BIG DATA IN THE WASTE INDUSTRY

Diana Celaj, Josh Desmond, Akshaye Shah, Sola Shirai

- Background
- Introduction to Big Data
- Current State of Data on Waste
- Uses of Big Data on Waste
- Our Recommendations

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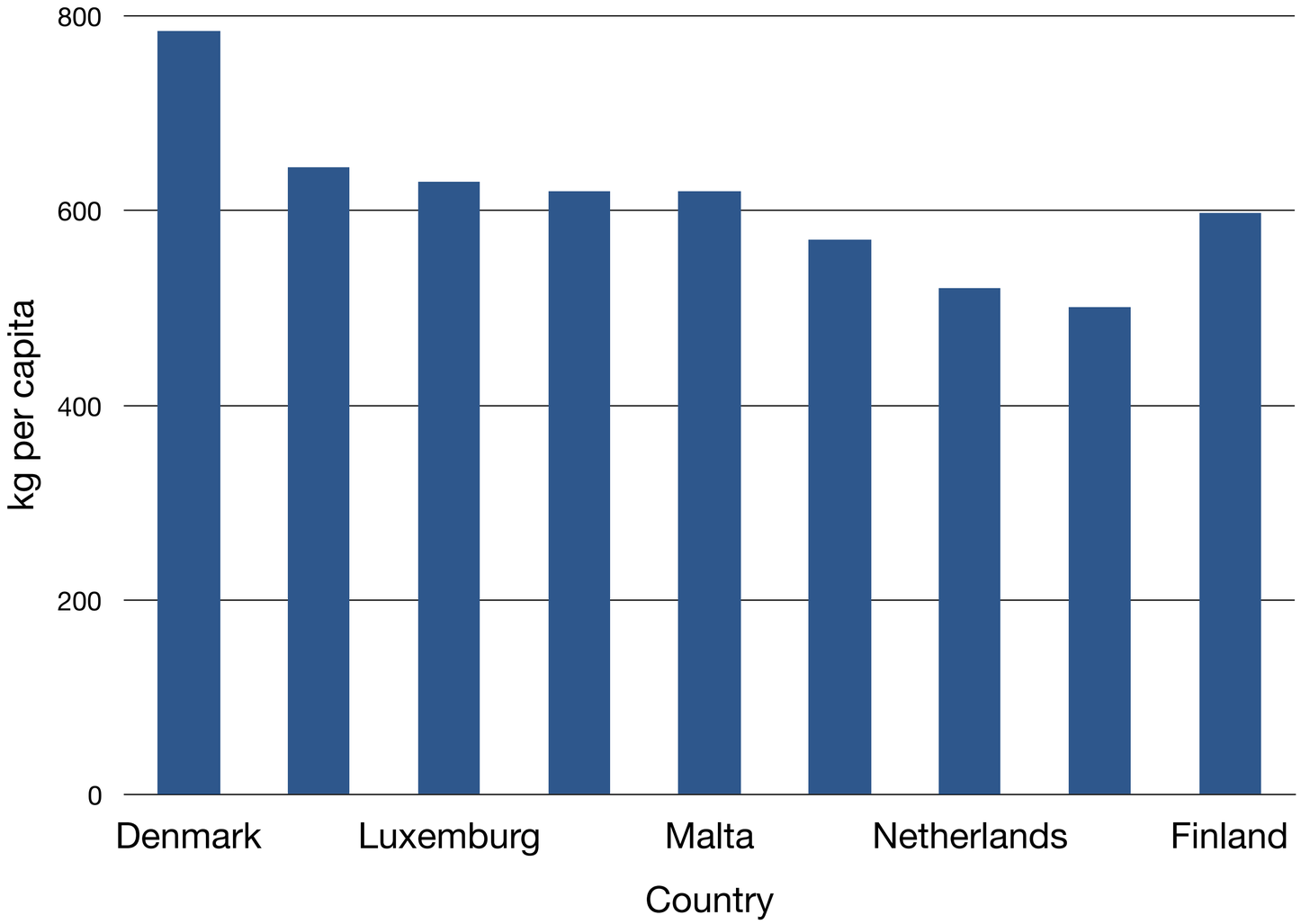
54 MEMBERS

MUNICIPAL WASTE COMPANIES

MEMBER'S BEST INTEREST

DENMARK IS A MAJOR PRODUCER OF WASTE

Largest municipal waste producer per capita in the EU in 2015



DENMARK IS AIMING TO REDUCE WASTE

50% Household Recycling Rate by 2022

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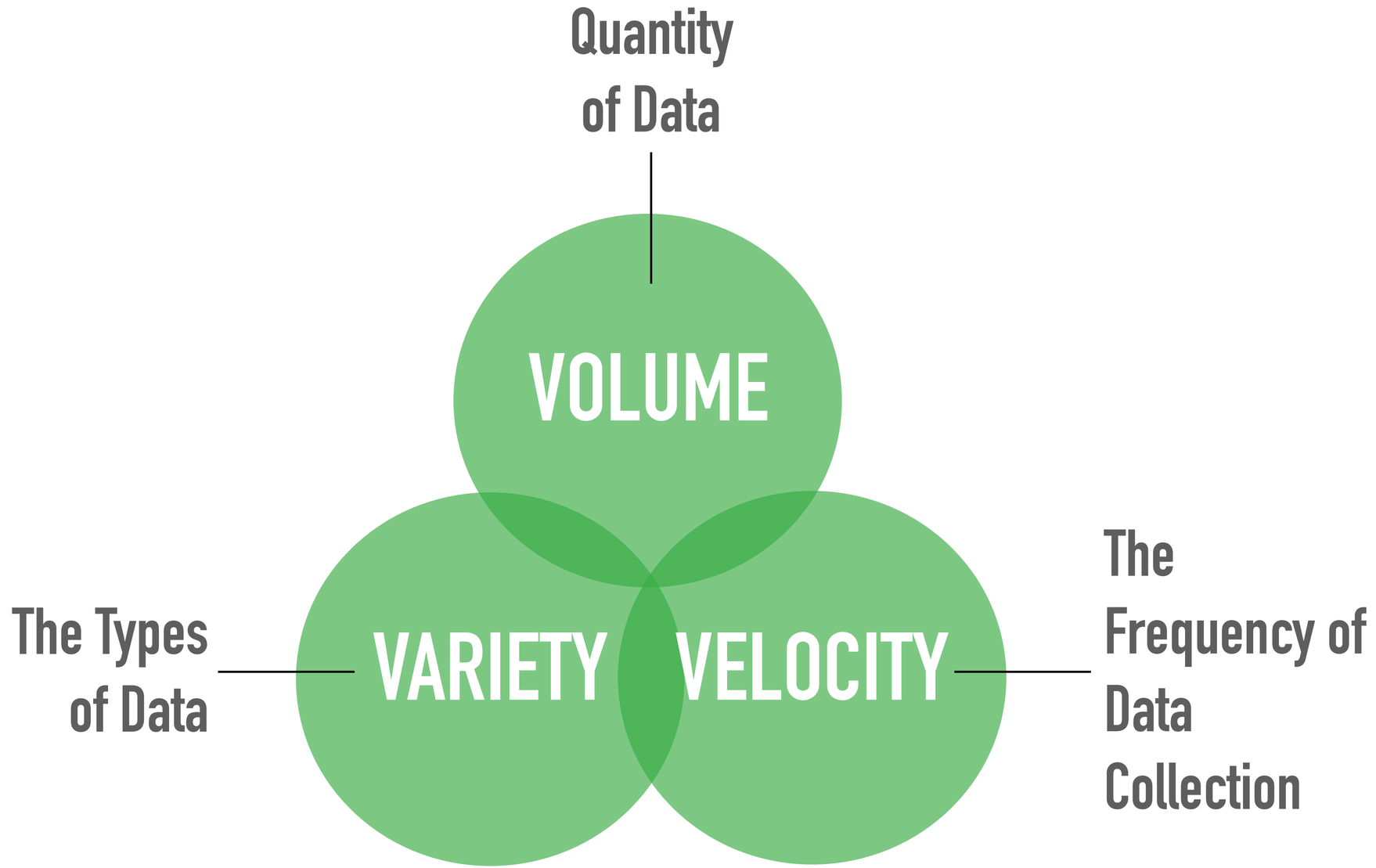
CHARACTERISTICS OF BIG DATA



BIG DATA HAS BEEN USEFUL IN OTHER INDUSTRIES

PREDIX

Saved $7 Million on jet fuel by analyzing jet engine data

TESCO

Saved $78 million in warehouse stocking costs through regional shopping habits

AARHUS UNIVERSITY

Reduced energy consumption by 8.1% through feedback to citizens

DATA MANAGEMENT IS COMPLICATED

- Poor management leads to unusable data
- Re-organizing data to a usable state can take 1-2 years

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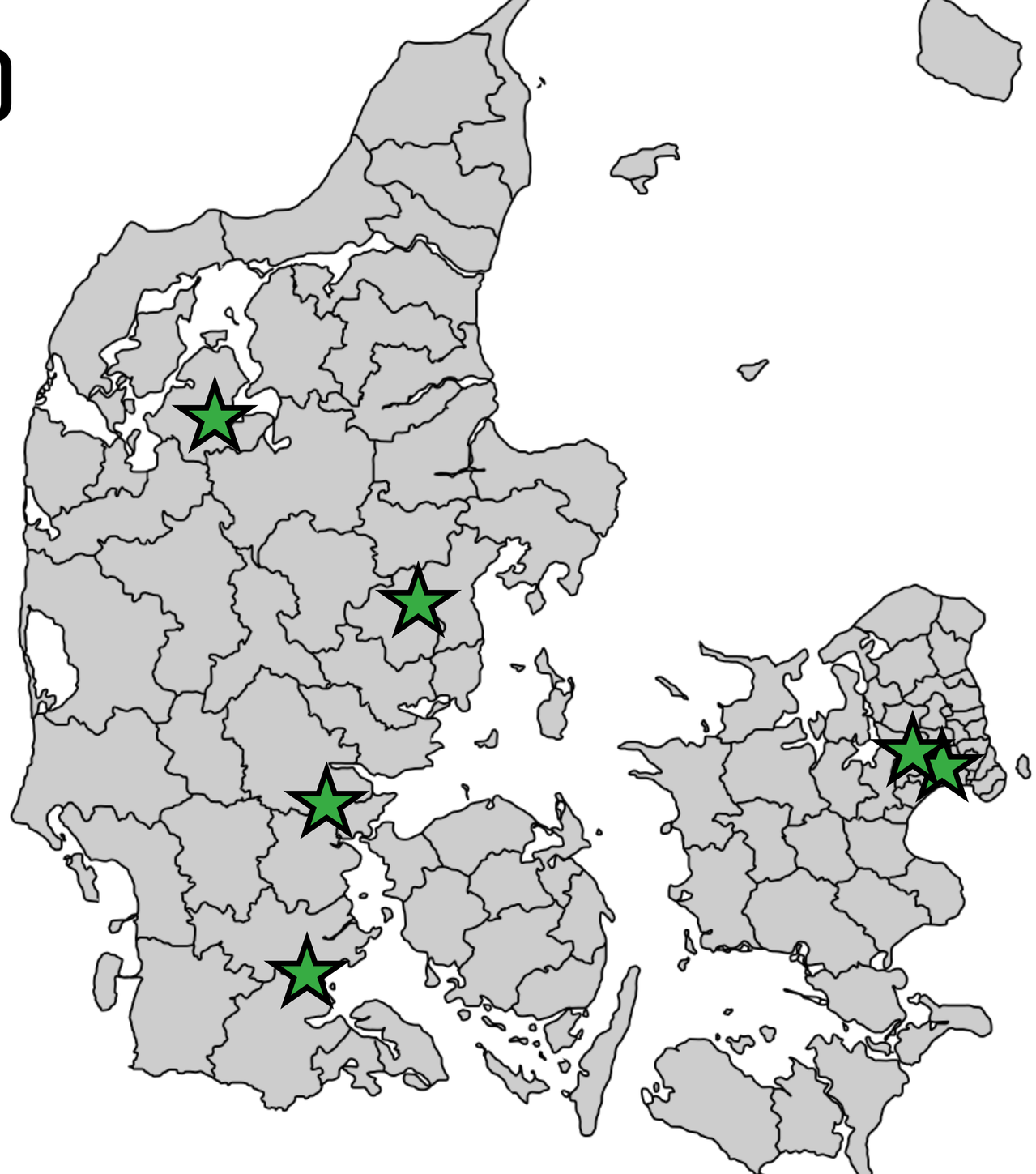
WE INTERVIEWED

Municipal Waste Companies:

- Frederiksberg
- Renosyd
- Vestforbraending
- Nomi4s
- Arwos

Field Experts:

- Big Data Researcher
- Cybersecurity Expert
- Legal Officer
- Data Analyst



STATE OF DATA COLLECTION

Danish EPA's ADS

- Mass and type of waste
- Treatment of waste transfer

Household Data

- Mass of bins, time of collection, location of bin
- RFID tags on waste bins

Operational Data

- Financial Data
- Data on Waste Transfer and Shipments
- Semi-Automatic Collection, QR Codes

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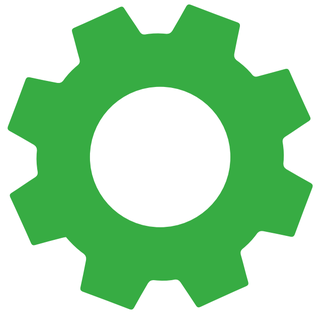


Operational Data

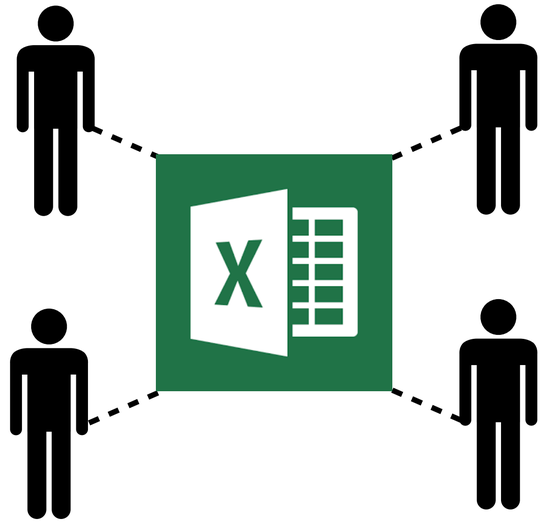
- Financial Data
- Data on Waste Transfer and Shipments
- Semi-Automatic Collection, QR Codes

DATA MANAGEMENT PRACTICES VARY

- Many third party developments
- Varying automatic data processing
- Limited communication among systems

NET DIALOG

MAACK IT



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BENEFICIAL USES OF DATA ON WASTE

- Performance Analysis
- Predictive Analytics
- Route Optimization
- Feedback to Citizens

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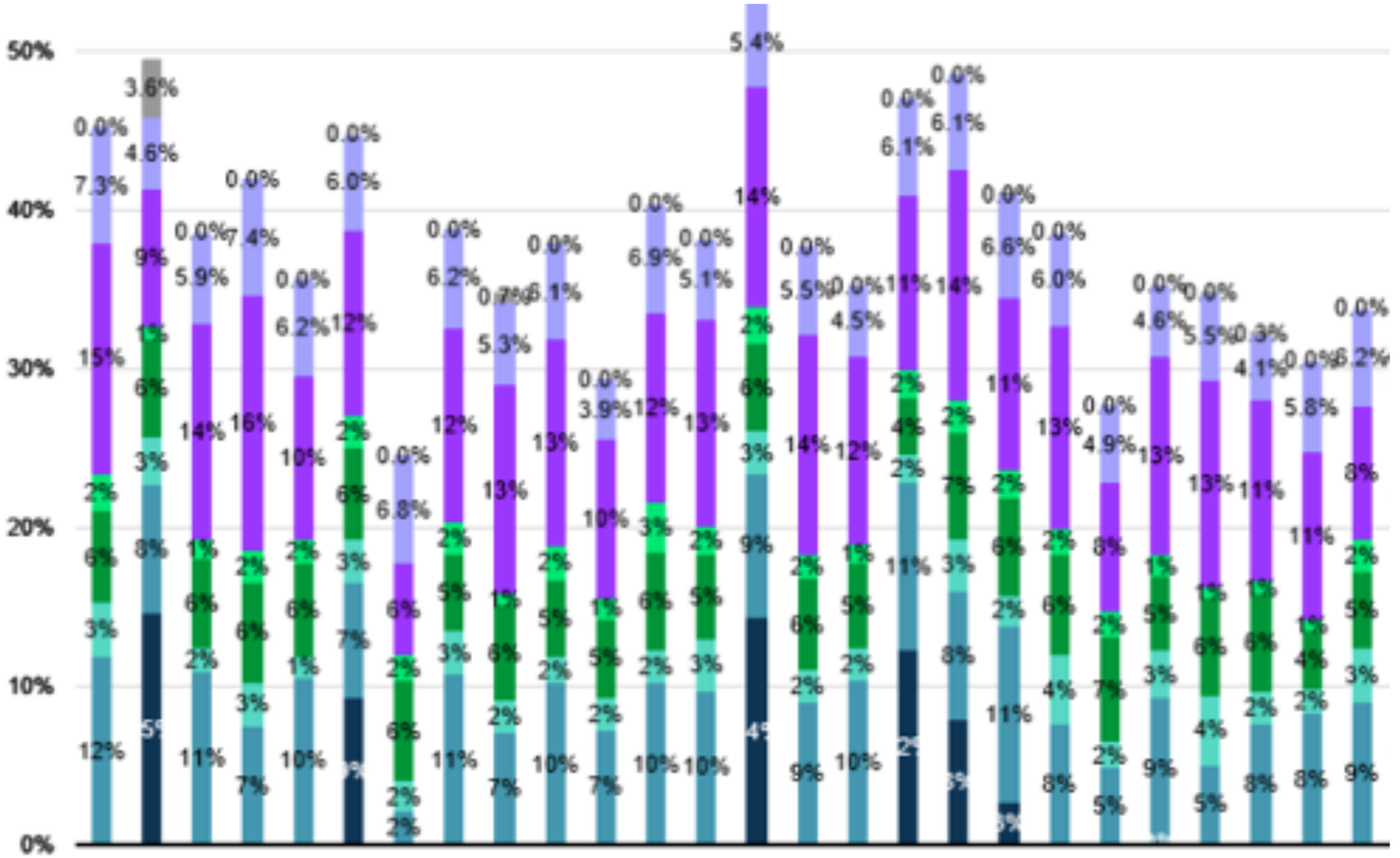

Recycling Percentage By Type Per Municipality

- Assess organizations' performance
- Identify weaknesses, measure success
- Comparisons between municipalities

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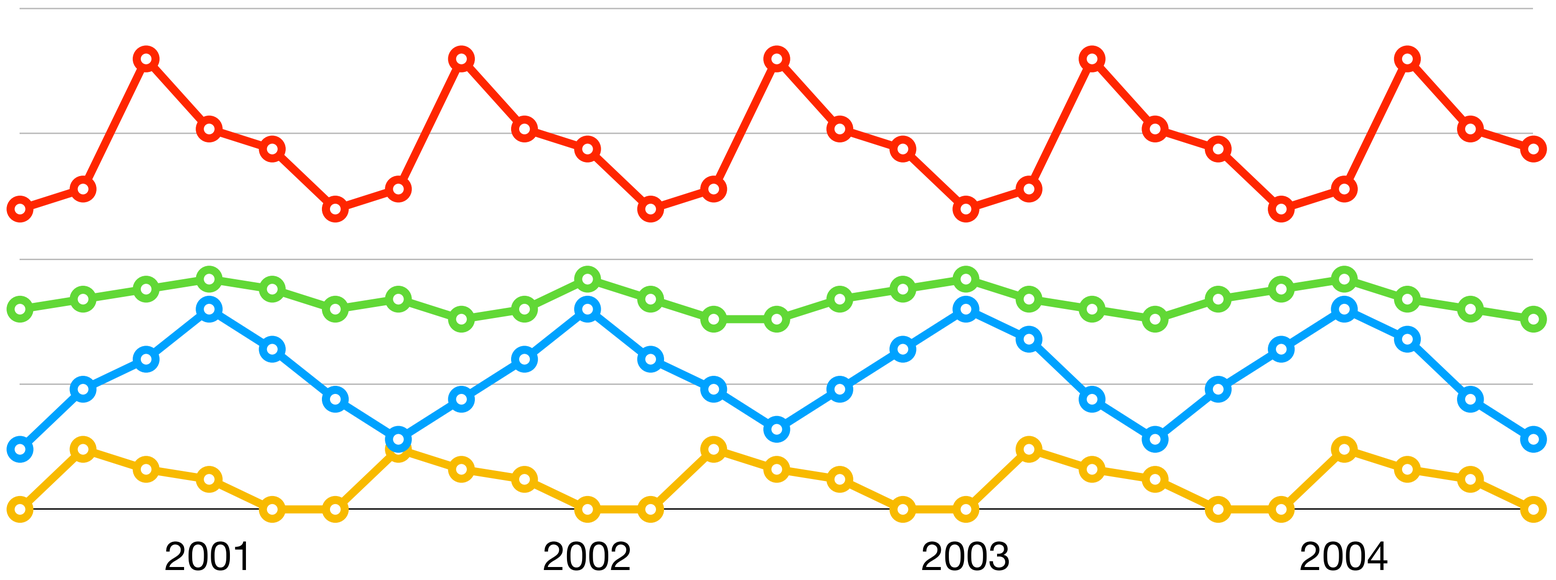

- Use data to predict future events
- Detects trends in waste production
- Predict yearly costs, future supply and demand

BENEFICIAL USES OF DATA ON WASTE

- Performance Analytics
- Predictive Analytics
- Route Optimization
- Feedback to Citizens

- Use waste collection trends to generate optimal collection routes
- Reduce amount of resources used
- Combine with real-time data for live route optimization

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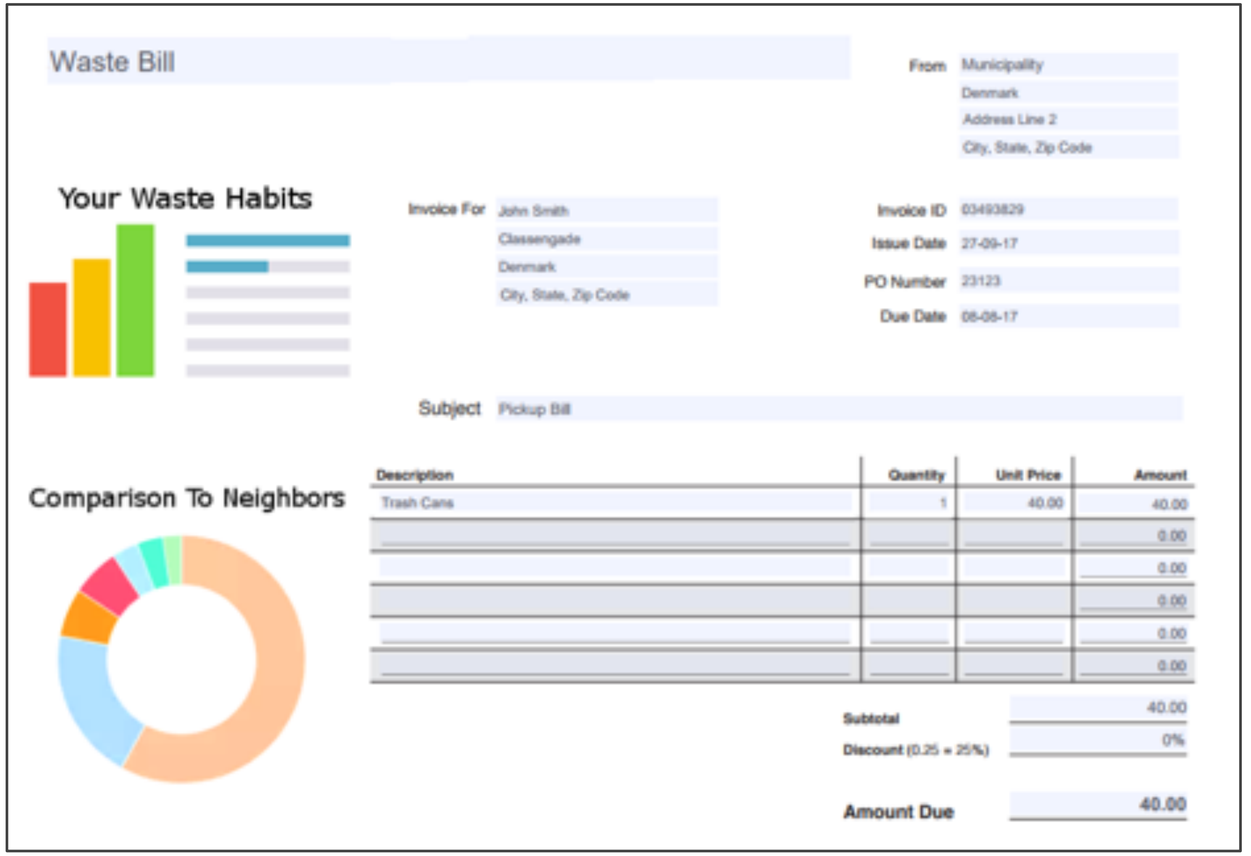

- Provide tailored feedback about waste habits
- Educate citizens and encourage waste reduction
- Rewards: pay-as-you-throw programs
- Recognition: congratulate and thank citizens

NEGATIVE USES OF DATA ON WASTE

Date, Street	Clasensgade 30	Fasanvej 42	Trianglen 26
01/09/17	5 kg	10 kg	7 kg
08/09/17	0 kg	9 kg	7 kg
15/09/17	0kg	10 kg	6 kg
22/09/17	6 kg	11 kg	13 kg

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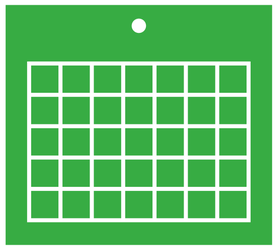

The Vacation Problem

Identify when homes are unoccupied

Marketing Problem

Identify demographics of homes based on waste production

The Unknown Problem

Unforeseen problems and uses in the future

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LIMITATIONS ON THE USE OF BIG DATA

- Laws exist that limit data collection and processing
- EU's General Data Protection Regulation
  - Stronger Consent Requirement
  - Requests to delete data
  - Document data flow

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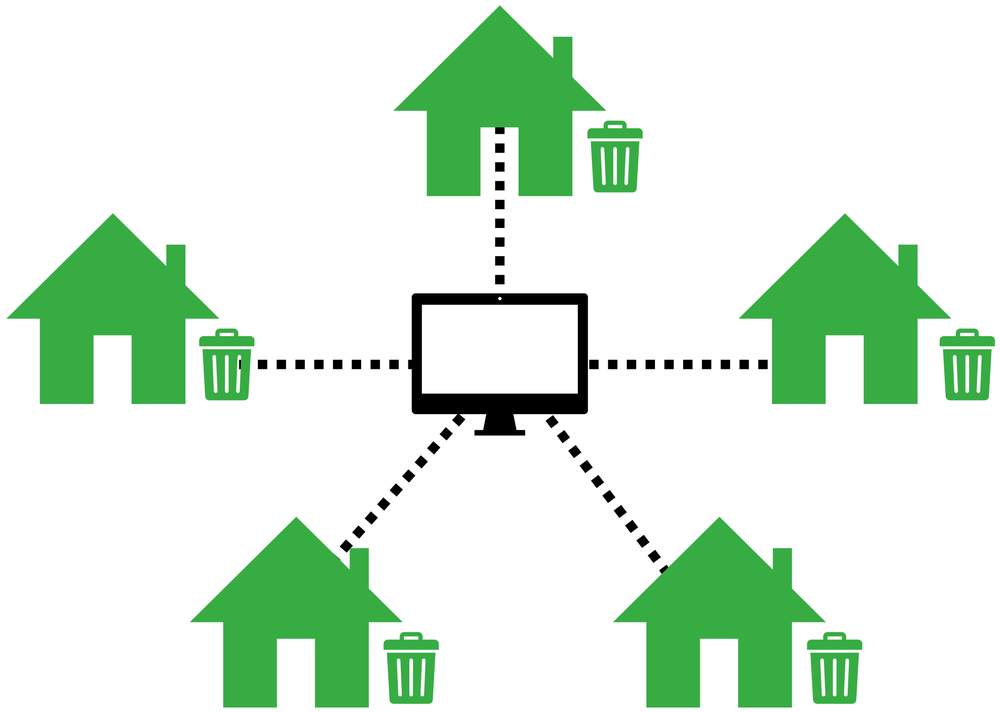
OUR RECOMMENDATIONS

Collection, Management, Privacy, Cybersecurity

Investigate the viability of collecting data on waste per household

- Possible through varying degrees of technology
- Beneficial uses such as feedback to citizens and route optimization
- Municipalities should perform cost-benefit-analysis before collecting

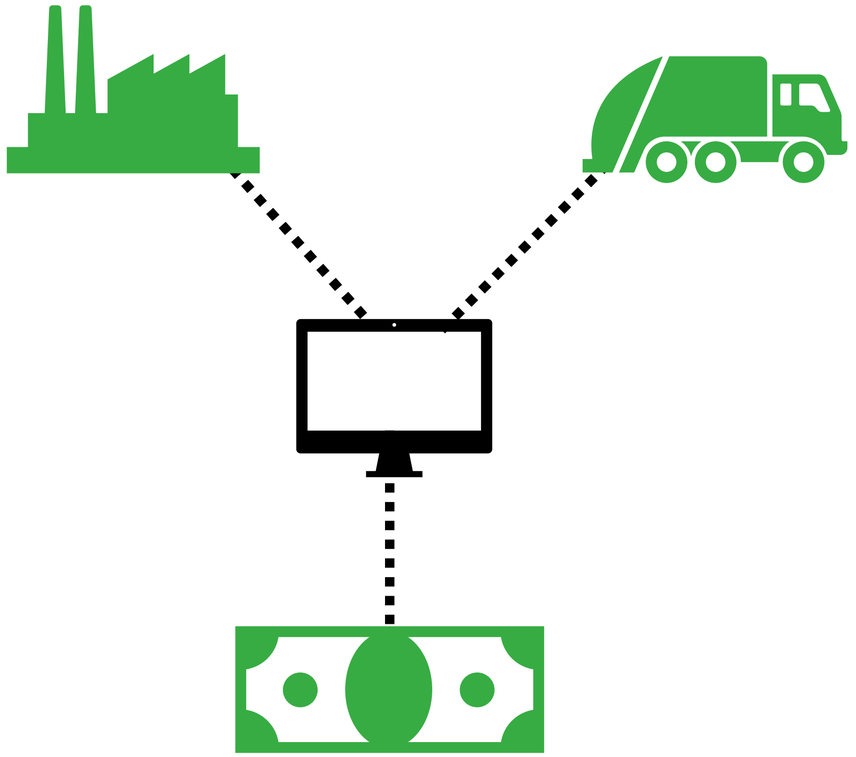


Determine if feedback to citizens is beneficial

- Consider the use of feedback programs
- Be aware of the negative side effects
- Support further research on feedback

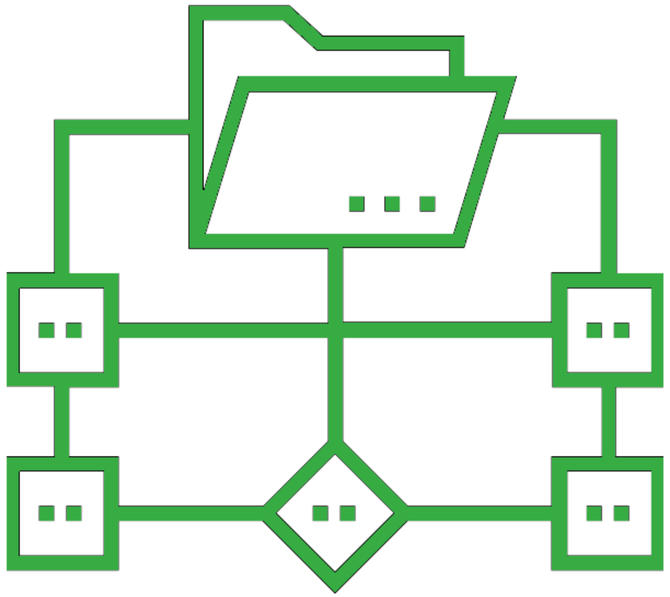
Collect more data on internal operations

- Financial data, data at transfer stations, data on shipments of waste
- Could be done through varying degrees of technology
- Must expand data collection and integration



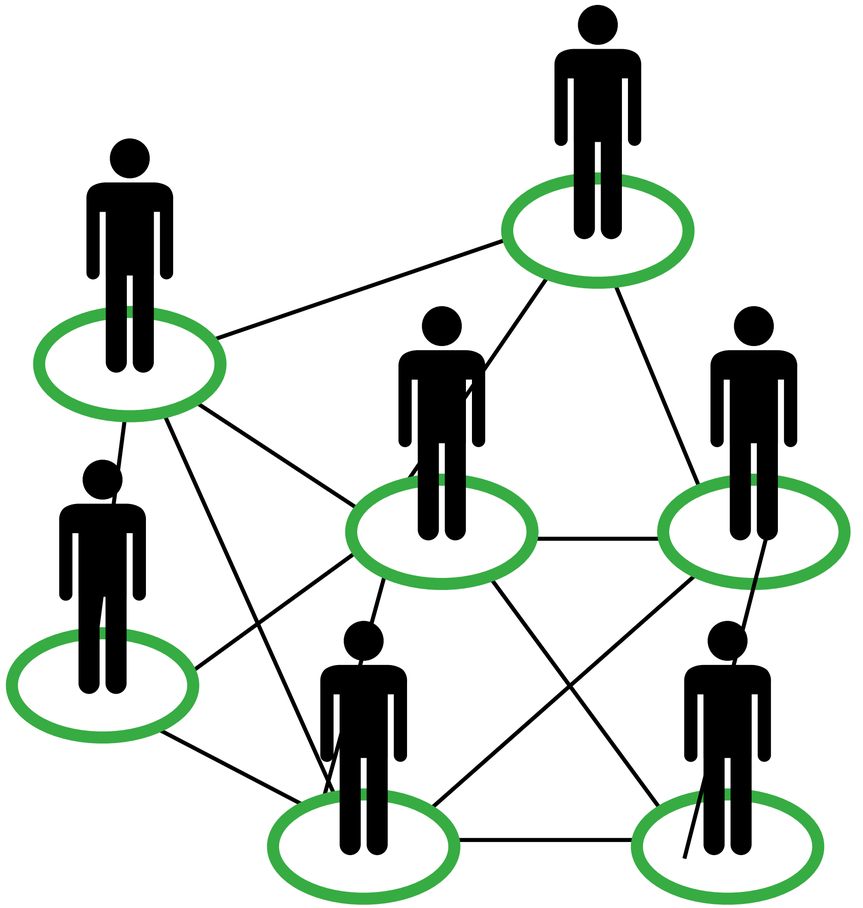
Develop strong data management platforms

- Management platforms must be created before collection of data
- Data can take 1-2 years to organize into a useable state



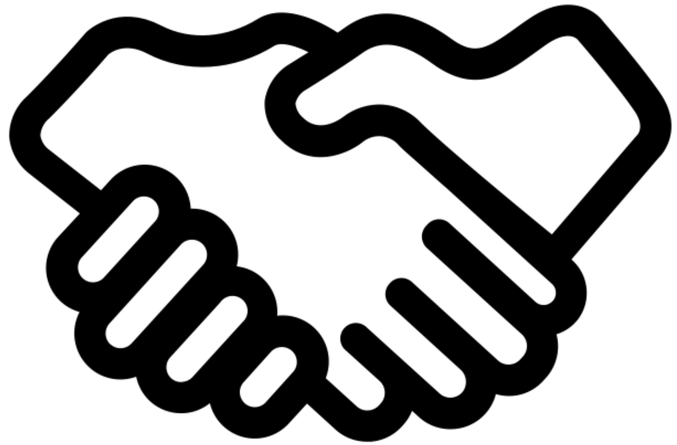
Create standards for the sharing of data between organizations

- Data exchange practices are currently insufficient
- Develop an industry standard data model
- Work with industry leaders in data management



Identify incentives for sharing data

- All parties can benefit from data sharing
- Incentives need to be clearly identified
- Data sharing between waste processors & waste collectors



Recommendations in regards to personal data

- Properly document data
- Only collect data for a specific use
- Do not share personal data
- Only store personal data for as long as necessary
- Anonymize personal data when possible

Recommendations to improve cybersecurity practices

- Limit access and control over data systems based on job function
- Use best practices
  - passwords, updates, response plan, remote access

KEY TAKEAWAYS

- Household data on waste can be dangerous
- Data management is often overlooked
- A data sharing format must be developed
- Incentives for sharing data must be clearly articulated

THANK YOU!

Special Thanks:
Mette Godiksen
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Fabio Carrera & Hugh Lauer