



Takeawaste.org

less waste, more food.

11.07.2022

Overview

Introduction

Proposed Solution

- Dataset
- Forecasting
- Dashboard

Conclusion



"If food waste could be represented as its own country, it would be the third largest greenhouse gas emitter, behind China and the United States."

United Nations Environment Programme

Motivation

- 1.3B tons of food are wasted every year^[1]
 - equals one third of food produced
- Contributes to greenhouse gas emission
 - Decomposing foodwaste in landfills emits methane
- "hidden" wasted resources:
 - One kg of beef requires 15000 liters of water^[2]

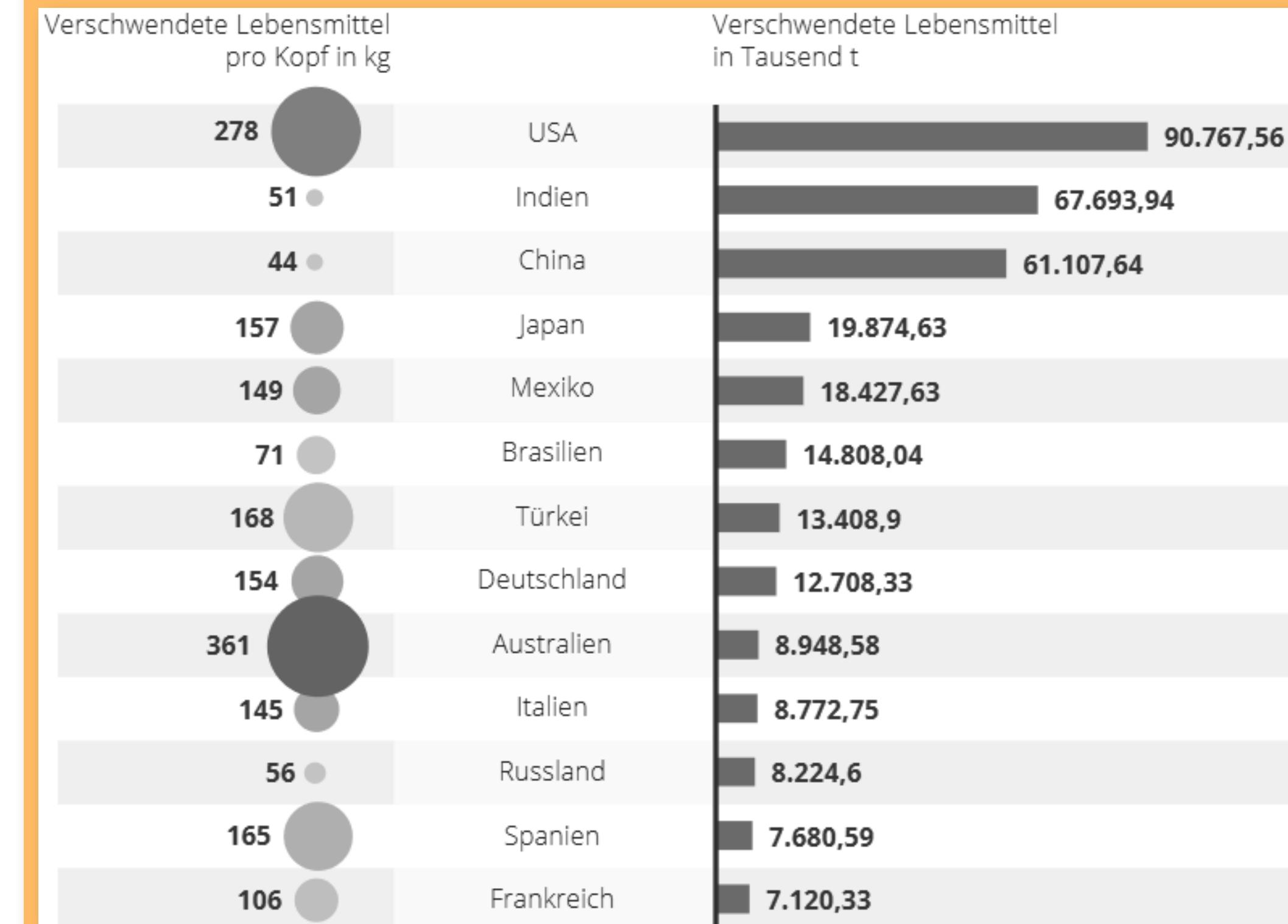


Figure 1: Food waste in kg per capita in 2018.
Source: [3]

Motivation

- Food services and retail outlets produce second largest amount of food waste
- 62% can be potentially avoided^[5]
 - E.g., Behaviour changes, reduce portions, etc.

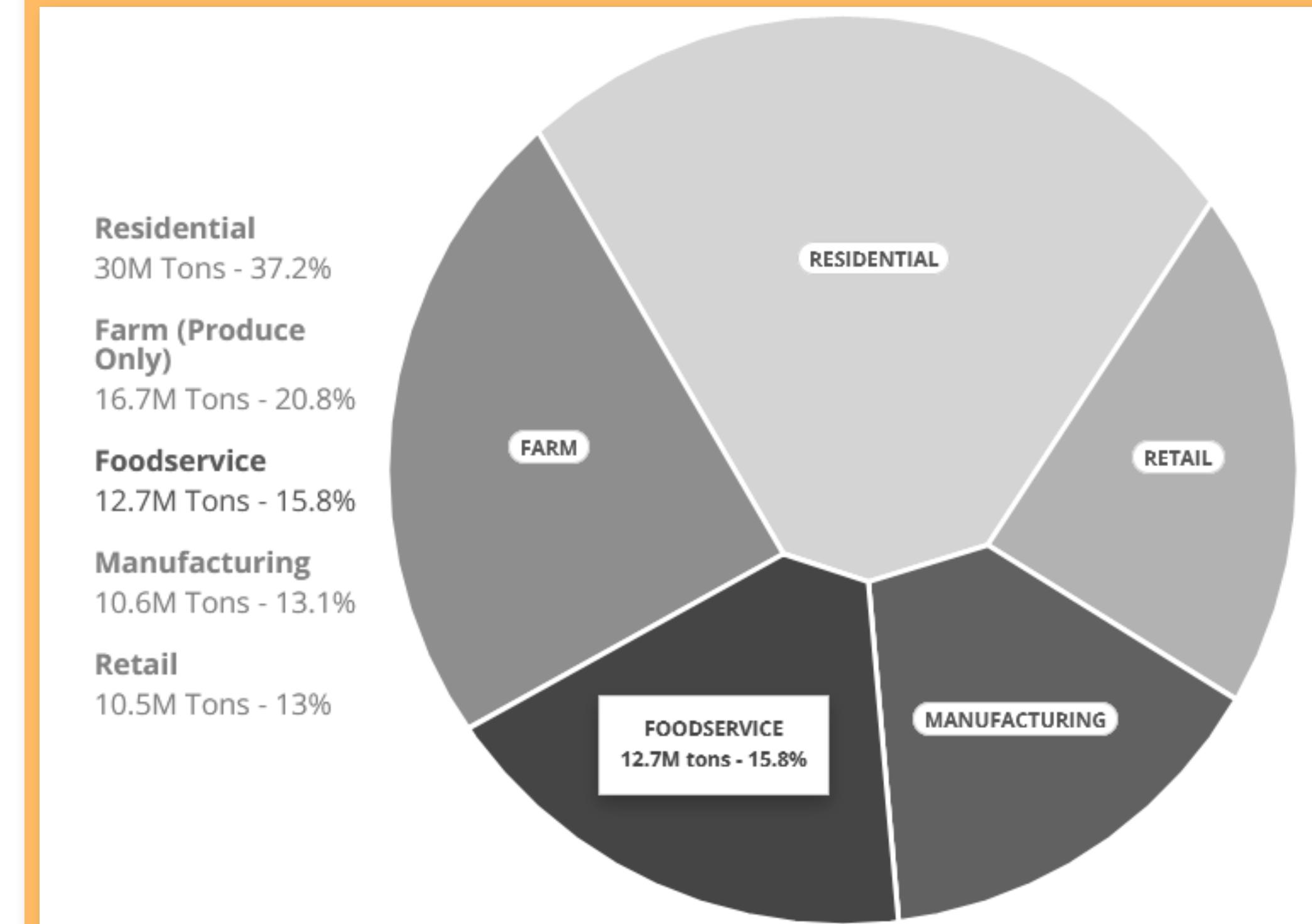
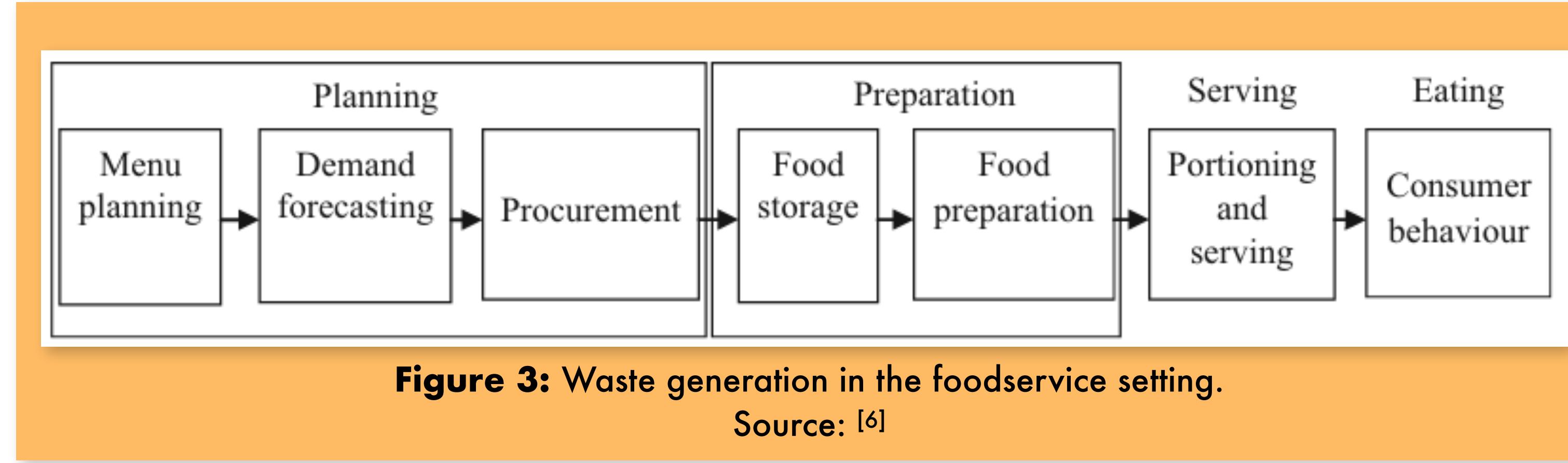


Figure 2: 80.6 million surplus food tons were generated across the entire USA in 2019.
Source: [4]

Related Work



Oliveira et al., (2016)^[6]:

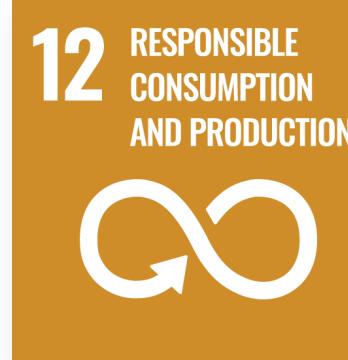
- Reviewed that food waste in foodservice industry is **largely avoidable**
- Difficulty to anticipate the consumer demand leads to **overproduction**
- Concluded that **focus should be on consumers** (e.g., raising consumer awareness or reducing portion sizes)

Hypothesis & Goals

A data-driven forecasting of consumer demand could lead to a reduction of food waste (and, by extension, to a reduction of green house emission).

⇒measured in reduction of total KG wasted

$$\text{usual orders}^* - (\text{recommendation} + \epsilon) = F.$$



**ENSURE SUSTAINABLE CONSUMPTION
AND PRODUCTION PATTERNS**

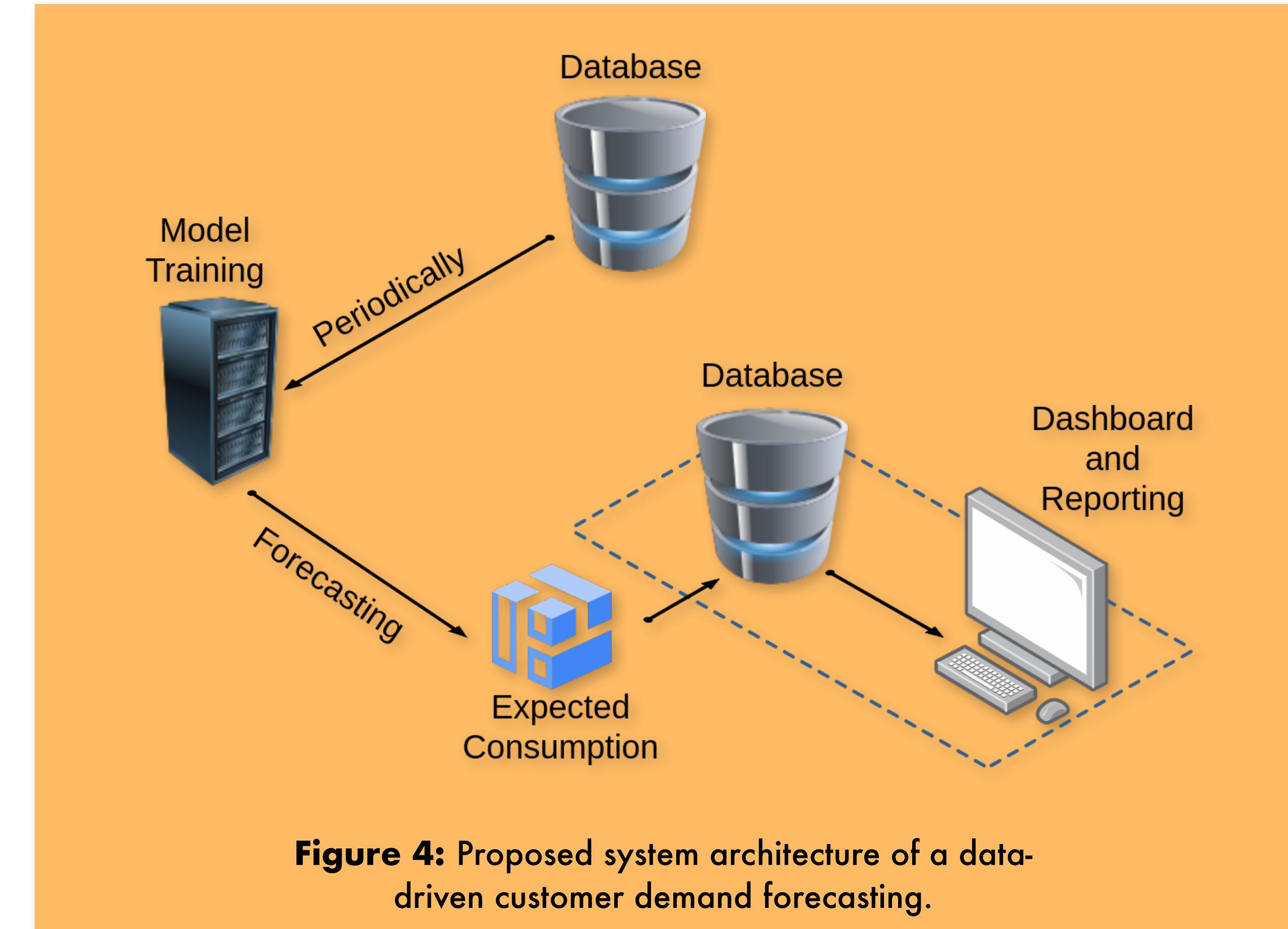


**TAKE URGENT ACTION TO COMBAT
CLIMATE CHANGE AND ITS IMPACTS**

Proposed Solution

Proposed Solution

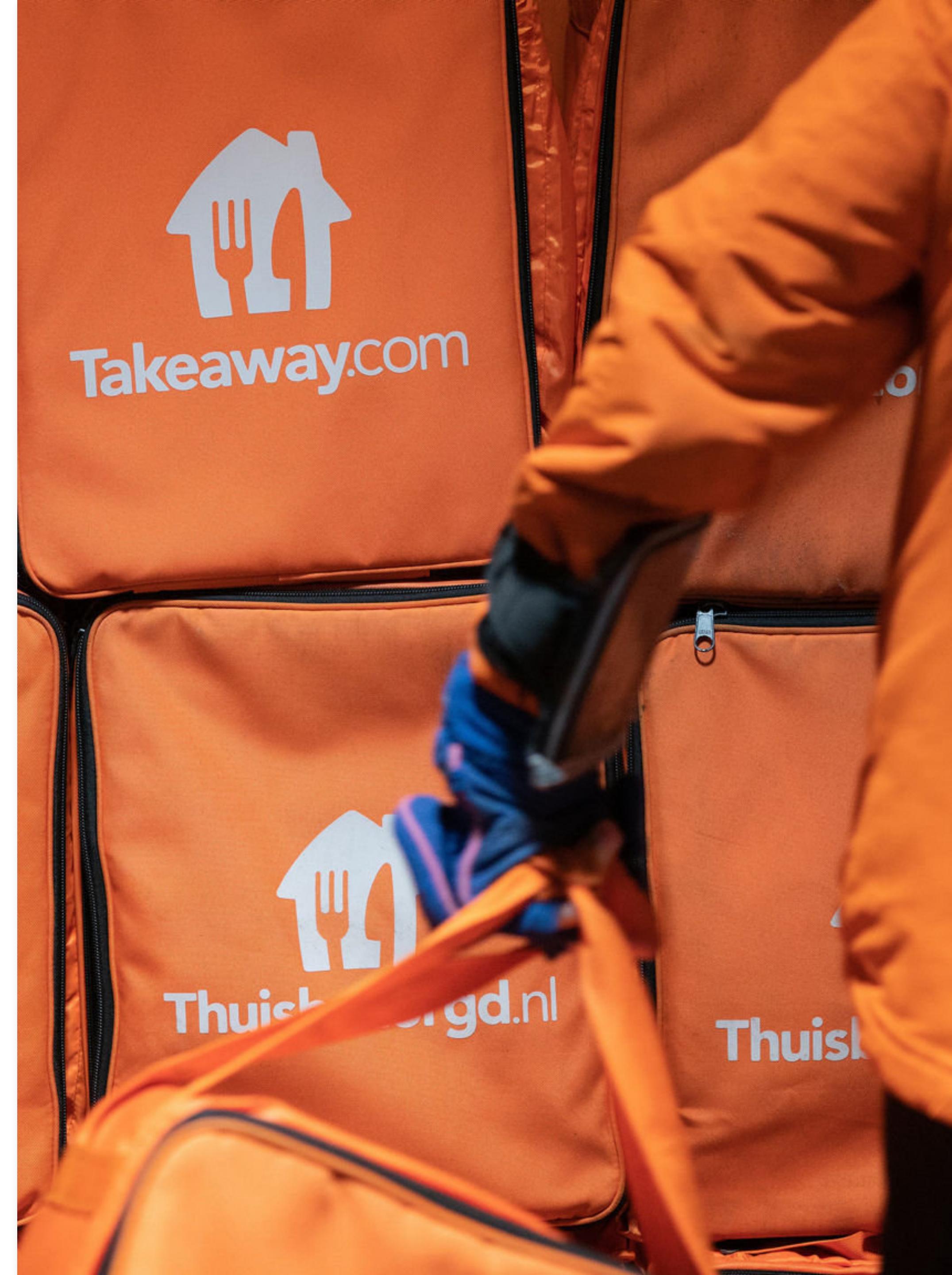
- Fetch historical data on customer demand
 - Train forecasting model
 - Predict consumption
 - Create report for business
- ⇒ **Periodical Process**



Dataset strategy

- **Focus on takeaway:** Availability of data and scalability
- **Google Dataset Search**
 - Keywords: "takeaway" "orders"
 - Format: tabular OR archive

⇒ 200k rows of orders from two Indian
takeaway restaurants in London, UK.



Forecasting

Model	Functionality	Disadvantages	Accuracy MSE and MAE
Fbprophet	trend + (daily) seasonality + public holidays ^[7]	needs big data sets	MSE: ~0.39 MAE: ~0.18
Arima	moving average, mostly short term predictions	moving average, mostly short term predictions	MSE: ~0.51 MAE: ~0.23
Sarima	moving average, seasonality	no daily predictions or daily seasonality	not measurable for period under consideration

Forecasting

Preparation: Concentrate on Order Dates and Total Product Count of the items

Receive 10 most bought items through grouping the total product count

Forecast the needed product count for the next week for each item

Connected to the database to allow result-visualization as a dashboard

Live Demo

Limitations & Conclusion

- preliminary assumptions had to be made. However, this does not detract from the overall results
 - ⇒Forecasting reduces overestimation and total KG food wasted
 - ⇒Scalability:
 - Takeaway platforms possess large data on customer demand



Thank You!



Appendix

Definitions

Food Waste:

⇒ Food (that is intended for human consumption), removed from the human food supply chain.

Foodservice industry:

⇒ Businesses which prepare meals outside the home.

Metric

Amount of dishes saved F are the difference between the usual orders (assuming upper bound) and the recommendation. To account for model error, the MSE ϵ is added.

$$\text{usual orders}^* - (\text{recommendation} + \epsilon) = F.$$

To get a kilogram estimate, the average amount of food saved per dish is around 500 grams. Therefore to get F is to be multiplied by 500 grams.

$$F \times 500g = \text{Kg food saved.}$$

Assumptions

- The recommendation is adequate
- Ceteris Paribus
- Current Consumption is equivalent to the upper bound
- Restaurant owners are receptive of the approach
- 500 grams of food wasted per overestimated dish
- Walk-in customers not accounted for

Sources

- [1] United Nations Environment Programme (2021). Food Waste Index Report.
- [2] Food and Agriculture Organization (2020). The State of Food and Agriculture.
- [3] Magnet (2018). Food waste around the world.
- [4] ReFed (2019). Food Waste Monitor.
- [5] Berner Fachhochschule (2018). Food Waste Reduktionspotenzial in der Gastronomie in der Schweiz nach Kategorien.
- [6] Oliveira, Beatriz & Pinto de Moura, Ana & Cunha, Luís. (2016). Reducing Food Waste in the Food Service Sector as a Way to Promote Public Health and Environmental Sustainability.
- [7] Taylor SJ, Letham B. (2017). Forecasting at scale.