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# DESKTOP WASTE CHARACTERIZATION

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ME →

AS MUCH FUN AS  
THIS IS... WHAT IF  
THERE WAS ANOTHER  
WAY?

Humacao # 48 06-09-2023  
Municipio - San Juan

# Desktop vs. Field Waste Characterization

## Advantages of Desktop Studies



Lower cost



Less time



Safer



Low gross factor

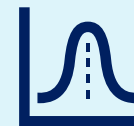
## Limitations of Desktop Characterization Studies



Comparable data needed



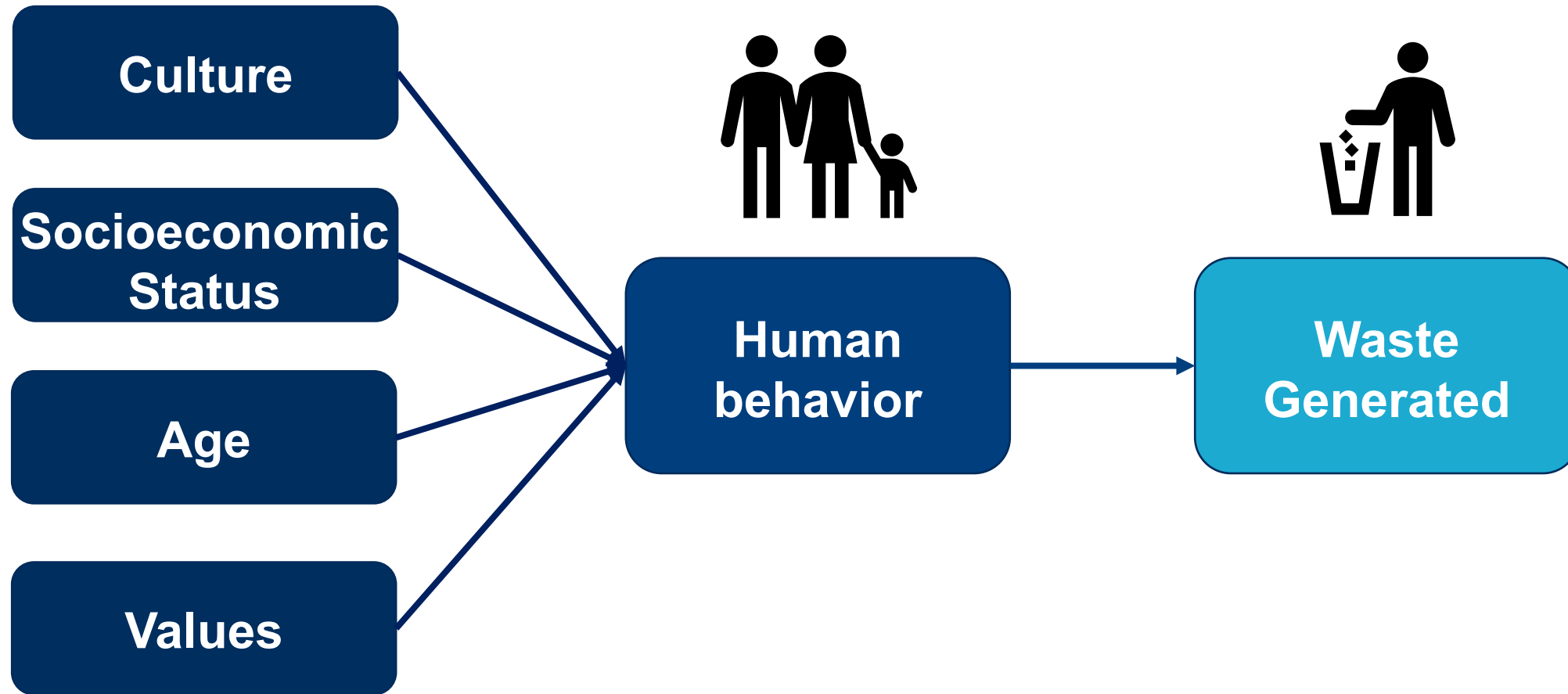
Not suited for identifying temporal variability



Systemic approach based on statistical analysis of national data is needed



# Fundamental Premise



# Characterizing The Wasteshed



**Unknown Waste  
Stream**

- **Income**
- **Population**
  - Population density (rural/urban)
- **Recycling**
- **Regional/geographic metrics**
  - Laws and mandates
  - Culture
- **Key industries/institutions**
  - Tourism
  - Universities



# Desktop Waste Characterization Process

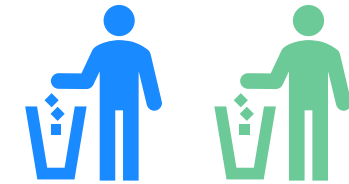


Unknown Waste Stream



Known Waste Streams

## ANALYTICAL HIERARCHY PROCESS



Metric	A	B	A/B
Population Density	2,600	1,300	2.00
Median Income	\$56k	\$53k	0.95
Tourism	8,000	32,000	0.25
Student Population	15%	5%	3.00

Relationships



# Analytical Hierarchy Process Steps

1

**Subjective  
pairwise  
comparisons**

2

**Use  
comparisons  
to weight  
metrics**

3

**Assign  
studies  
scores per  
metric**

4

**Final score  
for each  
study**

5

**Weighted  
average  
composition  
by study  
scores**



# Desktop Characterization Steps

Subjective  
pairwise  
comparisons

## How important is one metric compared to another?

Metric 1	Intensity	Metric 2	Intensity
Population	1.0	Median Income	2.0
Population	1.0	Population Density	1.0
Population	1.0	Student Population	2.0
Population	1.0	Recycling Rate	3.0
Population	1.0	Tourism Industry	1.5

Median income is  
twice as influential  
as population

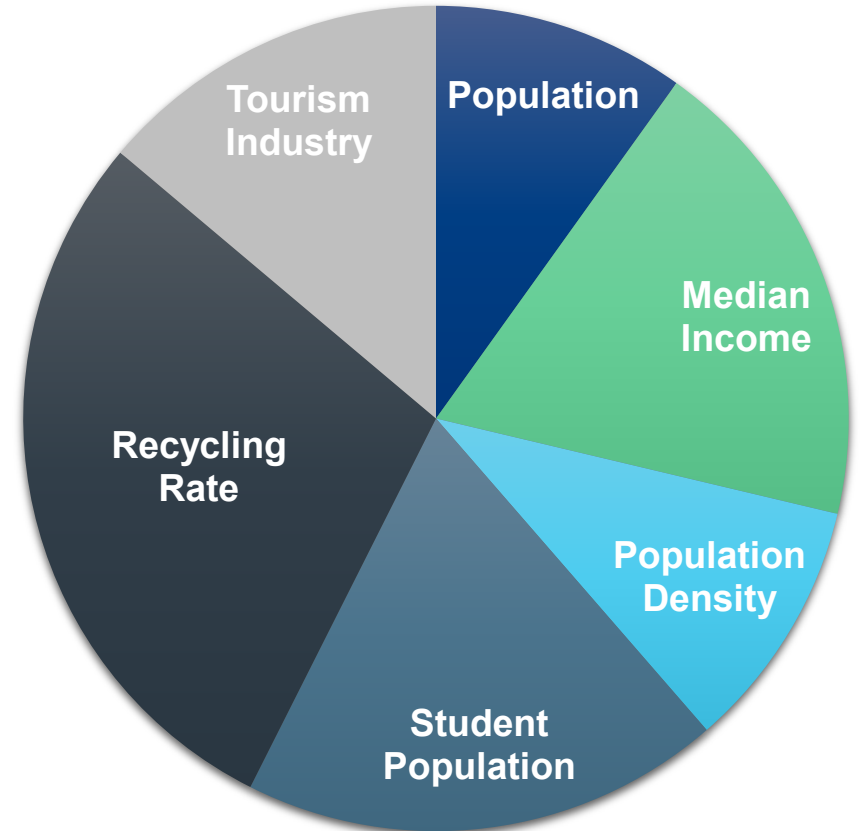


# Desktop Characterization Steps

Use comparisons to weight metrics

## Considering all comparisons, how can we score each metric?

Metric	Score
Population	0.10
Median Income	0.19
Population Density	0.10
Student Population	0.19
Recycling Rate	0.29
Tourism Industry	0.14



# Desktop Characterization Steps

Assign  
studies  
scores  
per metric

How do the metrics of each input study relate to the metrics of the unknown area?

Study	Median Income	Percent Difference	Matrix Score
Unknown Area	\$50,000	-	-
Known Area A	\$51,000	2%	2
Known Area B	\$48,000	-4%	1

A is twice  
as representative  
as B

# Desktop Characterization Steps

Final  
score  
for each  
study

How does each comparison area relate to the unknown area?

Known Area Studies	Study Score
A	0.27
B	0.22
C	0.10
D	0.13
E	0.20
F	0.09

Most similar

Least similar

# Desktop Characterization Steps

Weighted  
average  
composition  
by study  
scores

**What is the anticipated waste stream of the unknown area based on the known areas?**

Metric	Comp Study A	Comp Study B	Comp Study C	Results
Study Weight	0.41	0.27	0.32	
PET Bottles	1.8%	1.4%	2.4%	1.88%
HDPE Bottles	1.0%	1.0%	0.9%	0.97%
Food Waste	13.8%	13.7%	10.2%	12.62%
Yard Waste	14.5%	1.5%	4.0%	7.63%
Aluminum	0.8%	1.2%	1.1%	1.00%
Corrugated Cardboard	5.3%	2.6%	2.8%	3.77%

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# Pensacola Case Study





## Primary Motivation

- ▶ Preliminary organics technology feasibility



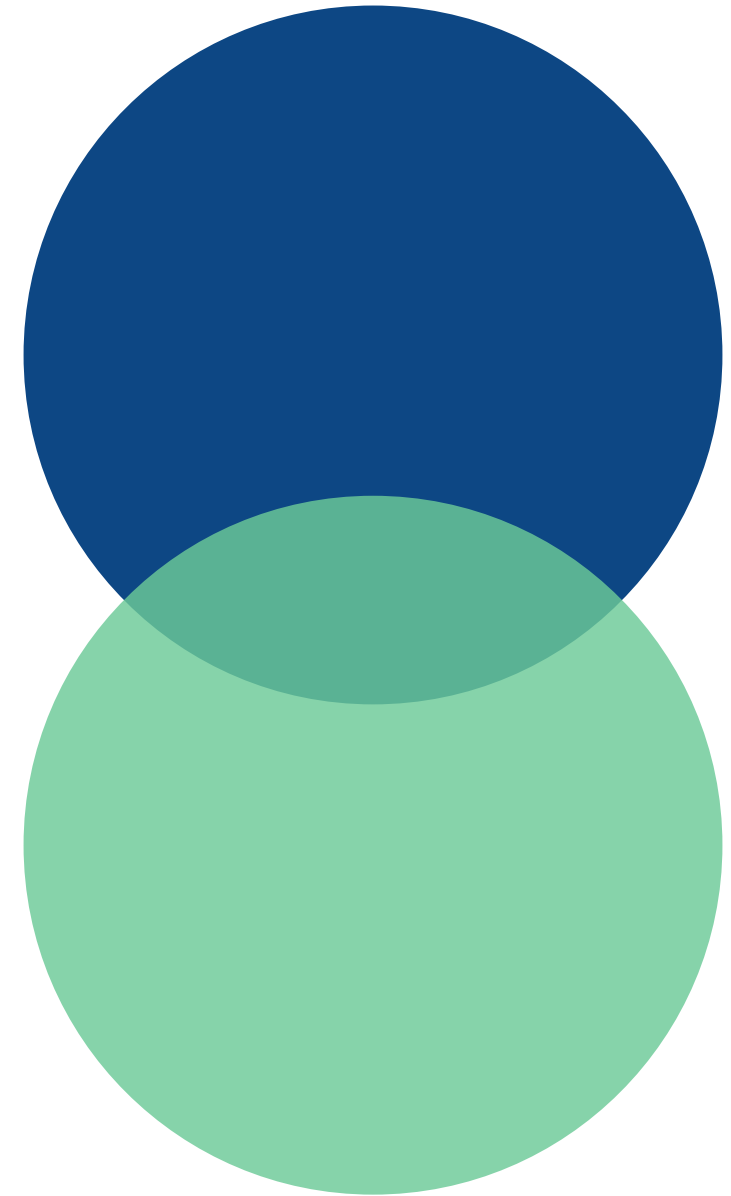
## Sectors Assessed

- ▶ Residential
- ▶ ICI

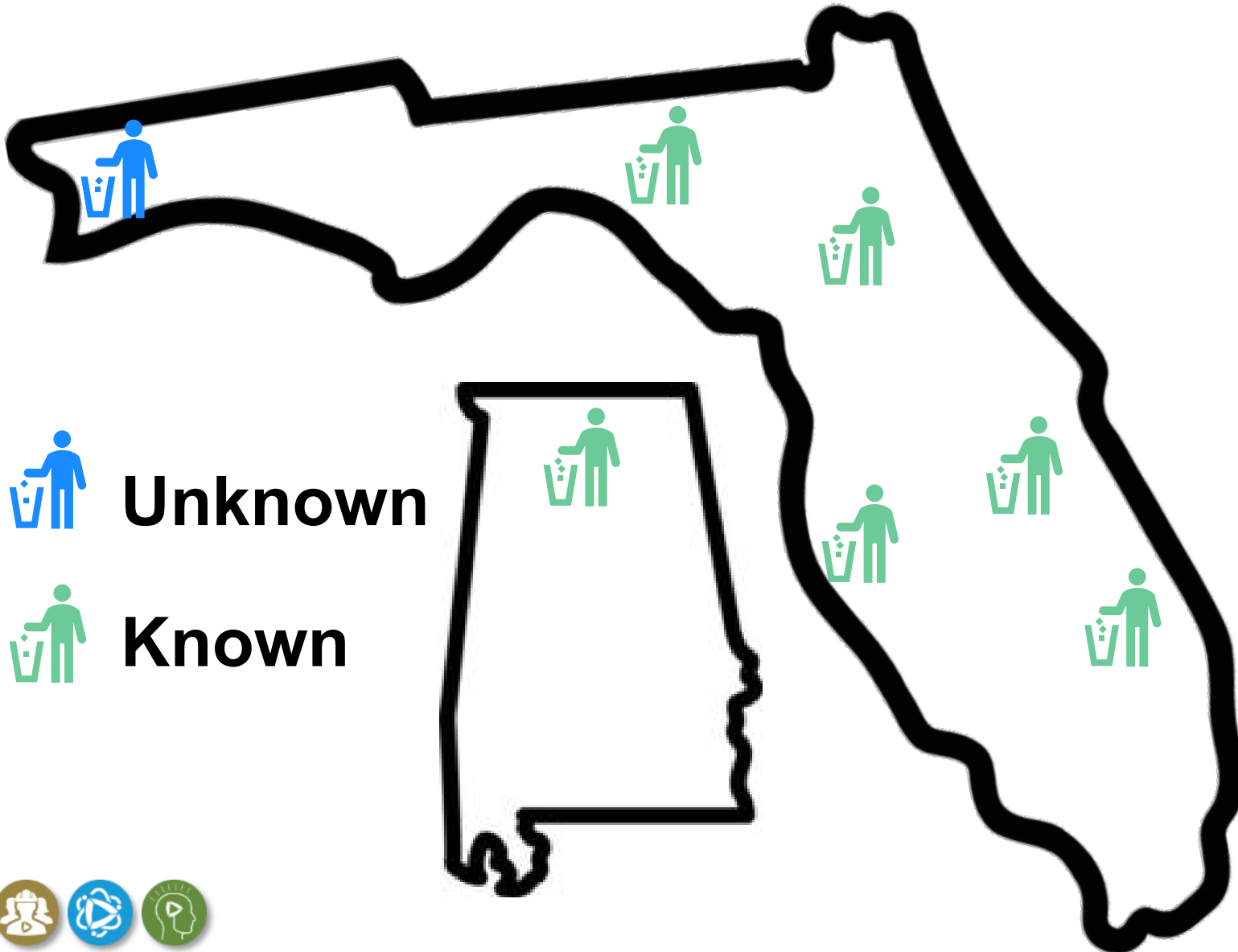


## Special Considerations

- ▶ Tourism
- ▶ UWF not in wasteshed



# Pensacola Case Study



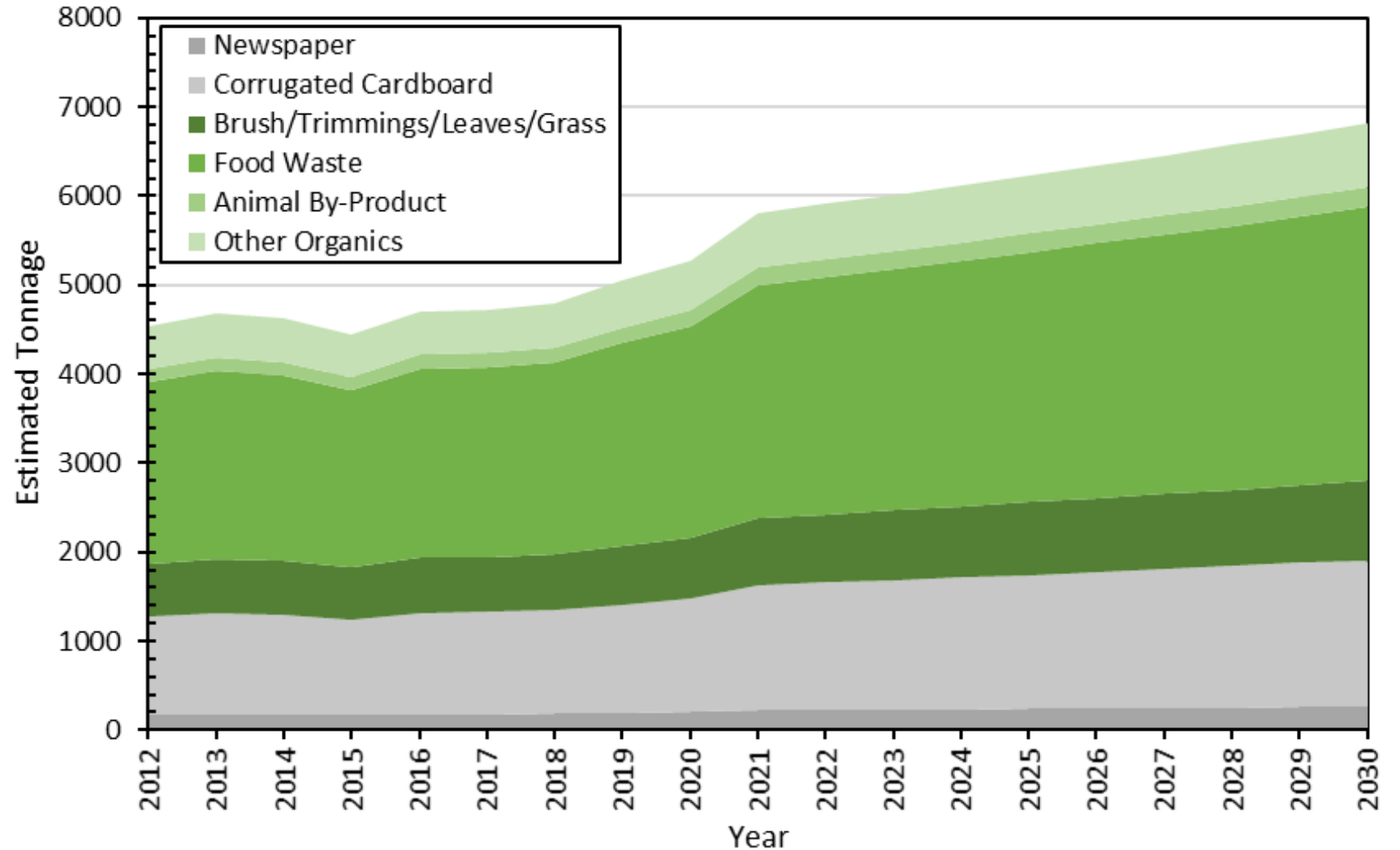
## Criteria

- Median income
- Total population
- Population density
- Student population
- Recycling rate
- Hotel/Motel rooms per capita (tourism)



# Pensacola Case Study

Validation  
resulted in  $\pm 2\%$   
per category







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# Massachusetts District Case Study





## Primary Motivation

- ▶ Preliminary anaerobic digestion feasibility



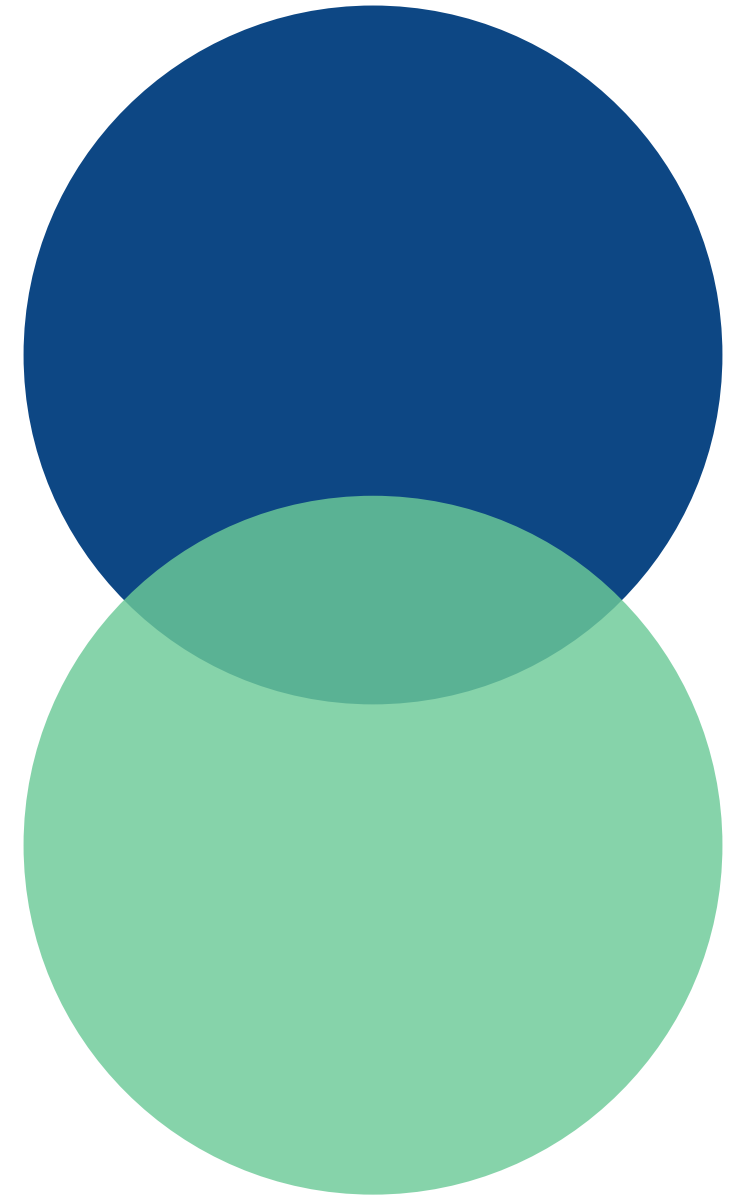
## Sectors Assessed

- ▶ Residential
- ▶ ICI

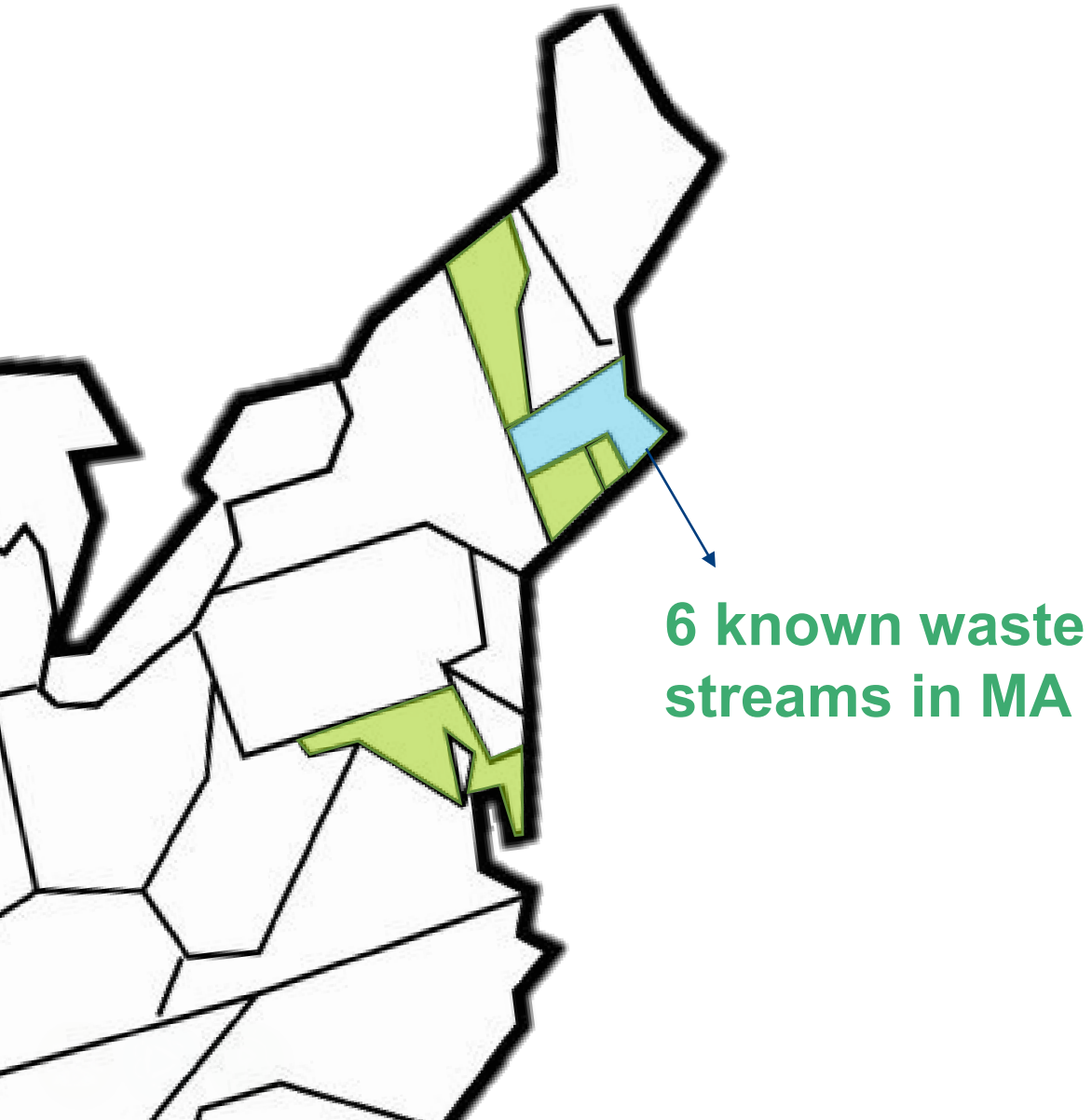


## Special Considerations

- ▶ Waste bans in place
- ▶ Municipality contracts



# Massachusetts District Case Study



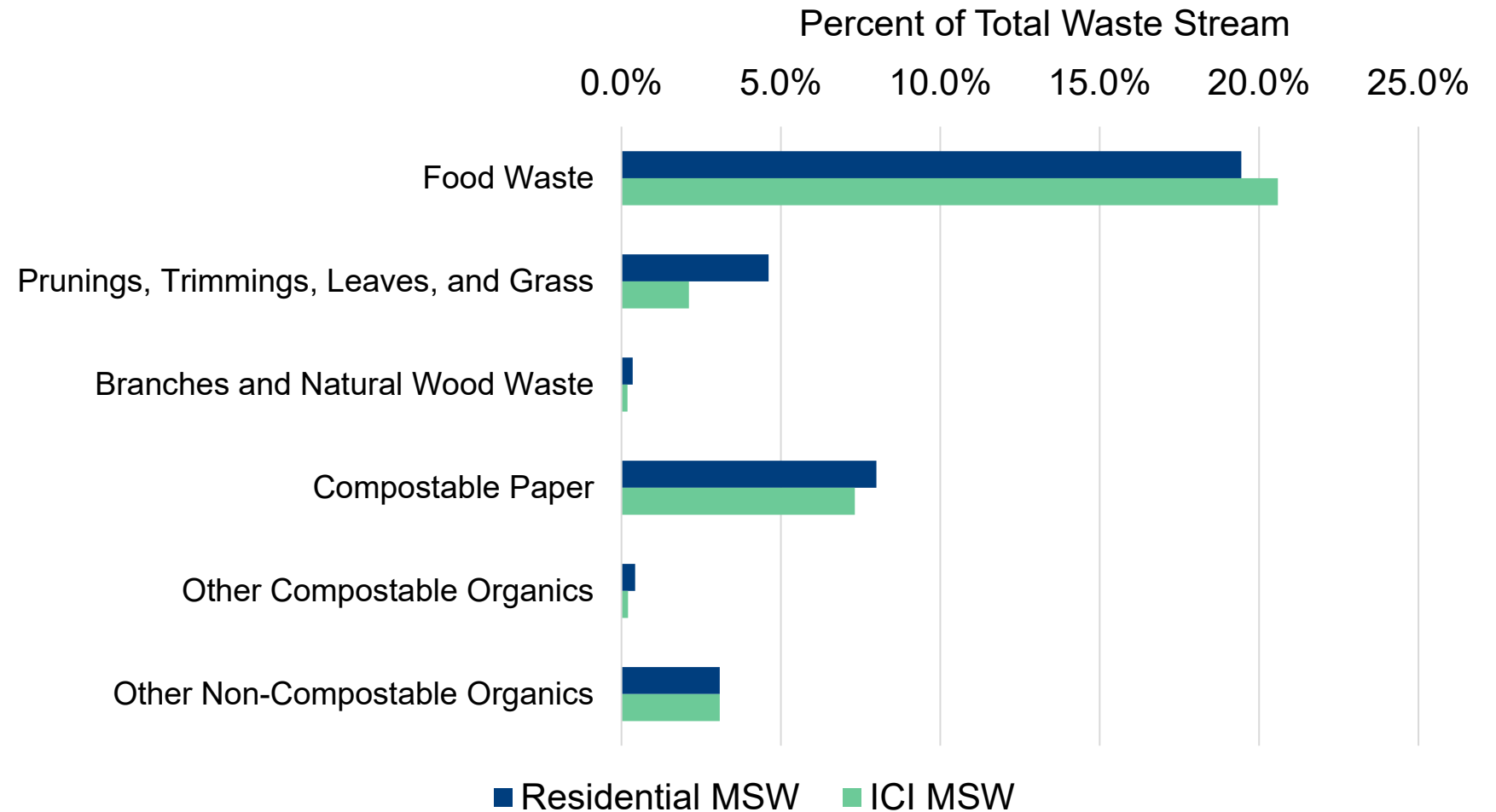
## Criteria

- Median income
- Total population
- Population density
- Presence/absence of organics diversion
- Recycling rate
- In/out of Massachusetts



# Pensacola Case Study

Validation  
resulted in  $\pm 1\%$   
per category

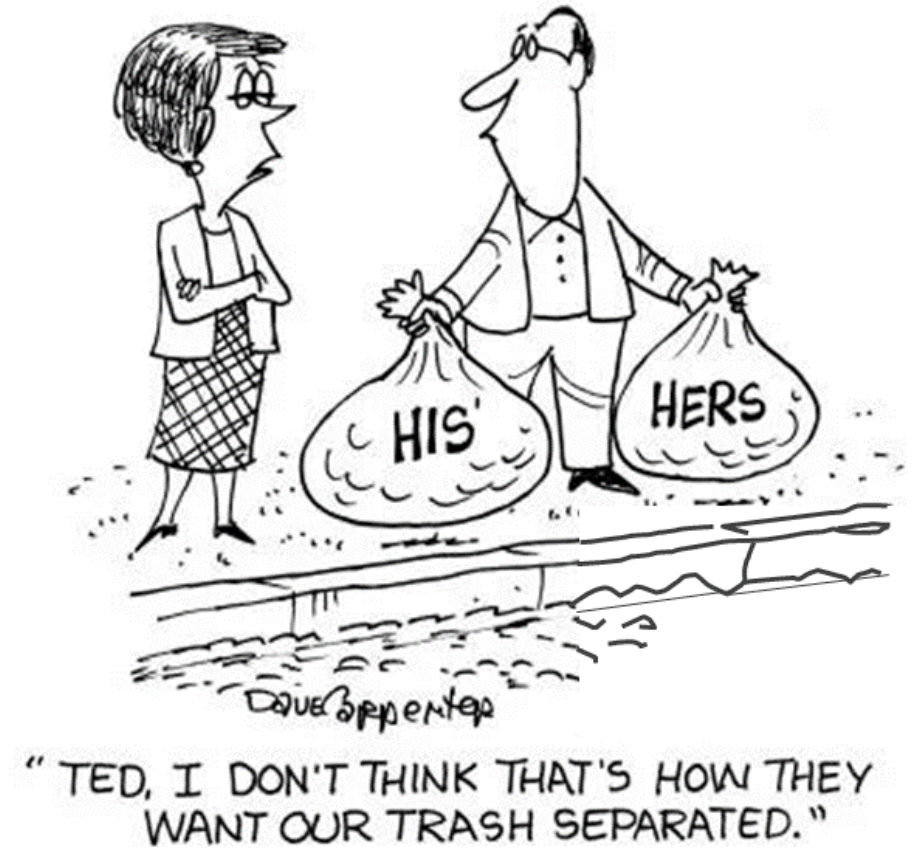


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# Summary

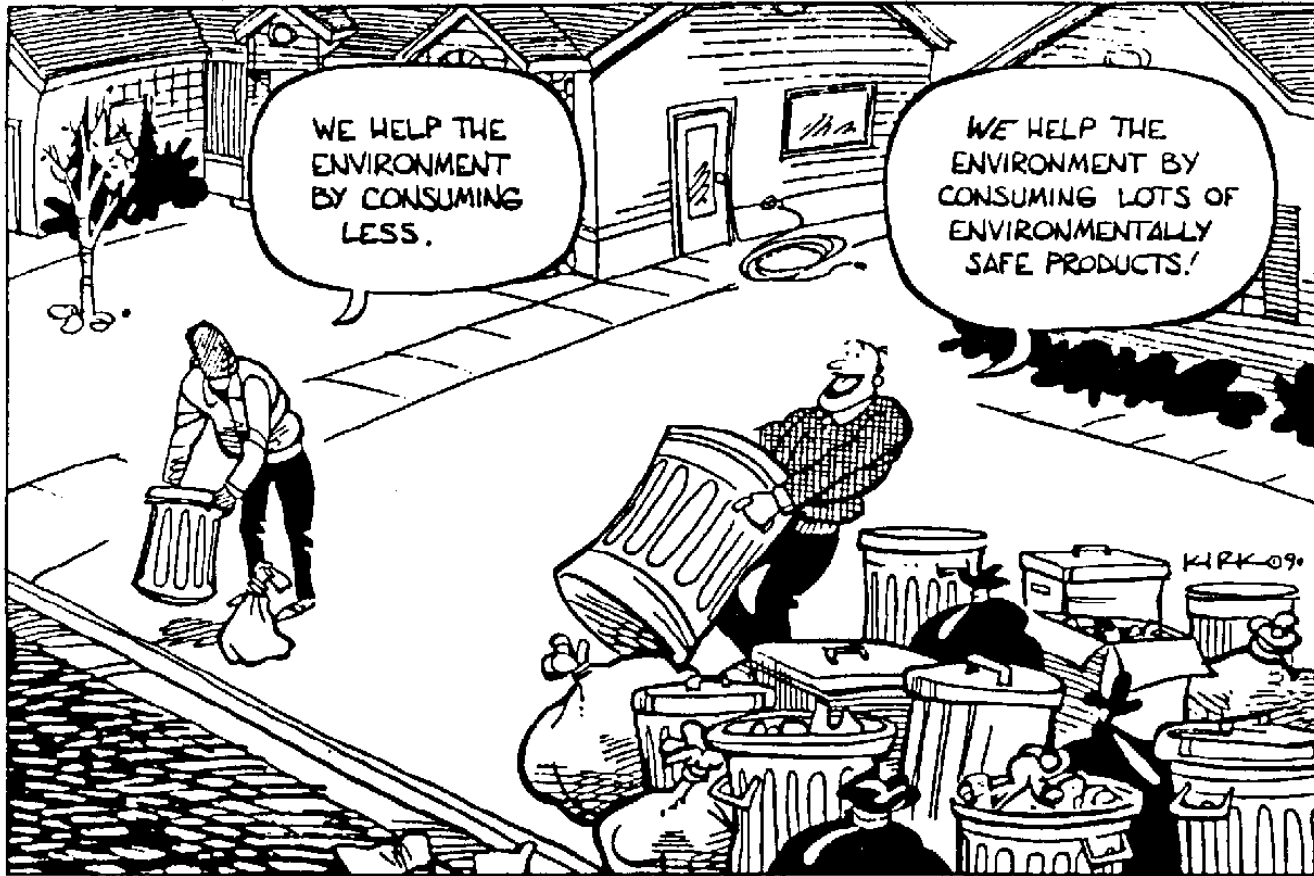
## Desktop Characterization is Best When:

- ✓ Preliminary assessment is needed
- ✓ Multiple comparable datasets are available
- ✓ Time and/or budget are constraints
- ✓ Supplementing manual data from the same area



# Summary

(Released by Kirk Anderson, Cartoonist)



## Major considerations:

- ✓ Proper characterization of waste
- ✓ Selection of appropriate studies

## Next steps:

- ✓ Statistical analysis of trends in waste composition



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# Thank you!

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