

A black and white photograph of a recycling facility. In the foreground, several workers wearing hard hats and safety vests are working at large, rectangular sorting bins. One worker is leaning over a bin, while another is standing nearby. In the background, there are more workers and a complex network of conveyor belts and machinery. The scene is industrial and busy. A teal-colored rectangular overlay is positioned in the center of the image, containing the title and author's name.

MARKET IMPACTS ON RECYCLABILITY

Brennan Madden



Are you ready to
effect change?



ORGANICS
MANAGEMENT



WASTE
RECOVERY



GLOBAL CORPORATE
SUSTAINABILITY

since 1986



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Recyclability: Recovery System Steps Evaluated

Residential Access-to-Recycling Assessment

- Survey of 300 community recycling programs assessing acceptance of each of the study packages in the United States

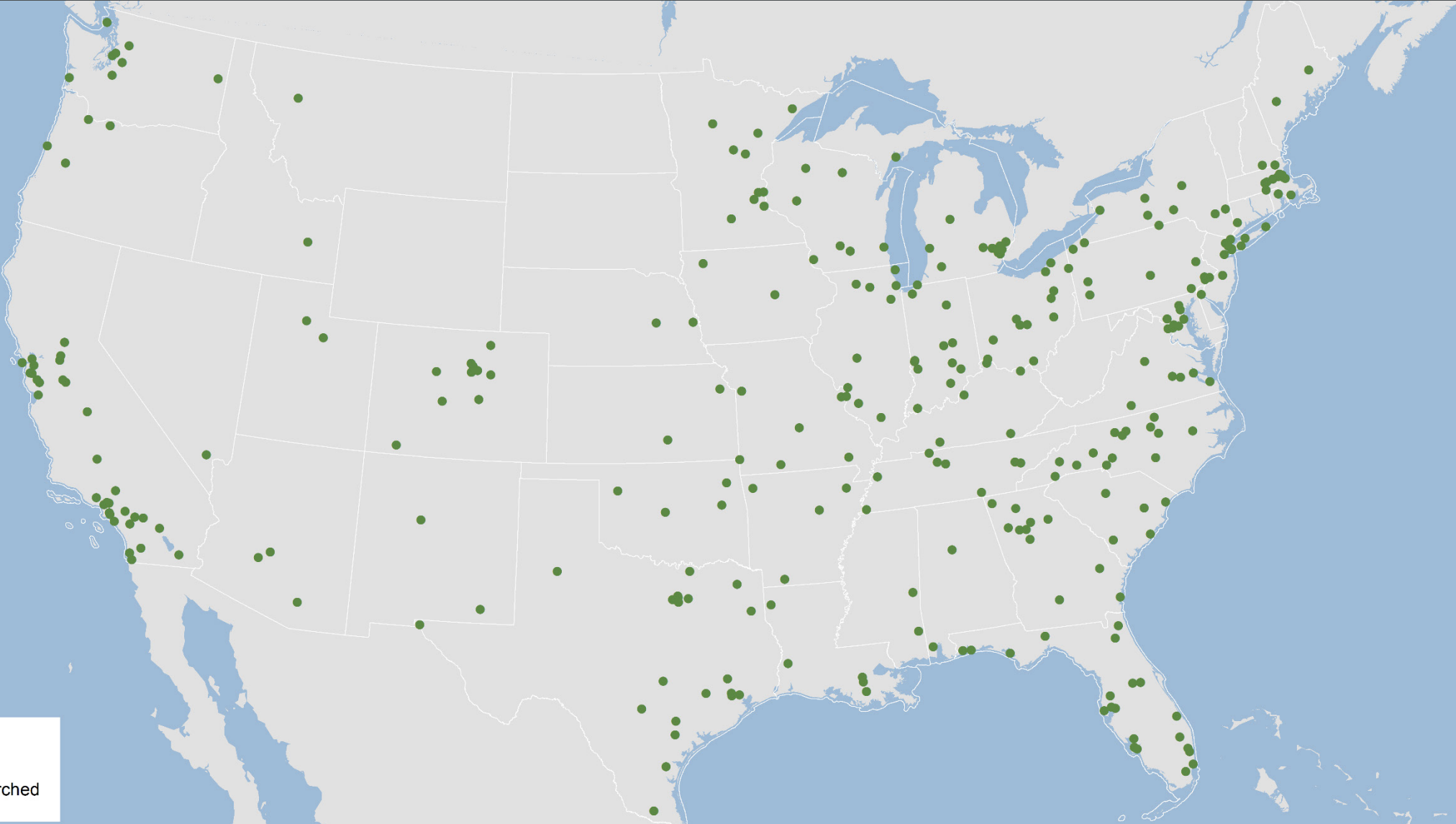
MRF Compatibility Assessment

- Assess the MRF compatibility of the study containers through sortability and commoditization based on typical US MRF configurations and throughput.

End Market Assessment

- Determine ISRI bale types, assess availability of reproprocessors/manufacturers and their design concerns (Design for Recyclability)
- Assess the compatibility with end markets on the packages

Randomly Selected Communities



Legend

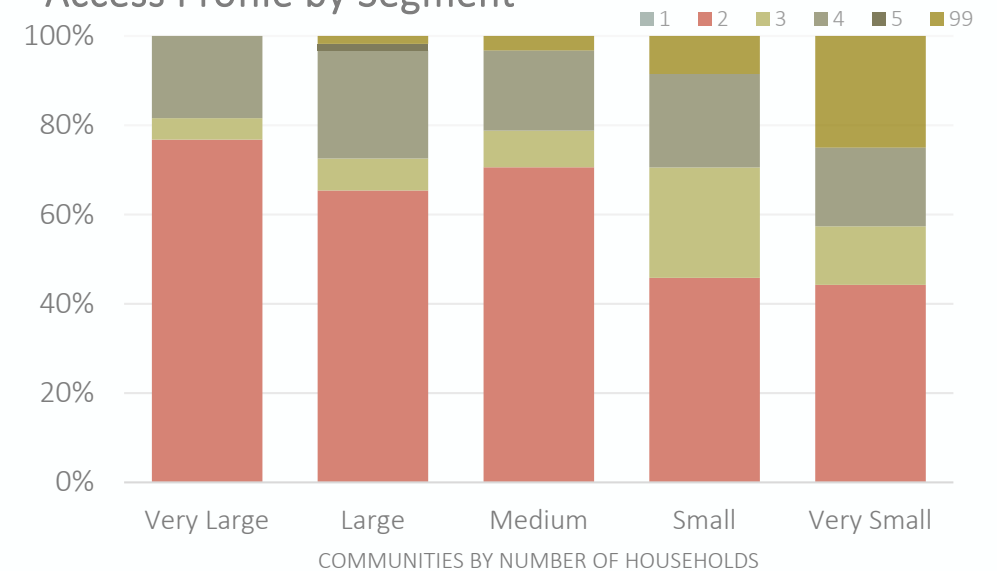
- Communities Searched

Community Access-to-Recycling Analysis

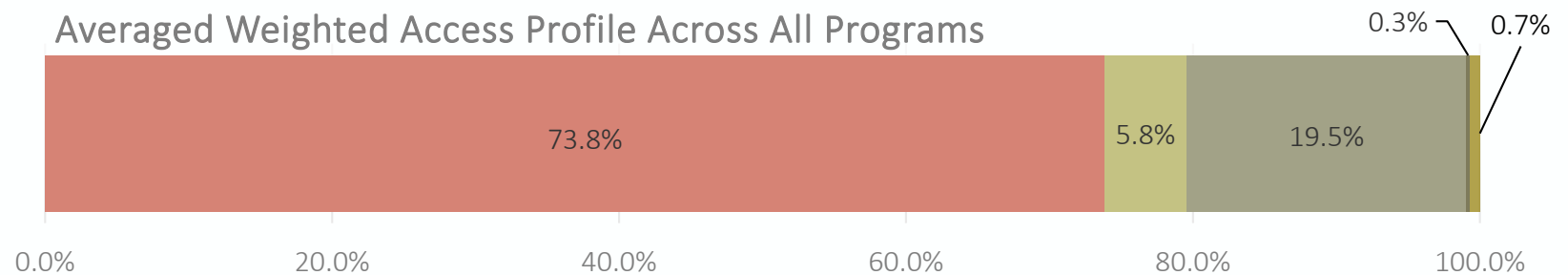
Communities marked as one of the following:

- 1 – Yes, explicitly mentioned/pictured package
- 2 – Yes, implicitly included via proxy package (similar use or material)
- 3 – All of a specific material (in this case, 'All Paper')
- 4 – No, implicitly prohibited via proxy package (similar use or material)
- 5 – Explicitly prohibits package
- 99 – No program available

Access Profile by Segment



Averaged Weighted Access Profile Across All Programs



Community Access-to-Recycling Analysis

Federal Trade Commission's Green Guidelines – the Recycling Mobius

Unqualified Recycling Claim

60% of US population must have access to a curbside or drop-off program that accepts the material



ONLY WHERE FACILITIES EXIST

Qualified Recycling Claim

30% of households must have to access to a curbside or drop-off program that accepts the material

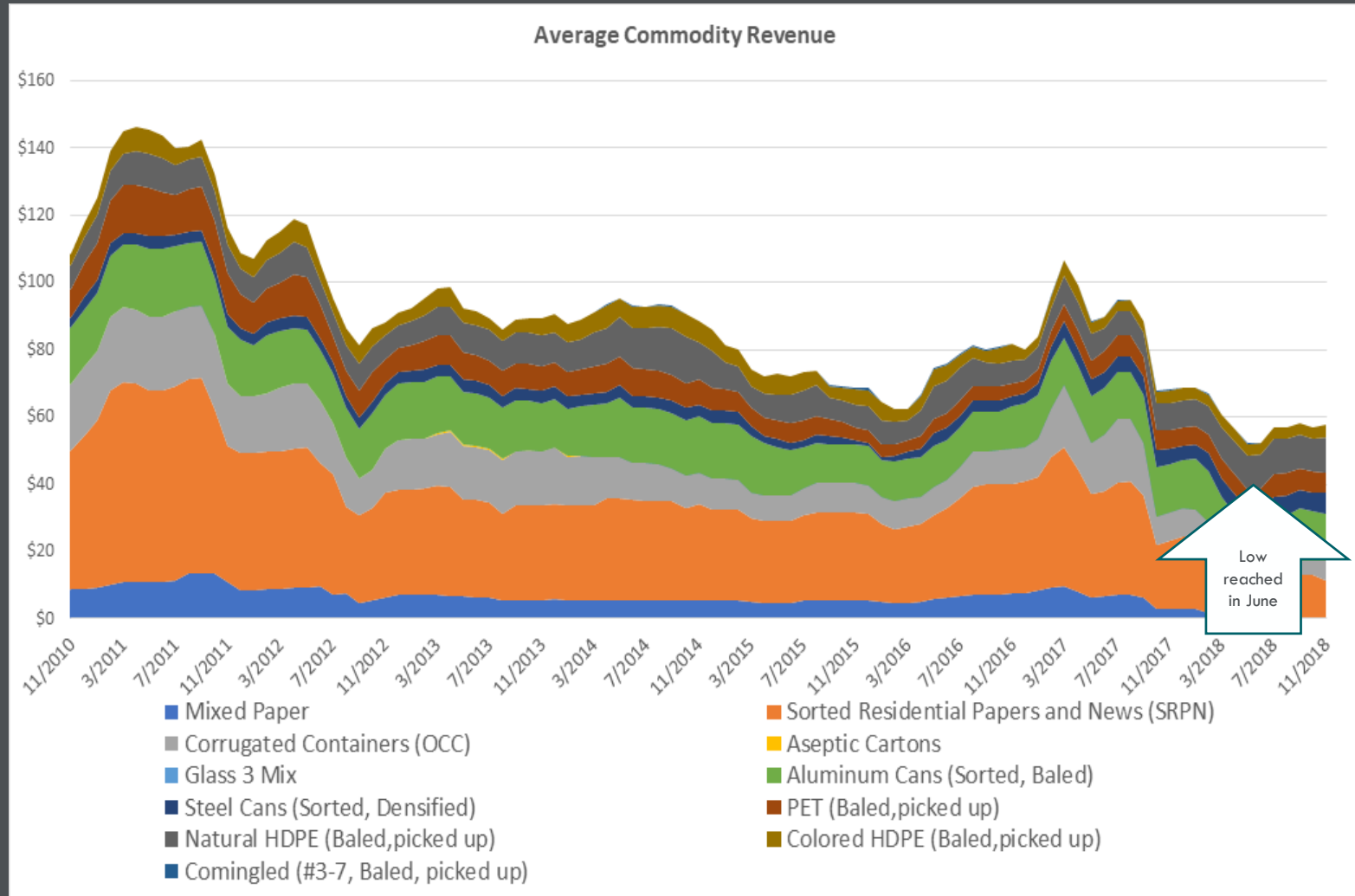
Minimum Recycling Claim

For less than 30 % access or possibly rejected by recycling facilities; also a safe place to start for a new package: “This product is recyclable only in a few communities that have appropriate recycling programs”

STORY OF THE QUARTER

Biggest developments in commodities market...

ACR Pricing at MRFs at new structural level (US\$ Graph), stabilizing since last July





Behind the biggest developments in commodities market...

Roaring World & North American Economies

- World 3.7% GDP growth (annualized)
- US 3.6%, Canada 2.1%, Mexico 2.19% GDP rate
- Unemployment - US 3.7%, Canada 5.6%, Mexico 3.2%,

Consumers are Spending, confident

- Consumer spending trends in line with GDP growth

Demand remains very good for paper & packaging

- Containerboard expected >4% CAGR through 2020,
- Paperboard 4.5%,
- Aseptic packaging >6%,
- Tissue 2%, printing/writing down over 15% (only digitalization down)
- Plastic bottles and containers growing at 6%
- Metal cans consumption 3.1% worldwide worldwide growth



Yet... commodities may get worse

Economic cycle peaked?

- High Stock market turbulence, no gains in any major indices YOY- SP/TSX index down over 8%
- Oil falls to \$51 per barrel
- Marked slowdown in the Chinese economy, 6% growth rate breach?
- German economy contracts .02%, mirroring European slowdown
- Despite tax cuts US economy slows after peaking in
- Thousands high paying job cuts in the US and Canada since Oct. 1

Commodities- bellwether slowing & instability

- Rapid drop in OCC pricing (of over \$51/ton)
- Pulp and containerboard inventories growing, mill downtime increasing, and sudden downward pressure on pricing on all paper grades (December)
- Aluminum scrap prices peaked in April/May
- After strong rally, natural gas and PE spot resin prices volatile



CHINA AND EXPORT DEVELOPMENTS

- China imported >60% of the world's total plastic - dropped this past year to nearly nothing
- China actions well-intentioned and not punitive:
 - Promise kept
 - Environmental catastrophe and OOC manufacturing curtailed
 - Desire to source all materials domestically (raw and recycled)
 - An evolving recycling infrastructure
 - 0.5% contamination rate furthers local solid waste development process
- Buying before quotas leads to speculatively high inventory and price drops in November on all imported grades in December
 - Inventory high
 - Prices down
- Increased customs enforcement to capture illegal waste being imported is also slowing things down, and providing an additional disincentive to importers of recyclables.
 - container rejections increasingly common- strict enforcement
- Vietnam, Malaysia, SE Asia crack down on mixed scrap imports
- China 25% tariffs on US recovered paper, aluminum and plastic resins affects buying in PNW, Midwest

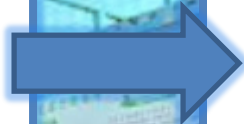
China is taking steps to draw on domestic recycling



Community Collection Point in Shanghai (Xinhua News)



Overall Recycling Rate:
17% in 2015



Goal Recycling Rate:
50% in 2025

Current Categories

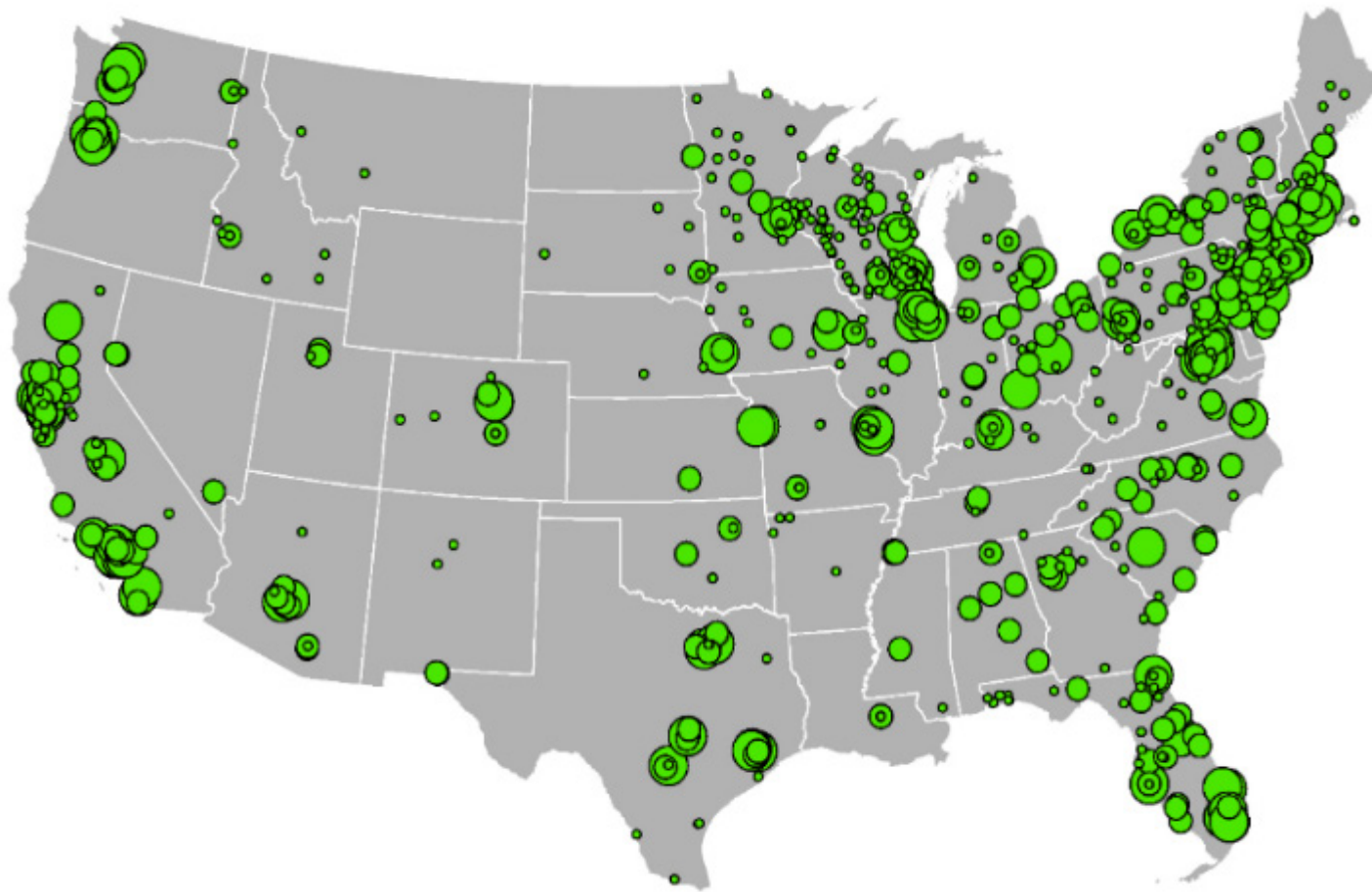
- Hazardous waste (red)
- "Dry" waste (other waste; black)
- "Wet" waste (kitchen scraps; grey/green)
- Recycling (blue)
 - Aluminum
 - Glass
 - Paper
 - Plastic

Community Collection Point in Guangzhou (Guangzhou Daily)



Huangxiang (just west of Shanghai) installed first intelligent garbage sorting and recycling machine. This machine electronically credits residents for their recycled materials – "paid recycling" system. ([Wuxi Government](#))

US Material Recovery Facilities (MRFs)

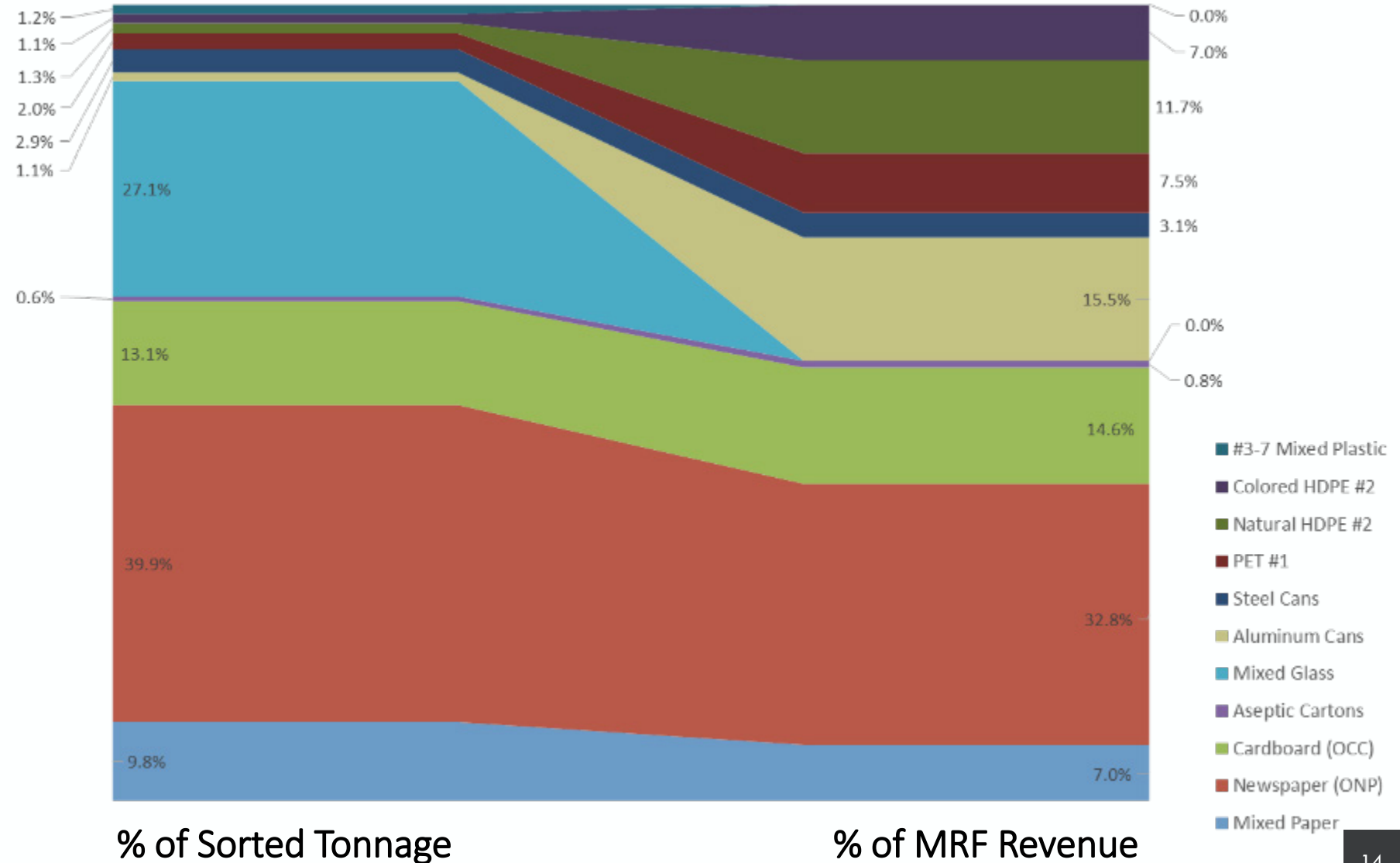


MRF Size:	Large	Med-Large	Med-Small	Small
Portion of US Tonnage:	55%	20%	19%	6%

- Most US MRFs are designed to handle rigid containers, newspapers, office paper and corrugated
- Size and form are known factors impacting successful sortation to target bales in the US MRF
- #3-7 Plastic US MRF acceptance is undergoing significant changes due to market pressures
- Most US MRFs are experiencing both a change in the materials received and the markets purchasing their material

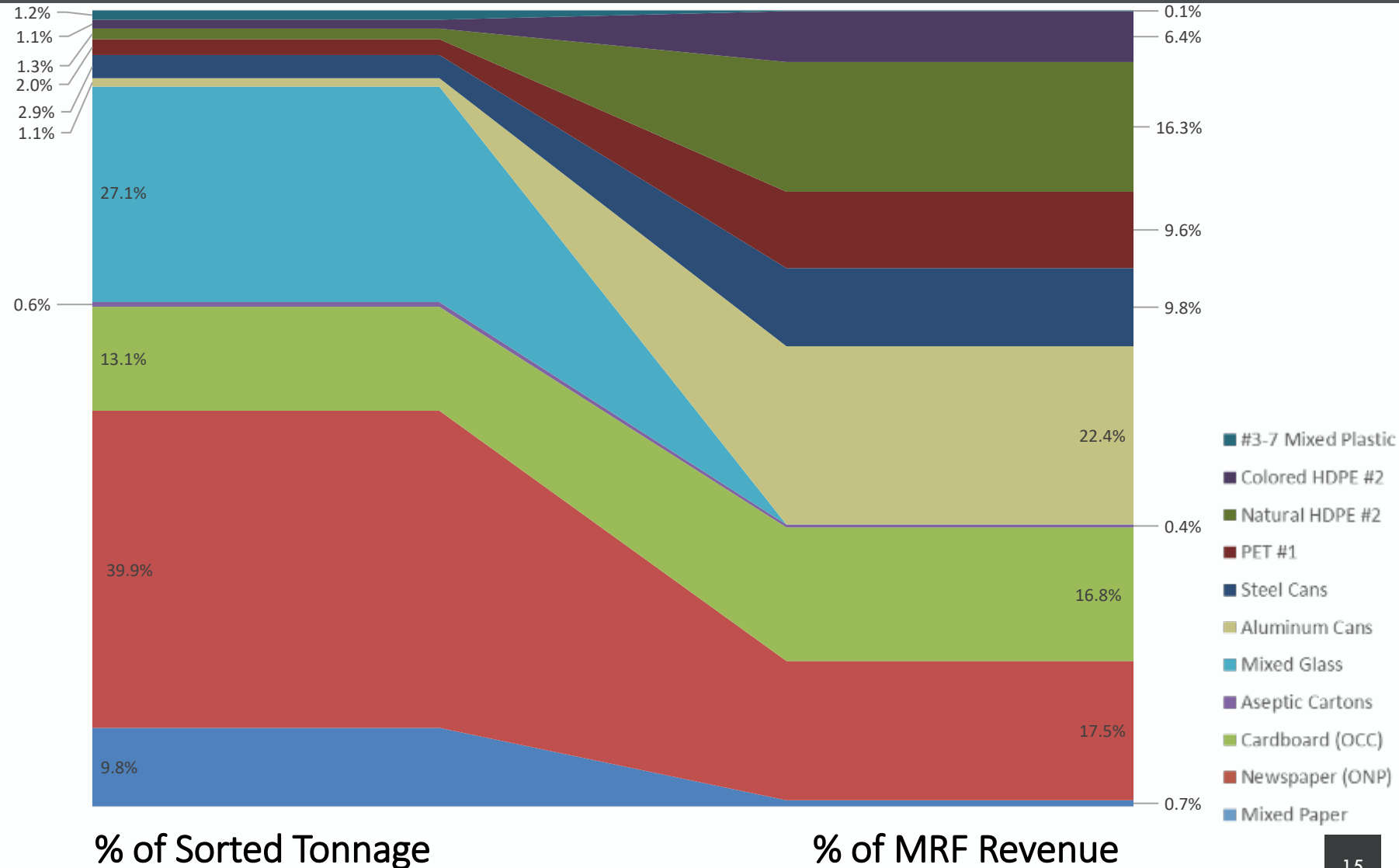
US MRF to End Market Relationship | Aug 2015

- Many US MRFs are privately owned or operated & need to make a profit to operate
- Others are public and expected to operate without additional funding or within a tight budget that includes income from commodity sales
- US MRF clients expect facilities to handle certain materials (tonnage on the left), though that expectation is shifting with new China import policies and tariffs.
- However, US MRFs have to operate within the budget provided by commodity sales (value of tonnage on the right).



US MRF to End Market Relationship | Nov 2018

- The recycled commodities outlook as changed for US MRFs either directly by losing buyers in China or indirectly by losing significant value in several commodities
- MRF clients' expectations are shifting with new China import policies and tariffs, so some MRFs are dropping glass, mixed plastics, mixed paper, etc.
- In addition to the shifts in MRF sales composition, the overall price for the combined MRF commodity sales is down significantly



NEW ANNOUNCED RECYCLED FIBER CAPACITY

Company	Project Type	Time Frame	Capacity (tons per year)	Recycled Inputs
Bio Pappel / McKinley Paper CO, Port Angeles	Re-open and Conversion to Containerboard	Q3 2019	250,000	OCC, RMP (rumored)
GP Juno Project, Toledo, Oregon	Front end bolt on to linerboard mill	Permitting, considered pilot	110,000 (40% wood chips, 60% #12 OCC (expand to use unsorted MSW))	RMP, Unsorted feedstock (see later slide)
Pratt Ohio	New Mill, Containerboard	Q4 2019	360,000	OCC, RMP
ND Paper Biron, Wisconsin	Mill Conversion to recycled pulp	Q4 2019	700,000	OCC, RMP
ND Paper Rumford, Maine	Mill Conversion to recycled pulp	Q4 2019	480,000	OCC, RMP
ND Paper Old Town, Maine	Unbleached pulp	Q1 2019	350,000	OCC, RMP
ND Paper Fairmont, West Virginia	Mill conversion to containerboard from deinking	Q2 2019	218,000	RMP, high grades
Midwest Paper Group	Conversion to Containerboard	Operating	350,000	OCC
Green Bay Packaging	Mill Rebuild	Q1 2021	650,000	OCC, RMP

MARKET CAPACITY | RECYCLED FIBER MILL DEVELOPMENT





**PROGRESS ON
DEVELOPMENT
OF NEW
RECYCLING
TECHNOLOGIES**

Continuous Materials & ReWall

- Make recycled roof board
- Bought ReWall current operations
- Testing for wider use

Georgia Pacific to test MWPF and JUNO separation technology

- Recover unsorted fiber from the waste stream in Toledo, OR (in permitting)

Merlin/Revital Ineos line

- Mono-depolymerization of PS packaging



OTHER MACRO MARKET INFLUENCING EVENTS

Economic backlash against the rise of globalization

- Norms of trade upended (i.e. Trump, China ban)
- Protectionist leaders and policies emerge
- Messy Brexit exit
- Escalation in Chinese/US trade war
- No joint communique issued at G20

Sustainable Materials Management/LCAs

- New metrics for recycling effectiveness introduced
- Growing movement in PNW, large service providers
- Low scores leads to exclusions of materials in Oregon and Washington

- Other Asian markets cushioned the blow, now leaving the market, Vietnam, Thailand, Malaysia, Indonesia, and India are filling up

Physical and Psychological Influences on Price



PAPER

- Paper down 40% since 2017, poised to drop
- ONP/free sheet demand continues to weaken
- China economic slowdown
- Continued freight challenges



PLASTIC

- Crude oil drops 20% after rising for 2 years
- Strength in HDPE held up market
- Resin volatility after historic rise
- PET down, PP steady
- 3-7 exports
 - SE Asian countries rising restrictions on slows exports



GLASS

- OI makes new public commitment to recycled content due to customer pressure
- Capacity loss continues (Atlanta, Milton, MA)
- Higher tipping fees and SMM scores used to remove glass from US programs



METALS

- 50% US tariffs affect long-freight can from west coast.
- Prices down 15% from mid-year highs
- MRF prices much lower
- 50% tariff does not help

Macro Economic Events

NAFTA Resolution

- Renamed “The US Mexico Canada Agreement” (USMCA)
- Still needs to pass respective legislative processes

Canadian Zero Plastic Waste Strategy

- All Plastics and packaging reusable/recyclable
- Collaborate with plastics packaging companies to improve plastic waste collection, and infrastructure
- Capture and remove the plastic litter from shorelines and in nearshore waters.

New Plastics Economy Global Commitment

- Elimination of problematic or unnecessary plastic packaging
- Reuse models applied, single-use re-evaluated
- All plastic packaging is 100% reusable, recyclable or compostable
- Safe plastic packaging



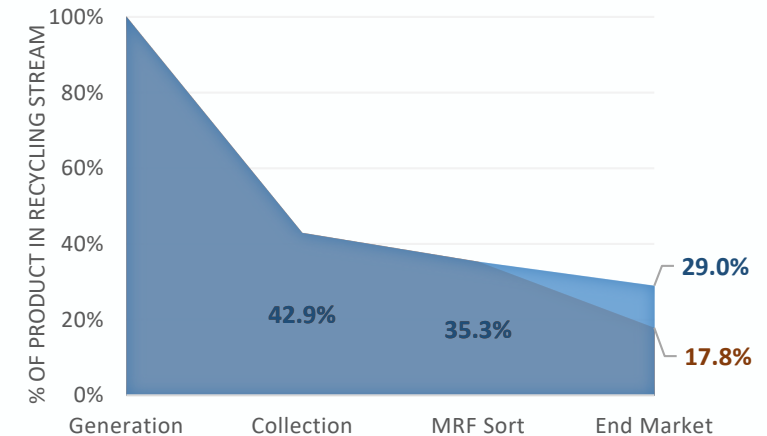
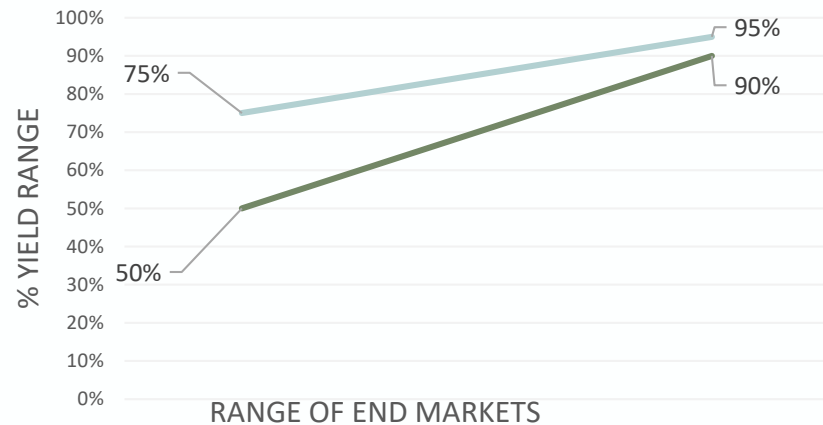


REAL TIME IMPACT

NEXT QUARTER

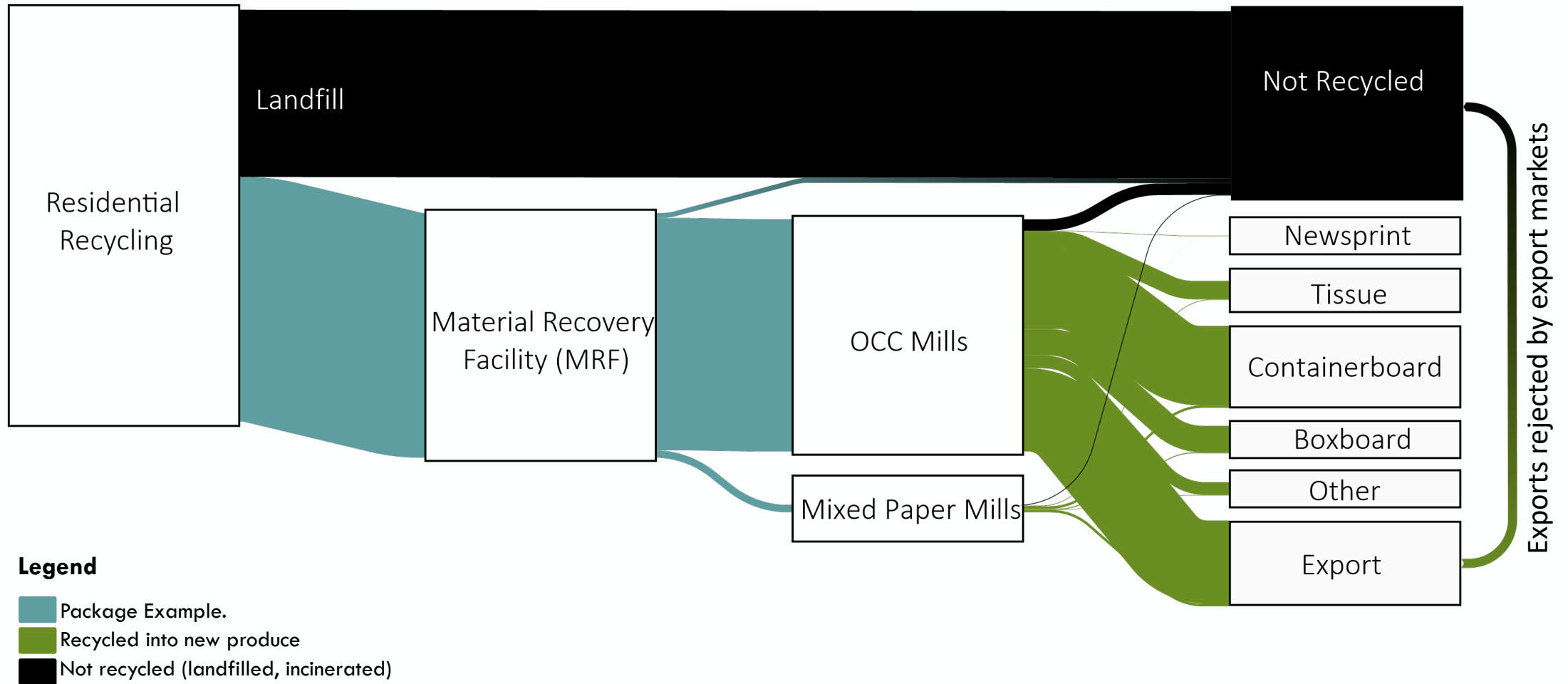
- “Harmonization” and the service provider alliance to try to limit residential recycling
- Continued MRF pricing pressures will lead to closures
- ISRI changing inbound specification for curbside
- Bright side: more processors use the materials to meet sustainability goals set by customers
- Lower pricing due to economic slowdowns (but not economic stops)
- Will capacity increase? Timing uncertain ...historical tale of announcing at peak of economy
- Rumbblings in non-deposit areas high
- UBC from MRFs under assault. Alcoa “out of the market”... Markets limited to non-UBC kiln opportunities.

End Market — presence, quality, acceptability



- Success rate at the end market depends on the quality of the commodities being delivered, but also the type of processing and products that are made at the that end market.
- Larger market forces, like China's new import policies, can shift the likelihood of a package or material making it to the new products – to get fully recycled according to what consumers expect.
- How much of a package or product gets into new product depends on many variables at each major stage of recycling
 - Collection Participation Rate
 - Access-to-Recycling
 - Ability of sorting facilities to sort to the right commodity
 - Markets being available and economically feasible for the commodity
 - Demand for the type and quality of material coming from sorting facilities

Material Flow Sankey Diagram





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