Data Collection & Management to Assess Performance

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Outline

• Waste Management in Canada
  – What is measured?
  – How is it measured?

• Data Collection Challenges

• How do we measure success?

• Are we successful?
Waste Management in Canada

• City/Municipality/Regional District
  – Predominantly Curbside and MF customer collection

• Contractor
  – C&D and IC&I waste collection
  – Contracted for:
    ▪ Collection
    ▪ Transportation
    ▪ Disposal
    ▪ Waste facility operation (eg. Landfill, MRF)

• Private Company
  – Eg. Private disposal facility
  – Data less available
What is Measured?

• Tonnages
  – Waste generated, collected, processed and/or disposed

• Number of Customers
  – Curbside Residential
  – Multi-Family and IC&I

• Participation Rates

• Collection Frequency

• Access to Recycling

• Diversion Rates

• Financial Metrics
  – Tipping Fees
  – Operating budgets
How is it Measured?

• Statistics Canada

• CCME
  – State of Waste Management In Canada (2014)

• City/Municipality
  – Facility scale house data
  – Contracted operations data

• EPR/Product Stewardship programs
  – Data collected and reported by organizations
  – Eg. Multi-Material BC, Call2Recycle
How is it Measured? (cont’d)

• Solid Waste Audit
  – Community based
  – Location based
  – Activity based

• Private Industry
  – Industry Association Publications
  – Contractor/Retailers/Independent Company
  – Waste Management Companies

• Benchmarking Studies
  – AECOM’s National Solid Waste Benchmarking Initiative (NSWBI)
## Waste System Overview

<table>
<thead>
<tr>
<th>Community #1</th>
<th>Community #2</th>
<th>Community #3</th>
<th>Community #4</th>
<th>Community #5</th>
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</thead>
<tbody>
<tr>
<td>Population</td>
<td>90,000</td>
<td>188,000</td>
<td>249,000</td>
<td>943,000</td>
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<tr>
<td>Total Households</td>
<td>38,000</td>
<td>83,000</td>
<td>104,000</td>
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<tr>
<td>Area (ha)</td>
<td>12,430</td>
<td>3,142</td>
<td>21,785</td>
<td>279,371</td>
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<td>Median Age</td>
<td>38</td>
<td>44</td>
<td>36</td>
<td>39</td>
</tr>
<tr>
<td>Mother tongue other than English or French (%)</td>
<td>12%</td>
<td>12%</td>
<td>16%</td>
<td>20%</td>
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</table>

### Collection Services Provided

#### Curbside collection
- Garbage: Yes, Yes, Yes, Yes, Yes
- Recycling: No, Yes, Yes, Yes, Yes
- Organics: Yes, Yes, Yes, Yes, Yes

#### M/F/ICI collection
- Garbage: Yes, No, Yes, Yes, Yes
- Recycling: No, No, No, Yes, Yes
- Organics: No, No, No, No, No

#### Curbside Collection
- Garbage
  - Tonnes collected: 24,002, 35,286, 52,100, 131,491, 243,181
  - Tonnes per customer: 0.80, 0.47, 0.78, 0.47, 0.74
- Recycling (curbside type)
  - Tonnes collected: 12,339, 8,035, 59,034, 96,115
  - Tonnes per customer: 0.23, 0.12, 0.21, 0.29
- Organics
  - Tonnes collected: 134, 14,634, 830, 82,963, 80,356
  - Tonnes per customer: 0.09, 0.27, 0.28, 0.30, 0.24

#### Multi-Family & ICI
- Garbage
  - Tonnes collected: 4,736, 10,471, 43,943, 56,062
  - Tonnes per service location: 5.83, 18.12, 26.23, 37.52
  - Tonnes per unit serviced: 2.38, 0.69, 0.42, 0.59
- Recycling (curbside type)
  - Tonnes collected: 8,838, 12,496
  - Tonnes per service location: 4.54, 8.36
  - Tonnes per unit serviced: 0.08, 0.13
- Organics
  - Tonnes collected: 1,506, 43,342, 19,500, 309
  - Tonnes per service location: 1,186, 18,233
  - Tonnes per unit serviced: 0.08, 0.13

### Self-Haul
- Recycling (curbside type+other) (tonnes): 4,488, 7,193, 4,592, 1,186, 18,233
- Organics (tonnes): 1,506, 43,342, 19,500, 309, 4,394
<table>
<thead>
<tr>
<th></th>
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<th>Community #4</th>
<th>Community #5</th>
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<tr>
<td><strong>Population</strong></td>
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<td><strong>Total Households</strong></td>
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<td>70,000</td>
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<td>325,000</td>
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<td><strong>Curbside Customers</strong></td>
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<td></td>
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<tr>
<td>Garbage</td>
<td>30,000</td>
<td>53,300</td>
<td>66,800</td>
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<td>279,000</td>
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<td>53,300</td>
<td>66,800</td>
<td>220,000</td>
<td>277,000</td>
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<td>Organics</td>
<td>1,500</td>
<td>53,300</td>
<td>3,000</td>
<td>0</td>
<td>279,000</td>
</tr>
<tr>
<td><strong>Collection Method</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Diversion System Type</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Recycling</td>
<td>N/A</td>
<td>Single-stream without glass</td>
<td>Single-stream with glass</td>
<td>Single-stream with glass</td>
<td>Dual-stream with glass</td>
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<td>Organics</td>
<td>Yard waste</td>
<td>Food waste</td>
<td>Yard waste</td>
<td>N/A</td>
<td>Co-mingled organics</td>
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<td><strong>Service Provider</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Garbage</td>
<td>Municipal</td>
<td>Municipal / Contracted</td>
<td>Municipal</td>
<td>Municipal / Contracted</td>
<td>Municipal / Contracted</td>
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<td>Recycling</td>
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<td>Contracted</td>
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<td>Municipal / Contracted</td>
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<tr>
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<td>Municipal / Contracted</td>
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<td>N/A</td>
<td>Municipal / Contracted</td>
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<td><strong>Collection Frequency</strong></td>
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<tr>
<td>Garbage</td>
<td>Weekly</td>
<td>Bi-weekly</td>
<td>Varying/seasonal</td>
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<td>Bi-weekly</td>
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<td>Recycling</td>
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<td>Bi-weekly</td>
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<td>Weekly</td>
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<tr>
<td>Organics</td>
<td>Varying/seasonal</td>
<td>Weekly</td>
<td>Bi-weekly</td>
<td>N/A</td>
<td>Weekly</td>
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<td><strong>Container Limits</strong></td>
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<td>Garbage</td>
<td># of cans/bags/carts</td>
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<td>1</td>
<td>1</td>
<td>Unlimited</td>
</tr>
<tr>
<td></td>
<td>L per can/bag/cart</td>
<td>360</td>
<td>100</td>
<td>378</td>
<td>100</td>
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<td>kg per can/bag/cart</td>
<td>91</td>
<td>23</td>
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<td>L per can/bag/cart</td>
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<td>N/A</td>
<td>378</td>
<td>100</td>
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<tr>
<td></td>
<td>kg per can/bag/cart</td>
<td>N/A</td>
<td>23</td>
<td>N/A</td>
<td>20</td>
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<tr>
<td>Organics</td>
<td># of cans/bags/carts</td>
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<td>L per can/bag/cart</td>
<td>Kraft Bag</td>
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<td>378</td>
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<td>kg per can/bag/cart</td>
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<td>23</td>
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## Facilities Summary (Self-haul)

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Community #1</th>
<th>Community #2</th>
<th>Community #3</th>
<th>Community #4</th>
<th>Community #5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is facility sharing location with other facility such as landfill?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Is facility staffed?</td>
<td>Staffed</td>
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<td>Unstaffed</td>
<td>Staffed</td>
<td>Staffed</td>
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<tr>
<td><strong>Materials accepted</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garbage</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Curbside recyclables type materials</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Organics</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>Other recyclables</td>
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<td>HHW</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Ownership</strong></td>
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<td>Private</td>
<td>Municipal</td>
<td>Municipal</td>
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<td><strong>Operations</strong></td>
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<td>Private/contracted</td>
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<td><strong>Self-haul facility FTEs</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Summer Season</td>
<td>7</td>
<td>N/A</td>
<td>19</td>
<td>15</td>
<td>0.01</td>
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<td>Winter Season</td>
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<td>15</td>
<td>3</td>
<td>0.01</td>
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</table>
## Facilities Summary (landfill)

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Community #1</th>
<th>Community #2</th>
<th>Community #3</th>
<th>Community #4</th>
<th>Community #5</th>
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<tr>
<td>Active/closed</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Active</td>
<td>Closed</td>
</tr>
<tr>
<td>Tonnes in place</td>
<td>2,000,000</td>
<td>9,770,000</td>
<td>108,917</td>
<td>2,000,000</td>
<td>115,191</td>
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<tr>
<td>Tonnes waste placed in reporting year</td>
<td>51,194</td>
<td>217,208</td>
<td>108,917</td>
<td>115,191</td>
<td>115,191</td>
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<tr>
<td>Area of closed and active cells (ha)</td>
<td>24</td>
<td>53.7</td>
<td>18</td>
<td>83</td>
<td>10</td>
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<tr>
<td>Estimated remaining capacity (years)</td>
<td>23</td>
<td>3</td>
<td>18</td>
<td>66</td>
<td>10</td>
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<td>Ownership</td>
<td>Municipal</td>
<td>Private</td>
<td>Municipal</td>
<td>Municipal</td>
<td>Municipal</td>
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<tr>
<td>Operations</td>
<td>Municipal</td>
<td>Private</td>
<td>Municipal</td>
<td>Private/contracted</td>
<td>Municipal</td>
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<td>Equipment</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Compactor</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Loader</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Scale Software</td>
<td>GeoWare</td>
<td>Autoscale</td>
<td>GeoWare</td>
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<tr>
<td>Quantity of scales – in</td>
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<td>1</td>
<td>1</td>
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<td>Quantity of scales – out</td>
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<td>1</td>
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<td>1</td>
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<td>Landfill gas management</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Landfill gas collected - annual average (sqfm)</td>
<td>237</td>
<td>1,440</td>
<td>184</td>
<td>N/A</td>
<td>1,269</td>
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<td>CO₂ Eq destroyed (tonnes)</td>
<td>25,928</td>
<td>161,500</td>
<td>19,219</td>
<td>N/A</td>
<td>196,000</td>
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<td>Utilization / destruction method</td>
<td>On-site power generation</td>
<td>Flare</td>
<td>flare and microturbine</td>
<td>N/A</td>
<td>On-site power generation</td>
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<td>Leachate management</td>
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<td></td>
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<tr>
<td>Leachate collected (m³)</td>
<td>61,018</td>
<td>1,194</td>
<td>28,690</td>
<td>2,500</td>
<td>52,974</td>
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<td>Local annual precipitation (mm)</td>
<td>747</td>
<td>250</td>
<td>387</td>
<td>388</td>
<td>691</td>
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<td>Leachate treatment</td>
<td>Off-site WWTP</td>
<td>On-site evaporation</td>
<td>Off-site WWTP</td>
<td>On-site recirculation</td>
<td>Off-site WWTP</td>
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<td>Landfill airspace utilization factor (AUF)</td>
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<tr>
<td>Volume consumed (m³)</td>
<td>60,932</td>
<td>302,958</td>
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<tr>
<td>Daily cover material used</td>
<td>Spoil/Clean fill</td>
<td>ADC - degradable film</td>
<td>Soil/Asphalt Shingles</td>
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<td>AUF</td>
<td>0.84</td>
<td>0.72</td>
<td>Unknown</td>
<td>Target 0.72</td>
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## Facilities Summary (composting)

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<th>Community #2</th>
<th>Community #3</th>
<th>Community #4</th>
<th>Community #5</th>
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<tbody>
<tr>
<td>Is facility sharing location with other facility such as landfill?</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Technology / process</td>
<td>In-vessel</td>
<td>Windrow</td>
<td>Windrow</td>
<td>Extended Aerated Stack Piles</td>
<td>Other</td>
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<td>Feedstock type</td>
<td>Yard and food waste</td>
<td>Yard waste</td>
<td>Yard waste</td>
<td>Biosolids, hog fuel, white wood, ash</td>
<td>Other</td>
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<td>Feedstock accepted from</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Residential/Curbside customers</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Multi-family customers</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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<td>IC&amp;I sector</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Other</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Tonnes accepted</td>
<td>17,829</td>
<td>41,770</td>
<td>6,361</td>
<td>141,839</td>
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<tr>
<td>Tonnes final product</td>
<td>8,500</td>
<td>36,000</td>
<td>1,525</td>
<td>19,296</td>
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<td>Private</td>
<td>Municipal</td>
<td>Municipal</td>
<td>Municipal</td>
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<tr>
<td>Operations</td>
<td>Private/contracted</td>
<td>Municipal</td>
<td>Municipal</td>
<td>Municipal</td>
<td>Private/contracted</td>
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<td>Residual rate (%)</td>
<td>11%</td>
<td>9%</td>
<td>2%</td>
<td>38%</td>
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NSWBI Data Collection Challenges

- Dependent on availability/accuracy of inputs
  - Consistency is key
  - Use of standard definitions
- Changes from year to year
  - Item/location not accurately tracked
  - Item examined in more detail
  - Addition of new program
  - Regulatory/stewardship changes
Issues with direct comparisons

- Different populations
  - Province variations
  - City vs rural
  - Population composition
  - Population density

- Different physical sizes of community
  - Facility location in community
  - Collection costs associated with transportation

- Different methods of measurement
  - Scale vs survey
  - Estimate vs count
Issues with direct comparisons (cont’d)

- Different collection programs
  - Automated vs manual
  - Collection frequency
  - Collection streams
  - Composition
  - Regional responsibility

- Different disposal options
  - Voluntary vs regulated
  - What facilities exist?
  - Disposal within community?

- Different regulatory requirements
  - Provincial
  - Regional bylaws
NSWBI Data Collection Challenges (cont’d)

• Incorporation of MF and IC&I data streams

• Financial Reporting
  – Breakdown of budget items
  – Subcontracted components
  – Other ‘outside’ costs
  – Prediction of long-term costs
  – “True” cost is not always known
How Do We Measure Success?

• Metrics mentioned above, but…
  – General standards, not always easy to interpret as a sign of success

• What do you share as a success?
  – Different stakeholder reporting interests
  – Different ideas of success
  – Various abilities to visualize/relate to results

• How does benchmarking help to measure success?
  – Manage and monitor the performance of existing programs
  – Insights based on national comparisons
  – Highlight potential opportunities for improvement & areas of excellence
Benchmarking Metrics

Tonnes Garbage Collected at the Curb per Customer per Year

1 Higher than expected tonnes per customer in 2013 likely attributed to flooding
2 Implemented bi-weekly collection in 2013
3 Rolled out new curbside recycling programs partway through 2013

Grouped based on service provided:
- Garbage + seasonal organics curbside collection
- Garbage + recyclables curbside collection
- Garbage + recyclables + seasonal organics curbside collection
- Garbage + recyclables + organics curbside collection
Benchmarking Metrics (cont’d)

Tonnes Recyclables Collected at the Curb per Customer per Year

- **Compare 2010**: 2010 avg., 0.214; 2010 median, 0.200
- **Compare 2011**: 2011 avg., 0.210; 2011 median, 0.210
- **Compare 2012**: 2012 avg., 0.214; 2012 median, 0.207

1 Curbside recycling introduced in 2013
2 Curbside collection of yard waste is offered on subscription basis for a fee of $50 per year.
3 Curbside recycling fully rolled out in June 2013
4 Plus 182 tonnes of scrap metal collected

Service provided by municipalities
Service not provided

Grouped based on service provided:
- Garbage + recyclables curbside collection
- Garbage + recyclables + seasonal organics curbside collection
- Garbage + recyclables + organics curbside collection

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Benchmarcking Metrics (cont’d)

Tonnes Organics Collected at the Curb per Customer per Year

Compare 2010
2010 avg., 0.23
2010 median, 0.24

Compare 2011
2011 avg., 0.22
2011 median, 0.22

Compare 2012
2012 avg., 0.21
2012 median, 0.21

2013 avg., 0.26
2013 median, 0.26

1 Two scheduled pick-ups annually in October and November, 10% household participation rate
2 Voluntary subscription based program during "growing season" only
3 Christmas trees collected curbside. Other organics mechanically sorted from garbage stream
4 Pilot program started in 2012

Grouped based on collection service provided:
- Yard waste
- Food waste
- Yard waste + food waste (co-mingled)
- Yard waste + food waste (separate collection)
Benchmarking Metrics (cont’d)

Annual Average Airspace Utilization Factor Achieved at Active Landfills

- **2012**
- **2013**

1. **Facility #6**
   - 2012: 0.68
   - 2013: 0.78
2. **Facility #8**
   - 2012: 0.60
   - 2013: 0.80
3. **Facility #9**
   - 2012: 0.72
   - 2013: 0.88
4. **Facility #1**
   - 2012: 0.75
   - 2013: 0.84
5. **Facility #4**
   - 2012: 0.59
6. **Facility #7**
7. **Facility #10**
8. **Facility #12**
9. **Facility #2**

- **Data not available - Target 0.72**
- **Compare 2012**
  - 2012 avg., 0.74
  - 2012 median, 0.70
- **2013 avg., 0.86**
- **2013 median, 0.8**

**Grouped based cover material used:**
- Clean fill
- ADC-waste derived material / clean fill
- ADC-waste derived material
- Biodegradable film

---

1. Average over three landfills
2. New cell added in 2013, therefore less compaction
3. 2013 AUF available but increased compaction expected with new compactor
4. ADC from reclamation, street sweepings, catchbasin grit. Recompacling excavated waste in 2013

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Benchamking Metrics (cont’d)

Processing Efficiency - MRF Residual Rate

Grouped based on material separation:
- Single-stream with glass
- Single-stream without glass
- Dual-stream with glass
- Source separated

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So...Are We Successful?

- Communities look at:
  - Standard metrics
  - Year to year changes
  - Comparisons between communities

- Use other benchmarking metrics to help show the full picture

- Refine metrics based on community feedback
Success through Benchmarking

Number of WCB claims per 1,000 Hours
Curbside Collection Garbage, Recycling, Organics and/or Multi-Stream)

- Garbage
- Recycling
- Organics
- Multi stream

# of WCB claims per 1,000 hrs

Community #1, Community #2, Community #3, Community #4, Community #5, Community #6, Community #7, Community #8, Community #9, Community #10, Community #11, Community #12

Data not available
Missed Collection Calls Received vs. Responded To per Scheduled Collections (Curbside Garbage)

- Missed collection call received
- Missed collection calls responded to

1. All three streams
Success through Benchmarking (cont’d)

Number of Disposal Staff FTEs per Tonne Waste Disposed

![Bar chart showing number of disposal staff FTEs per tonne waste disposed across different facilities.](chart.png)

Grouped based operations contract:
- Municipal
- Private/Contracted

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Success through Benchmarking (cont’d)

Average Annual Cost to Customer for Solid Waste Management Collection Service

<table>
<thead>
<tr>
<th>Community #7</th>
<th>Community #5</th>
<th>Community #6</th>
<th>Community #8</th>
<th>Community #9</th>
<th>Community #1</th>
<th>Community #3</th>
<th>Community #4</th>
<th>Community #10</th>
<th>Community #11</th>
<th>Community #12</th>
<th>Community #2</th>
</tr>
</thead>
</table>

Service provided by Municipalities

1 Includes disposal
2 Curbside recycling introduced in 2013
3 Curbside collection of yardwaste is offered on subscription basis for a fee of $50 per year. Curbside recycling fully rolled out in June 2013
4 Includes processing of recycling and organics

Grouped based on service provided:
- Garbage + seasonal organics curbside collection
- Garbage + recyclables curbside collection
- Garbage + recyclables + seasonal organics curbside collection
- Garbage + recyclables + organics curbside collection
Public Education Cost per Capita

- **2011**
- **2012**
- **2013**

### Community #1
- 2011: $3.00
- 2012: $3.50
- 2013: $3.00

### Community #2
- 2011: $1.00
- 2012: $1.00
- 2013: $1.00

### Community #3
- 2011: $2.50
- 2012: $2.50
- 2013: $2.50

### Community #4
- 2011: $4.00
- 2012: $4.00
- 2013: $4.00

### Community #5
- 2011: Data not provided
- 2012: Data not provided
- 2013: Data not provided

### Community #6
- 2011: $1.50
- 2012: $1.50
- 2013: $1.50

### Community #7
- 2011: $0.50
- 2012: $0.50
- 2013: $0.50

### Community #8
- 2011: $0.50
- 2012: $0.50
- 2013: $0.50

### Community #9
- 2011: $0.50
- 2012: $0.50
- 2013: $0.50

### Community #10
- 2011: $0.50
- 2012: $0.50
- 2013: $0.50

### Community #11
- 2011: $0.50
- 2012: $0.50
- 2013: $0.50

### Community #12
- 2011: $0.50
- 2012: $0.50
- 2013: $0.50

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1. Does not include public education cost incurred by member municipalities
2. Additional costs are incorporated into collection and disposal budgets

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Thank You

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