IBM Data Science Capstone -
Battle of Neighborhoods

Finding Viable Food Waste Management Center Locations

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Introduction

The Problem - Food Waste in the U.S.

In the United States, food waste is estimated to be between **30–40 percent of the food supply**.

This loss is due to inefficiency at almost every level of the food retail and production chain and **results in massive losses of money, energy, water, and labor, as well as the food** that could be used to feed the hungry.

Introduction

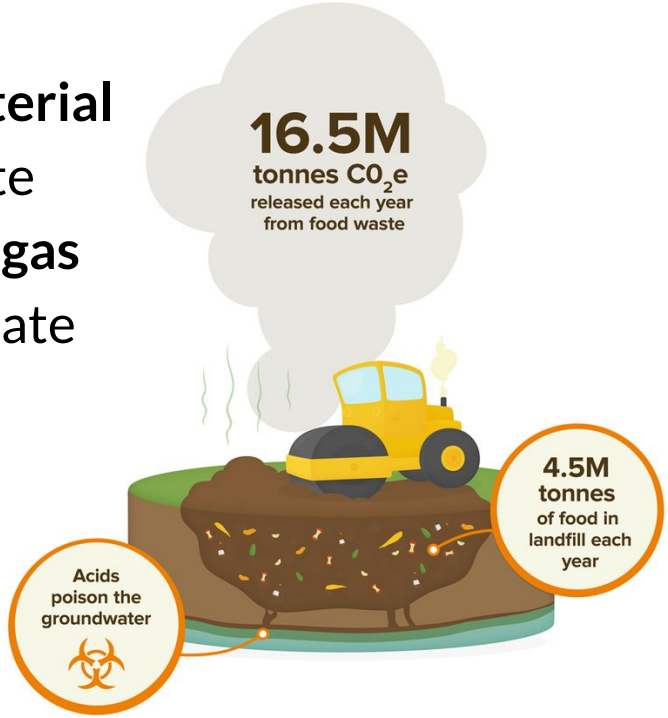
The Problem - Food Waste in the U.S.

In 2010 alone, based on the USDA's Economic Research Service, 31 percent food loss occured at the retail and consumer levels, corresponding to approximately **133 billion pounds and $161 billion worth of food.** (1)

Introduction

The Result?

This wasted food is the largest category of **material placed in landfills** (2) and the rotting food waste **contributes a large part to global greenhouse gas emissions** resulting in global warming and climate change.



Introduction

What can we do?

By more efficiently managing our food supply chains and wasted foods, **we can save money, water, and energy, mitigate climate change**, and reduce our impact on the environment, all while **feeding more people, reducing poverty, and improving impoverished communities.**

Let's Talk Food Waste

"Food losses" are inefficiencies that occur before the food reaches the consumer (issues in the production, storage, processing, distribution, etc.) whereas **"food waste" refers to food that is fit for consumption but consciously discarded** at the retail or consumption phases. (3) This report will focus primarily on food waste.

Sources of Food Waste:

- **Residential** (Homes, apartments, dwellings): Primarily rotten food and kitchen scraps

- **Restaurant-based** (Restaurants, cafes): Primarily rotten food and kitchen scraps

- **Retail-based** (Supermarkets, convenience stores): Primarily foods that are still viable for consumption, but near expiration date (which are mostly artibrarily set)

Food Waste Solutions

Commonly Employed Solutions of Food Waste:

- **Composting** to create fertilizer (On-site and/or mass composting via composting centers)

- **Anaerobic digestion**, which uses microorganisms to break down biodegradable material as opposed to dumping in landfills

- Using the food waste to **create animal feed**

- Recycling the food waste to use in creation of **bio-fuels**

- **Selling still-viable food** (fruits, vegetables, canned goods) to lower income people at a heavily discounted price or **giving it away to homeless**

- **Selling cooked/prepared food** made from no-cost, still-viable food waste at low-cost

The All-In-One Solution: Food Waste Management Centers

At present, the US is not doing nearly enough to manage food waste.

The optimal solution would be for individuals and companies to self-regulate their own waste, but this is a slow process that requires education and a cultural shift to more conscientious waste management practices.

Tip

Don't wait till the end of the presentation to give the bottom line.

Revea your product or idea (in this case a translation app) up front.

Rather than trying to educate every individual and immediately enact change across business, if we were able to **centralize the food waste**, a few experts and specialists could manage the various types of food waste much more effectively and efficiently.

Food Waste Management Centers could be placed throughout our most populated cities in the areas where the most food waste is **created**.

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Sources of Food Waste:

Highlight what's new, unusual, or surprising.

- ➔ **Emotional**
  Give people a reason to care.
- ➔ **Simple**
  Provide a simple unifying message for what is to come

FWMC Within the Community

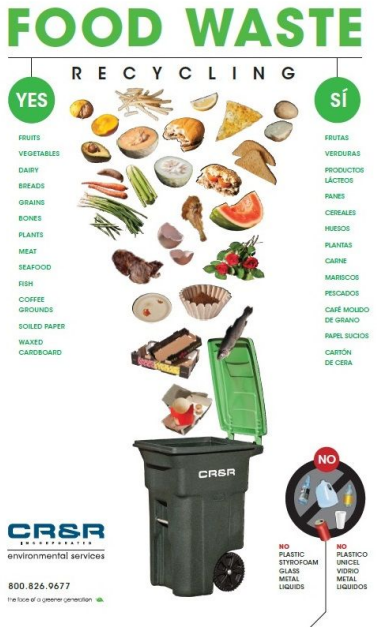
These centers can become integral parts of the community: **supporting the lower income people and homeless** with discount food, **reducing food waste** volume which will maintain a **cleaner neighborhood**, educating the community in reducing food waste, and **reducing the waste disposal costs** to businesses.

Analysis to be Performed: Selecting Food Waste Management Center (FWMC) Locations

FWMC Functions

Let's assume our FWMC will...

- **Receive shipments** of food waste from all nearby restaurants, supermarkets, residents, and food-service businesses.
- **Sell viable fresh food** such as fruits and vegetables at a discount.
- **Sell lunch boxes** made from recovered food at low-cost.
- **Package the rotting/unusable food** scraps for shipping to a composting center or biofuel production facility.
- **Work with and educate the community** on food waste reduction



FWMC Functions

What kind of location is optimal?

A FWMC needs to be placed in a location optimized to:

- Receive shipments from each restaurant and business in the area.
- Sell discounted food (both prepared and fresh) to the community.
- Be convenient to easily drop off food waste.
- Work well with the community.

In short...

It needs to be placed in a central location where people and restaurants are!

In this analysis, I plan to determine optimal locations for a Food Waste Management Center (FWMC) within the city of **Jackson, Mississippi.**

Why Jackson, Mississippi??

The state of Mississippi is a state with the highest rate of wasted food.

Based on a study performed by Hloom, the people of Mississippi on average throw away **14% of their food at home** and **11.6% of restaurant meals.** (4)

Why Jackson, Mississippi??

It is also one of the only states that has **almost no composting, food bank, or anaerobic digestion facilities** to reduce food waste, meaning that **nearly 100% of the food waste is dumped in a landfill**: the worst-case scenario for handling food waste.

This makes Jackson, Mississippi a prime target for the development of food waste management.

Who cares?

The **target audience** for this project is any government entity like the Environmental Protection Agency, the U.S. Department of Agriculture, or any business entrepreneur that may be looking to capitalize on food waste as an untapped resource.

Potential Benefits of a FWMC:

- Both state and local government entities can incorporate food waste prevention and education campaigns as part of a **city-wide community development** effort.
- Having a centralized Food Waste Management Center means easier management and **collection of waste data**.
- **Cost reductions across the entire spectrum of waste management** (garbage collection decreases, less landfill space used, etc)
- Potential profitability in **sales of composted fertilizer**.
- Potential profitability in **sales of food** made from donated no-cost ingredients.
- Potential profitability in **sales to facilities producing biofuels**.

Data Sources

Required Data and Data Sources

➔ **EPA Estimated Food from Residential and Commercial Sources: U.S. Waste data.**

We will briefly examine the **trends of food waste** in the United States and how much is managed, used for power generation, recycled, composted, etc.

Data Sources

Required Data and Data Sources

➔ **Foursquare API: Supermarket, restaurant, food-service data**

In order to properly perform this analysis, we need to locate the high food waste production areas of Jackson, Mississippi. This can be done using the FourSquare API to find **high-density areas of restaurants, cafes, and supermarkets.**

We will assume for our analysis that areas with high densities of restaurants, cafes, and supermarkets are also commonly residential areas.

Methodology

1

First, we will do a **brief analysis of current food waste management** and how much the U.S. wastes and examine how much more there is still to be done. We will scrape the necessary data from the web using the JSON and BeautifulSoup Python packages. The data will be stored in a Pandas dataframe and visualized using Folium and Matplotlib.

2

Next, we will make the necessary **requests for venue information from the Foursquare API**. The data will be cleaned, stored, and sorted. We will need to group the venues into groups based on location (in our case, neighborhoods). Again, we will visualize the data using Folium.

– Methodology

3 Next, we will use the **K-Means clustering algorithm** to cluster the neighborhoods to determine which are the high-density food waste producer neighborhoods.

4 Based on our K-Means clustering analysis, we will **examine and determine the best neighborhood** for a Food Waste Management Center.

This Project Around the Web

This project can be found around the web at the following links:

IBM Watson Studio:
https://jp-tok.dataplatform.cloud.ibm.com/analytics/notebooks/v2/cc31f32a-f0ad-43e4-a474-79f89ad0d697?projectid=0e052036-fd3e-4893-a04b-46349d1af3d9&context=analytics

Github:
https://github.com/Glitch852/Coursera_Capstone/blob/master/IBM%20Data%20Science%20Capstone%20-%20Final.ipynb

References

1) U.S. Food and Drug Administration, "Food Waste and Loss", https://www.fda.gov/food/consumers/food-waste-and-loss
2) Jean C. Buzby, Hodan F. Wells, and Jeffrey Hyman (United States Department of Agriculture), "The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States", https://www.ers.usda.gov/webdocs/publications/43833/43680_eib121.pdf
3) Harvard T.H. Chan School of Public Health, "Food Waste: The Big Picture", https://www.hsph.harvard.edu/nutritionsource/sustainability/food-waste/
4) Eleanor Goldberg, "These States Waste The Most Groceries And Restaurant Meals", https://www.huffpost.com/entry/these-states-waste-the-most-groceries_n_57b1f085e4b007c36e4f7168

LOVE FOOD

Don't waste it.


Thank you for reading my report!
-Eugene