



# **ECONOMIC IMPACT POTENTIAL**

**AND CHARACTERIZATION OF MUNICIPAL SOLID WASTE IN MICHIGAN**



2016

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# Agenda

- Introduction to Project
- Methodology
- Findings
  - Composition
  - Comparison with Great Lakes States
  - Economic Impact
  - Miscellaneous Findings
- Ways to use this data



# Mission

West Michigan Sustainable Business Forum promotes business practices that demonstrate environmental stewardship, economic vitality, and social responsibility through education and collaboration.



# WMSBF Current Projects

- Climate Resiliency Framework Initiative
- Solid Waste Task Force
- Imagine Trash Kent County Commercial Campaign
- Green Labs



# “Trash Research Project”

- Determine composition of Michigan MSW now being disposed of in landfills and incinerators
- Compare the composition of Michigan’s MSW to the MSW waste of other Midwest states
- Economic analysis of MSW composition



# Research Partners



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# Situation

**TABLE 1-1  
MICHIGAN LANDFILL SOLID WASTE DISPOSAL SUMMARY**

Waste Type	Municipal Solid Waste	Incinerator Ash	Industrial Waste	Construction & Demolition	Total
By Volume in Cubic Yards	22,425,777	44,825	9,413,457	4,510,264	36,394,323
Est. by Weight in Tons	7,475,259	14,942	3,137,819	1,503,421	12,131,441
% of Total	66%	0.1%	23%	11%	---

Source: MDEQ Solid Waste Annual Report for FY 2014

**TABLE 1-2  
MICHIGAN MUNICIPAL SOLID WASTE DISPOSED ORIGIN  
(by weight in tons)**

Incinerator	Landfill	Total
1,386,982	7,475,259	8,862,241



# Situation

**TABLE 2-4:  
QUANTITIES OF MICHIGAN MSW DISPOSED VS. RECOVERED  
(tons in 000s)**

	Paper	Metal	Plastic	Glass	Textiles	Organics	Electronics	Other	Total MSW
<b>Disposed Tons</b>	1,833	316	1,208	181	308	2,006	235	1,937	8,026
<b>Recycled Tons</b>	444	172	73	188	29	378	24	102	1,413
<b>Total</b>	2,277	488	1,282	369	338	2,384	259	2,039	9,439
<b>Rate</b>	20%	35%	6%	5%	9%	16%	16%	5%	15%



# Methodology



# Study Design

- ASTM D5231-92 (2008)
- MDEQ consulted on regulatory reqs
- 10 samples per site, 300 pounds
- Coin flip methodology, Random numbers
- No Seasonality
- Interns
- 22 categories, redefined



**TABLE 1-3:  
WASTE SORT LOCATION INFORMATION, SCHEDULE AND WEIGHT**

<b>Host Site</b>	<b>Location</b>	<b>Operator</b>	<b>Urban/Rural</b>	<b>Sort Days</b>	<b>Weight Sorted(lbs)</b>
South Kent Landfill	Byron Center	Kent County DPW	Mixed	6/3 - 6/4	3,167.23
North Kent Transfer Station	Rockford	Kent County DPW	Mixed	6/25 - 6/26	2,295.20
Waste to Energy Facility	Grand Rapids	Kent County DPW	Urban	6/9	3,088.90
Elk Run Landfill	Onaway	Republic Services	Rural	6/11	2,108.40
Central Sanitary Landfill	Pierson	Republic Services	Rural	6/23 - 6/24	2,262.90
Muskegon County Solid Waste Management	Ravenna	Muskegon County	Mixed	5/20 - 5/21	2,886.21
Oakland Heights Development	Auburn Hills	Republic Services	Mixed	6/16	3,039.75
Ottawa County Farms	Coopersville	Republic Services	Mixed	5/27	1,785.40



# Considerations

- All MSW is contaminated from a recycling perspective.
- Food waste and its packaging
- Materials were sorted by their ability to be recycled in the state that they were disposed.
- Fine soil mixes and dirt proved the most challenging material to classify.
- Decisions (eg: Coffee grounds)







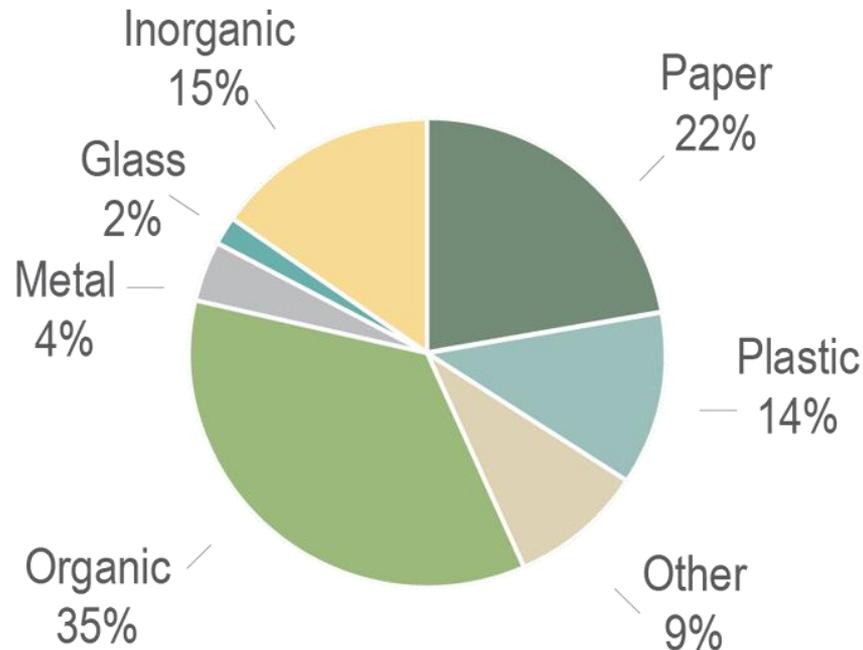




# Findings



## Michigan Municipal Solid Waste Composition (mean % by weight)



Source: West Michigan Sustainable Business Forum  
2016 Michigan MSW Valuation Study. [wmsbf.org/msw](http://wmsbf.org/msw)

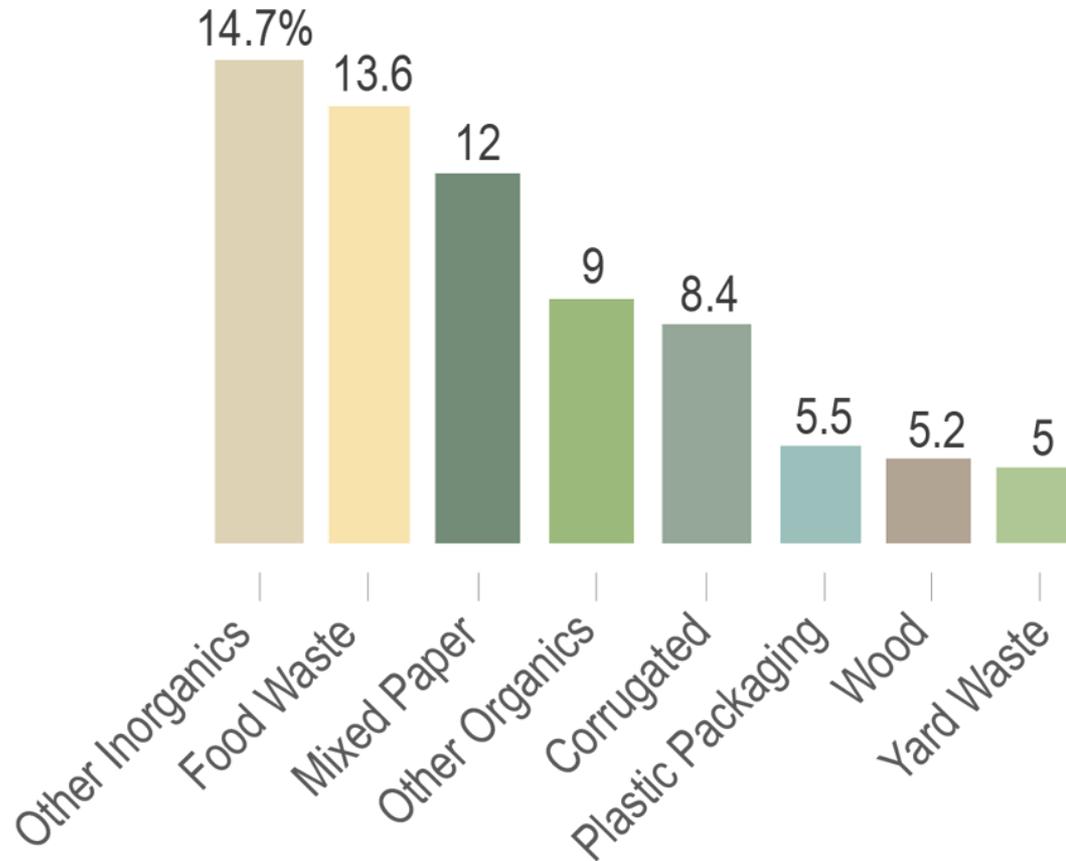


**TABLE 2-1:  
MICHIGAN STATEWIDE AGGREGATE COMPOSITION  
(mean % by weight)**

	Conf Int. (90%)				Conf Int. (90%)		
Material	Mean	Lower	Upper	Material	Mean	Lower	Upper
<b>Paper</b>				<b>Other Wastes</b>			
Mixed	12.07%	10.98%	13.16%	Textiles	3.65%	2.98%	4.32%
Newsprint	1.22%	0.93%	1.50%	Bulk Items	1.20%	0.33%	2.06%
Corrugated	8.42%	7.17%	9.67%	Other Inorganics	14.65%	12.64%	16.67%
<b>Subtotal Paper</b>	<b>21.71%</b>	<b>19.08%</b>	<b>24.33%</b>	<b>Subtotal Other Wastes</b>	<b>19.50%</b>	<b>15.95%</b>	<b>23.05%</b>
<b>Plastic</b>				<b>Organic</b>			
Plastic (#3,4,5,7)	4.10%	3.44%	4.75%	Food Waste	13.57%	11.97%	15.17%
Plastic Bags	2.77%	2.45%	3.10%	Yard Waste	5.00%	3.59%	6.41%
Plastic Packaging (#2-5,7)	5.50%	4.92%	6.08%	Soil	2.36%	0.63%	4.09%
PET Beverage (#1)	0.94%	0.82%	1.05%	Wood	5.19%	3.73%	6.65%
Polystyrene	0.71%	0.61%	0.81%	Other Organics	9.05%	8.00%	10.11%
<b>Subtotal Plastic</b>	<b>14.02%</b>	<b>12.24%</b>	<b>15.79%</b>	<b>Subtotal Organic</b>	<b>35.17%</b>	<b>27.92%</b>	<b>42.43%</b>
<b>Metals</b>				<b>MI Deposits</b>	<b>0.29%</b>	<b>0.21%</b>	<b>0.37%</b>
Ferrous	3.32%	2.70%	3.94%				
Aluminum	0.43%	0.34%	0.51%	<b>Household Hazardous</b>	<b>0.93%</b>	<b>0.49%</b>	<b>1.36%</b>
<b>Subtotal Metals</b>	<b>3.75%</b>	<b>3.04%</b>	<b>4.45%</b>				
				<b>Electronics</b>	<b>2.49%</b>	<b>1.53%</b>	<b>3.46%</b>
<b>Glass</b>	<b>2.15%</b>	<b>1.75%</b>	<b>2.56%</b>				

Note: Subtotals for the mean percentages may not equal the sum of the mean percentages due to rounding. Confidence intervals for primary categories and subcategories are calculated independently.

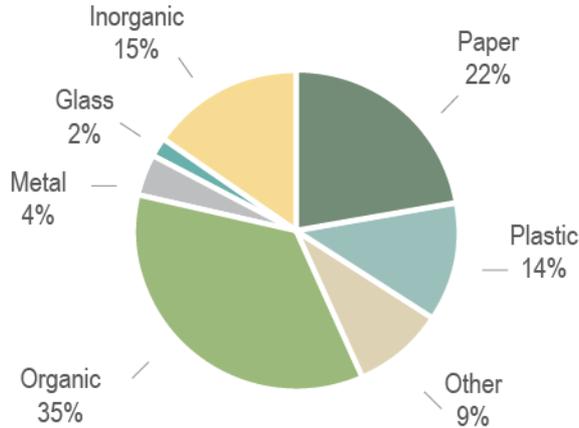
## Top Materials in Michigan MSW Composition (mean % by weight - 5% or greater)



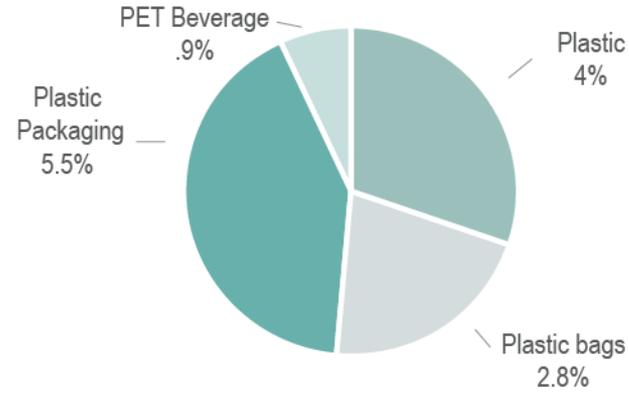
Source: West Michigan Sustainable Business Forum  
2016 Michigan MSW Valuation Study. [wmsbf.org/msw](http://wmsbf.org/msw)



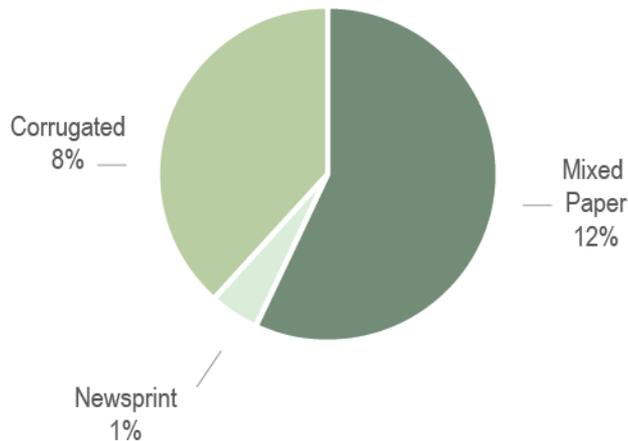
**FIGURE 2-1**  
**Michigan Municipal Solid Waste Composition**  
 (mean % by weight)



**FIGURE 2-3**  
**Plastics in Michigan MSW Composition**  
 (mean % by weight)



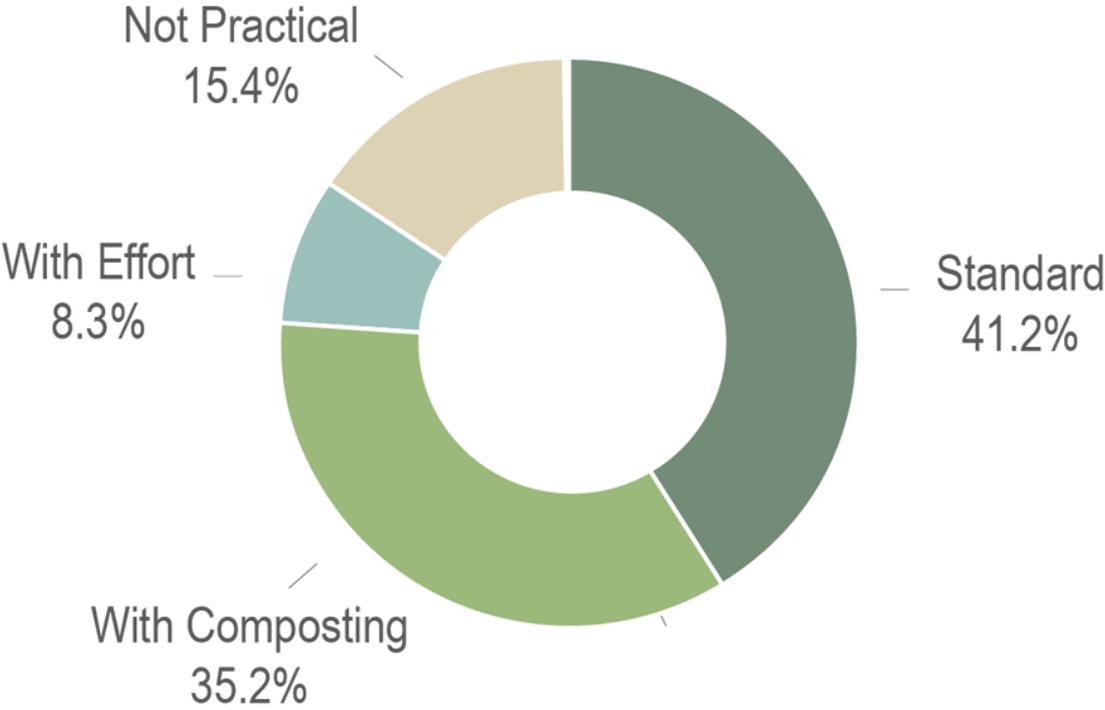
**FIGURE 2-4**  
**Paper in Michigan MSW Composition**  
 (mean % by weight)



**FIGURE 2-5**  
**Organics in Michigan MSW Composition**  
 (mean % by weight)



# Michigan MSW Material by Ease of Recycling (mean % by weight)



Source: West Michigan Sustainable Business Forum  
2016 Michigan MSW Valuation Study. [wmsbf.org/msw](http://wmsbf.org/msw)



# Considerations

- Yard Waste needs further study
- Ferrous reclaimed from incinerator ash
- Categories consistently challenged
  - Cigarettes, diapers, coffee grounds...
- Counted vs. observed
- Deposit container surprise
- Everything was contaminated

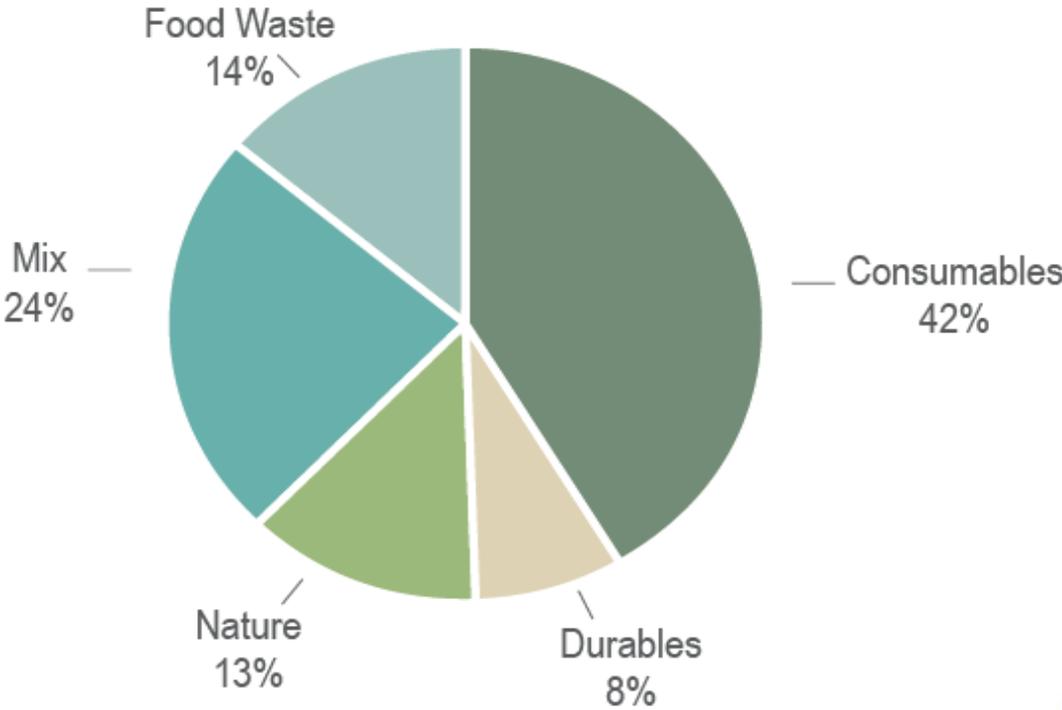


# Other Findings

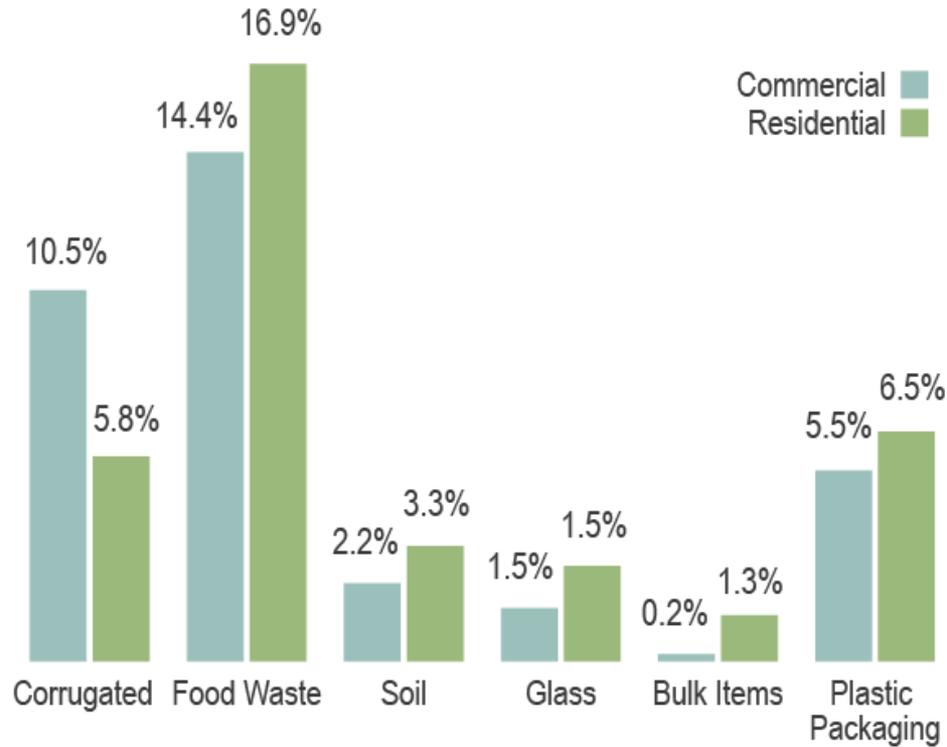
- Electronic waste
  - More than comparable states
  - Low value
  - Low materials of concern
- Deposit containers
  - More prevalent than expected
- EPS
  - Confirmed industry claims



**FIGURE 2-7**  
**Michigan MSW Generation by Product**  
(mean % by weight)



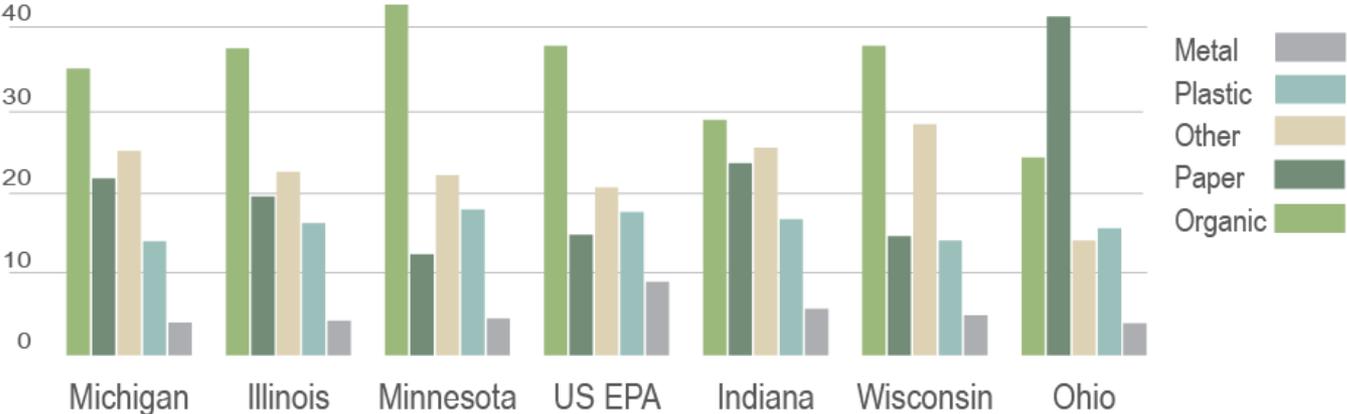
**FIGURE 2-8**  
**Michigan MSW Material Disposed Notable Variances**  
**Commercial vs. Residential**  
**(by weight)**



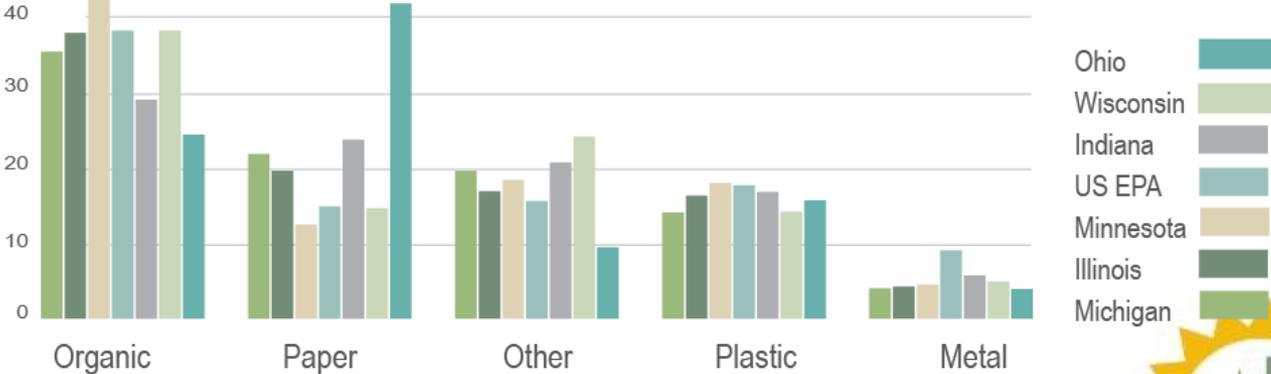
# Comparison



**FIGURE 3-1**  
**Between States Comparison MSW Disposed (by mean% of weight)**



**FIGURE 3-2**  
**Between States Category Comparison MSW Disposed (by mean% of weight)**



**TABLE 3-2:  
MINNESOTA 2000 COMPARED TO 2013 STATEWIDE WASTE CHARACTERIZATION RESULTS**

<b>Material</b>	<b>2000</b>	<b>2013</b>
Paper	34.3%	24.5%
Plastic	11.4%	17.9%
Organics	25.7%	31.0%

**TABLE 3-2:  
MINNESOTA 2000 COMPARED TO 2013 STATEWIDE WASTE CHARACTERIZATION RESULTS**

<b>Material</b>	<b>2000</b>	<b>2013</b>
Paper	34.3%	24.5%
Plastic	11.4%	17.9%
Organics	25.7%	31.0%



# Valuation

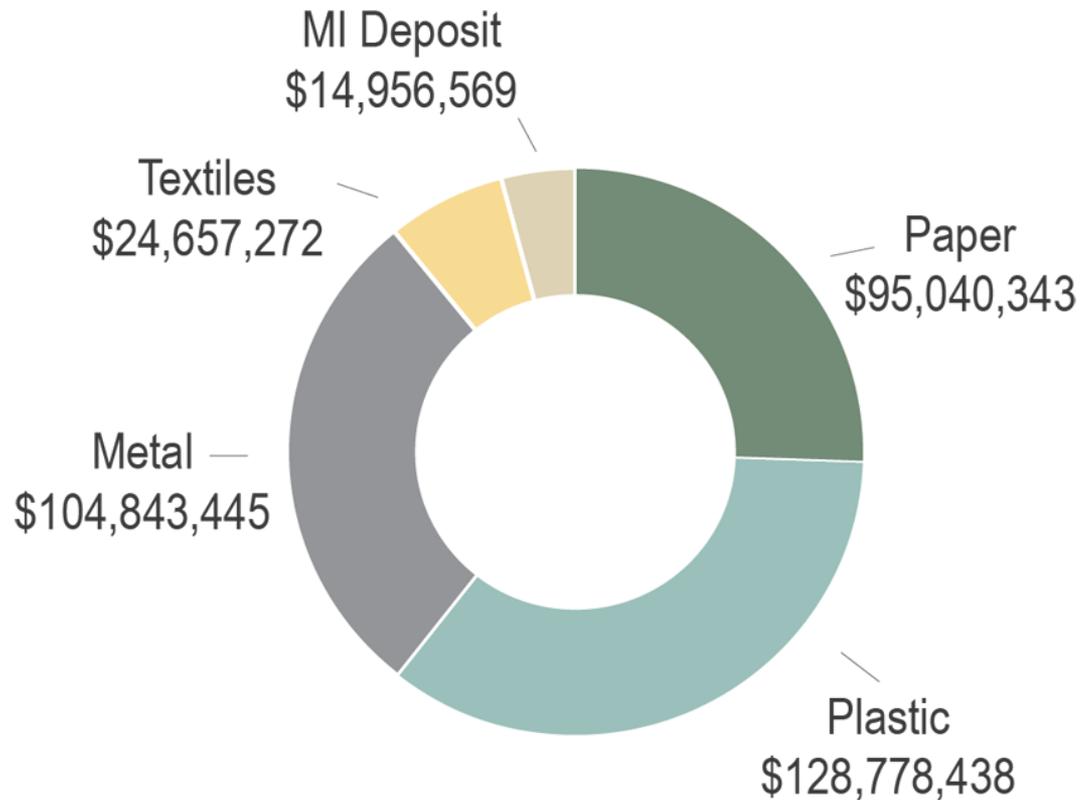


MSW VALUE

\$368 MILLION



## Total Value of Michigan MSW Material Disposed (\$)



Source: West Michigan Sustainable Business Forum  
2016 Michigan MSW Valuation Study. [wmsbf.org/msw](http://wmsbf.org/msw)



**TABLE 4-2:  
ESTIMATED MATERIAL PRICES AND DATA SOURCES**

<b>Material</b>	<b>Data Source</b>	<b>Low Price</b>	<b>High Price</b>
Mixed Paper	KC: mixed paper	\$37.51	\$38.06
Newsprint	KC: newspaper	\$61.18	\$64.87
Corrugated	KC: corrugated	\$79.11	\$90.87
Plastic (#3,4,5,7)	KC: plastic 3-7	\$54.22	\$76.19
Plastic Bags	KC: plastic bags	\$30.00	\$80.00
Plastic Packaging (#2-5,7)	KC: weighted average	\$163.49	\$248.23
PET Beverage (#1)	KC: PET plastic	\$281.59	\$343.78
MI Deposit	KC: alum/PET/glass	\$671.17	\$729.76
Polystyrene	Local company	0.00	0.00
Yard Waste	Local company	0.00	0.00
Soil	Local company	0.00	0.00
Food Waste	Local company	0.00	0.00
Wood	Local company	0.00	0.00
Other Organics	Local company	0.00	0.00
Ferrous	KC: scrap metal	\$147.50	\$222.50
Aluminum	RRRASOC: aluminum	\$1537.13	\$1652.50
Glass	KC: glass	0.00	0.00
Other Inorganics	N/A	0.00	0.00
Textiles	Company website	\$100.00	\$100.00
Bulk Items	N/A	0.00	0.00
Electronics	Local company	0.00	0.00
Household Hazardous	N/A	0.00	0.00



**TABLE 4-3:  
MARKET VALUE OF AVAILABLE RECYCLABLES**

<b>Material</b>	<b>Available Quantity</b>	<b>Quality Adjustment</b>	<b>Adj. Low Price</b>	<b>Adj. High Price</b>	<b>Low Price Total Value</b>	<b>High Price Total Value</b>
Mixed Paper	1,019,181	0.9	\$33.90	\$34.40	\$31,098,212	\$31,556,18
Newsprint	102,828	0.9	\$60.86	\$64.54	\$5,632,700	\$5,972,44
Corrugated	711,169	0.9	\$78.23	\$89.85	\$50,072,698	\$57,511,7'
Plastic (#3,4,5,7)	346,060	0.9	\$42.96	\$60.37	\$13,379,666	\$18,803,44
Plastic Bags	233,975	0.9	\$25.79	\$68.77	\$5,430,458	\$14,481,22
Plastic Packaging (#2-5,7)	464,414	0.9	\$117.93	\$179.06	\$49,291,787	\$74,841,4'
PET Beverage (#1)	79,190	0.9	\$237.35	\$289.77	\$16,916,121	\$20,652,35
MI Deposit	24,585	0.9	\$622.33	\$675.96	\$13,769,911	\$14,956,56
Polystyrene	59,919	0.9	0.00	0.00	0	0
Yard Waste	422,103	0.9	0.00	0.00	0	0
Soil	199,351	0.9	0.00	0.00	0	0
Food Waste	1,145,999	0.9	0.00	0.00	0	0
Wood	438,248	0.9	0.00	0.00	0	0
Other Organics	764,312	0.9	0.00	0.00	0	0
Ferrous	280,346	0.9	\$143.46	\$216.40	\$36,195,945	\$54,600,66
Aluminum	36,132	0.9	\$1437.16	\$1545.02	\$46,735,061	\$50,242,78
Glass	181,620	0.9	0.00	0.00	0	0
Other Inorganics	1,237,287	0.9	0.00	0.00	0	0
Textiles	308,216	0.8	\$100.00	\$100.00	\$24,657,272	\$24,657,27
Bulk Items	101,158	0.9	0.00	0.00	0	0
Electronics	210,334	0.9	0.00	0.00	0	0
Household Hazardous	78,358	0.9	0.00	0.00	0	0
<b>TOTAL:</b>	<b>8,444,784</b>				<b>\$293,179,831</b>	<b>\$368,276,0</b>



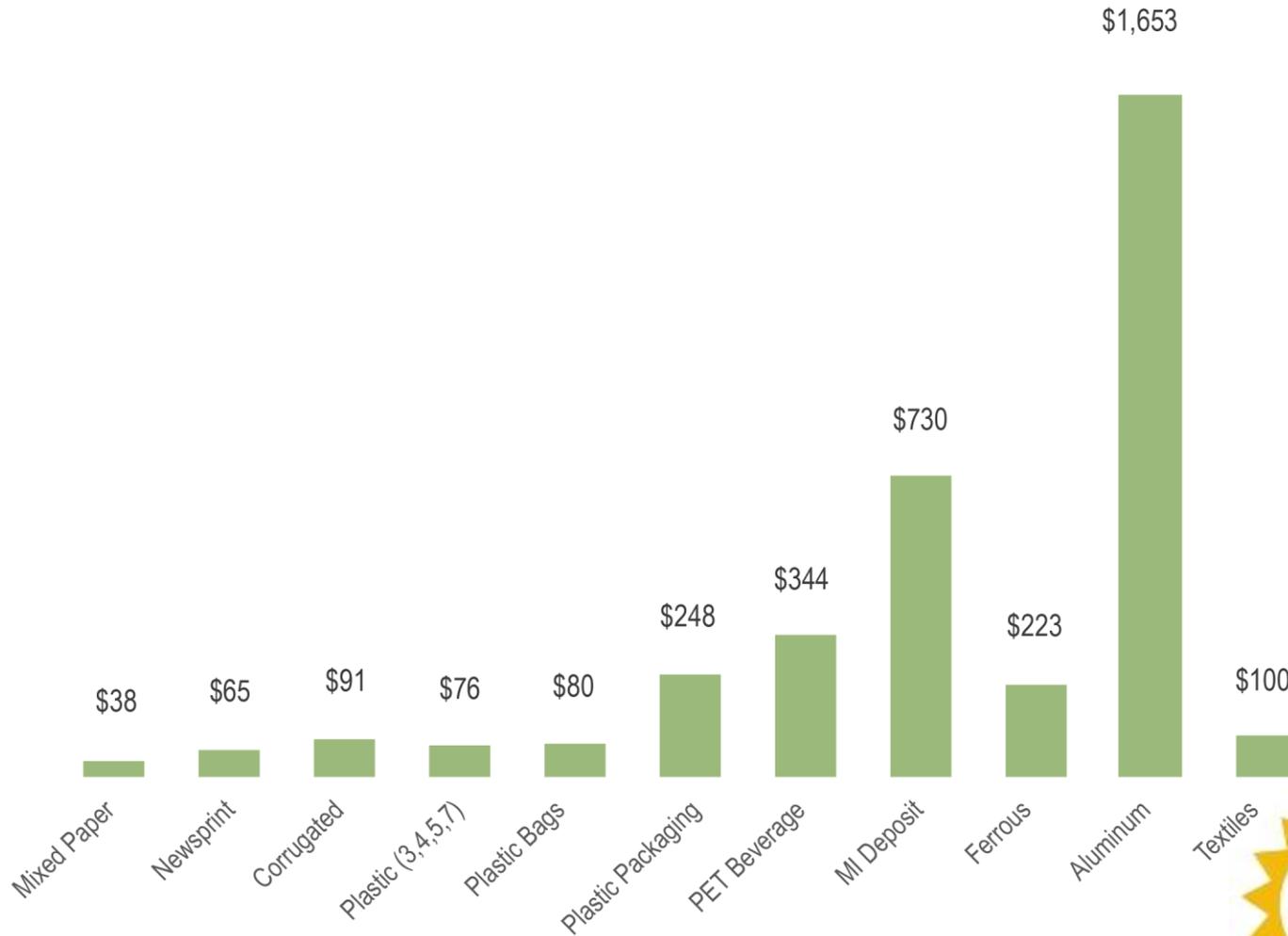
## Total Value of Michigan MSW Commodities Disposed (\$)



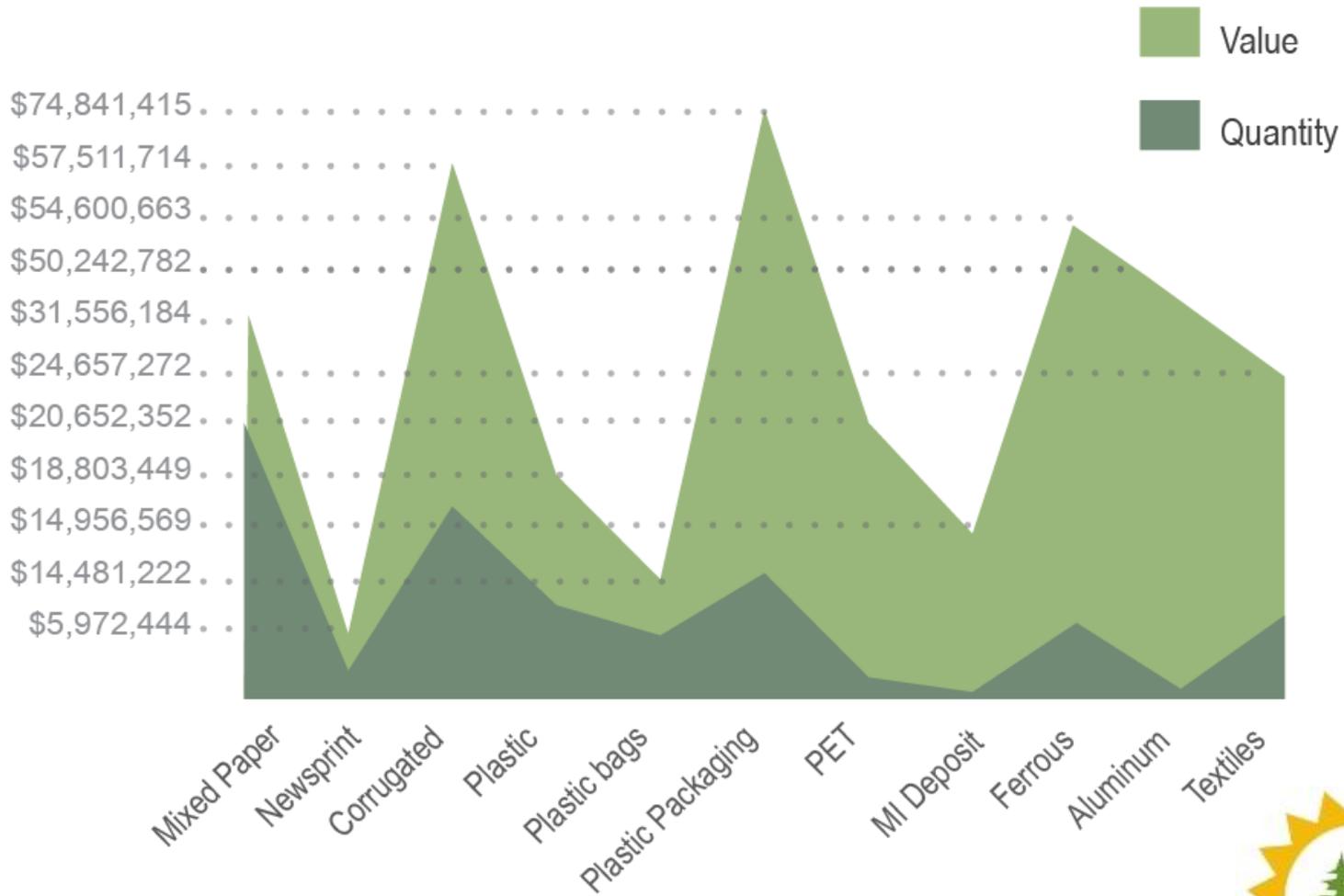
Source: West Michigan Sustainable Business Forum  
2016 Michigan MSW Valuation Study. [wmsbf.org/msw](http://wmsbf.org/msw)



**FIGURE 4-1**  
**Market Value of MSW Commodities Disposed**  
**(\$ per ton)**



**FIGURE 4-4**  
**Total Value vs Total Quantity**



# Net Value

- Operating Costs
- Indirect Effects
  - Landfill Capacity
  - Real Estate Values
  - Environmental (GHG)
  - Health Impacts



# Potential Economic Impact

\$399 MILLION

2,619 jobs



**TABLE 5-1:  
MICHIGAN STATEWIDE COMPOSITION (by weight), AVAILABLE MATERIAL VALUATION  
( \$ in millions) AND NET RECYCLING VALUE (\$ per ton)**

Material	Comp.	Value	Net	Material	Comp.	Value	Net
<b>Paper</b>				<b>Other Wastes</b>			
Mixed	12.07%	\$31.6m	\$1.81	Textiles	3.65%	\$24.7m	\$58.10
Newsprint	1.22%	\$6.0m	\$22.64	Bulk Items	1.20%	0	-41.90
Corrugated	8.42%	\$58m	\$55.48	Other Inorganics	14.65%	0	-41.90
<b>Subtotal Paper</b>	<b>21.71%</b>	<b>\$95.6m</b>	<b>---</b>	<b>Subtotal Other Wastes</b>	<b>19.50%</b>	<b>\$24.7m</b>	<b>---</b>
<b>Plastic</b>				<b>Organic</b>			
Plastic (#3,4,5,7)	4.10%	\$18.9m	\$18.48	Food Waste	13.57%	0	-41.90
Plastic Bags	2.77%	\$14.5m	\$26.87	Yard Waste	5.00%	0	-41.90
Plastic Packaging (#2-5,7)	5.50%	\$74.8m	\$137.16	Soil	2.36%	0	-41.90
PET Beverage (#1)	0.94%	\$20.6m	\$247.87	Wood	5.19%	0	-41.90
Polystyrene	0.71%	0	-41.90	Other Organics	9.05%	0	-41.90
<b>Subtotal Plastic</b>	<b>14.02%</b>	<b>\$128.8m</b>	<b>---</b>	<b>Subtotal Organic</b>	<b>35.17%</b>	<b>0</b>	<b>---</b>
<b>Metals</b>				<b>MI Deposits</b>	<b>0.29%</b>	<b>\$15m</b>	<b>\$673.10</b>
Ferrous	3.32%	\$54.6m	\$186.62				
Aluminum	0.43%	\$50.2m	\$1542.17	<b>Household Hazardous</b>	<b>0.93%</b>	<b>0</b>	<b>-41.90</b>
<b>Subtotal Metals</b>	<b>3.75%</b>	<b>\$104.8m</b>	<b>---</b>				
				<b>Electronics</b>	<b>2.49%</b>	<b>0</b>	<b>-41.90</b>
<b>Glass</b>	<b>2.15%</b>	<b>0</b>	<b>---</b>				

Composition: Mean percentage of available material by weight.

Material Value: Aggregate value of available material according to verifiable commodity prices.

Net Recycling Value: High estimate of value per ton plus indirect benefits, minus processing costs.

Note: Subtotals for the mean percentages may not equal the sum of the mean percentages due to rounding. Confidence intervals for primary categories and subcategories are calculated independently.



# Takeaways



# Surprises

- Electronics
- Deposit Containers
- EPS Foam

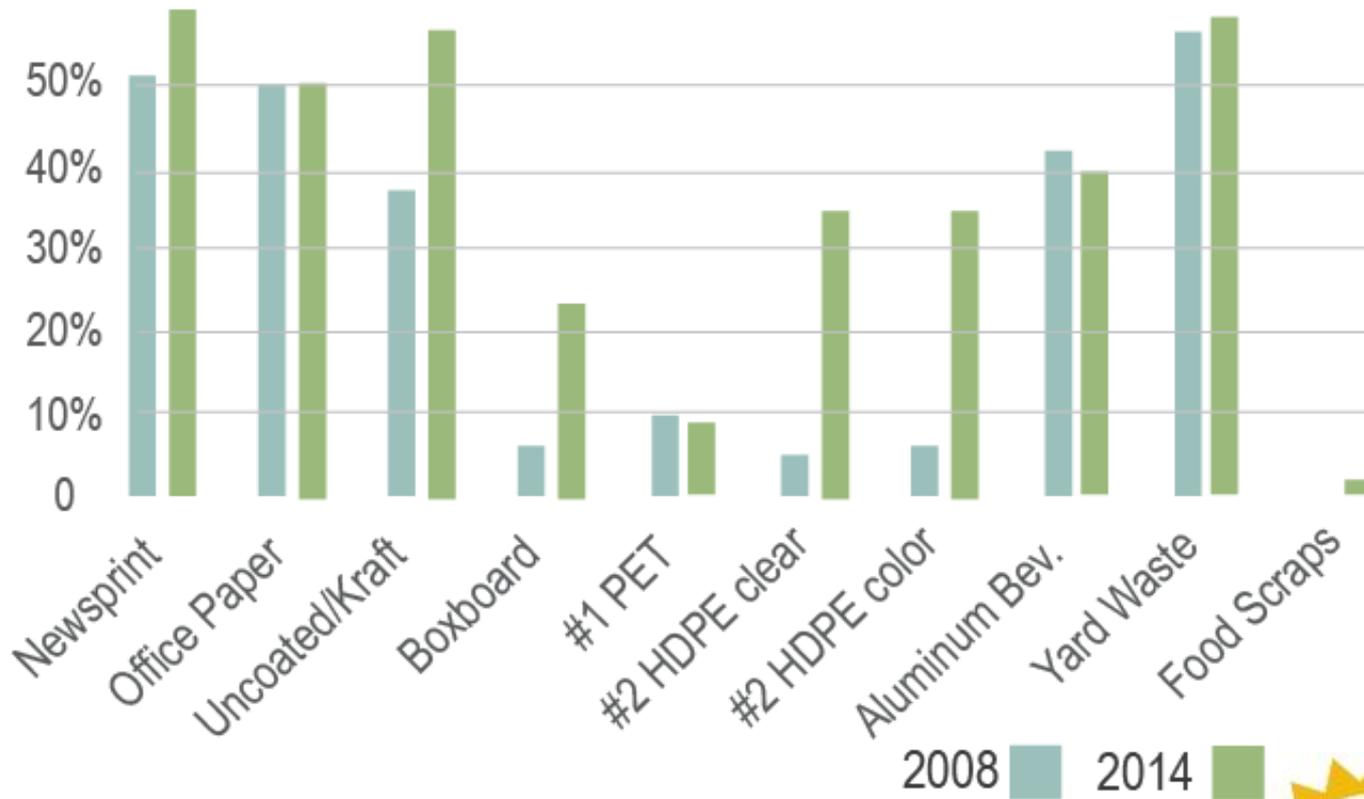


# Recommendations

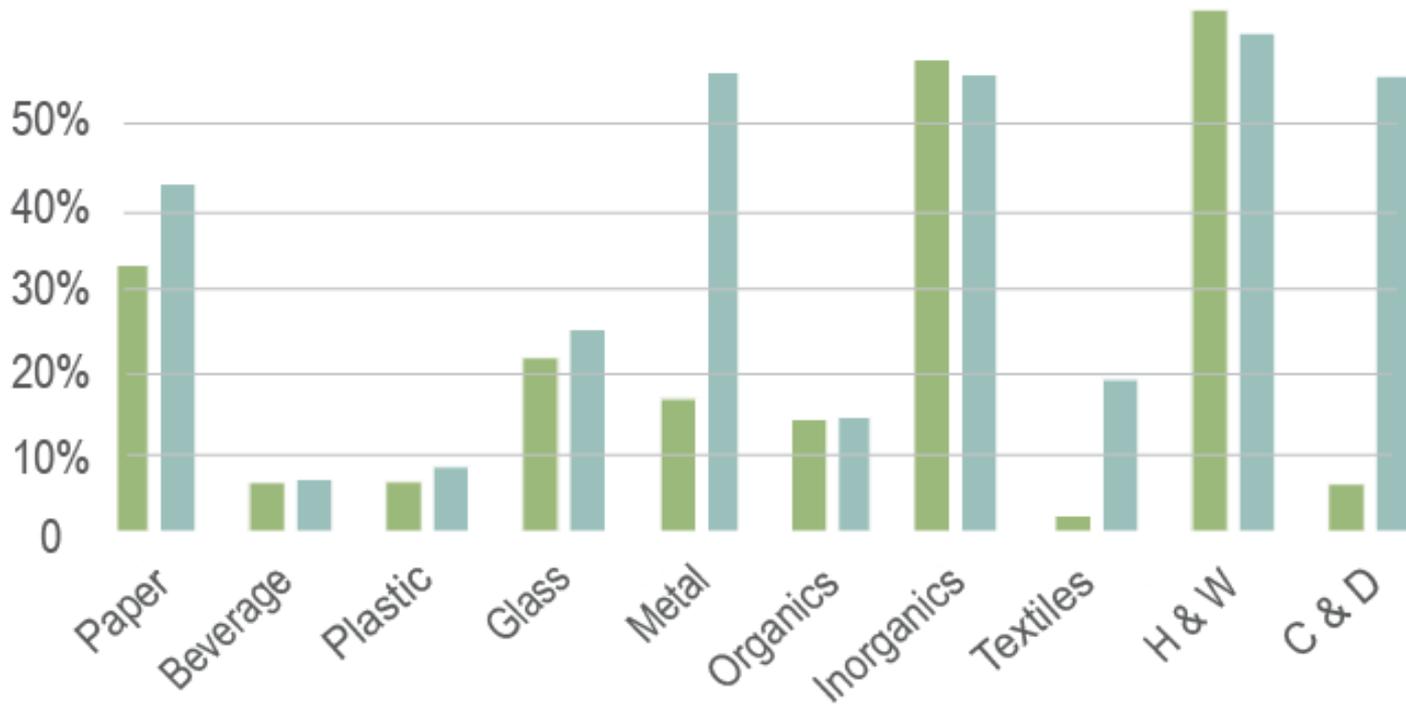
- Focus on 42% that has value
- Target high value, high supply materials first
  - Corrugated Cardboard
  - High-value resins
- Availability and usage of conventional recycling programs



**FIGURE 5-3**  
**Comparison of 2014 and 2008 Illinois**  
**Recovery/Diversion Commodity Materials**



**FIGURE 5-2**  
**Comparison of 2014 and 2008 Illinois**  
**Recovery/Diversion Rates**



# Recommendations

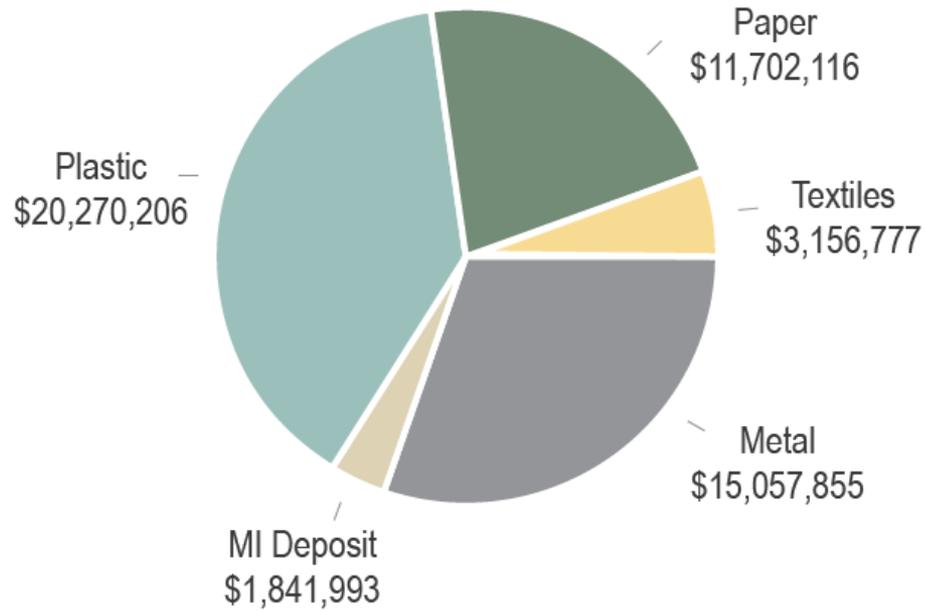
- Address food waste
- Source reduction of low-value materials
  - Low-value resins
  - Misc.
- Decrease electronic waste by half
- Promote availability of textile recycling
- Educate public on costs of recycling
- Pursue further study



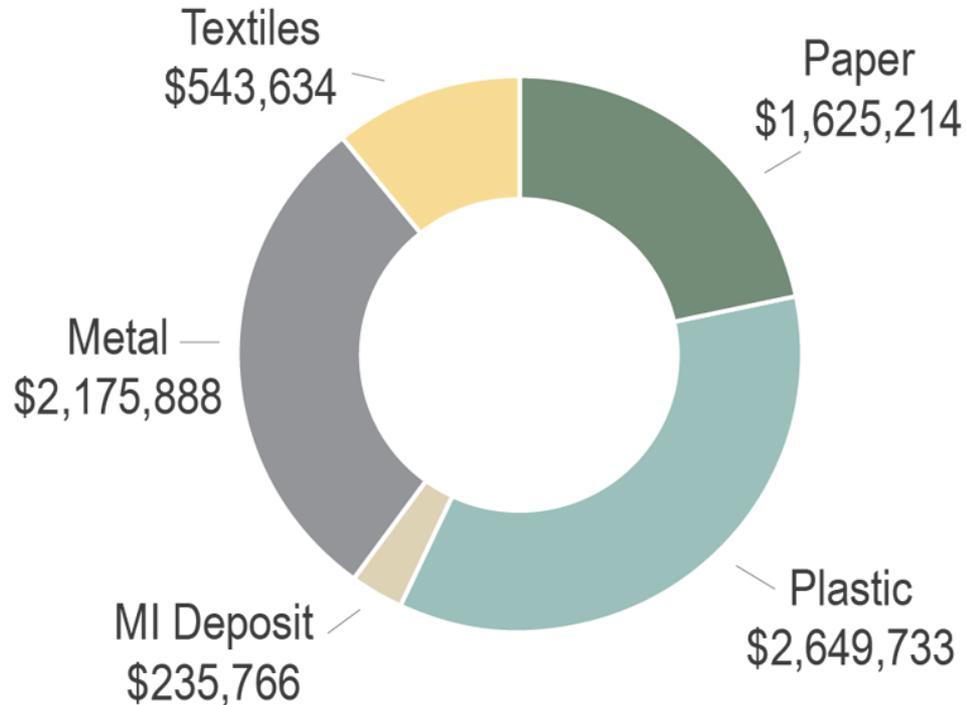
# Using the Data



**FIGURE 6-7**  
**Total Value in W. Michigan MSW Disposed**  
**(mean % by weight)**



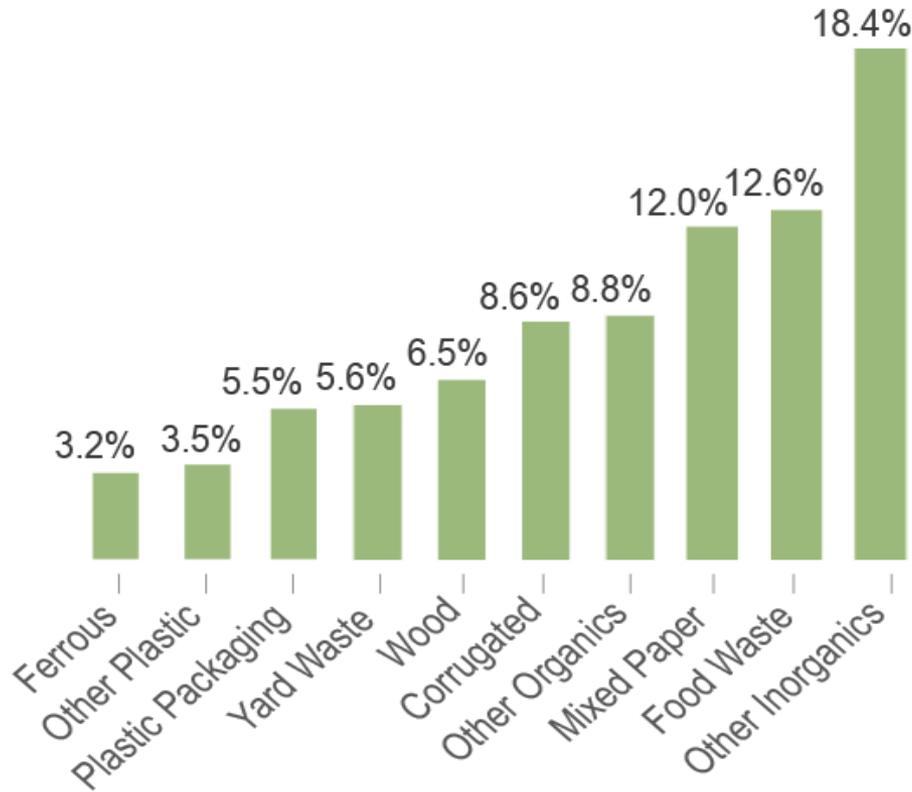
## Total Value Muskegon Co. MSW Disposed (\$)



Source: West Michigan Sustainable Business Forum  
2016 Michigan MSW Valuation Study. [wmsbf.org/msw](http://wmsbf.org/msw)



**FIGURE 6-9**  
**Top 10 Materials in Kent County Composition**  
**(mean % by weight - 5% or greater)**



**TABLE 6-4:  
WEST MICHIGAN COMPOSITION (mean % by weight), AVAILABLE MATERIAL (tons) AND AVAILABLE MATERIAL VALUATION (\$ in 000s)**

Material	Comp.	Available Material	Value	Material	Comp.	Available Material	Value
<b>Paper</b>				<b>Other Wastes</b>			
Mixed	11.36%	118,833	\$4,070,508	Textiles	3.77%	39,460	\$3,156,777
Newsprint	1.32%	13,841	\$808,080	Bulk Items	0.70%	7,295	0
Corrugated	7.98%	83,435	\$6,823,528	Other Inorganics	15.36%	160,675	0
<b>Subtotal Paper</b>	<b>20.66%</b>	<b>216,109</b>	<b>\$11,702,115</b>	<b>Subtotal Other Wastes</b>	<b>19.83%</b>	<b>207,430</b>	<b>\$3,156,777</b>
<b>Plastic</b>				<b>Organic</b>			
Plastic (#3,4,5,7)	4.32%	45,153	\$3,096,167	Food Waste	12.61%	131,929	0
Plastic Bags	2.74%	28,704	\$2,066,689	Yard Waste	4.42%	46,213	0
Plastic Packaging (#2-5,7)	5.14%	53,797	\$12,018,620	Soil	3.37%	35,199	0
PET Beverage (#1)	0.95%	9,983	\$3,088,730	Wood	6.15%	64,321	0
Polystyrene	0.72%	7,562	0	Other Organics	8.46%	88,511	0
<b>Subtotal Plastic</b>	<b>13.87%</b>	<b>145,199</b>	<b>\$20,270,206</b>	<b>Subtotal Organic</b>	<b>35.01%</b>	<b>366,173</b>	<b>0</b>
<b>Metals</b>				<b>MI Deposits</b>	<b>0.27%</b>	<b>2,805</b>	<b>\$1,841,993</b>
Ferrous*	3.59%	37,539	\$7,517,282				
Aluminum	0.48%	5,070	\$7,540,572	<b>Household Hazardous</b>	<b>0.87%</b>	<b>9,050</b>	<b>0</b>
<b>Subtotal Metals</b>	<b>4.07%</b>	<b>42,609</b>	<b>\$15,057,854</b>				
				<b>Electronics</b>	<b>3.07%</b>	<b>32,146</b>	<b>0</b>
<b>Glass</b>	<b>2.34%</b>	<b>24,492</b>	<b>0</b>				

Note: Subtotals for the mean percentages may not equal the sum of the mean percentages due to rounding.



# Do Your Own: [wmsbf.org/msw](http://wmsbf.org/msw)

Table 2-1 x MSW = Available Weight

Table 4-2 x AW = Market Value



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**OUR GOAL**

**2020**



**REDUCE LANDFILL WASTE  
20% by 2020 | 90% by 2030**

**2030**



**KENT COUNTY  
DEPARTMENT OF  
PUBLIC WORKS**

# OUR GOAL: TO REDUCE LANDFILL WASTE

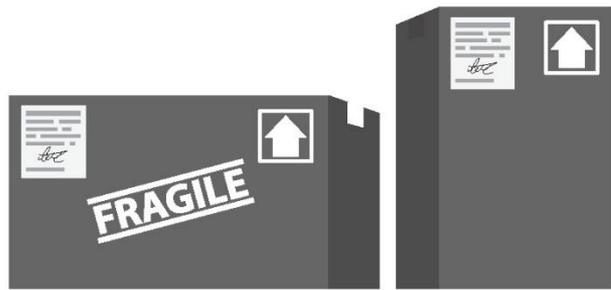


2020



2030

# Imagine...



*used boxes  
being  
recycled into  
nice new  
boxes*



**TAKE THE PLEDGE TODAY: [IMAGINETRASH.ORG](http://IMAGINETRASH.ORG)**

# Imagine...



*using food  
scraps to  
nourish your  
garden*



**TAKE THE PLEDGE TODAY: [IMAGINETRASH.ORG](http://IMAGINETRASH.ORG)**

# Imagine...



*using spent  
hops to power  
homes*



**TAKE THE PLEDGE TODAY: [IMAGINETRASH.ORG](http://IMAGINETRASH.ORG)**

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**OUR GOAL**

**2020**



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**Learn More:  
[wmsbf.org/msw](http://wmsbf.org/msw)**

Thank you

