STATE OF RECYCLING – Q1 2021

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Managing change in a resource-constrained world.

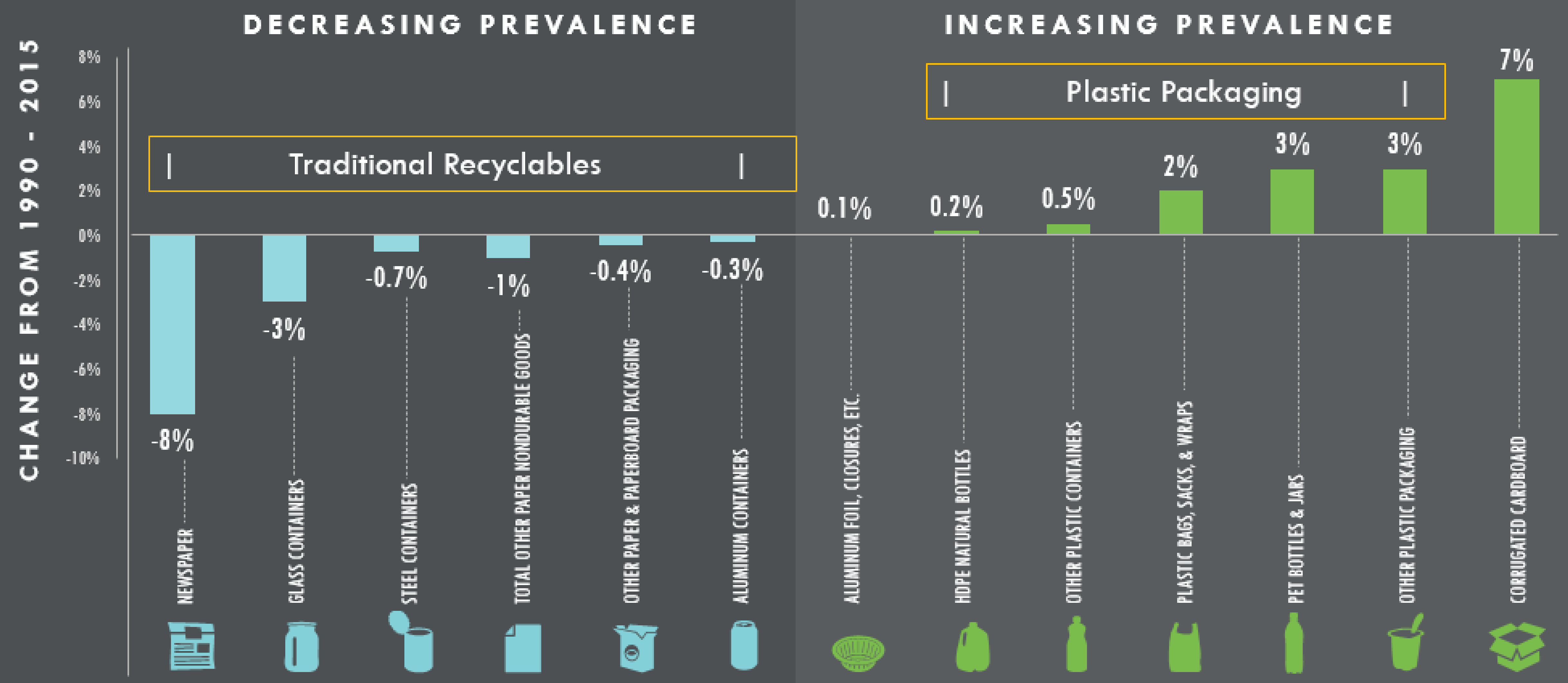
since 1986

ORGANICS MANAGEMENT

WASTE RECOVERY

GLOBAL CORPORATE SUSTAINABILITY

THE EVOLVING PACKAGING WASTE STREAM



Source: RRS recycle.com. From packaging generation by weight US EPA Advancing Sustainable Materials Management 2015

EVOLVING MATERIAL STREAM

UNITS PER TON 2000

UNITS PER TON ADDED TO 2016

BY 2030

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LIGHTWEIGHTING CHALLENGES FOR MATERIAL RECOVERY

- Working harder for same ton
- Throughput Is volumetric & based on geometry
- Screen openings, air flow, conveyor speeds, chemistry, dexterity
- 35 TPH throughput In 2010 Is 26TPH In 2018- shows up in cost

RESIDUE COST HAS TRIPLED – IMPACT OF SINGLE STREAM

TRADE OFF- CONVENIENCE/VOLUME VS THE CART THAT DOES NOT GET INSPECTED

331% INCREASE IN 15 YEARS

Year	%Residue	Comparative $/T (Current LF $/T)
2007	8%	<$4
2012	13%	$6.37
2014-2015	16%	$7.92
2020 Avg. Est.	22.2%	$13.25

AFTER RISING FOR A DECADE- MRF COSTS BEGIN STABILIZE

SLIGHTLY LOWER IN 2020 AS REPORTED PUBLICLY

MATERIAL RECOVERY FACILITY COST CATEGORIES

Inbound Processing $/Ton

COST CATEGORY	2009	2015	2019	2020	Change
Fixed	$12.00	$20.00	$25.00	$21.00	108%
O&M	$46.00	$54.00	$56.00	$51.00	22%
Residue	$4.00	$8.00	$10.00	$11.00	150%
TOTAL	**$62.00**	**$82.00**	**$91.00**	**$83.00**	**46%**

O&M

- Impacts of China- Slowing down the line
- Rise of film and clamshells
- More units per ton = less throughput
- Labor shortage
- Aging of the fleet-new growth 5-10 vs. 20/yr.

Fixed Cost

- Trend towards automation
- Oversupply of MP- need for better cleaning of paper
- Larger regional footprint
- More peripheries & technology
- Higher speeds

Residue

- Agressive MRF interptretation
- Impact of China- tighter quality standards
- Enforcement
- “Wish” Cycling
- PAYT/Recycling Free

- NERC STUDY - $112 before Revenue Share

  https://nerc.org/documents/NERC%20Report%20on%20Blended%20MRF%20Values%20Survey%20-%20May%202020%20EPA%20Region%203%20States.pdf

- THE RECYCLING PARTNERSHIP STUDY – $64 Net Charge

  https://recyclingpartnership.org/wp-content/uploads/dlm_uploads/2020/02/2020-State-of-Curbside-Recycling.pdf

COMPARISON	PROCESS FEE CHARGE	REVENUE CREDITS	NET PROCESS CHARGE
NERC Study	$112	$34.92	$77.08
Recycling Partnership	$107 (implied)	$43.37 (implied)	$64.08
RRS Rate Study	$122	$20.00	$102

RRS SINGLE STREAM COMMODITY REVENUE BEHAVIOR

Big Positive Movers in the Quarter

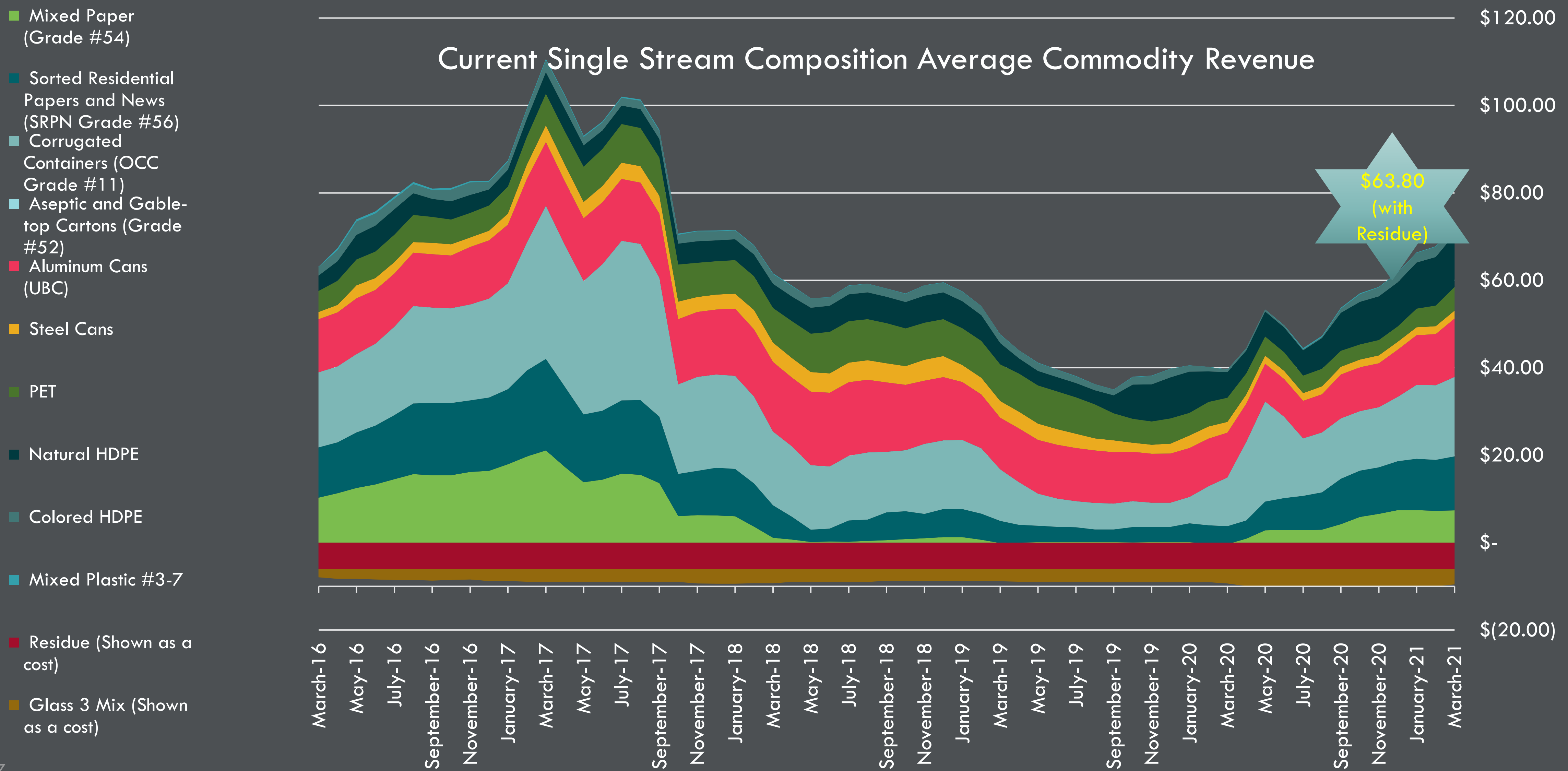
- Steel Cans from $106 to CAN$373 in < than 45 days
- Aluminum Cans 24.3%
- NHDPE 13.1%, maintains price advantage to AL cans for 4th straight month by CAN$397 per ST
- Fiber up across the board over 8%
- Polypropylene bottle spikes over $1005

What a difference a year makes!!!

- 103% increase, now over CAN$ 95 compared to CAN$ 42

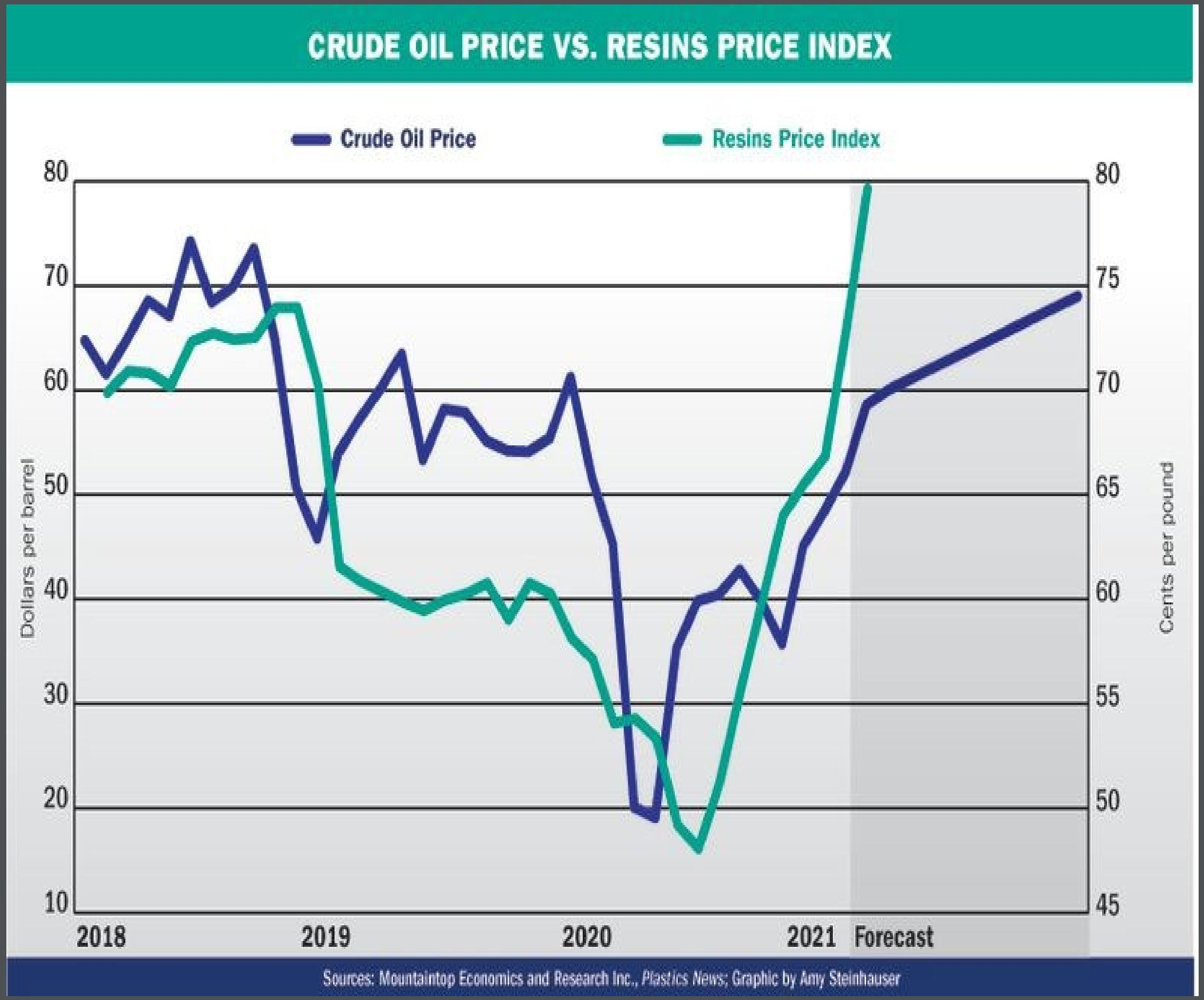
Looks good for the next quarter for fiber and metal, plastic in flux and 2Good2B true

AVERAGE RESIDENTIAL SINGLE STREAM COMMODITY REVENUE



HEADLINES AND GRAPH OF THE MONTH

1. **Prices for …curbside recyclables – OCC, UBCs, PET, HDPE and PP –**surged over the past month…good news for MRFs" ***Resource Recycling***
2. **"Freight Container rates hit nine-year high** Recycled commodities are having difficulty acquiring container…because of a shortage in Asia. Shipping lines since late 2020 prefer to send empty containers to speed their return to Asia rather than loaded with scrap. West Coast has "quadrupled" to over $40T per container since late November. "- ISRI,, Argus
3. **Shanyeng and Nine Dragons taking April downtime** worldwide as "demand softens" and prices for OCC/mixed paper increase rapidly for export *(it is almost certain, and the rumor mill confirms, North, Latin and South American container and paperboard mills will follow suit to slow price rises).*



Plastic News before the shutdown of resin facilities in Louisiana and Texas

AFPA GUIDANCE FOR RECYCLING

- Bring clarity to how packaging works in paper mills
- Researched based findings on paper-based packaging performance
- 10 companies, Fiber Box Assn. technical group
- Survey in June 2020 from mills informed the Guidance
  - 86 mills, 75% responded to survey
  - Challenges slow pulping is a “challenge to recyclability”
  - Three materials out of 10- paper cups and aseptics/cartons did not return enough responses to the survey
    - 30 mills now accept polycoated paper cups due to innovation

corrugated packaging

Corrugated packaging is strong, convenient and sustainable. It is the single most recycled packaging material. In 2019, the U.S. recycling rate for corrugated packaging was 92%. Walls of corrugated packaging consist of two parts: linerboard (or facing) on the exterior and corrugated medium (fluted paper) between layers of facing. Various layers can be used to increase the packaging's strength.

Easier to recycle

- water-based inks
- water soluble dyes
- UV EB inks
- water soluble adhesives
- paper tape
- polymer tape
- pressure sensitive labels
- clay coatings
- varnish coatings
- polymer barriers
- polymer windows
- metalized foils
- non-tree fibers

Definitions for non-fiber elements appear in the appendix.

THE BOTTOM LINE:

- Water soluble inks, dyes and adhesives, UV EB inks, paper and polymer tapes, clay coatings and varnish cause few problems.

Recycling challenges

- hot melt adhesives
- wax coatings
- bioplastic barriers
- metals
- plastics
- laminated foils
- stamped foils
- wet strength resins

● 33% or more of respondents rated these non-fiber elements as a challenge in mills. Being a challenge does not make something not recyclable.

BOARD & RY PULP MILL START UPS

1ST HALF 2021

2020 Capacity Increases		**NET Metric Tons (000)**	
4 total facilities		**964**	
2021 Through June			
Name	**City**	**NET Metric Tons(000)**	**Comment**
Green Bay Packaging	Green Bay, WI	680	Started up March 25, OCC and MP
Nine Dragons	Biron, Wisc.	240	First part of three-part RCP expansion, pulp mill (will be followed by recycled medium and 2nd phase pulper expansion) altogether 600K TPY
Nine Dragons	Rumford, ME	200	Long planned pulper expansion
	TOTAL	**1,120**	

2.7 MMT now on-line since 2019

BOARD & RY PULP MILL NEW CONFIRMED ANNOUNCEMENTS
1ST QTR. 2022

Name	City	NET Metric Tons(000)	Comment	Current Open Date
Atlantic Packaging	Whitby, Ontario	400	October announcement	2022-2023
Cascades	Ashland, VA	240	First part of three-part RCP expansion, pulp mill (will be followed by recycled medium and 2nd phase pulper expansion) altogether 600K TPY	2022-2023
Kamine Celadon	Tampa, Fl Port	400	Signed financing last week	2022
	TOTAL	**1,040**		

New Start-Ups + New Announcements increases total capacity by over 5.4 MMT since 2018 if all these projects are built

SINGLE STREAM RECYCLING SERVICE REMAINS POPULAR

of Programs tripled in 15 years

- MRF capacity more than doubled and over 3,000 munis offer service
- Fastest growing new municipal service
- Still growing despite severe commodity quality problems using current cleaning

Persistent Record

- < handful Single Stream programs ever rescinded

Convenience, most popular municipal ser

- Huge popularity after initial roll out pains
- surveys uniformly show >85% approval rating with consistent service

Cheapest home-delivered service by far

TOP RECYCLING TRENDS NEXT TEN YEARS

1. Regulatory Strategies push packaging in N. America
   a) Recycled Content- will help pricing
   b) EPR expansion for traditional and non-tradition
   c) Bans- landfill and outright
   d) Deposit interest returns
2. Big Garbage, CPGs warm up to regulatory aids
3. Evolving ton continues, MRF cost rises
4. MRF automation- AI, robots, OS, autonomous vehicles
5. WfH permanent- 5-12% more blue bin paper volume; loss of AfH paper keeps pricing on writing paper grades high
6. China fiber needs still dominate the market. Mainland consumption/material insufficient, poorer quality
7. Europe, Latin America, Australia, & S. America recyclables consumption up
8. Chemical recycling Chimera
9. Pressure on plastics grows
10. Reuse comes back into focus

CIRCULAR ECONOMY

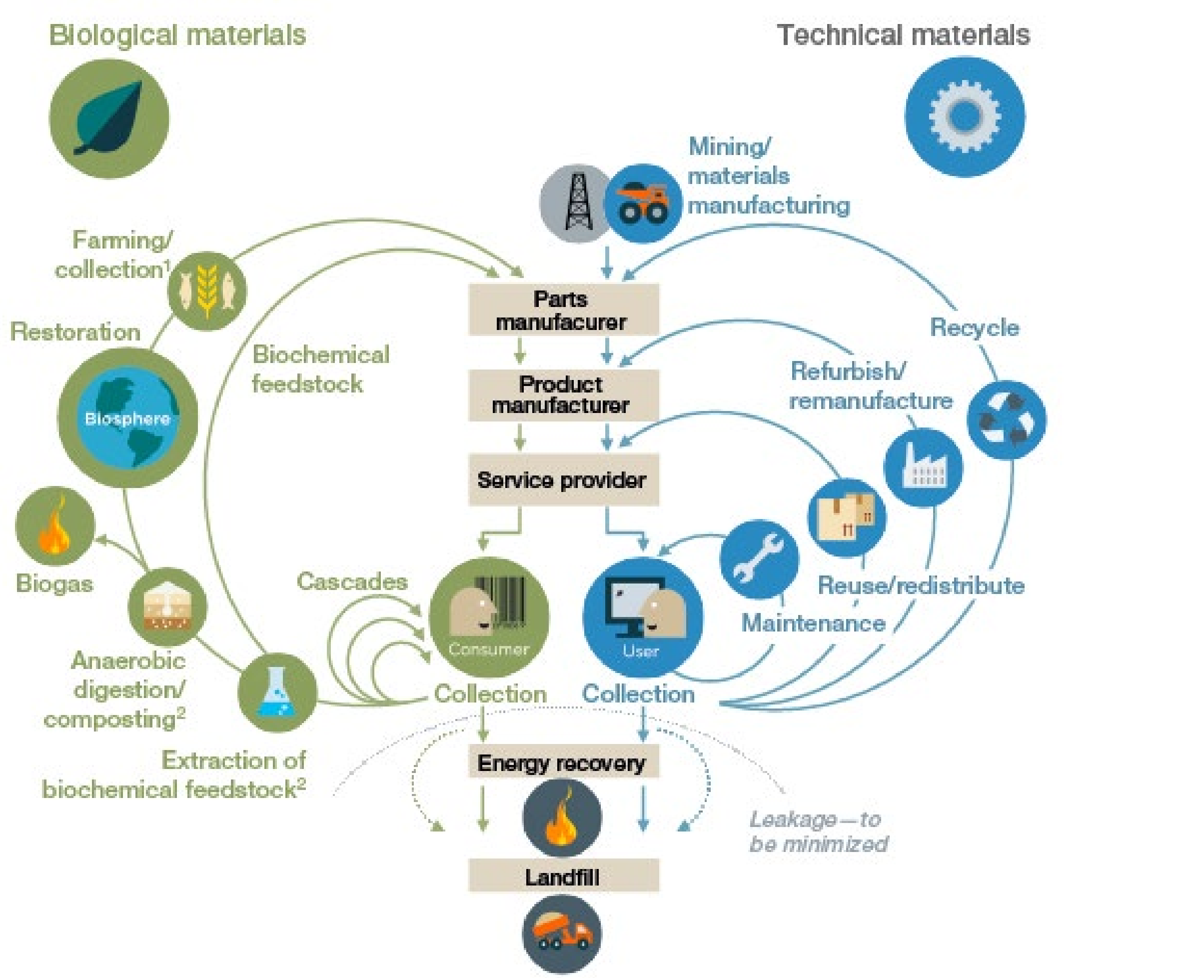


Image: Ellen MacArthur Foundation

- Ellen MacArthur Foundation
- Shared vision across industry, NGOs, govt's
- New Plastic Economy
- Global Commitment and Plastic Pacts
  - Reuse
  - All plastic packaging 100% reusable, recyclable, compostable
- Commitments translating into goals, targets, and action across stakeholders.

GLOBAL WASTE CRISES LINKED TO OCEAN PLASTICS

- Global waste to grow 70% by 2050 and fastest in regions with weakest waste management and recycling infrastructure
- Influence of climate change on vulnerable geographies exacerbating mismanaged waste
- Ocean plastics crises highlighting infrastructure deficits

40% of Jakarta a city of more than 10 million is below sea level

Source: Transbogor.co, Jan 22, 2016

Globally plastics have a long way to go to achieve circularity and are widely mismanaged. Regulatory response is growing.

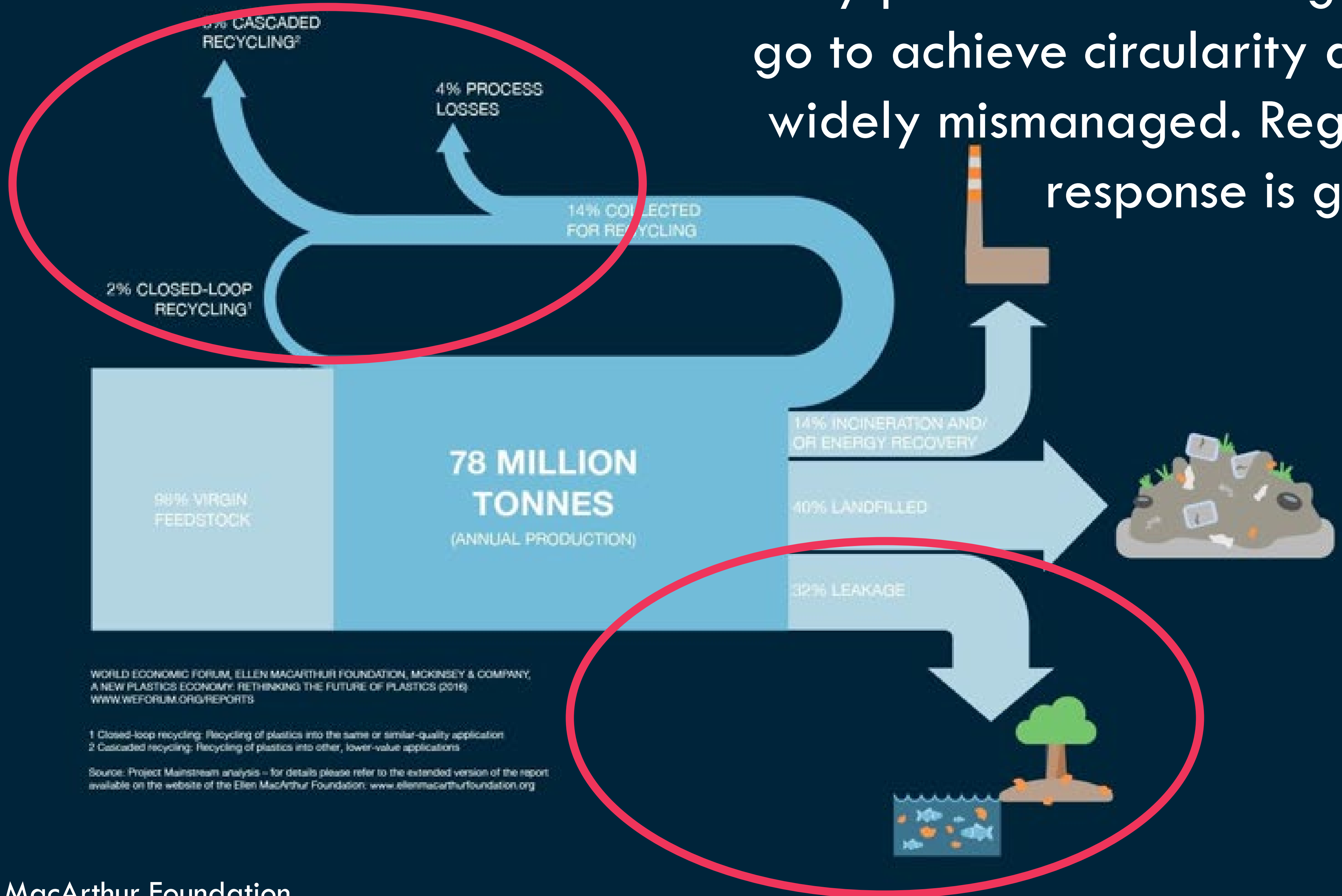
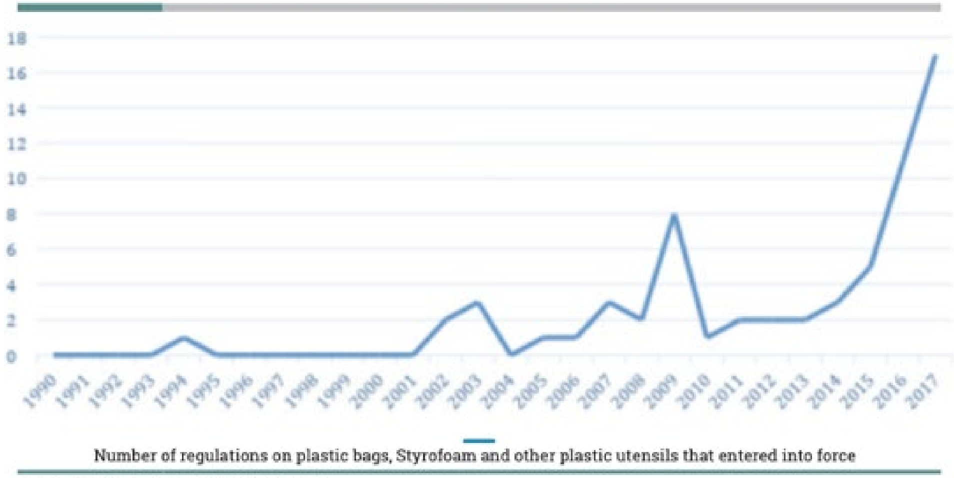


Image: Ellen MacArthur Foundation

SINGLE USE PLASTIC - A REGULATORY TARGET

Figure 3.3. Estimated number of new regulations on single-use plastics entering into force at the national level worldwide



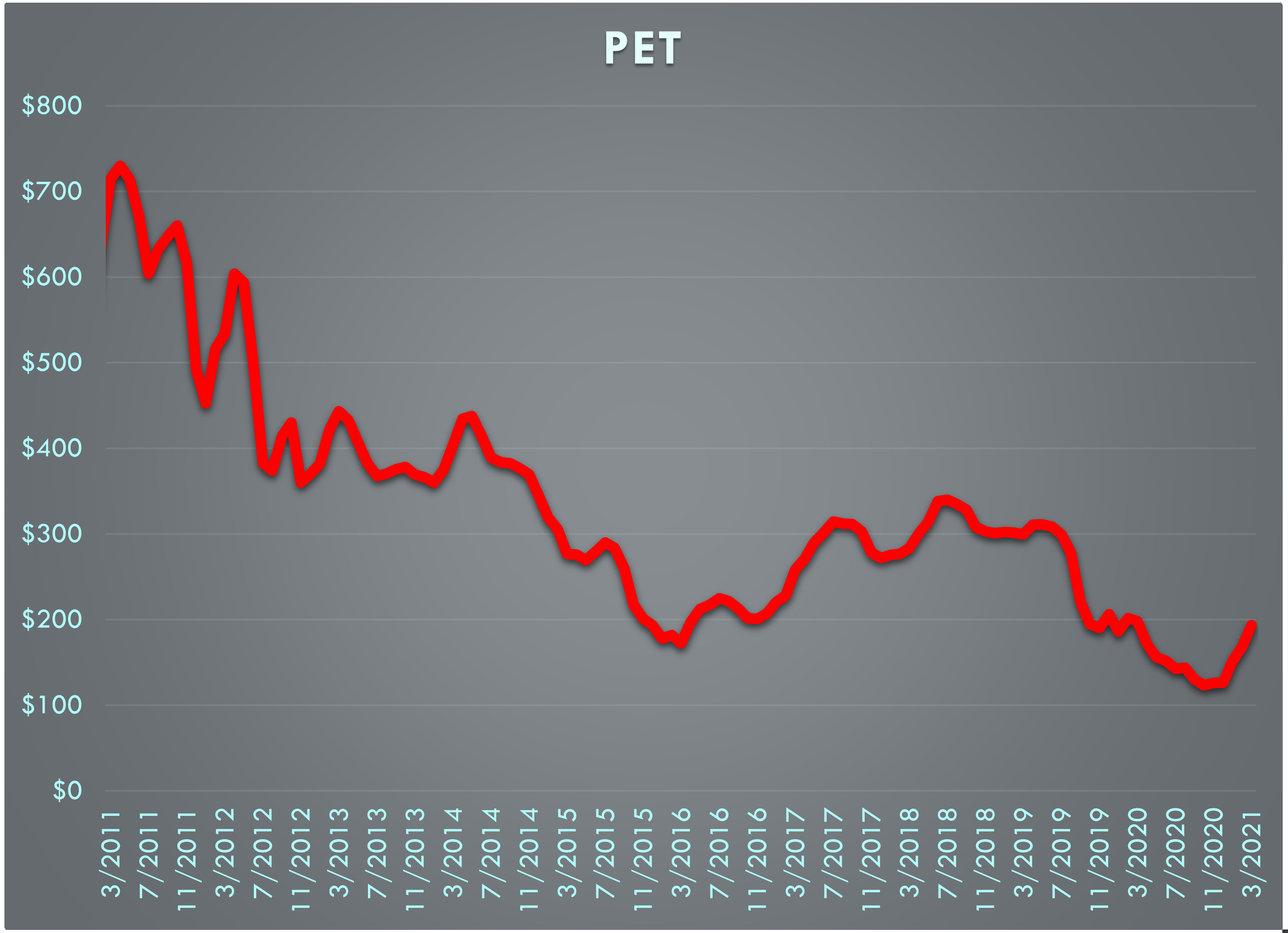
Source: Data independently collected by authors

Source: UNEP, Single-Use Plastics Roadmap to Sustainability, 2018

- 127 Countries have adopted some form of regulation for plastics bags.
- 27 Countries have enacted through law some type of ban on single-use plastics – product or material
  - EU Directive on SUP - ban selected single use plastics to be implemented by member states
  - United Kingdom – will ban selected single use plastics (Oct 2020) and tax selected packaging w/o 30% recycled content by 2022.
  - Bali, Indonesia – Ban on single use plastics

UPDATE - PET

- Best prices in two years but still low
- Virgin overproduction
- Companies still supportive of rPET in packaging
- Haulers and brands warm to regulatory prodding



PET PLASTIC (#1)
THERMOFORM ISSUE AND BTB WILL BE CONTROVERSIAL

PAST MARKET BEHAVIOR

- Low-cost virgin resin historically had capped pricing on recycled PET
- PET recycling rate had been flat for the past 10 years at around 30%.
- Oversupply of virgin material

RRS FORECAST AND RECOMMENDATIONS

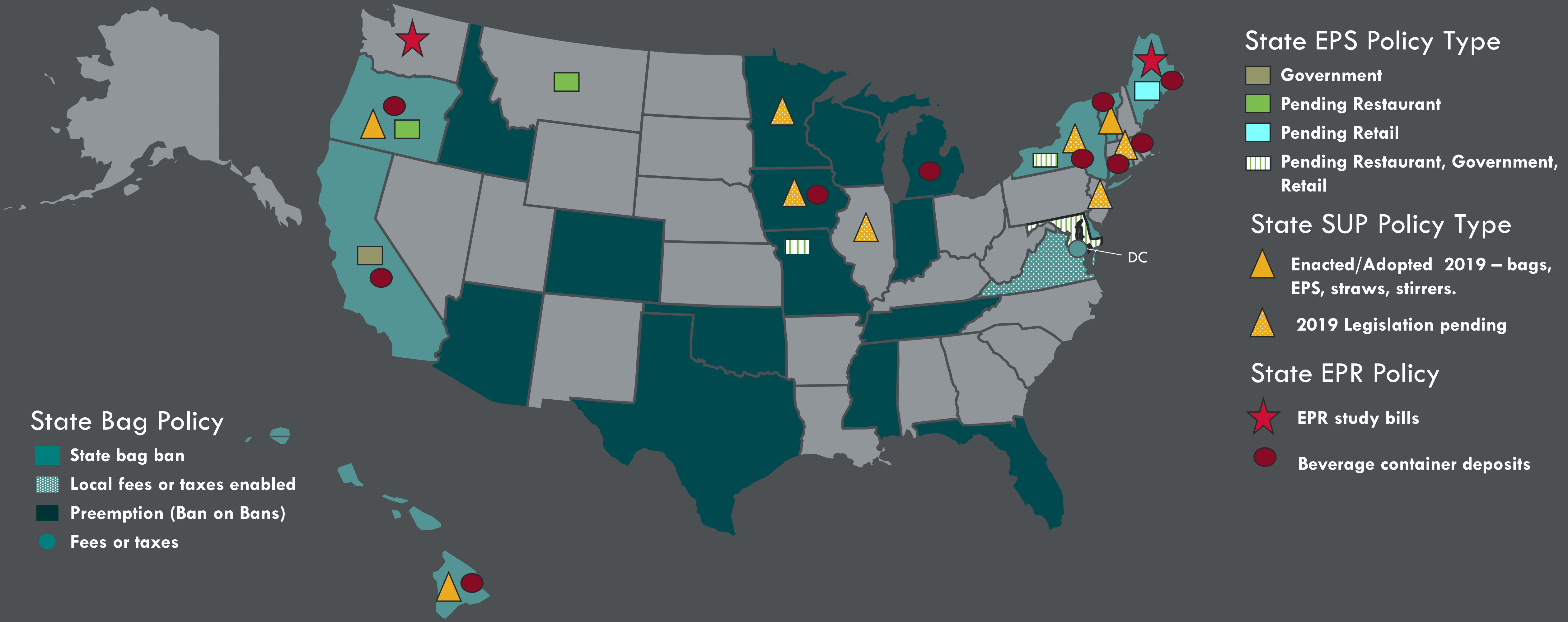
SHORT TERM

- **Best pricing since 2019, breaks $.10 per pound and is at pre-Covid levels.** Volatile soft oil market and virgin PET oversupply- offset by loss of deposit system PET bales in 2020, now helped by rising resin and oil pricing
- Global warming and fire events have stabilized pricing and rPET demand. Pricing is uncertain given volatility in the energy sector
- Thermoform removal being pushed to MRFs- ***NOT THE RIGHT SCALE***

LONG TERM

Low-cost virgin PE oversupply will push market down but will see demand driven increase in rPET (recycled PET)

U.S. STATE POLICIES FOR BAGS, PREEMPTION, EPS, SUP, AND EPR



 Disclaimer: Map illustrates recent activity & trends and not intended to be a complete representation of all existing policy.

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