The Changing Waste Stream

Seattle Solid Waste Advisory Committee

Susan Robinson
Federal Public Affairs Director
Waste Management

October 1, 2014
WM Recycling Services

• WM handled over 15 million tons of recyclables in 2013
  ✓ Over 12.5 million tons of traditional recyclables
  ✓ 2.5 million tons of organics
• WM handles more residential recyclables than any other company in North America
• The amount of material processed at our single-stream MRFs has tripled since 2002

WM Recycling Facts

• 150 Material Recovery Facilities (MRFs), including:
  50 Single Stream MRFs      12 C&D MRFs;      80 other MRFs

• 50 Organics processing plants
<table>
<thead>
<tr>
<th>Recycling and Solid Waste in the U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Evolving Ton</td>
</tr>
<tr>
<td>What do these changes mean for recycling?</td>
</tr>
<tr>
<td>Where do we go next?</td>
</tr>
</tbody>
</table>
Waste generation and recovery rates in the U.S.

US EPA 2012 MSW Report
What’s in the Waste Stream?

Yardwaste and foodwaste = 28% of the waste stream

Traditional curbside recyclables = 51.8% of the waste stream

Source: US EPA, 2012
Impacts of changing waste stream on recycling

Trends and the Evolving Ton

Alternatives for hard to handle materials

Where are we going?
The Evolving Ton

• The materials and products we use in our daily lives have evolved
• Per capita waste generation is down 8% since 2000, affecting recycling, landfilling and waste-to-energy.
• We are seeing less paper, more plastic and no growth in metal.
Paper & Packaging Generation 1990 vs 2012
(thousands of tons)

Data from US EPA 2012 MSW Report

Courtesy RRS
Change in Paper and Packaging in 2012 since 1990

-8%
-6%
-4%
-2%
0%
2%
4%
6%

Declining prevalence
Increasing prevalence

% Change from 1990

- newspaper
- glass containers
- steel containers
- other paper & paperboard packaging
- aluminum foil, closures, etc.
- HDPE natural bottles
- other plastic containers
- plastic bags, sacks, & wraps
- PET bottles and jars
- other plastic packaging
- corrugated containers
2012 Paper and Packaging Recycling over Changing Landscape

Change from 1990-2012

Declining prevalence
Increasing prevalence

<table>
<thead>
<tr>
<th>Category</th>
<th>Declining (%)</th>
<th>Increasing (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>newspaper</td>
<td>70</td>
<td>30</td>
</tr>
<tr>
<td>glass containers</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>steel containers</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td>other paper &amp; paperboard packaging</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>aluminum containers</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>aluminum foil, closures, etc.</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>HDPE natural bottles</td>
<td>30</td>
<td>70</td>
</tr>
<tr>
<td>other plastic containers</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>plastic bags, sacks, &amp; wraps</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>PET bottles and jars</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>other plastic packaging</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>corrugated containers</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

Total other paper & cardboard goods
Change in the Recycling Industry

A history of change

Change is not new to our industry:

- Glass to aluminum
- Glass and aluminum to plastic
- Trend from source-separated collection to single stream collection
- Ongoing trend towards domestic market constriction and growth in export markets

What is different/the same in 2014?
Paper
A changing industry

• **Newspaper** has historically made up 60% of recyclables collected. All types of paper made up **80%** of the material we received for recycling.

• **A 50% reduction in newspaper** readership in last 10-years resulting in the consolidation/closure of major recycled **newsprint** mills in North America

• There is an increase in residential single stream material which has increased the volume of a grade called **Curbside Mixed Paper**.

• New low cost manufacturing technology in China competes with aging North American machines so more **Mixed Waste Paper** goes to China.
The Shrinking Newspaper

North American shipments of newspaper in millions of metric tons:

- This is a reduction of 50% over eight years
- The crunch created by high export demand, changing consumer practices and a crushing recession has been toughest on the domestic paper industry

<table>
<thead>
<tr>
<th>Year</th>
<th>Shipment (millions of metric tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>15.8</td>
</tr>
<tr>
<td>2005</td>
<td>12.7</td>
</tr>
<tr>
<td>2010</td>
<td>7.8</td>
</tr>
<tr>
<td>2011</td>
<td>7.3</td>
</tr>
<tr>
<td>2012</td>
<td>6.7</td>
</tr>
<tr>
<td>2013</td>
<td>6.4</td>
</tr>
</tbody>
</table>

Courtesy: Resource Recycling Magazine
Plastics

Impact of changing market conditions

• At the same time that paper grades have changed, plastics volumes are increasing
• Plastics made up 12.7% of the waste stream in 2011, up from 10.5% in 2010
• The 12.7% plastics in the waste stream by weight makes up over 25% of the waste stream by volume
• Use of single serve containers and plastic packaging is up
• Plastic bottles have “light weighted” - water bottles take up the same space (volume) but weigh up to 25% less
• Recyclers must process more bottles to get a ton, and these tons are more expensive to process.
• Our cost are incurred by volume and our revenue is by weight.

The changing waste stream means we process more volume with less weight which leads to higher processing costs
The evolving package

Glass jars, metal cap to PET jar, PP cap

• Light-weighting
• Flexible packaging expected to grow 3.5% annually in the next few years

HDPE Bottle, PP Cap to multi-layer, flexible film pouch

From steel can, paper label adhesive to multi-layer, foil-lined flexible film pouch
## Packaging comparison

<table>
<thead>
<tr>
<th>Package</th>
<th>Product Weight</th>
<th>Package Weight</th>
<th>Product: Package Ratio</th>
<th>Emissions Kg CO2 e / 8 oz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass bottles/ cap</td>
<td>8 oz</td>
<td>198.4 g</td>
<td>1:1</td>
<td>0.29</td>
</tr>
<tr>
<td>PET/cap</td>
<td>8 oz</td>
<td>22.7 g</td>
<td>01:1</td>
<td>0.18</td>
</tr>
<tr>
<td>UBC</td>
<td>8 oz</td>
<td>11.3 g</td>
<td>21:1</td>
<td>0.08</td>
</tr>
<tr>
<td>Pouch</td>
<td>6.75</td>
<td>5.7 g</td>
<td>35:1</td>
<td>0.02</td>
</tr>
<tr>
<td>Soup Can</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel can</td>
<td>108 oz</td>
<td>312.4 g</td>
<td>10:1</td>
<td>1.07</td>
</tr>
<tr>
<td>Pouch</td>
<td>108 oz</td>
<td>28.4 g</td>
<td>108:1</td>
<td>0.11</td>
</tr>
</tbody>
</table>

**What are the impacts of these changes on our MRFs?**

We are starting to see data that verifies trends and can see the implications...
Net impact on MRFs: Lighter inbound material

- The volume in a ton has increased with the loss of ton density.
- Inbound material at MRFs is now 45-60% paper and 40-55% containers
- Glass and residue is a greater percentage of our recycling mix

These all have implications on the design of MRFs, and increase the cost of recycling.
<table>
<thead>
<tr>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts of changing waste stream on recycling</td>
</tr>
<tr>
<td>The Evolving ton</td>
</tr>
<tr>
<td><strong>What makes something recyclable?</strong></td>
</tr>
<tr>
<td>What are we doing?</td>
</tr>
</tbody>
</table>
What makes something recyclable?

Collection

1. Convenient recycling collection is important for successful programs. Cart based single stream collection allows for broader collection and more types of materials collected (pro and con). It also increases recycling volumes collected and allows for collection.
2. At the same time, single stream recyclables often are wet, dirty and contains broken glass. The material is flattened during compaction, and the flatten recyclables may be mis-sorted.

Processing

1. Processing/sorting single stream recyclables requires both technology and labor.
2. There are physical limitations to what can be recycled. Equipment and staff may not be able to identify or separate certain materials.
3. Film plastic is the single biggest processing problem at MRFs. Food and moisture also challenge the process.

Marketing

1. Robust markets are critical for sustainable recycling. Volume + value = market.
2. Markets are global. WM exports 33% of its material - mostly paper, some PET, HDPE most 3-7 plastics.
3. There is a robust market for clean and dry film plastic film collected in take-back programs. None for film collected at curbside.
Single stream recycling is growing

Pros
• Convenient so more consumers recycle
• Single stream allows for broader collection and more types of materials collected (pro and con)
• Increases recycling volumes collected
• Allows for collection efficiencies

Cons
• Material gets wet and dirty
• Broken glass
• Flatten materials  mis-sorted materials
• Sorting requires technology and labor
• Films plastic collected in curbside programs have no markets due to moisture and dirt from collection and processing
• Wet material and food impede recycling, and can contaminate large volumes of material.

The statement “Anything can be recycled” has been taken too far
Screening inbound recyclables

• Stars screens use size and shape to sort containers from paper.
• Containers/smaller items drop through openings

• Pre-sorting does not remove everything
• Contamination wraps around the stars
• Openings are blocked
• Containers can’t fall down - they flow along with the fiber
Cleaning the Equipment

• Some of the material removed from the stars
• Staff is needed to remove this material throughout the day
Film Plastics in Disc Screens
Sample MRF #1: The Good

Inbound sorts by customer - averages:
- About 50% fiber (OCC, ONP, MWP)
- About 35% glass containers, plastics, metals
- Plastics is 10% (PET, HDPE and Mixed 3-7 plastics)

Inbound contamination averages: 5%

<table>
<thead>
<tr>
<th>Material</th>
<th>Material Sub</th>
<th>Shape</th>
<th>Color</th>
<th>Product Bale</th>
<th>Sum (lbs)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber</td>
<td>Aseptic-Gable Top</td>
<td>Aseptic</td>
<td></td>
<td></td>
<td>12</td>
<td>0.0%</td>
</tr>
<tr>
<td>Glass</td>
<td>Glass cullet &gt; 1/4</td>
<td>GP-250</td>
<td></td>
<td></td>
<td>8587</td>
<td>31.1%</td>
</tr>
<tr>
<td>Plastic</td>
<td>2 HDPE</td>
<td>Bottle</td>
<td>Colored</td>
<td>HDPE-C</td>
<td>313</td>
<td>1.1%</td>
</tr>
<tr>
<td>Plastic</td>
<td>2 HDPE</td>
<td>Bottle</td>
<td>Natural</td>
<td>HDPE-N</td>
<td>324</td>
<td>1.2%</td>
</tr>
<tr>
<td>Fiber</td>
<td>Mixed Paper</td>
<td>MixPpr</td>
<td></td>
<td></td>
<td>1469</td>
<td>5.3%</td>
</tr>
<tr>
<td>Plastic</td>
<td>Plastic 3-7</td>
<td>MxPlstc3-7</td>
<td></td>
<td></td>
<td>498</td>
<td>1.8%</td>
</tr>
<tr>
<td>Fiber</td>
<td>OCC</td>
<td>OCC</td>
<td></td>
<td></td>
<td>3466</td>
<td>12.6%</td>
</tr>
<tr>
<td>Fiber</td>
<td>ONP</td>
<td>ONP</td>
<td></td>
<td></td>
<td>9063</td>
<td>32.8%</td>
</tr>
<tr>
<td>Plastic</td>
<td>1 PET</td>
<td>Bottle</td>
<td></td>
<td>PET</td>
<td>1068</td>
<td>3.9%</td>
</tr>
<tr>
<td>Residue</td>
<td>Res</td>
<td>Res</td>
<td></td>
<td></td>
<td>1348</td>
<td>4.9%</td>
</tr>
<tr>
<td>Metal</td>
<td>Scrap Steel</td>
<td>ScrpStl</td>
<td></td>
<td></td>
<td>152</td>
<td>0.5%</td>
</tr>
<tr>
<td>Metal</td>
<td>Tin</td>
<td>Tin</td>
<td></td>
<td></td>
<td>720</td>
<td>2.6%</td>
</tr>
<tr>
<td>Metal</td>
<td>Aluminum</td>
<td>UBC</td>
<td></td>
<td>UBC</td>
<td>561</td>
<td>2.0%</td>
</tr>
<tr>
<td>Metal</td>
<td>Aluminum</td>
<td>NonUBC</td>
<td></td>
<td>UBC</td>
<td>18</td>
<td>0.1%</td>
</tr>
<tr>
<td>UBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>27599</td>
</tr>
</tbody>
</table>

Material Sub-Total: 579
Sample MRF #2: The Bad

Inbound sorts by customer Averages:
✓ ~65% fiber (OCC, ONP, MWP)
✓ ~35% containers (glass, plastics, metals)

Inbound contamination averages:
4-13%

Larger city programs:
7-13%

<table>
<thead>
<tr>
<th></th>
<th>City A</th>
<th>City B</th>
<th>City C</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCC</td>
<td>22.3%</td>
<td>30.3%</td>
<td>30.1%</td>
</tr>
<tr>
<td>ONP</td>
<td>31.2%</td>
<td>27.1%</td>
<td>28%</td>
</tr>
<tr>
<td>MWP</td>
<td>12.8%</td>
<td>5.3%</td>
<td>6.1%</td>
</tr>
<tr>
<td>Glass</td>
<td>8.5%*</td>
<td>8.2%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Metals</td>
<td>5.9%</td>
<td>5.6%</td>
<td>3.8%</td>
</tr>
<tr>
<td>PET</td>
<td>4.0%</td>
<td>4.5%</td>
<td>2.9%</td>
</tr>
<tr>
<td>#3-7 plastics</td>
<td>3.5%</td>
<td>2.9%</td>
<td>2.3%</td>
</tr>
<tr>
<td>HDPE</td>
<td>2.5%</td>
<td>3.6%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Film</td>
<td>1.2%</td>
<td>0.5%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Aseptic</td>
<td>0.8%</td>
<td>0.8%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Residual</td>
<td>7.2%</td>
<td>11.2%</td>
<td>13.3%</td>
</tr>
</tbody>
</table>
### Inbound sorts by customer - averages:

- About 45.5% fiber (OCC, ONP, MWP)
- About 32.7% glass, plastics, metal
- Inbound contamination averages: 22.7%

<table>
<thead>
<tr>
<th>Material</th>
<th>Material Sub</th>
<th>Color</th>
<th>Product Bale</th>
<th>Min  (lbs)</th>
<th>Max  (lbs)</th>
<th>Avg  (lbs)</th>
<th>Sum  (lbs)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber</td>
<td>Aseptic-Gable Top</td>
<td></td>
<td>Aseptic</td>
<td>0.0</td>
<td>4.6</td>
<td>0.7</td>
<td>52.1</td>
<td>0.6%</td>
</tr>
<tr>
<td>Plastic</td>
<td>Bulky Rigid Plastics</td>
<td></td>
<td>BlkyRgd</td>
<td>0.0</td>
<td>24.0</td>
<td>1.6</td>
<td>127.3</td>
<td>1.3%</td>
</tr>
<tr>
<td>Glass</td>
<td>Three Mix Glass &gt; 3/8</td>
<td></td>
<td>GP-3Mix</td>
<td>2.1</td>
<td>76.1</td>
<td>16.8</td>
<td>1329.0</td>
<td>14.1%</td>
</tr>
<tr>
<td>Plastic</td>
<td>2 HDPE Colored</td>
<td></td>
<td>HDPE-C</td>
<td>0.5</td>
<td>11.9</td>
<td>3.2</td>
<td>251.0</td>
<td>2.7%</td>
</tr>
<tr>
<td>Plastic</td>
<td>2 HDPE Natural</td>
<td></td>
<td>HDPE-N</td>
<td>0.2</td>
<td>8.2</td>
<td>2.3</td>
<td>181.2</td>
<td>1.9%</td>
</tr>
<tr>
<td>Fiber</td>
<td>Mixed Paper</td>
<td></td>
<td>MixPpr</td>
<td>0.0</td>
<td>18.5</td>
<td>0.4</td>
<td>27.9</td>
<td>0.3%</td>
</tr>
<tr>
<td>Plastic</td>
<td>Plastic 3-7</td>
<td></td>
<td>MxPlstc3-7</td>
<td>0.1</td>
<td>13.1</td>
<td>3.3</td>
<td>258.1</td>
<td>2.7%</td>
</tr>
<tr>
<td>Fiber</td>
<td>OCC</td>
<td></td>
<td>OCC</td>
<td>2.0</td>
<td>52.2</td>
<td>25.4</td>
<td>2003.2</td>
<td>21.2%</td>
</tr>
<tr>
<td>Fiber</td>
<td>ONP8</td>
<td></td>
<td>ONP8</td>
<td>0.0</td>
<td>100.7</td>
<td>26.8</td>
<td>2115.6</td>
<td>22.4%</td>
</tr>
<tr>
<td>Plastic</td>
<td>1 PET</td>
<td></td>
<td>PET</td>
<td>0.9</td>
<td>12.1</td>
<td>5.1</td>
<td>404.7</td>
<td>4.3%</td>
</tr>
<tr>
<td>Residue</td>
<td>Residue</td>
<td></td>
<td>Res</td>
<td>1.4</td>
<td>71.3</td>
<td>27.1</td>
<td>2137.6</td>
<td>22.7%</td>
</tr>
<tr>
<td>Metal</td>
<td>Scrap Metal</td>
<td></td>
<td>ScrpMtl</td>
<td>0.0</td>
<td>17.8</td>
<td>1.1</td>
<td>83.1</td>
<td>0.9%</td>
</tr>
<tr>
<td>Metal</td>
<td>Steel-Tin</td>
<td></td>
<td>Tin</td>
<td>0.1</td>
<td>10.6</td>
<td>3.6</td>
<td>281.1</td>
<td>3.0%</td>
</tr>
<tr>
<td>Metal</td>
<td>Aluminum</td>
<td></td>
<td>UBC</td>
<td>0.3</td>
<td>8.2</td>
<td>2.3</td>
<td>183.6</td>
<td>1.9%</td>
</tr>
</tbody>
</table>

**NOTE:** Values calculated by hand will differ due to rounding.
Contamination in Single Stream Recyclables

- Contamination of loads is on average 16% of inbound tons and increasing.
- Contamination can be up to 50% of incoming loads.
- Contamination cost an average of $140 per ton.
- Markets are demanding reduced contamination (Green Fence).
- Processing costs have increased by 20% in two years, which is driving up cost to customers.

©2014 Waste Management
Price and Volume drive recycling investments.
What do these changes mean for recycling?

- The changing waste stream has increased processing cost at MRFs, driving up the overall cost of recycling.
- There are more non-recyclable materials in the feedstock - which increases the cost of recycling programs.
- There are more low-value materials in the recycling stream, which reduces overall revenue. Communities with revenue-sharing may see less revenue from the sale of commodities.
- A lighter recycling stream makes it harder to increase recycling rates
  - More light-weight plastic
  - More lower value materials
  - Light-weighting of all packaging
### Impacts of changing waste stream on recycling

### What is recyclable

### Alternatives for hard to handle materials

### What is next?
Back to the Basics: Public Education and Outreach for Recycling

Recycle Often. Recycle Right.\textsuperscript{SM}

The Path to Sustainable Profitable Recycling
Recycling Education - Key Messages

1. Maximize recycling of all bottles, cans, and paper products
2. Keep items clean and dry
3. No plastic bags
# Tools

## Interim Microsite

<table>
<thead>
<tr>
<th>Tools Category</th>
<th>Links</th>
</tr>
</thead>
</table>
| Campaign Information | Campaign Intro Pass it On!  
  Legal Guidelines  
  Background and Research  
  Stories from the Field  
  RecycleOftenRecycleRight.com |
| How to Recycle Right | Official WM Video  
  6 Key Messages  
  Mythbusters & FAQs |
| PSS Planning/City Implementation | Tools at a Glance  
  All Campaign Tools  
  Campaign Rollout Checklist  
  Annual Public Education Plan  
  Elevator Speech  
  Introduction to City PPT |
| PSS Toolkits | Intro & Background Curriculum |
| K-12 | Best Practices  
  Industry Articles  
  Industry Presentations  
  Studies  
  WM Thought Leadership Presentations |
| Research | |
Add some fun to Recycle Often. Recycle Right.

To reinforce the recycling message and increase kids' involvement, the curriculum includes a package of WM promise cards, tree leaves and ambassador stickers for hands-on projects.

Help this tree grow greener.
Become a Recycling Ambassador and promise to teach others to Recycle Often and Recycle Right.

I promise to
I'm an official RECYCLING AMBASSADOR
RECYLE OFTEN. RECYCLE RIGHT.

Act Two.
Recycling gives new life to old materials. A plastic water bottle, for example, can become a park bench or the filling for a new coat. By doing your part, you can help save raw materials which saves time, energy and expense.

Learn more and become a Recycling Ambassador at: RecycleOftenRecycleRight.com

Can Do.
Recycling gives new life to old materials. For example, the aluminum can you recycle today could be back on the shelf as a new can in 60 days. By doing your part, you can help save raw materials which also saves time, energy and expense.

Learn more and become a Recycling Ambassador at: RecycleOftenRecycleRight.com

New News.
Recycling gives new life to old materials. The newspaper you put in the recycle bin today could return to your house as a cereal box. By doing your part, you can help save raw materials which also saves time, energy and expense.

Learn more and become a Recycling Ambassador at: RecycleOftenRecycleRight.com
Start recycling.

All your recyclables in one place.

We make recycling easier — by leading the way in mixed recycling. That lets people put all their recyclables in one bin and leaves the sorting process to us.
Sustainable recycling requires broad, multi-stakeholder support

Local recycling goals must be realistic. Policies and contract terms must support these goals.

Local regulations and our recycling contracts must be aligned to ensure the development of economically sustainable recycling programs.

Sustainable recycling must include public education and outreach to support local regulations and economic realities.