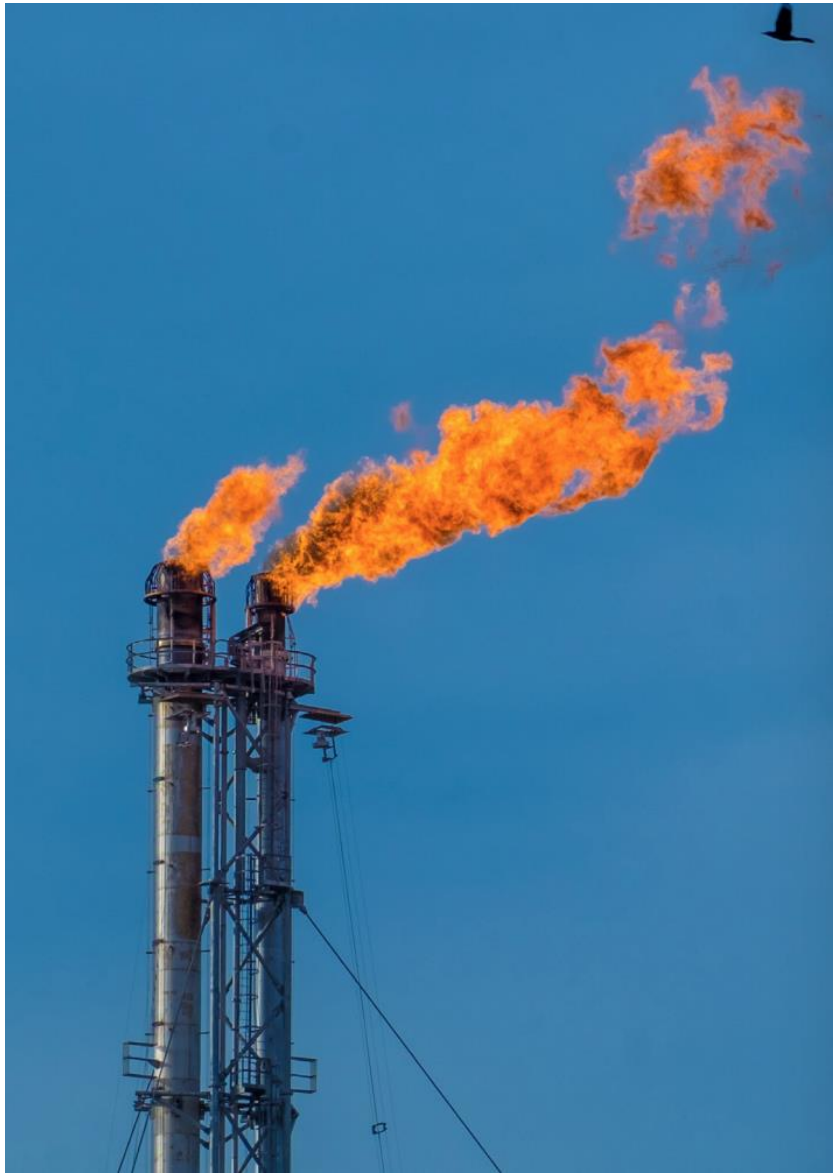
This map is a mix of existing, under construction, and proposed new cracker facilities. Under Construction: Corpus Christi, Texas; Monaca (Beaver County), Pennsylvania. Planned: Welcome

:YOND PLASTICS



Demographics at the Intersection of Plastics and Climate

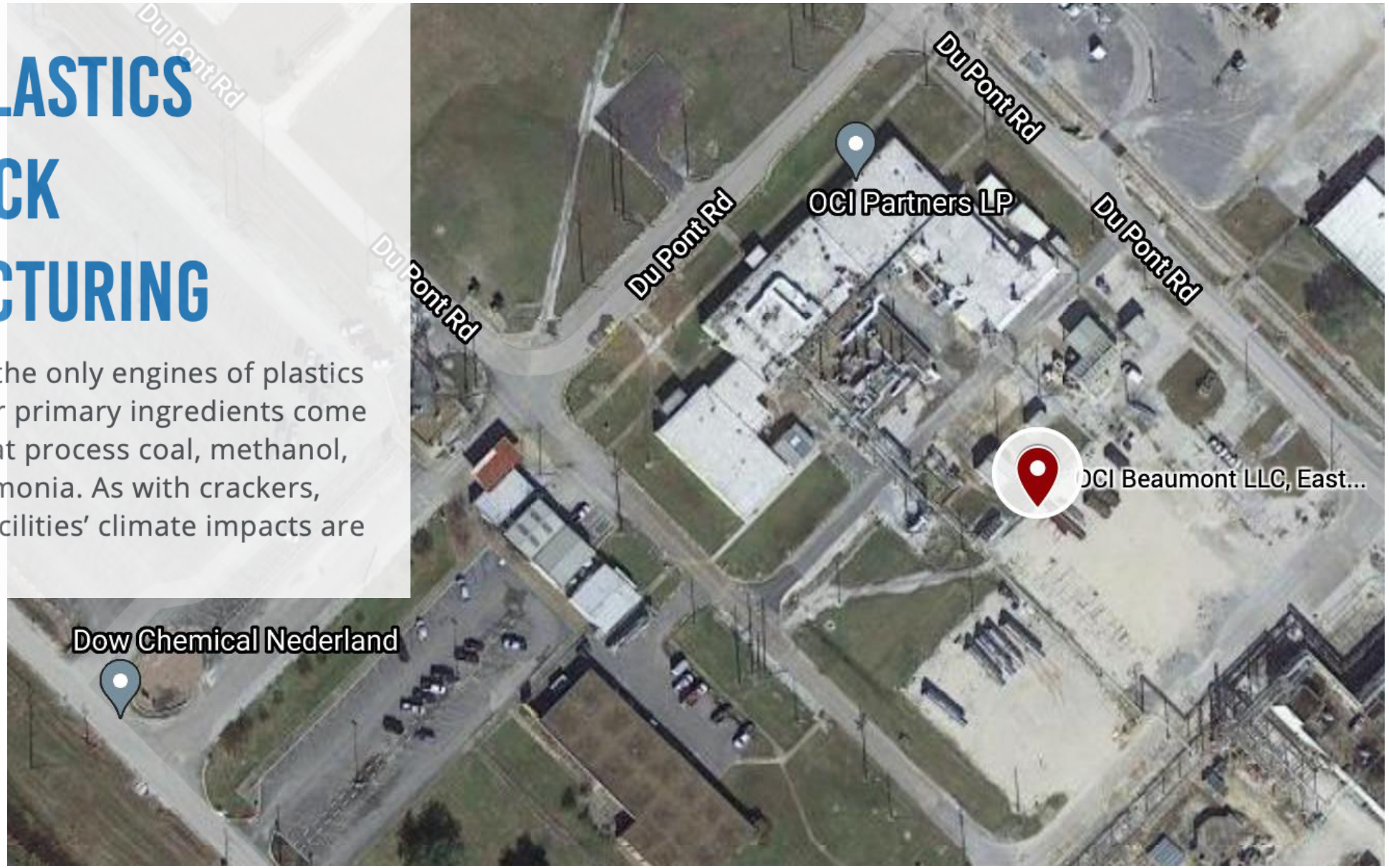
		CO2e/year from Plastics Facilities		People who live within 3 miles of the center of production			
Rank by Plastics CO2e /year	Community	Reported Releases (million tons, 2020)	Share	Number of People	% People of Color	Per Capita Income	Social Vulnerability Inde
	U.S. (overall)	**114,185,000**	-	330 million	40%	$34,102	0.094
	Top 18 Plastics/Climate intersection communities	**109,870,000**	**96%**	**388,810**	**67% (ave.)**	**$24,567 (ave.)**	**0.917 (median)**
1	Houston/Baytown, Texas (23 sites)	20.2	17.7%	36,951	75%	$24,064	0.933
2	Freeport, Texas (8 sites)	16.6	14.6%	16,194	76%	$23,283	0.949
3	Norco/Taft, Louisiana (3 sites)	10.3	9%	9,509	32%	$26,656	0.802
4	Plaquemine/St. Gabriel, La. (9 sites)	8.6	7.5%	7,274	59%	$27,743	0.942
5	Beaumont/Port Arthur, Texas (10 sites)	7.8	6.8%	21,589	50%	$25,010	0.933
6	Lake Charles, La. (8 sites)	7.7	6.8%	10,076	17%	$30,043	0.792
7	Baton Rouge, La.(2 sites)	6.3	5.5%	13,866	92%	$20,460	0.954
8	Geismar, La.(9 sites)	5.2	4.6%	2,148	34%	$28,619	0.951
9	Point Comfort/Seadrift, Texas (3 sites)	4.8	4.2%	174	34%	$23,712	0.907
10	Kingsport, Tennessee (1 site)	4.1	3.6%	26,223	10%	$27,706	0.911
11	Corpus Christi, Texas (4 sites)	4.0	3.5%	8,106	57%	$32,743	0.744
12	Orange, Texas (5 sites)	3.3	2.9%	7,167	40%	$27,225	0.944
13	Linden, New Jersey (1 site)	2.7	2.4%	190,186	83%	$23,703	0.647
14	Longview, Texas (1 site)	2.4	2.1%	7,464	65%	$22,428	0.68
15	Victoria, Texas (1 site)	1.9	1.7%	472	62%	$25,684	0.909
16	Decatur, Alabama (4 sites)	1.4	1.2%	4,907	66%	$22,380	0.923
17	Hopewell, Virginia (1 site)	1.3	1.1%	23,073	48%	$24,122	0.977
18	Calvert City, Kentucky-- (2 sites)	1.27	1.1%	3,431	5%	$28,416	0.754



SECTION 4

OTHER PLASTICS FEEDSTOCK MANUFACTURING

Crackers are not the only engines of plastics production. Other primary ingredients come from factories that process coal, methanol, chlorine, and ammonia. As with crackers, these chemical facilities' climate impacts are abundant.



THE ONGOING PLASTICS BUILDOUT IS NOT JUST FOR U.S. CONSUMPTION. PLASTICS COMPANY FLEETS DELIVER ETHANE GAS FROM THE U.S. TO CRACKERS IN INDIA, CHINA, AND EUROPE. SOON AFTER ETHANE IS EXTRACTED FROM BENEATH THE STATE OF TEXAS, IT BECOMES SINGLE-USE PLASTIC PACKAGING IN ASIA.

In the application of spray polyurethane foam, petrochemicals are reacted and create plastic envelopes around buildings.

SECTION 7

OFF-GASSING: FOAMED PLASTIC INSULATION

2021

The use of blowing agents in plastic insulation releases at least 27 million metric tons of carbon dioxide equivalent gas per year from buildings and landfills[43]. This is as much CO2e as was released by 13 average-sized coal-fired power plants in 2020. Regulations may eliminate the use of these fluorochemicals in plastics but releases will continue from existing insulation for years.

Reduce/Reuse: A Climate Solution for Plastic Pollution

EESI Briefing
December 9, 2021

Miriam Gordon, Policy Director
Upstream

We heart reuse.

We can’t create a good quality of life for 7.5B people and growing on a “one-way throw-away” model.

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We Can’t Recycle and Compost Our Way Out

Recyclable- *myth*

- Most recovered materials down-cycled- doesn’t turn off the tap
- Foodware too dirty to recycle
- Recyclable better for the environment only 56% of the time

Compostable- *myth*

- Only 14 of 182 compost facilities in CA process compostable plastic- but it creates a contaminated product
- Food packaging lowers compost quality
- Compostables in landfill = 30X more GHG impact than when composted

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Will Banning Plastic Solve the Problem?

150 MMT of plastic in our oceans...

and the problem is growing

Are single-use plastic bans the right solution?

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The problem isn't just plastic... it's "single-use" itself

Bio-based plastic

- Corn, sugar, starch, or other crops
- Don't degrade quickly enough; not all designed to biodegrade; contaminant in compost
- Fossil fuels used to grow and process - agriculture impacts (water pollution)

Aluminum

- Average recycled content 73%
- Virgin aluminum = 5 x more carbon than recycled
- Bauxite mining releases perfluorocarbons 9,200 times more harmful than CO_2

Paper

- Over ½ of paper produced = packaging (**3 billion trees per year**)
- Toxic chemicals
- Greater GHG emissions compared to plastic

Wood / Bamboo

- Impacts from monoculture
- Biodiversity loss, heavy soil erosion, and sedimentation and eutrophication

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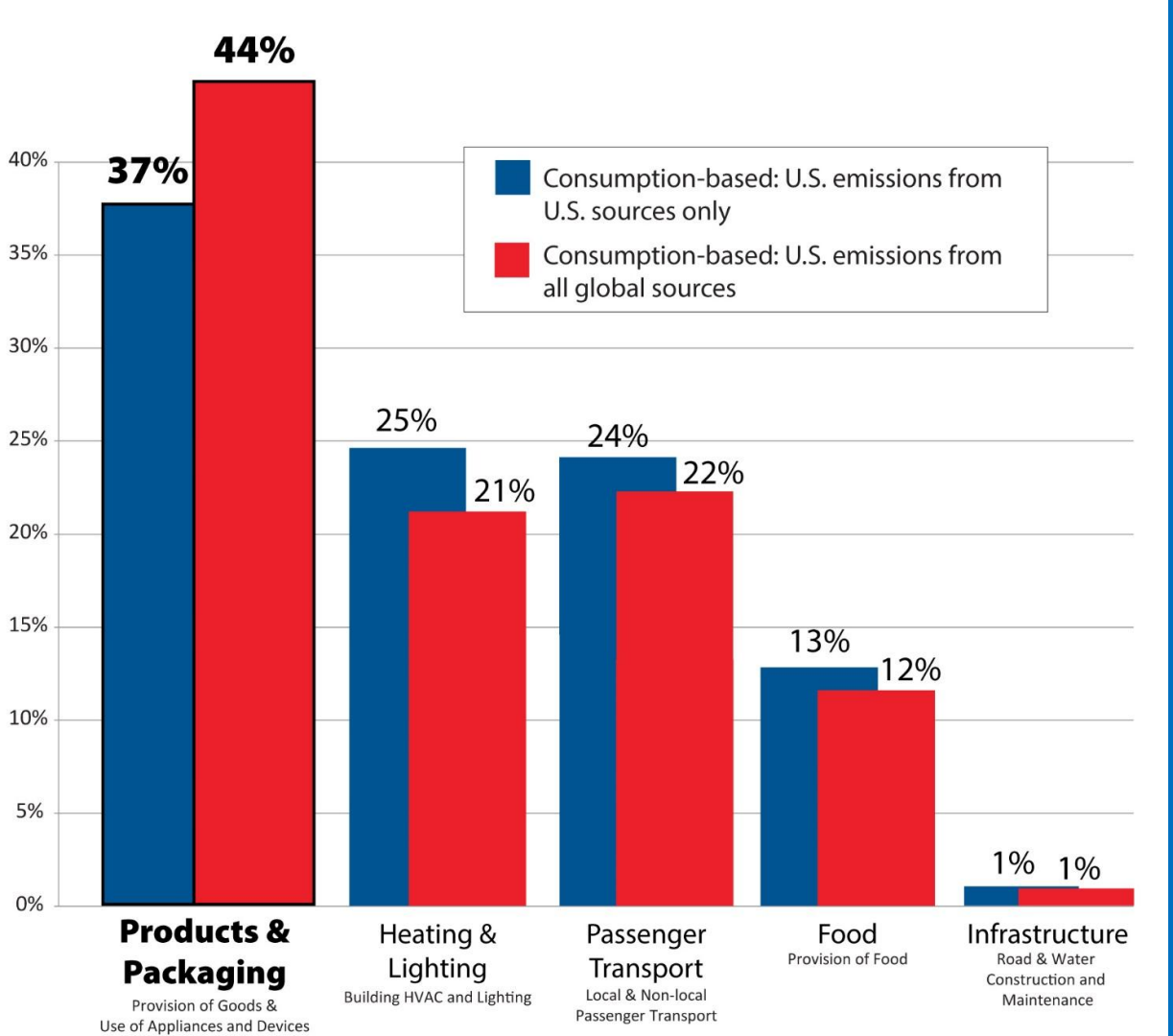

Greenhouse gas emissions from products

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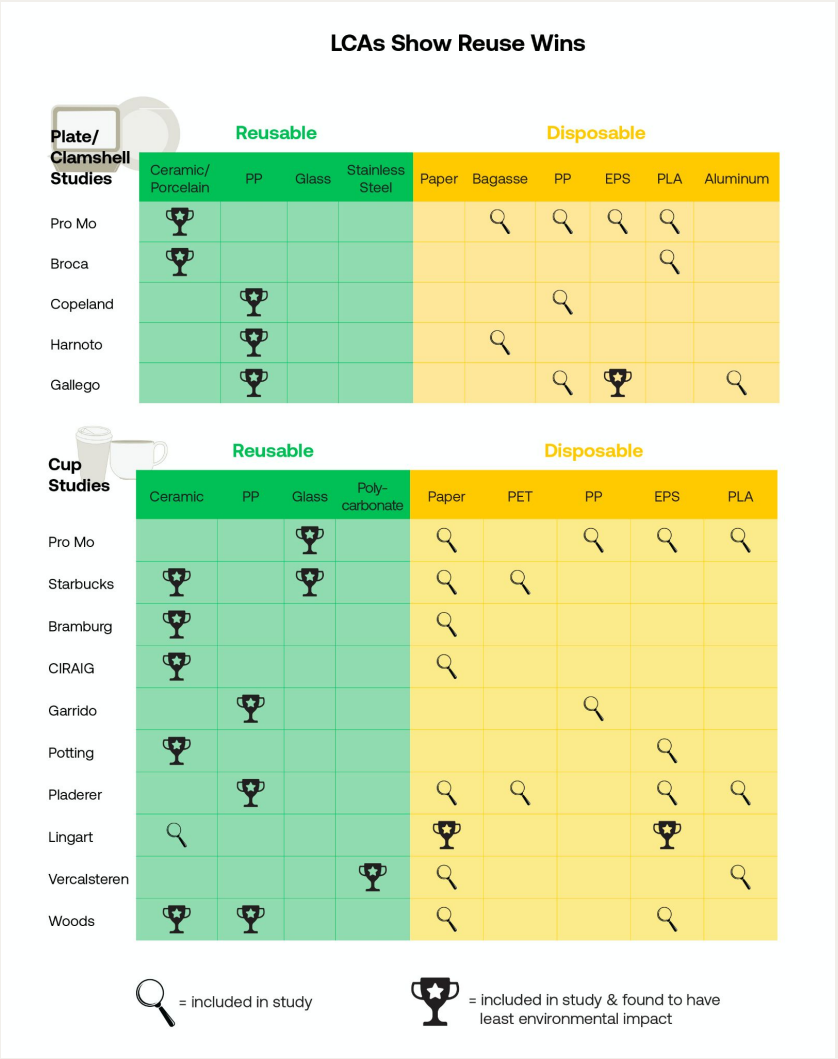
Upstream Report: Reuse Wins

Finding #1

Reuse Beats Single-Use by Every Environmental Measure



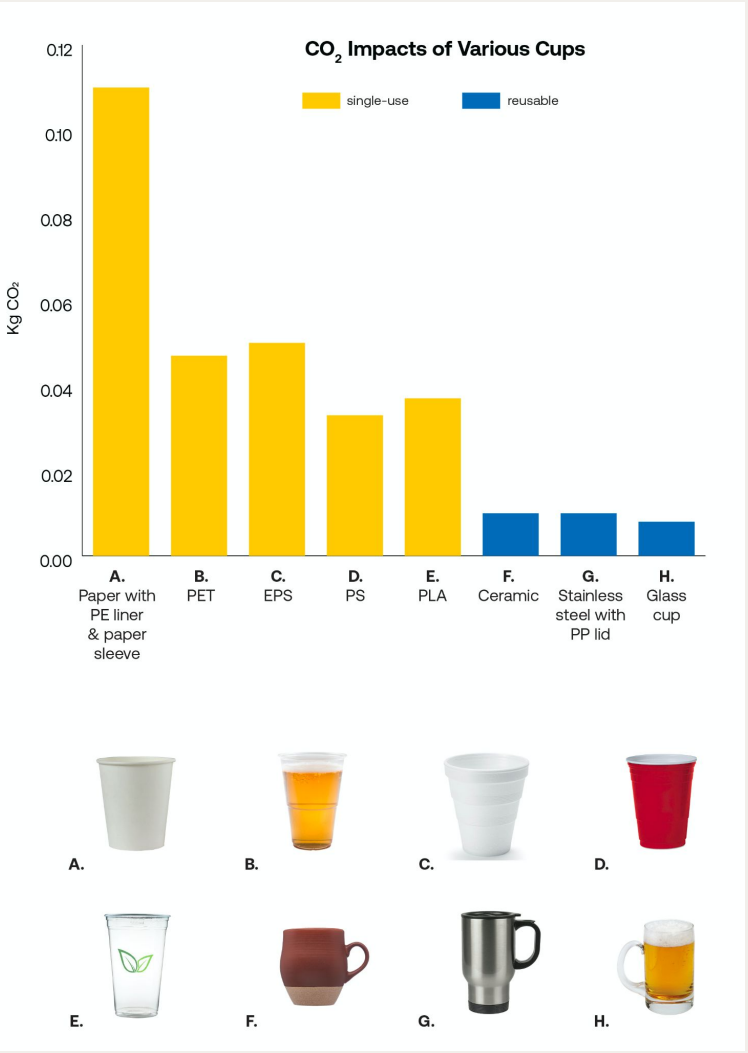
Better for Climate

Cups CO2 Impacts

Disposable paper, plastic, and bioplastic

3-10 x higher than

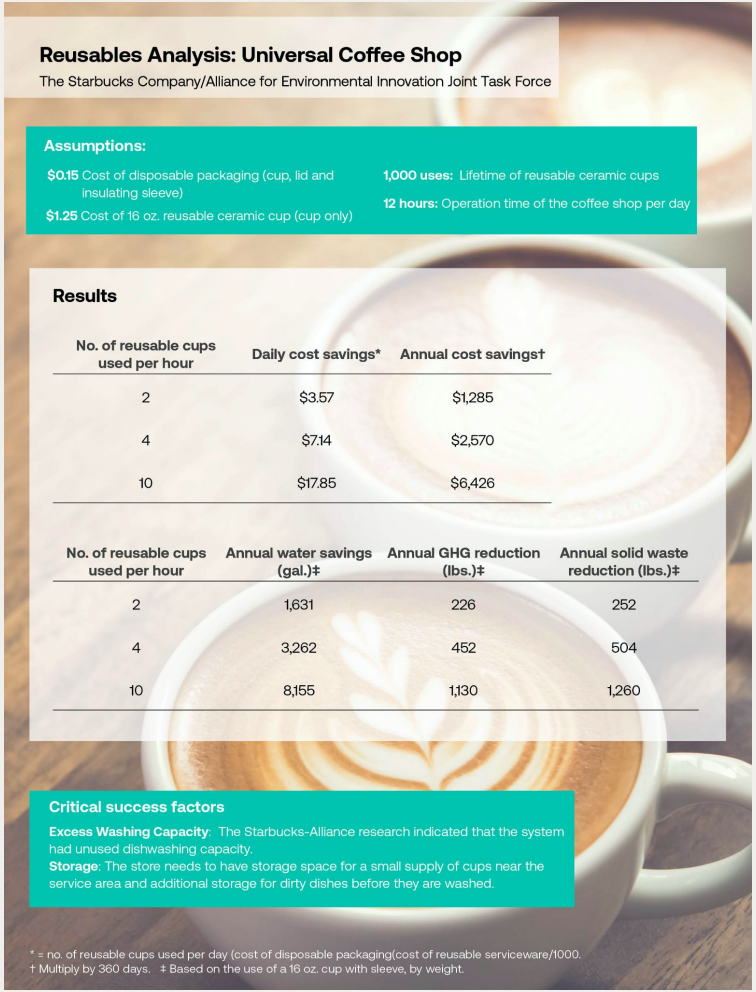
Reusable ceramic, stainless steel and glass



CO_2 Impacts: Disposables vs. Reusables

Product	DISPOSABLE Product Type	kgCO2e / per one product	REUSABLE Product Type	kgCO2e / per one product
Clamshells / Plates	Bagasse Clamshell (Sugarcane)	0.24	PP Clamshell (Hard Plastic)	0.004
	PS Plate (Rigid Plastic)	0.07	PP Plate (Hard Plastic)	0.05
	PLA Plate (Fiber-based plastic)	0.1	Ceramic / Porcelain Plate	0.02
	Cellulose Plate (Compostable)	0.12		
Cups	Paper Cup with PE Liner & Paper Sleeve	0.11	Ceramic / Porcelain Cup	0.01
	PET Cup (Lightweight Plastic)	0.04	Stainless Steel Cup with PP Lid	0.01
	EPS Cup (Styrofoam)	0.05	Glass Cup	0.01
	PS Cup (Solo Cup)	0.03		
	PLA Cup (Fiber-based)	0.04		

Finding #2- Reuse Saves Businesses Money



Reusables Analysis: Universal Coffee Shop

The Starbucks Company/Alliance for Environmental Innovation Joint Task Force

Assumptions:

$0.15 Cost of disposable packaging (cup, lid and insulating sleeve)

$1.25 Cost of 16 oz. reusable ceramic cup (cup only)

1,000 uses: Lifetime of reusable ceramic cups

12 hours: Operation time of the coffee shop per day

Results

No. of reusable cups used per hour	Daily cost savings*	Annual cost savings†
2	$3.57	$1,285
4	$7.14	$2,570
10	$17.85	$6,426

No. of reusable cups used per hour	Annual water savings (gal.)‡	Annual GHG reduction (lbs.)‡	Annual solid waste reduction (lbs.)‡
2	1,631	226	252
4	3,262	452	504
10	8,155	1,130	1,260

Critical success factors

Excess Washing Capacity: The Starbucks-Alliance research indicated that the system had unused dishwashing capacity.

Storage: The store needs to have storage space for a small supply of cups near the service area and additional storage for dirty dishes before they are washed.

* = no. of reusable cups used per day (cost of disposable packaging(cost of reusable serviceware/1000.
† Multiply by 360 days. ‡ Based on the use of a 16 oz. cup with sleeve, by weight.

Imagine a city where...

- All restaurants serve on real plates, cutlery and cups.
- To-go coffee is provided in returnable reusable cups.
- Take-out and delivery is provided in reusable to-go containers that are easily returned.
- At public venues, water is provided in reusable bottles.
- At the ballpark, everyone is drinking beer and soda out of real cups.
- You can get groceries, cleaning, and personal care products delivered to your home in reusable containers- or in reusable containers at the store.

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And in this city...

- Tens of thousands of people are employed in delivery, pick-up, cleaning, stocking and logistics.
- Litter and solid waste costs are down and community pride is up.
- None of these innovations required you to bring your own anything.
- Community leaders and policymakers worked to create the conditions for this thriving reuse economy.
- Then the big companies saw this was the future, and everyone started doing it.

Waste Management vs. Waste Prevention

- Decades of focus on diversion from landfill
- Reduce and reuse must be stand-alone policy goals
- To be effective, they need specific enforceable metrics

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Two Policy Approaches to Shift the Paradigm

1. **REDUCE-**
   eliminate the unnecessary stuff

2. **REUSE-**
   make *reuse and refill* the norm

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Overview of Strategies and Policies

Strategy #1- Reduce as Much as Possible

- **Sector-wide targets for reduction-** (build into EPR and bottle bills)
- **Bans on throw-away packaging products** (bags, toiletries, foodware, cups, bottles)
- **Accessories on request-** (CA and WA; 30+ local policies)

Strategy #2: Transition the Rest to Reusable/Refillable

- **Refillables infrastructure and targets in Bottle Bill (BFFPPAct)**
- **Reusable bags** (State and local laws enacted, BFFPPAct)
- **Sector-wide targets for reusable packaging**
- **Only reusable foodware for on-site dining** (local ordinances)
- **Consumer charges for throw-away cups and containers,** plus mandatory reuse
- **Reuse at government events and workplaces, in gov't purchasing**

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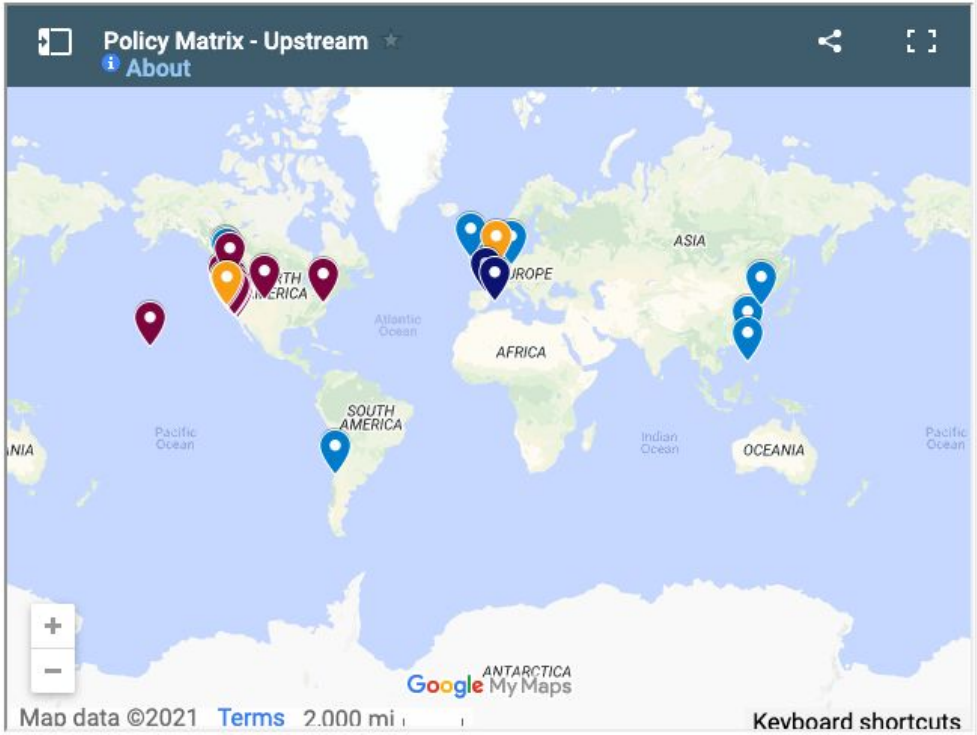
Learn More About Reuse Policies at www.upstreamsolutions.org

Reuse policies are being passed around the world.

Follow the progress of the reuse movement via Upstream's policy tracker below – and get a global view as reuse policies make waves around the world on our Reuse Policy Map.

Policy Tracker



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