

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

19 Juni 2025

Gido Stoop

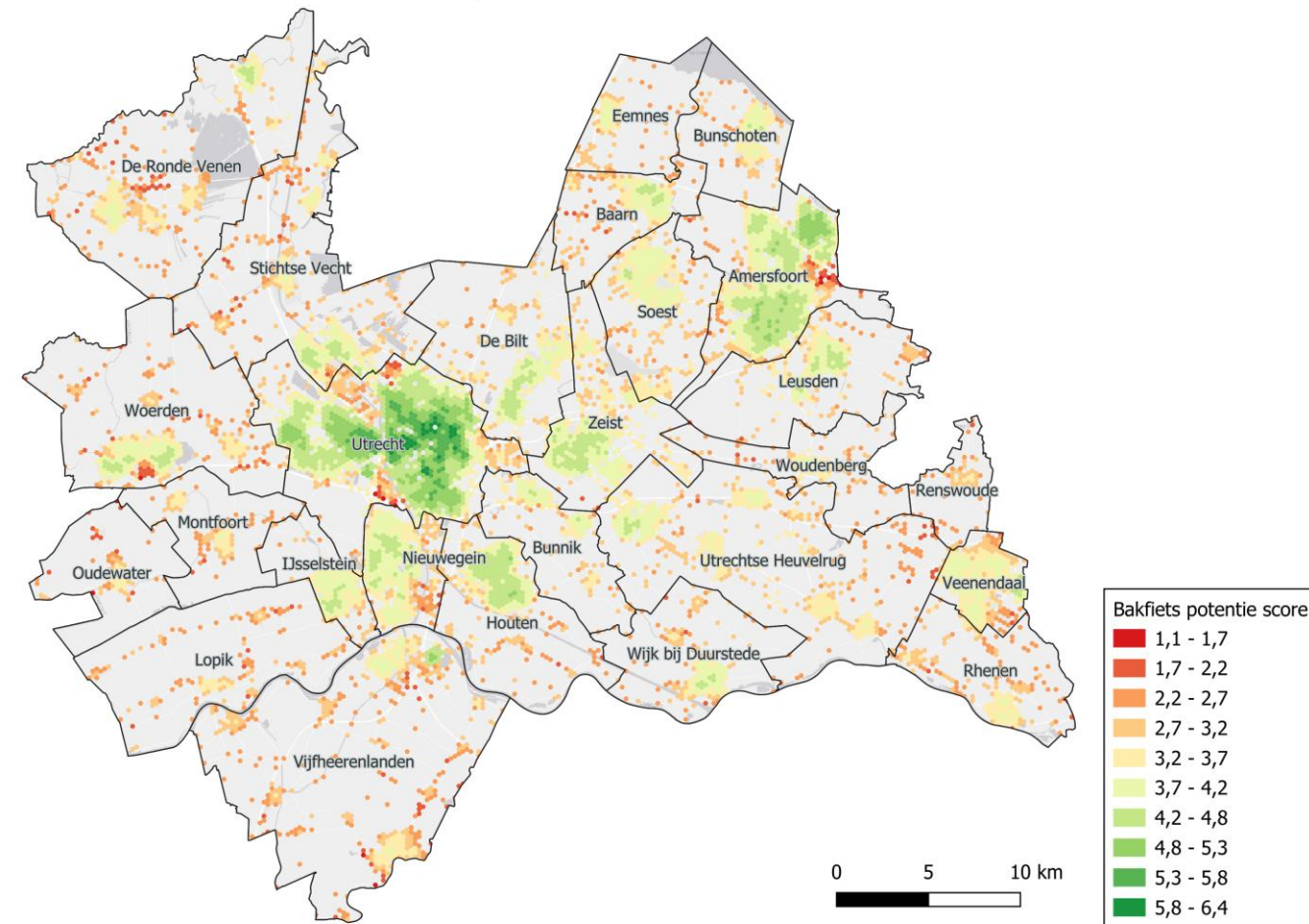


Why?

- 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
- Today's example: Shared Cargo Bikes

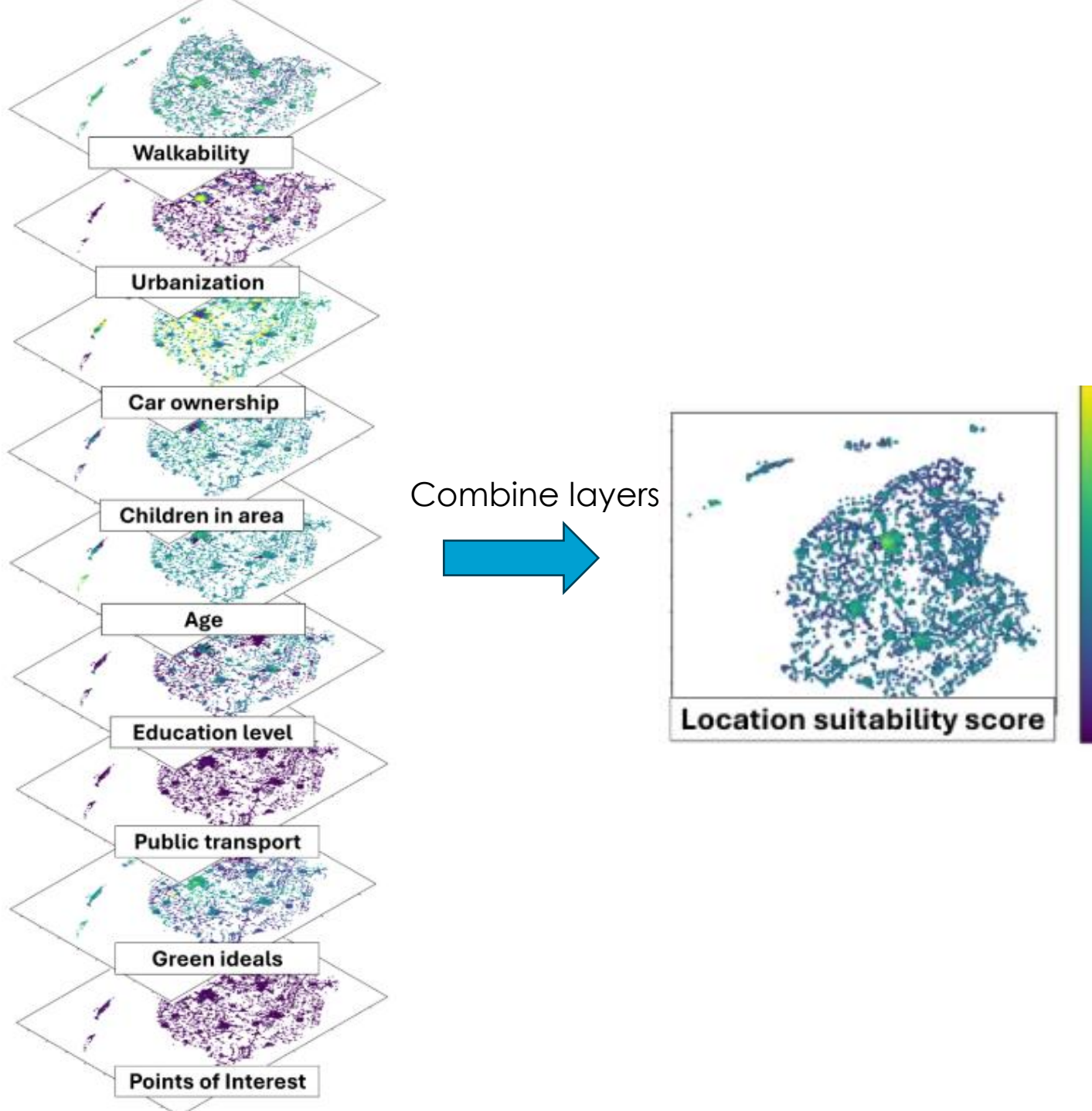


Knowledge from literature and workshops to criteria

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



Indicators & Method



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



Goals of the (practical) research

- Traceable
- Reproducible
- Understandable
- Therefore:
 - Ipy nb (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.shp"
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
```

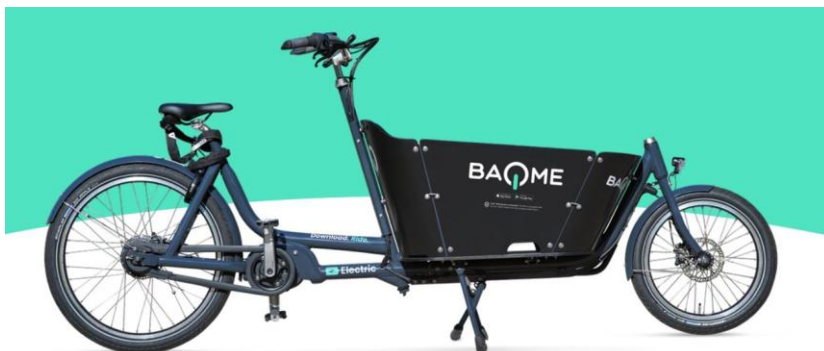
```
# Dissolve separate parts of street to one
streets_filtered_gdf = streets_filtered_gdf.dissolve('name')
```

Validation & Calibration

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

- 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

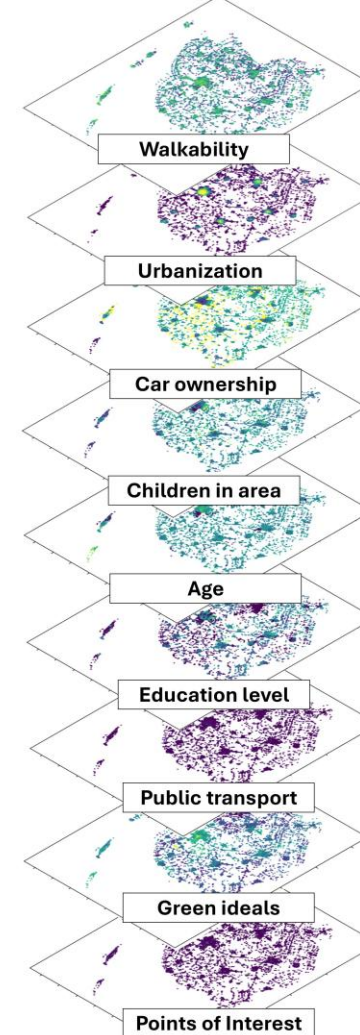


Questions?

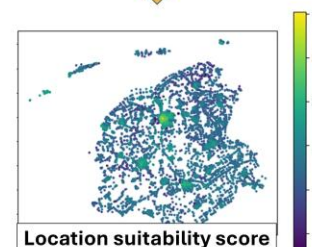
Gido Stoop, Gidostoop@hu.nl

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

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



Combine layers



Linear regression
with user data



Calibrate model with
weights based on
coefficients

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

Shared mobility: First national validated model for location selection of shared mobility vehicles

Based on workshops and a literature review, criteria were selected that can predict the potentially successful adoption of shared vehicles. Using these criteria, a location selection tool was developed that can predict where the potentially successful locations are. Each crossroad in the Netherlands has been evaluated with these criteria using open datasets. The goal of this tool is to gain and spread knowledge about the important criteria when selecting locations, as well as serving as a starting point for a data-driven discussion between service providers and policy makers.

The results shown in the example on this poster are based on user data for shared cargo bikes. However, efforts are currently being undertaken with service providers of shared moped, bicycles and cars to also validate and calibrate the model to these transport modes.

Gido Stoop
HU University of Applied Sciences Utrecht
Gido.Stoop@hu.nl



Web-map



Github



HIER KOMT ALLES SAMEN