A GIS Approach for Identifying Suitable Locations for Shared Mobility Vehicles in Urban and Rural Areas of the Netherlands

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Gido Stoop

HOGESCHOOL UTRECHT

Interreg North Sea

Co-funded by the European Union

ShareDiMobiHub

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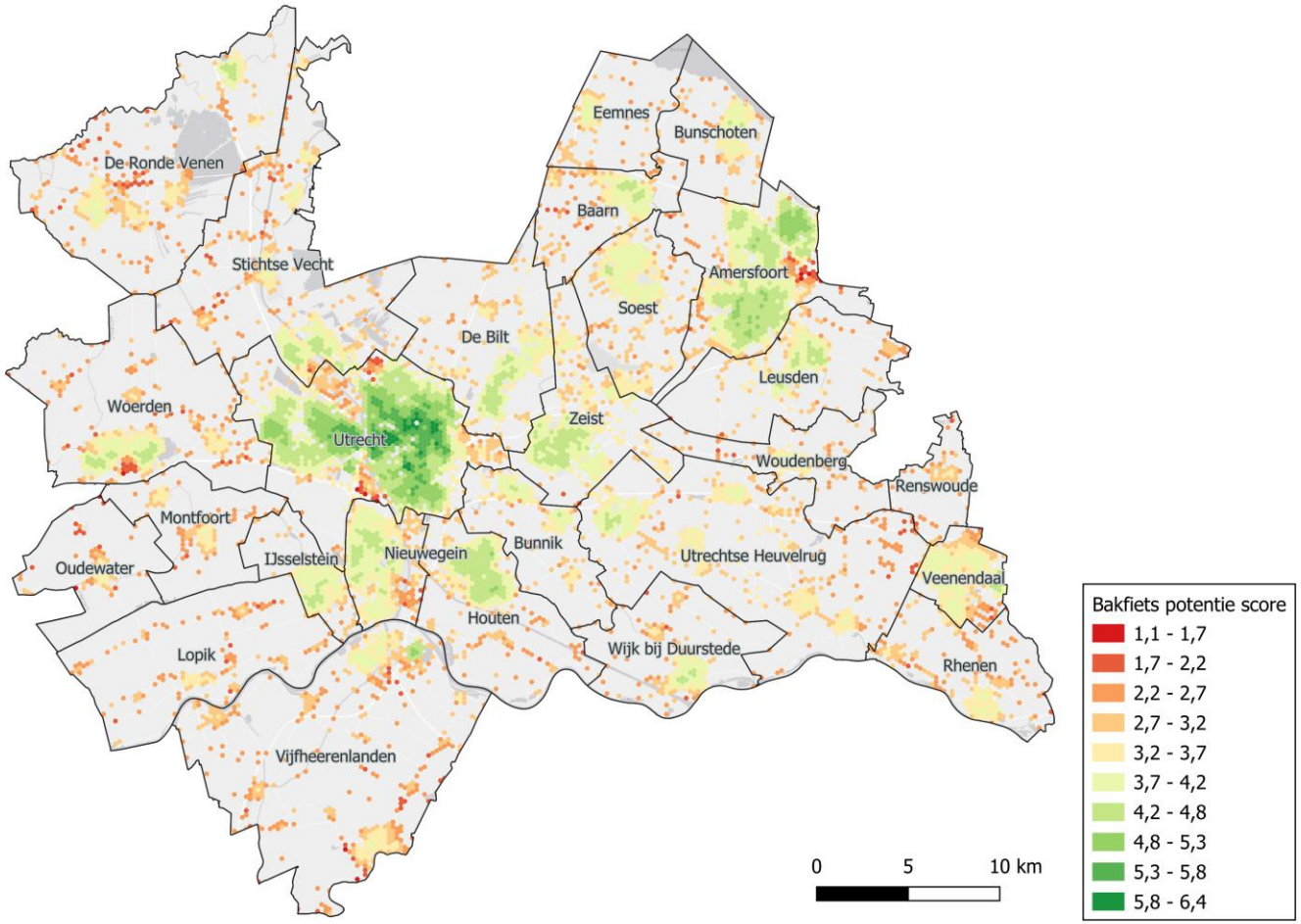
Why?

- Locations are selected on ‘gut feeling’
- Lacking expertise on shared mobility in some municipalities
- Consultants are expensive and quality is varying

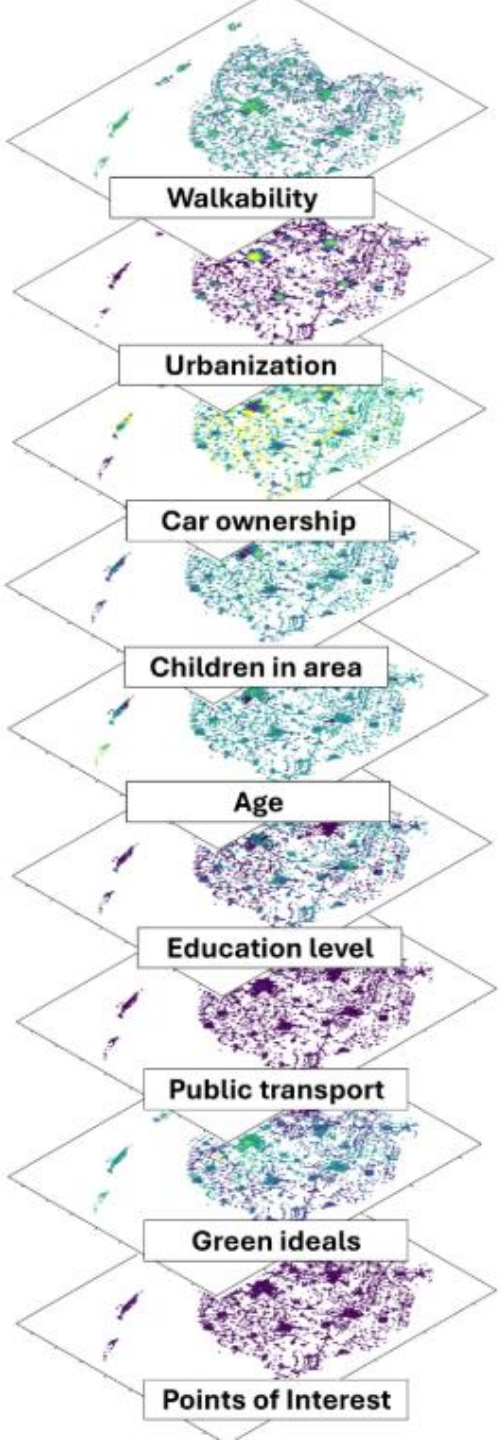
The research

- A method for finding the most suitable locations for shared vehicles
- Todays example: Shared Cargo Bikes

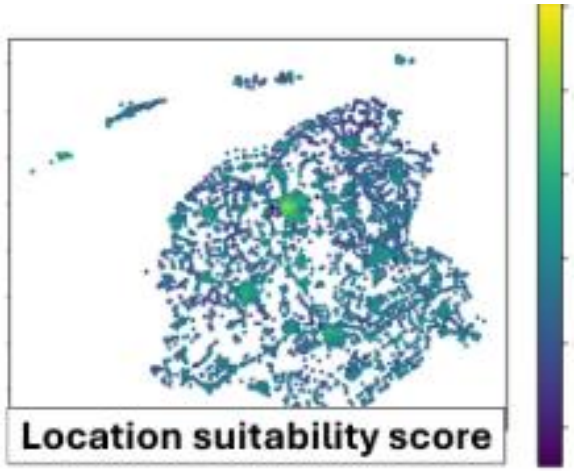


Knowledge from literature and workshops to criteria

- Shared mobility is rather ‘new’
- First, literature review
- Then workshops
  - Sticky note session
  - Municipalities, companies, public/private partners



Combine layers



Indicators & Method

- Open datasets
- National level
- For every crossroad
- Combine for final score

Goals of the (practical) research

- Tracebale
- Reproducable
- Understandable
- Therefore:
  - Ipynb (python and Github)
  - Webmap
  - Physical prototype
  - Guidebook
  - Scientific paper

1.2 Load and Preprocess OSM Roads

- Load the road shapefile
- Remove minor road types
- Dissolve by name
- Convert MultiLineStrings to single lines
- Line intersections: Find crossroads

```
def merge_multilinestring(geometry):
    if isinstance(geometry, MultiLineString):
        merged = linemerge(geometry)
        return merged
    return geometry

area_name = 'Prov_Utrecht'
coord_system = 28992

OSM_streets_file = fr"sources/osm_roads_{area_name}/gis_osm_roads_free_1.sh
output_file = fr"output/crossroads/crossroads_{area_name}_{coord_system}.gp

# Download and open OSM roads
streets_gdf = gpd.read_file(OSM_streets_file)
streets_gdf = streets_gdf.to_crs(epsg=28992)

# Remove small paths
rm_path_types_list = ["bridleway", "busway", "footway", "motorway", "path",
streets_filtered_gdf = streets_gdf[~streets_gdf["fclass"].isin(rm_path_type

# Dissolve seperate parts of street to one
streets_filtered_gdf = streets_filtered_gdf.dissolve('name')
```

Indicator	Coefficient $R^2 = 0.50$	P-value	Weights
Walkability	-7250	0.000	0.31
Urbanization	-22670	0.000	1.00
Car ownership	-7789	0.008	0.37
Children in area	1853	0.362	0.00
Age	-12170	0.000	0.56
Education level	-3755	0.006	0.18
Public transport	-3658	0.132	0.00
Green ideals	-4814	0.000	0.19
Points of interest	-4200	0.007	0.21

*In spatial models an $R^2 > 0.50$ is considered a good fit

Validation & Calibration

- Free-floating user coordinates data from Rotterdam
- Dependent variable: Average distance to the 50 closest datapoints
- Weights are applied to the final score calculation

Drawbacks and How to use this?

- Real world is much more complex
- Every city and village is different

- For a first exploration of the area
- To get a grasp of the important criteria
- Data driven decision making
- As a starting point of dialog and discussion

Next steps

- Do the same for mopeds, bicycles and cars
- Combine models for a ‘hub’ model
- Finish paper
- Finish guidebook

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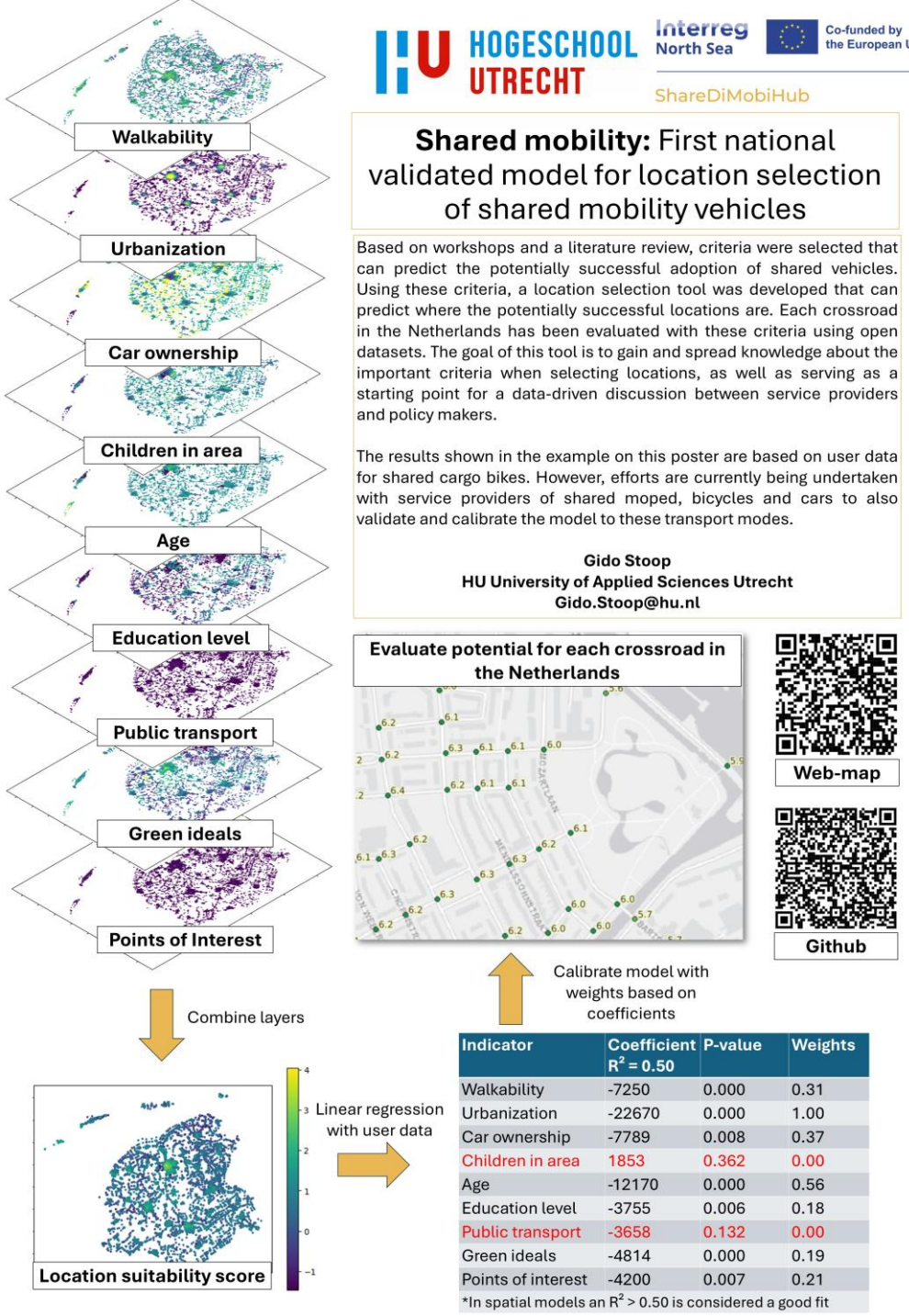
Questions?

Gido Stoop, Gidostoop@hu.nl

Github: https://github.com/GidoStoop/Shared-Mobility-Location-Suitability-Model

Webmap: https://webmap.hu.nl/en/app/location_tool_cargobike_provu



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