

URBAN CO-CREATION DATA LAB

#2 Waste management



Problem

- The current and expected **increase of population** living in cities will cause an **increase in pressure** regarding the solid **waste** that is **produced in urban environment**
- Considering that **50% of the waste** is generated in cities, it's critical to **improve and optimize waste management** in urban environments
- **Waste collection** is the activity with **higher costs** in waste management

Business understanding

- Lisbon Urban Hygiene Department (DMHU) have the necessity to **anticipate the production of mixed waste** for each mixed waste collection circuit
- Necessity to **optimize waste collection operations** (e.g., to optimize the number of trucks to collect waste)
- This can allow to **reduce the number of loads** needed, and consequently **optimize HR and fuel consumption**, reducing **carbon footprint** and the **costs** associated with waste collection

Service



Development of a service to **predict mixed waste** production for 95 waste collection circuits for **every week of the following month**

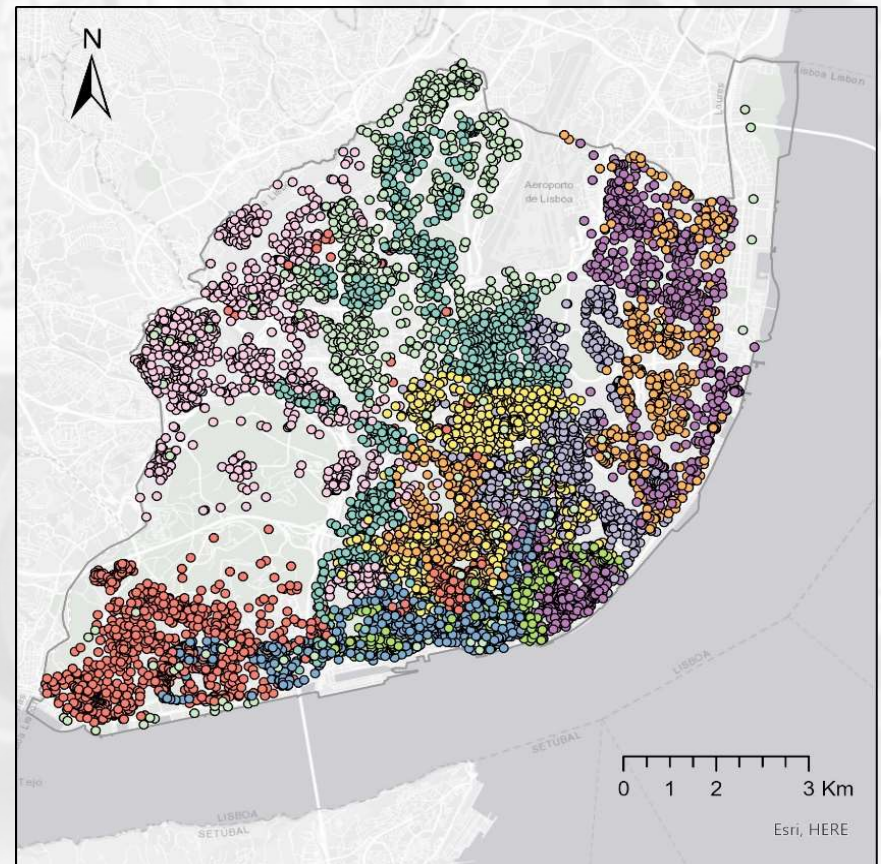
Data understanding



Mixed waste loads (2017 - 2020)
for 95 mixed waste collection circuits

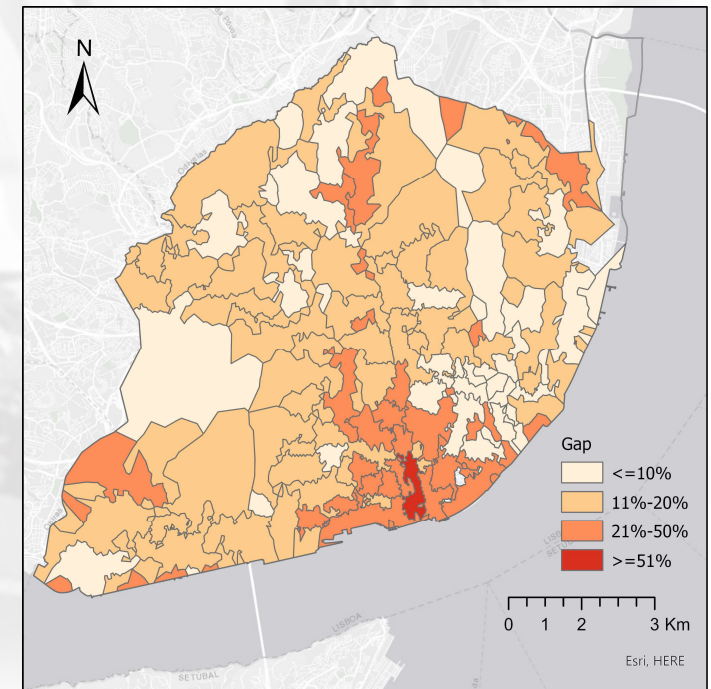
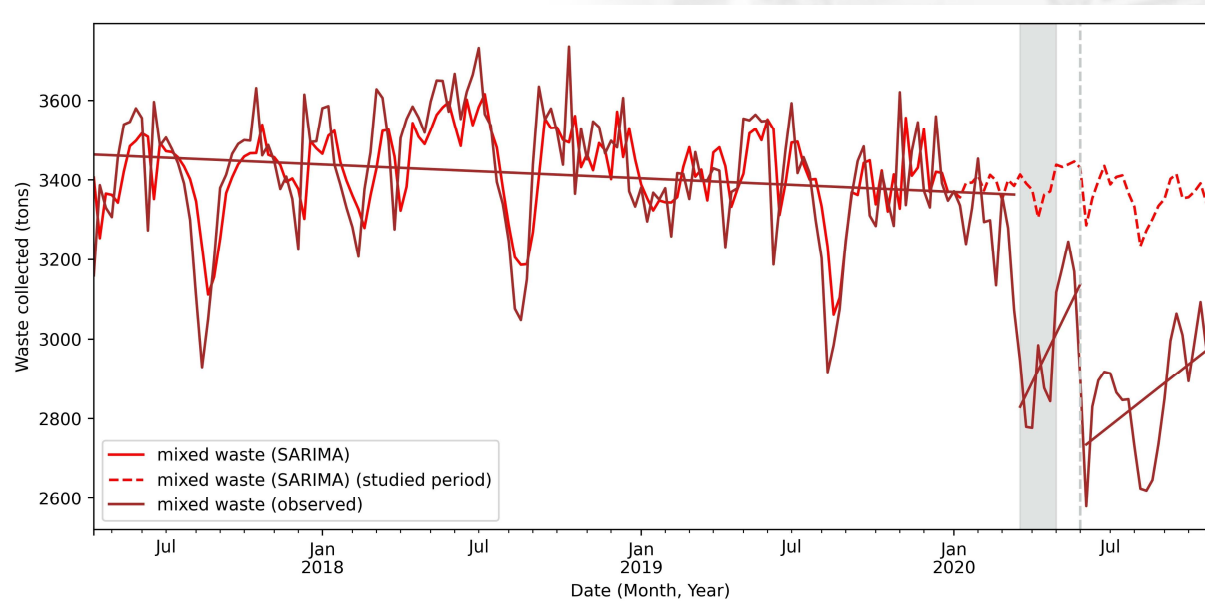


Holidays



Data understanding

- Decreasing trend of mixed waste production from 2017 to 2019
- During COVID-19 lockdown mixed waste production had a substantial decrease
- Highest reduction in tourism and non residential areas

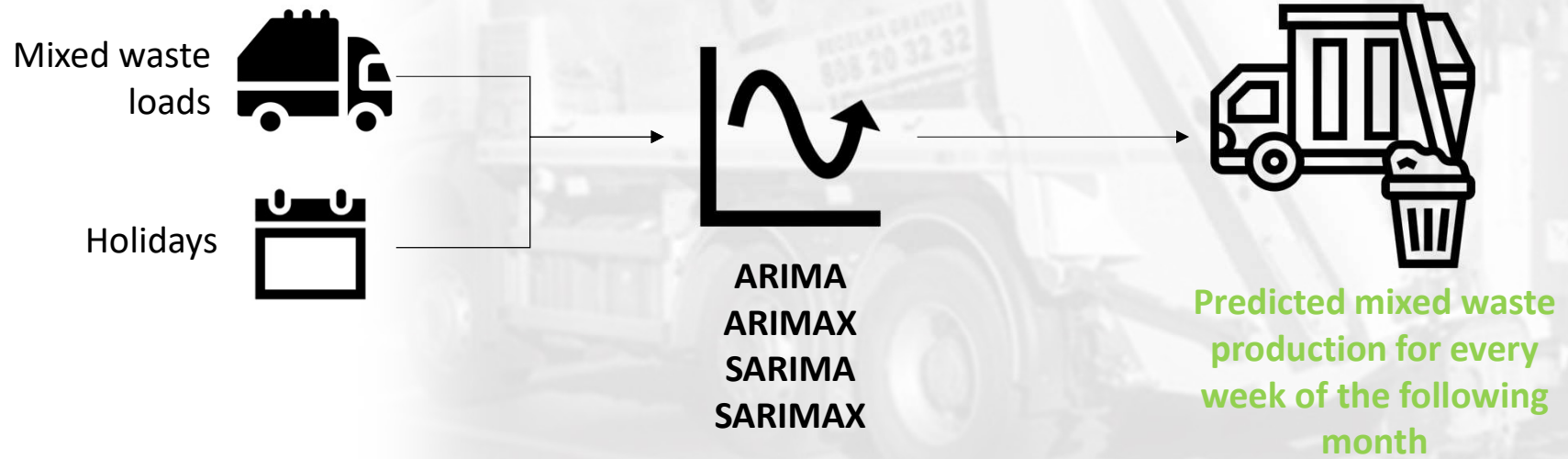


Data preparation

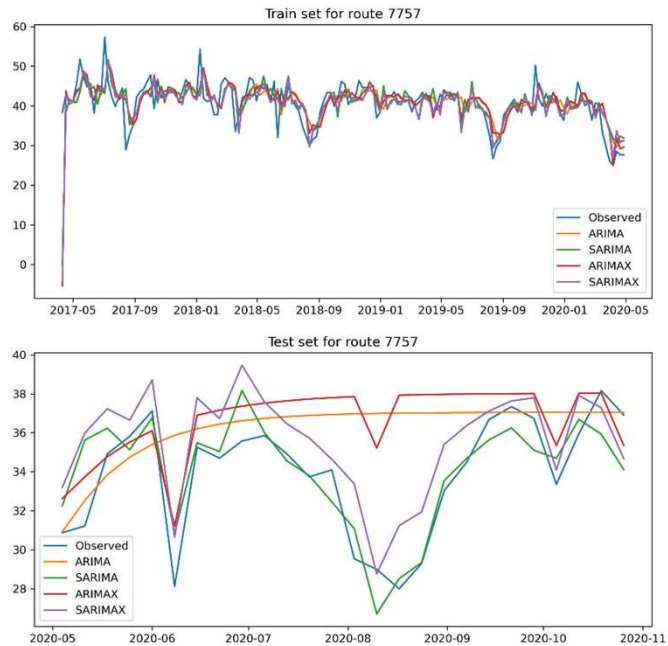
- Mixed waste data was **aggregated weekly** by waste collection circuit
- Created a flag to **identify weeks with holidays**

Feature	Description
date	Date identifying the first day of the week
waste_t	Quantity of mixed waste in tons collected in a specific week
holiday	Flag identifying holidays

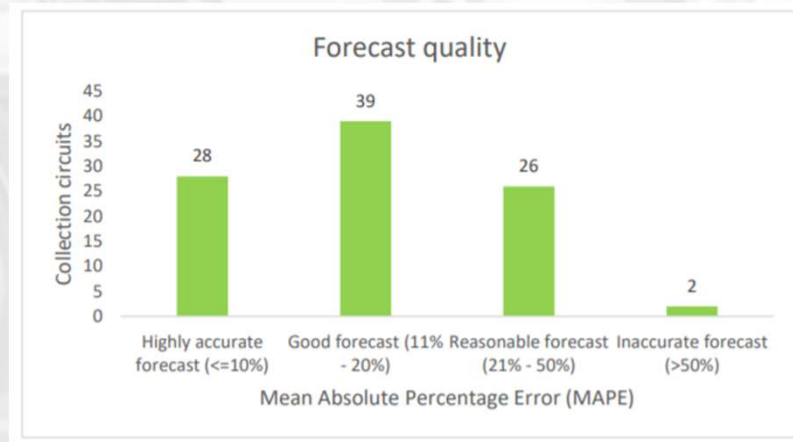
Modelling



Modelling

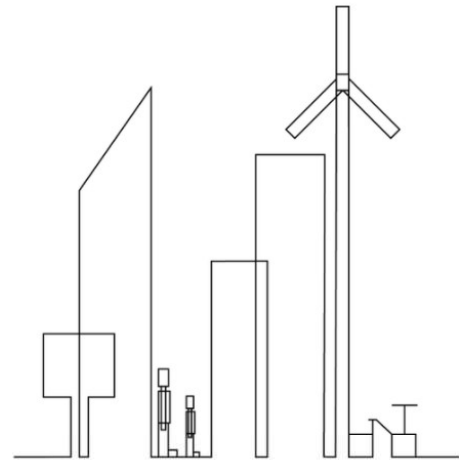


Model	MAE (t)	RMSE (t)	MAPE (%)
ARIMA	5,3	4,6	16
ARIMAX	5,4	4,7	16
SARIMA	5,1	4,4	16
SARIMAX	5,3	4,6	16



The SARIMAX model was chosen for evaluation

Evaluation



URBAN
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Managing the Weekly Production of Waste in Lisbon



Overview



Circuits



Events



Holidays



Prediction

Beneficiaries:



Co-financed by the Connecting Europe
Facility of the European Union



Thank you

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