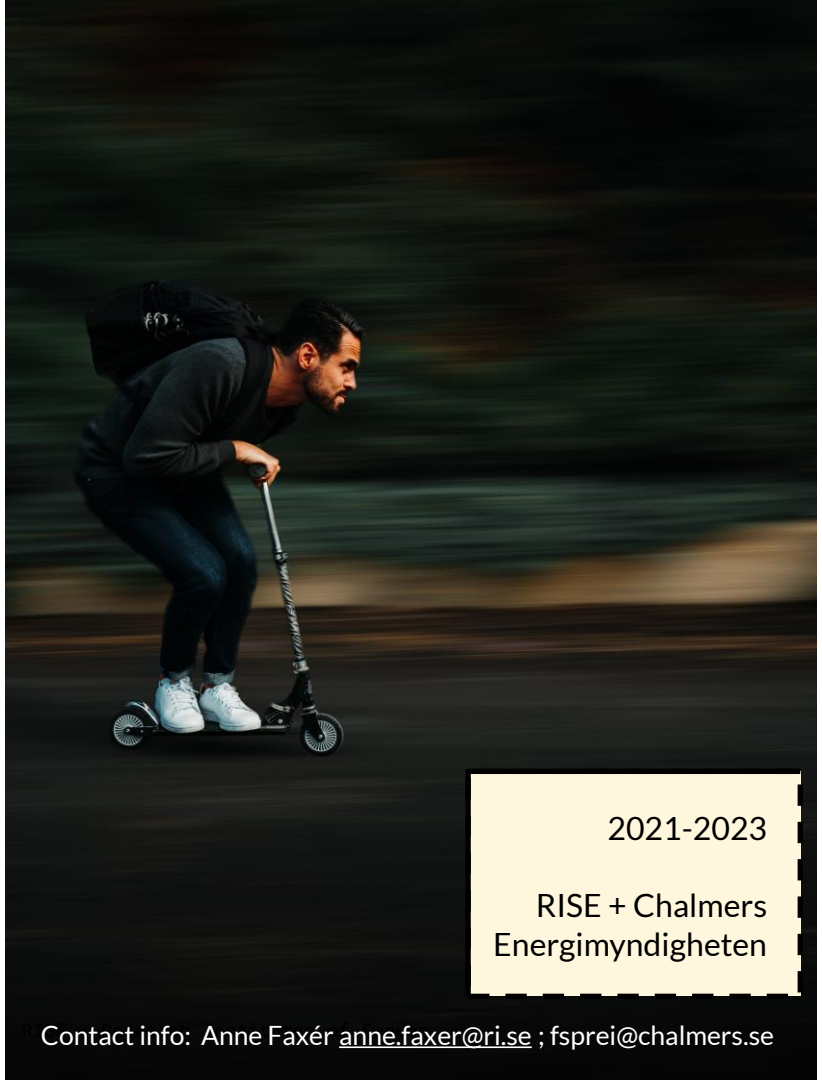
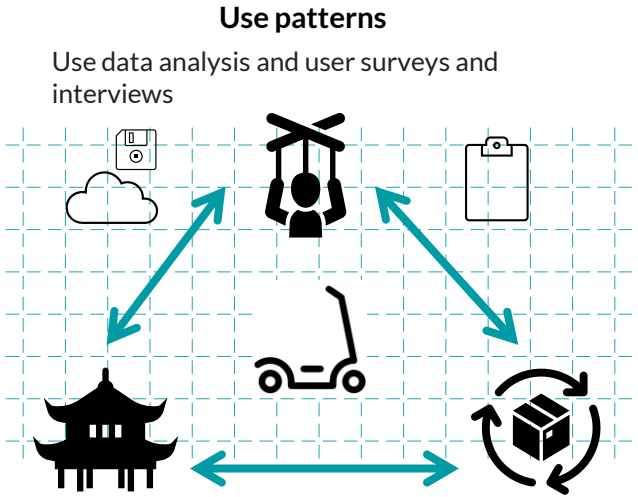


eSPARK - Assessing electric scooters' role in the fossil-free transport system

2021-2023

RISE + Chalmers
Energimyndigheten



Understand the current situation, conditions, and best practices for e-scooters to contribute to a transport efficient society

Life Cycle Assessment

Contact info: Anne Faxér anne.faxer@ri.se ; fsprei@chalmers.se

Use Pattern

Neighborhood effects

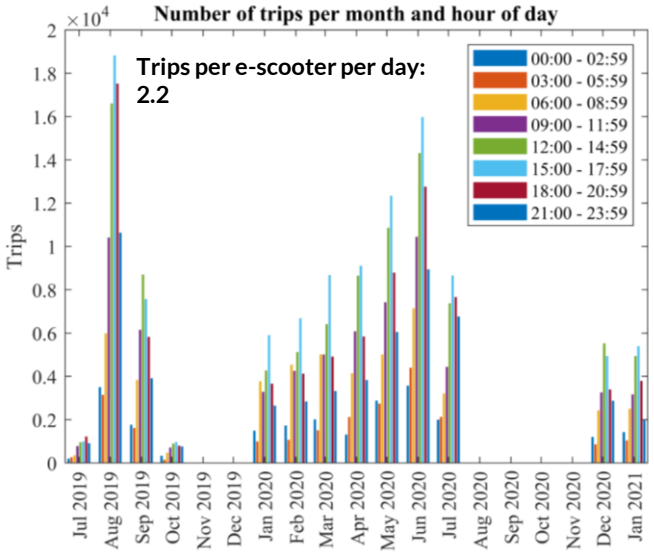
Neighborhood effects

- Objectives:
  - Demand of e-scooter sharing v.s built environment characteristics
  - Predict e-scooter sharing demand and its spatial distribution for a new city
  - To compare of the performance of CNN with spatial regression
- Data:
  - E-scooter sharing data (642 days data from Stockholm and 309 days for Gothenburg)
  - Open street Maps where geo-coded data of points of interests (POIs) such as residential and commercial buildings and public transport stops.

RI. SE

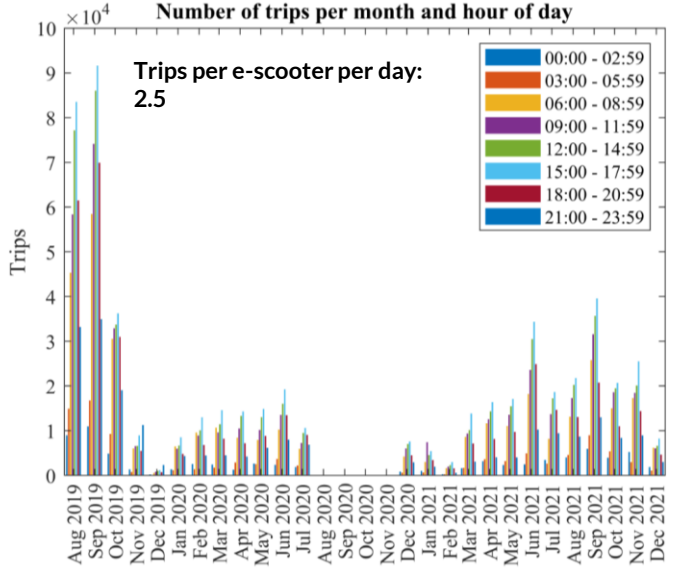
Results – e-scooter sharing data

Gothenburg



~0.5 million trips
~6 000 e-scooters
309 days

Stockholm



~2.5 million trips
~21 000 e-scooters
642 days

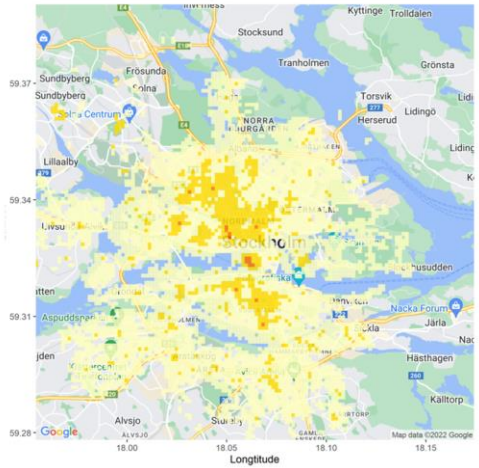
RI. SE

Results – point of interest

- Most important
  - Night life (restaurants, night clubs, bars,…)
  - Bike sharing
  - Overnight, healthcare and Tram

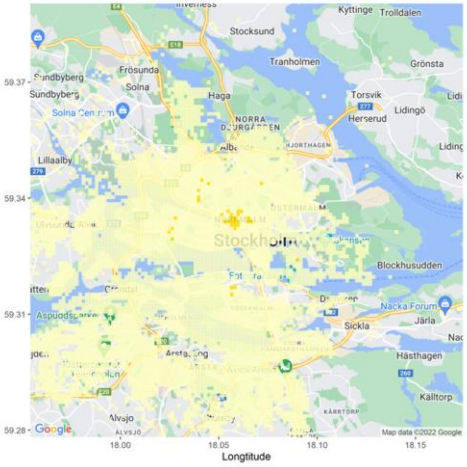
Results

Spatial regression



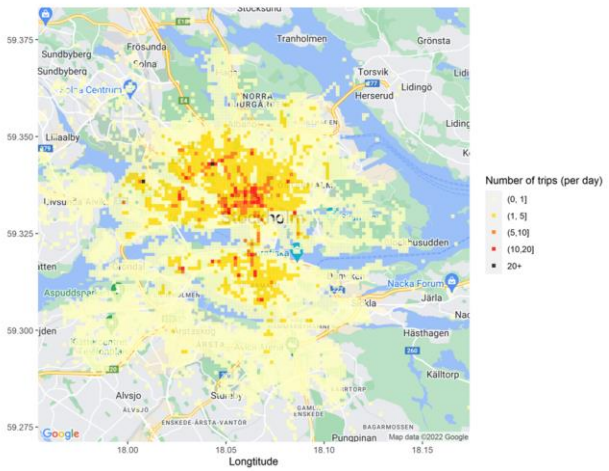
RSE: 0.57

CNN



RSE: 0.94

Real map



Conclusion

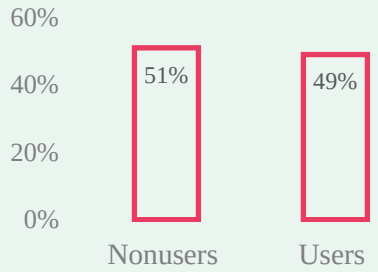
- E-scooter used in areas with high other activity + night life
- The prediction results can give a good indication on the geographical boundary of e-sccoter sharing
- Spatial regression slightly better but bad results for CNN can be due to too small dataset

Use Pattern - survey

- Objectives
  - Who uses an e-scooter?
  - What is the substitution effect?
- Survey
  - 1800 respondent >16 years in Gothenburg and Stockholm
  - April and May 2022

User profile and travel patterns with e-scooters

- Male with high income
- Children 7-12 in household
- Frequent car user
- Has public transport monthly card
- E-bike owners



Substitutions

- For trips < 4km ~50% chance that user will subsitute with e-scooter
- Sunny weather & work related trips highest probability

Resource

PRELIMINARY RESULTS OF LCA STUDY

LCA study

Objectives

To understand:

- the environmental burden, the energy and resource utilization of ***shared stand-up e-scooters in Swedish cities***
- which parts/factors of the life cycle that have the largest impact on the resource and energy demand of the e-scooter

RI. SE

Results (preliminary)

- The production phase is the phase of the life cycle which contributes the most to the environmental impact
- The processes of the production phase with the largest impact are:
  - production of aluminium for the e-scooter
  - the battery pack
  - The printed circuit board
- The total number of km driven during the lifetime of the e-scooter is crucial for the environmental impact of the e-scooter

RI. SE

LCA (conclusion/future work)

The rapid development of the shared e-scooters has in a short time increased the durability and sustainability of the e-scooter by introducing swappable batteries, improving safety by making scooter more robust and also the possibilities to repair them.
However, new legislation might put an indirect weight-limit for scooters which imply that we need to work further on the trade-off between weight, robustness and lifetime.

So are e-scooters sustainable?

Still a question mark (preliminary)…

- Carbon wise still questionable
- But are a valid substitute in areas with high transport demand (even for car users)

⟶ Can reduce congestion both for cars and public transport

The Research Team

Chalmers

Frances Sprei

Khashayar Kazemzadeh

RISE

Shiva Habibi

Kateryna Melnyk

Joakim Rosell

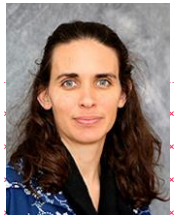
Stefan Pettersson

Kristina Holmgren

Elin Einarson Lindvall

Jenny Lundahl

Susanne Stenberg



Anne Faxér

Anne.faxer@ri.se

073-564 12 38

Frances Sprei

fsprei@chalmers.se

031-7722146