

NATIONAL ACADEMIES OF
SCIENCES, ENGINEERING & MEDICINE

Costs and Approaches for Municipal Solid Waste
Recycling Programs

MSW Recycling Flow in the U.S.

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Washington, DC
April 16, 2024

I AM FOCUSING ON WHAT GETS RECYCLED AT THE CURBSIDE & END USES FOR THOSE
RAW MATERIALS

- NOT GETTING INTO YARD OR FOOD WASTE

BUT FIRST, SOME CAVEATS

CAVEATS

MSW data is imperfect

Recycling data is imperfect & subject to methodology

- E.G., groups use statistics that promote their goals but are out of context or use faulty methodology

Product loss is inherent in recycling

EPA'S TOP DOWN APPROACH RELIES ON A MIX OF US DOC PRODUCT MANUFACTURING DATA, PRODUCT LIFE SPAN ESTIMATES & WASTE CHARACTERIZATION FOOD & YARD WASTE ESTIMATES
EPA HAS THREE CATEGORIES OF MSW

- DURABLE (MORE THAN 3 YEARS OF USEFUL LIFE)
- NON-DURABLE (LESS THAN 3 YEARS OF USEFUL LIFE)
- PACKAGING (ASSUMED TO BE LESS THAN 3 YEARS OF USEFUL LIFE)
- EPA COVERS GENERATION, DISPOSAL & RECYCLED/COMPOSTED & MANAGED BY OTHER FOOD PATHWAYS
- CONSISTENT METHODOLOGY UNTIL 2018
- BEST USED FOR MATERIAL-SPECIFIC DATA & TRENDS
- EPA RECYCLING DATA USUALLY FROM INDUSTRY ASSOCIATIONS

THE BOTTOM UP APPROACH RELIES ON STATE MSW DISPOSAL DATA FOR DISPOSAL TONNAGES

- ASSUMES DESCRIPTION OF MATERIALS WHEN ARRIVE AT TRANSFER STATION/DISPOSAL FACILITY ARE ACCURATE
- INEVITABLY INCLUDES CONSTRUCTION & DEMOLITION DEBRIS & OTHER NON-MSW DUE TO UNINENTIONAL OR DELIBERATE MISIDENTIFICATION

SEE:

- A REVIEW OF NATIONAL MUNICIPAL SOLID WASTE GENERATION ASSESSMENTS – TONJES & GREENE – WASTE MANAGEMENT & RESEARCH 30(8)758-771
- VARIATION IN MUNICIPAL SOLID WASTE GENERATION & MANAGEMENT ACROSS TIME & SPACE – FIRMANSYAH, ET AL – RESOURCES, CONSERVATION & RECYCLING 204 107472

WHAT ARE THESE & WHERE DO THEY GO?



MONTGOMERY COUNTY DEP

RECYCLABLES ARE SIMPLY **RAW MATERIALS LOOKING FOR BUYERS**

- UNIQUE RAW MATERIAL B/C SUPPLY IS MANDATED
- *DEMAND MIGHT BE "MANDATED" UNDER MINIMUM CONTENT LAWS BUT PRICE CAN'T BE MANDATED*

RECYCLABLES ARE BOUGHT NOT SOLD

BUYERS WANT

- CONSISTENT QUANTITY
- CONSISTENT QUALITY
- AT AN ACCEPTABLE PRICE
- LOOKING FOR THAT SWEET SPOT WHERE BUYERS & SELLERS ARE HAPPY & NO ONE IS STEALING THE RECYCLABLES

NOTE: RECYCLABLES CAN BE CIRCULAR BUT MANY MARKETS AREN'T AS THE SLIDES POINT OUT

- **LOCAL GOVERNMENTS & MRFS ARE MORE INTERESTED IN REVENUE THAN MEETING CIRCULARITY CRITERIA**

STEEL CANS



CHEMISTRY WORLD

STEEL



STEEL FABRICATION SERVICES

WHERE DO THEY GO?

STEEL CANS CAN BE MADE INTO ANY STEEL PRODUCT

- ALL YOU NEED TO SORT IS A MAGNET
- ELECTRIC ARC FURNACES, 70 PERCENT OF US STEEL PRODUCTION, RELY ON STEEL SCRAP OF ALL KINDS

STEEL RECYCLING RATE 2018 EPA DATA:

- CANS: 1,290 MT, 70.9%
- ALL PACKAGING: 1,630 MT, 73.8%
- NONDURABLES & DURABLES: NA
- TOTAL FERROUS: 6,360 MT, 33.1%

EPA DATA FOR 2018 (MOST RECENT):

- https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
- ALL STEEL DATA, TABLE 7
- PACKAGING SPECIFIC DATA, TABLES 24 & 25

INDUSTRY RECYCLING DATA FOR 2019:

- STEEL CONTAINERS: 63.2% & OVERALL STEEL: 69%
- <https://www.steel.org/wp-content/uploads/2021/08/AISI-and-SMA-Steel-Recycling-Rates-Report-Final-07-27-2021.pdf>

ALUMINUM CANS



RECYCLING TODAY

ALUMINUM CANS



ALL AMERICAN 930 ALUMINUM FOUNDRY

WHERE DO THEY GO?

ALMOST AS EASY AS STEEL BUT ALUMINUM PRODUCTS ARE ALLOY SPECIFIC

- ALUMINUM CANS CAN ONLY BE USED TO MAKE ALUMINUM CANS
- REQUIRES AN EDDY CURRENT SEPARATOR

ALUMINUM RECYCLING RATE 2018 EPA DATA:

- CANS: .670 MT, 50.4%
- PACKAGING: .670 MT, 34.9%
- NONDURABLES & DURABLES: NA
- TOTAL ALUMINUM: .670, 17.2%

EPA DATA FOR 2018 (MOST RECENT):

- https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
- ALL ALUMINUM DATA, TABLE 7
- PACKAGING SPECIFIC DATA, TABLES 24 & 25

INDUSTRY DATA: 2022

- 45.2% CONSUMER RECYCLING RATE
(https://www.aluminum.org/sites/default/files/2023-09/EPW-Subcommittee-Testimony_092823.pdf)

GLASS BOTTLES



CAP GLASS

WHERE DO THEY GO?

GLASS BOTTLES HAVE DIFFERENT COLORS WHICH COMPLICATES MAKING THEM BACK INTO NEW BOTTLES

- BOTTLES FROM BEVERAGE CONTAINER DEPOSIT STATES & POSSIBLY FROM DUAL STREAM COLLECTION PROGRAMS CAN BE MADE INTO BOTTLES
- MIXED COLOR CULLET IS TURNED INTO FIBERGLASS OR A VARIETY OF AGGREGATE MARKETS

GLASS RECYCLING RATE EPA DATA: 2018

- BOTTLES & JARS: 3,060 MT, 31.3%
- DURABLES: NA
- TOTAL: 3,060 MT, 255

EPA DATA FOR 2018 (MOST RECENT):

- https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
- ALL GLASS DATA, TABLE 6
- PACKAGING SPECIFIC DATA, TABLES 24 & 25

GLASS INDUSTRY DATA: 2022

- GLASS BOTTLES & JARS: 31.3%
- <https://web-assets.bcg.com/56/7c/6670ab5741579ab31767b5a10bc1/gpi-brochure-v19-bcg.pdf>

GLASS CULLET



CAP GLASS

MIXED UNSORTABLE BROKEN GLASS – CULLET – IS TURNED INTO FIBERGLASS OR AGGREGATE FOR A VARIETY OF USES

- FIBERGLASS INDUSTRY AN AGGRESSIVE USER DUE TO IMPROVED PROCESSING TECHNOLOGIES THAT ELIMINATE CERAMICS FROM CULLET & NO COLOR REQUIREMENTS
- OTHER USES INCLUDE REFLECTIVE PAINT, MATCH HEADS, GLASPHALT, ETC.

PAPER

Two types of pulp

- Chemical (kraft) & mechanical (groundwood)
- Chemical by far the most common

Packaging is 62% of paper generation

- Mostly boxes
- Printed paper 24% & declining
- Tissue, towel, plates, “other” the remainder

Most important recyclable in terms of weight & revenue

NOW WE GET MORE COMPLICATED

PAPER PRODUCTS ARE MADE FROM EITHER CHEMICAL (KRAFT) OR MECHANICAL (GROUNDWOOD) PULP

- KRAFT IS BY FAR THE LARGEST COMPONENT
- KRAFT IS USED FOR PACKAGING & MOST PRODUCTS
- GROUNDWOOD IS USED FOR NEWSPAPERS & SOME OTHER PRODUCTS

EPA PAPER DATA 2018:

- CORRUGATED BOXES ARE AMOST HALF OF THE PAPER WE USE
- PACKAGING IS 62%
- PRINTED PAPER ABOUT 24% & DECLINING
- TISSUE, TOWEL, PLATES, OTHER NONPACKAGING PAPER PRODUCTS 13.5%
- TISSUE & TOWEL PAPER & SMALL PIECES OF PAPER ARE UNRECYCLABLE ALTHOUGH COULD BE COMPOSTABLE

INDUSTRY RECYCLING DATA FOR 2022: ALL PAPER: 68%

- CORRUGATED BOXES: 93%
- <https://www.afandpa.org/news/2023/us-paper-and-cardboard-recycling-rates-continue-hold-strong-2022>

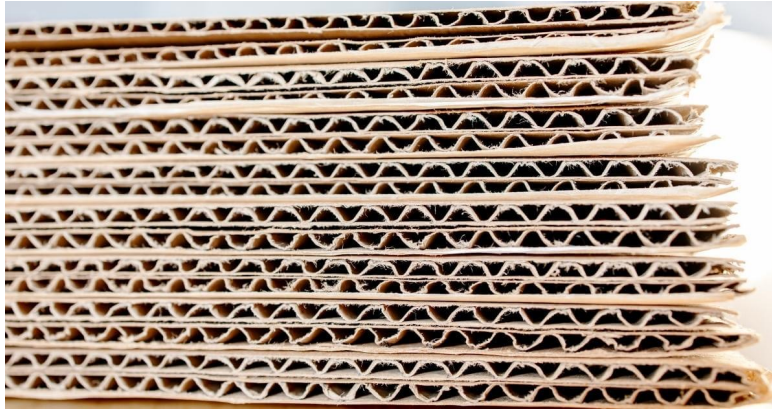
CORRUGATED “CARDBOARD” BOXES



WASTE360

LET'S LOOK AT THE TWO RESIDENTIAL GRADES STARTING W/CORRUGATED BOXES

LINERBOARD & CORRUGATED MEDIUM



BAY CITIES PACKAGING & DESIGN

WHERE THEY GO

CORRUGATED BOXES ARE MADE BACK INTO BOXES

- OR, MORE PRECISELY, THE TWO PRODUCTS THAT MAKE A BOX:
- LINERBOARD & CORRUGATED MEDIUM

EPA PAPER RECYCLING RATE 2018: 45,970 MT, 68.2%

- CORRUGATED BOX RECYCLING RATE 2018: 32,090 MT, 96.5%
- EPA ALL PAPER PACKAGING RECYCLING RATE: 33,890 MT, 80.9%
- https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
- ALL PAPER DATA, TABLE 5
- PACKAGING SPECIFIC DATA, TABLES 24 & 25

RESIDENTIAL MIXED PAPER



ROGUE DISPOSAL & RECYCLING

RESIDENTIAL MIXED PAPER, IS, AS YOU CAN SEE, A WIDE VARIETY OF PAPER

- NO GOOD DATA SOURCES FOR ITS TONNAGE OR RECYCLING RATES SINCE COMPOSITION VARIES SO MUCH

DUPLEX PAPERBOARD



BOX PACKING SOLUTION

<https://www.bboxpackingsolution.com/packaging-design-guidance/paper-materials-apply-for-paper-packaging/clay-coated-news-back-ccnb/>

CAN BE USED FOR BOXES, VARIOUS PAPER GRADES, MOLDED PULP, ETC.

- DUPLEX BOARD IS A UNIQUE KIND OF PAPERBOARD
- OFTEN USED FOR PHARMACEUTICAL PACKAGING, GARMENT BOXES, PAPER PLATES & CUPS

NOW WE GO TO PLASTICS WHICH, NO SURPRISE, ARE THE MOST COMPLICATED OF ALL

PLASTICS

Multitude of resins

- PET, HDPE & LDPE/LLDPE 78% of packaging resins
- LDPE/LLDPE, PP & HDPE 65% of all plastic resins in waste stream
- 12% of all resins and less than 3% of packaging resins are other resins

Packaging gets the most attention but is only 41% of plastic waste generated

- Nondurables are 21%
- Durables 38%

Plastic recycling rate is 8.7%

- Packaging is 2/3 of the plastics recycled
- Durables are most of the rest and are an array of carpet, mattress, clothing, electronics, etc.
- Packaging recycling rate is 13.6%
- 29% of plastics packaging is “bags, sacks & wraps” – 10% recycling rate
- 31% of plastics packaging is “other” – coatings, closures, trays, loose fill, clamshells, etc. – 2.7% recycling rate

All data EPA 2018

DATA EPA 2018 TABLE 8, https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf

THIS IS WHY PLASTIC RECYCLING IS SO DIFFICULT

- SO MANY RESINS
- SO MANY PRODUCTS & APPLICATIONS
- SO MUCH UNIQUE VERSATILITY IN USE

A UNIVERSAL RECYCLING PROCESSING TECHNOLOGY DOES NOT EXIST

LET’S LOOK AT THE PRIMARY PLASTIC PRODUCTS COLLECTED AT THE CURBSIDE
STARTING W/PET

PET BOTTLES



GREENMAX INTCO RECYCLING

WHERE THEY GO

PET BOTTLES ARE MADE BACK INTO BOTTLES OR FIBER (CARPET/CLOTHING, ETC.) PRODUCTS

- FIBER COMPANIES CREATED PET RECYCLING & WERE THE PRIMARY MARKET UNTIL 2020
- NOW A LARGER PERCENTAGE GO TO BOTTLE MARKETS – THEN FIBER – THEN OTHER END USES

EPA PET BOTTLE RECYCLING RATE 2018: 910 TT, 29.1%

- https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
- ALL PLASTIC DATA, TABLE 8
- PACKAGING SPECIFIC DATA, TABLES 24 & 25

INDUSTRY RECYCLING DATA FOR 2022:

- PET BOTTLES 29% <https://napcor.com/news/2022-pet-recycling-report/>
- STINA/ISRI/NAPCOR REPORT 1,910.8 Millions of Pounds) <https://resource-recycling.com/recycling/wp-content/uploads/sites/3/2024/04/Post-Consumer-Recycling-Data-PR-3-28-2024.pdf>

PET CLAMSHELLS



HARDY PACKAGING LTD

PET CAN ALSO BE USED TO MAKE CLAMSHELL CONTAINERS, PRODUCE TRAYS & OTHER PLASTIC PACKAGES

- THIS IS A SLIGHTLY DIFFERENT MANUFACTURING PROCESS
- CLAMSHELLS CANNOT BE RECYCLED W/PET BOTTLES TO MAKE BOTTLES
- HOWEVER CLAMSHELLS CAN BE RECYCLED W/PET BOTTLES TO MAKE FIBER PRODUCTS
- THE CLAMSHELL RECYCLING RATE IS UNKNOWN <https://napcor.com/news/2022-pet-recycling-report/>

NATURAL HDPE BOTTLES



BIFFA

WHERE THEY GO:

NATURAL HDPE BOTTLES & JUGS ARE USED FOR MILK, WATER & SOME FRUIT JUICES

- BECAUSE THEY ARE NOT DYED THEY CAN BE COLORED & USED BY MANY END MARKETS
- THEIR PRIMARY MARKET IS NON-FOOD-CONTACT COLOR HDPE PACKAGES SUCH AS DETERGENT& SHAMPOO BOTTLES

EPA NATURAL HDPE BOTTLE RECYCLING RATE 2018: 750 TT, 29.3%

- https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
- ALL PLASTIC DATA, TABLE 8
- PACKAGING SPECIFIC DATA, TABLES 22 & 24
- STINA/ISRI/NAPCOR REPORT: ALL HDPE BOTTLES 846.8 MILLION POUNDS:
<https://resource-recycling.com/recycling/wp-content/uploads/sites/3/2024/04/Post-Consumer-Recycling-Data-PR-3-28-2024.pdf>

COLOR HDPE PACKAGING



BERG MILL SUPPLY

COLOR HDPE IS WIDELY USED FOR SHAMPOO, DETERGENT & OTHER BOTTLES & JUGS & TOOTHPASTE TUBESE & A HOST OF NON-FOOD CONTACT PACKAGES

WHERE THEY GO

THE DYES CANNOT BE REMOVED FROM THE RESIN IN MECHANICAL PROCESSING

- AS A RESULT, THESE COMMON PACKAGES GO TO NON-PACKAGING USES SUCH AS PIPES

EPA OTHER HDPE PLASTIC CONTAINER RECYCLING RATE 2018: 220TT, 18.1%

- https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
- ALL PLASTIC DATA , TABLE 8
- PACKAGING SPECIFIC DATA, TABLES 22 & 24
- STINA/ISRI/NAPCOR REPORT: <https://resource-recycling.com/recycling/wp-content/uploads/sites/3/2024/04/Post-Consumer-Recycling-Data-PR-3-28-2024.pdf>

PIPE



ADS

WHERE COLOR HDPE PACKAGES GO

PIPING & OTHER CONSTRUCTION-RELATED MARKETS

- WHO CARES ABOUT THE COLOR OF THE SEWER OR WATER PIPE?
- DISPLACES VIRGIN PLASTIC IN A PRODUCT THAT CAN LAST FOR A CENTURY

POLYPROPYLENE PACKAGING



GREEN PHILLY

PAINT PAILS



KW PLASTICS

WHERE THEY GO

POLYPROPYLENE PACKAGING IS RECYCLED INTO PACKAGES OR A WIDE VARIETY OF DURABLE PLASTIC PRODUCTS SUCH AS TOYS, BATTERY CASES, GARDEN TOOLS, FIBER

- DO NOT CURRENTLY GO BACK INTO FOOD CONTACT BOTTLES
- THIS IS KW PLASTICS “TRU-SNAP” PAINT CONTAINERS
- MADE FROM 100 PERCENT RECYCLED PP

EPA PP RECYCLING RATE 2018: 20TT, 8%

- https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
- ALL PLASTIC DATA , TABLE 8
- PACKAGING SPECIFIC DATA, TABLES 22 & 24
- STINA/ISRI/NAPCOR REPORT: PP & OTHER BOTTLES: 26.4 MILLIONS OF POUNDS:
<https://resource-recycling.com/recycling/wp-content/uploads/sites/3/2024/04/Post-Consumer-Recycling-Data-PR-3-28-2024.pdf>

PLASTIC FILM



BENNINGTON COUNTY SOLID WASTE ALLIANCE

DATA IS SKETCHY “BAGS, SACKS & WRAPS”:

- 4,200 MT GENERATED 2018
- 420 TT RECYCLED 2018 – 10% RECYCLING RATE
- https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
- ALL PLASTIC DATA , TABLE 8
- PACKAGING SPECIFIC DATA, TABLES 24 & 25
- STINA/ISRI/NAPCOR REPORT: FILM: 1,110.3 MILLIONS OF POUNDS:
<https://resource-recycling.com/recycling/wp-content/uploads/sites/3/2024/04/Post-Consumer-Recycling-Data-PR-3-28-2024.pdf>

WHERE THEY GO

PLASTIC LUMBER THE PRIMARY MARKET

NOTICE WHAT IS MISSING?

FLEXIBLE PACKAGING



QUORA

NOT DIRECTLY FOUND IN EPA DATABASE

WHAT IS IT?

- A PACKAGE THAT LOSES IT SHAPE WHEN EMPTY
- MADE OF "ANY COMBINATION OF PAPER, PLASTIC FILM & FOIL"
- TYPICALLY IS A BAG, FILM, LIDDING, OVERWRAP, POUCH, ROLLSTOCK, SLEEVE OR WRAP
- SECOND LARGEST PACKAGE W/19% OF PACKAGING MARKET
- FOOD PRODUCTS BY FAR THE BIGGEST USER AT ABOUT 52% OF SHIPMENTS
- HIGHLY LIGHTWEIGHT W/TREMENDOUS ENVIRONMENTAL ADVANTAGES
- THOSE ADVANTAGES ALSO MAKE IT TREMENDOUSLY DIFFICULT TO RECYCLE

FLEXIBLE PACKAGING ASSOCIATION: <https://www.flexpack.org/>

EXPORTS



PHOTO: LA TIMES: THE PORTS OF LOS ANGELES & LONG BEACH

WHY DO WE EXPORT RECYCLABLES?

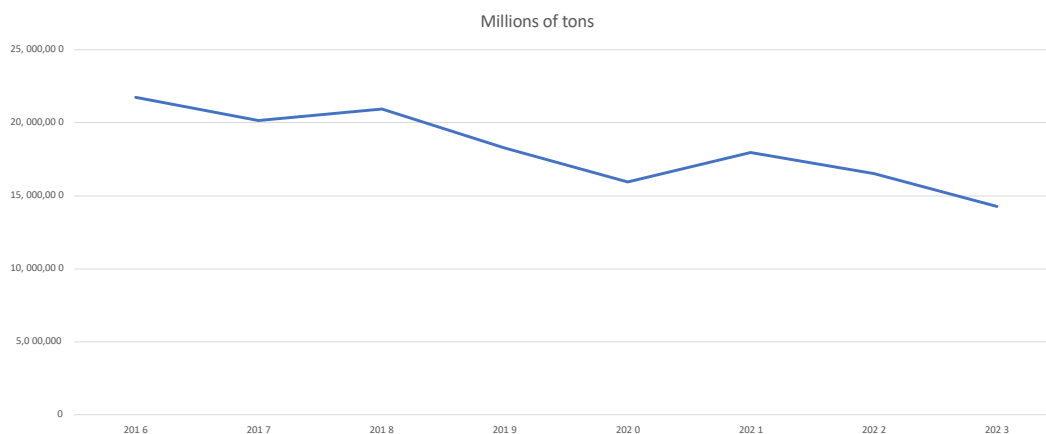
- BECAUSE SOMEONE WANTS THEM MORE THAN WE DO

METAL & PAPER THE BIGGEST EXPORTS

- TRACKED BY MILLIONS OF TONS
- WHEREAS PLASTIC BY BILLIONS OF POUNDS
- TOTAL PLASTIC EXPORTS LESS THAN 5% OF PAPER
- ALUMINUM CANS & GLASS CULLET/BOTTLES NOT EXPORTED

PAPER EXPORTS REMAIN IMPORTANT

RECYCLED PAPER EXPORTS 2016 - 2023



SOURCE: RESOURCE RECYCLING, FEBRUARY 13, 2024

PAPER EXPORTS DROPPED FROM 20.1 MILLION TONS IN 2017 TO 14.23 MT IN 2023

- DOWN 2.3 MILLION TONS FROM 2022 OR 13%
- DOMESTIC DEMAND IS UNDERCUTTING EXPORTS
- INDIA, THAILAND, & MEXICO RECEIVE SLIGHTLY LESS THAN HALF
- IMPORTS TO INDIA DOWN 31% & MEXICO DOWN 23%
- 67% OF EXPORTS OCC, 15% RMP
- OCC EXPORTS HAVE INCREASED WHILE RMP HAVE DECREASED OVER THE LAST DECADE

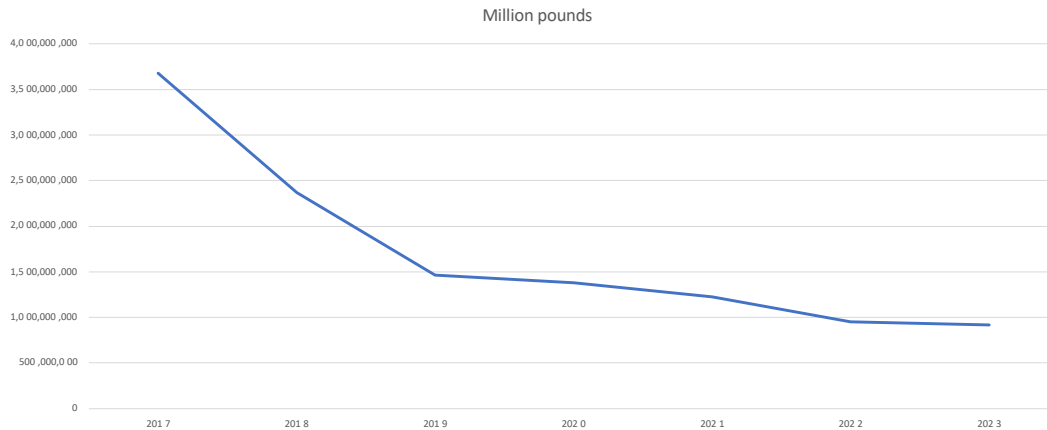
EXCESS CONTAINER CAPACITY HAS LOWERED CONTAINER RENTALS

- MIDDLE EAST WAR CAUSING BOATS TO GO SOUTH AROUND THE CAPE OF GOOD HOPE ADDING COST & TIME
- COLLAPSE OF KEY BRIDGE CAUSING PROBLEMS IN MID-ATLANTIC AREA

PAPER EXPORTS WILL BE BIG (1/3) AS LONG AS MANUFACTURING IS "OUTSHORED"

- RESHORING IN IN TERMS OF MANUFACTURING JOBS UP 263% FROM 2019

RECYCLED PLASTIC EXPORTS 2017 - 2023



EXPORT DATA RESOURCE RECYCLING, FEBRUARY 13, 2024

EXPORTS HAVE DROPPED 75% SINCE 2017 WHEN MORE THAN 3.7 BILLION POUNDS WERE EXPORTED

- DECLINE SLOWING

PLASTICS: 2023:

- 918 MILLION POUNDS
- A 3.5% DECLINE FROM 2022
- WORTH NOTING THAT PET & HDPE EXPORTS HAVE BEEN DECLINING FOR OVER A DECADE

WHY?

- CHINA & ALSO INCREASED DOMESTIC DEMAND
- CANADA & MEXICO GET 55 PERCENT
- BOTH COUNTRIES SLOWLY INCREASING COMBINED EXPORT PERCENTAGE
- PRIMARILY FILM & NON-BOTTLE RIGIDS

MIXED PLASTICS & POLYETHYLENE GRADES ARE EACH 37% OF THE EXPORTS

MATERIAL RECYCLING RATES & TONNAGES - 2018

MATERIAL	TONNAGE	PERCENT
Paper	45,970	68.2
Glass	3,060	25.0
Ferrous	6,360	33.1
Plastics	3,090	8.7

(Millions of tons – USEPA data)

https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
TABLE 2

NOTE – 2017-2018 – 2.1 MILLION TON INCREASE IN TONS RECYCLED BUT

- 3% DROP IN TOTAL MSW RECYCLED & COMPOSTED

CAUSED BY CHANGE TO EPA WASTE GENERATION METHODOLOGY WHICH FOUND AN
ADDITIONAL 23 MILLION TONS OF FOOD WASTE

PRODUCT RECYCLING RATES & TONNAGES - 2018

PRODUCT	TONNAGE	PERCENTAGE
Corrugated Boxes	33,260,000	96.5%
Glass Bottles/Jars	3,060,000	31.3%
Steel Cans	1,120,000	70.9%
Aluminum Cans	670,000	50.4%
PET bottles	910,000	29.1%
Milk bottles	220,000	29.3%
Other HDPE	290,000	18.1%
PP containers	20,000	8.0%
All plastic packaging	1,980,000	13.6%

(USEPA data)

https://www.epa.gov/sites/default/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf
TABLES 5-8

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