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Movements in Tartu city based on mobile positioning data

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1. Objective and task list

Tartu City Government wants to know:

- how many movements in Tartu are within the city borders, how many are coming from outside and how many are just crossing the city (ratios, %)
- how many of those movements are short, medium, long distance movements (ratios, %) – distances to be agreed during the project.

Task list on pre-calculated 2019 mobile positioning data:

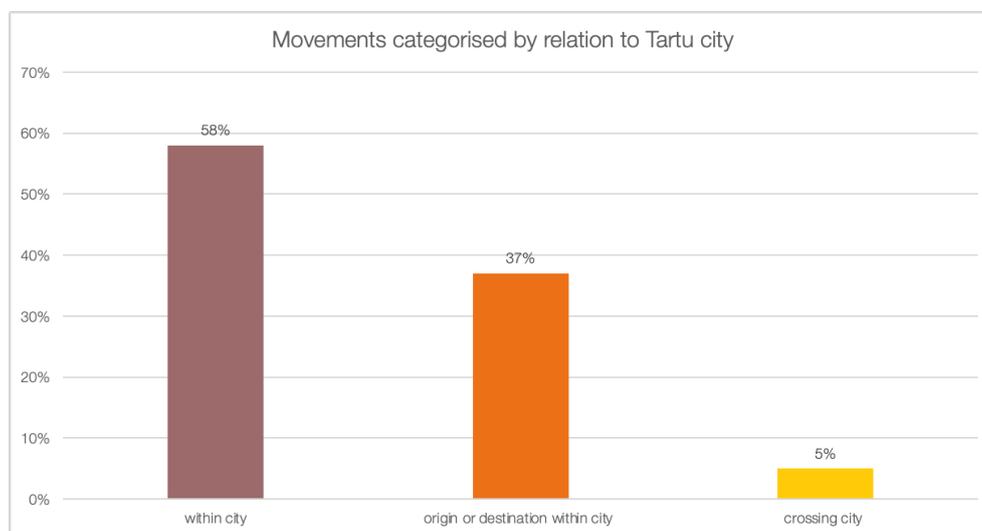
- Recalculate grid-grid routes with timing and distance
- Filter out all grid-grid pairs inside Tartu borders as we definitely need them
- Create routes geometry, filter grid-grid routes which are crossing Tartu city borders in addition to previous
- Calculate moves distances
 - Filter moves which include grid-grid geometry intersects Tartu city
 - Assign travelled distance to moves
 - Combine moves which are shorter than given time interval together, sum up distances
- Classify distances into categories depending on request
- Classify moves into categories: inside Tartu, from somewhere to Tartu, crossing Tartu
- Count classes per time interval

In the results discussed in the following sections, only the movements that are 'touching Tartu city's soil' have been kept, all movements going around the city of Tartu but not crossing city borders, have been removed. The distances for the movements have been calculated based on actual roads, using routing engine.

2. Main results

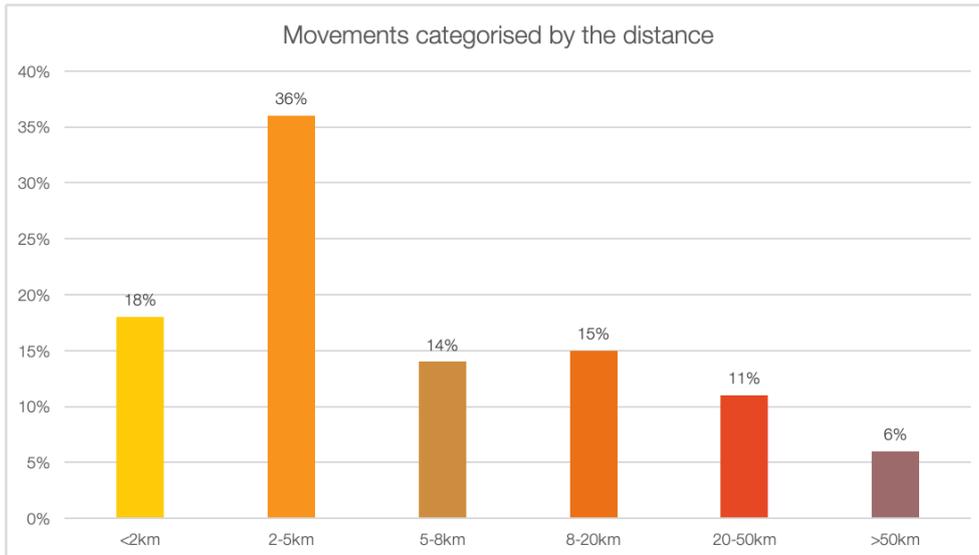
Ratios for the movements based on category:

- 58% of all the movements are made within city borders (city_move)
- 37% of all the movements have either their origin or destination within city borders (outside_city_move)
- 5% of all the movements are crossing the city, without having their origin or destination within the city borders (crosses)

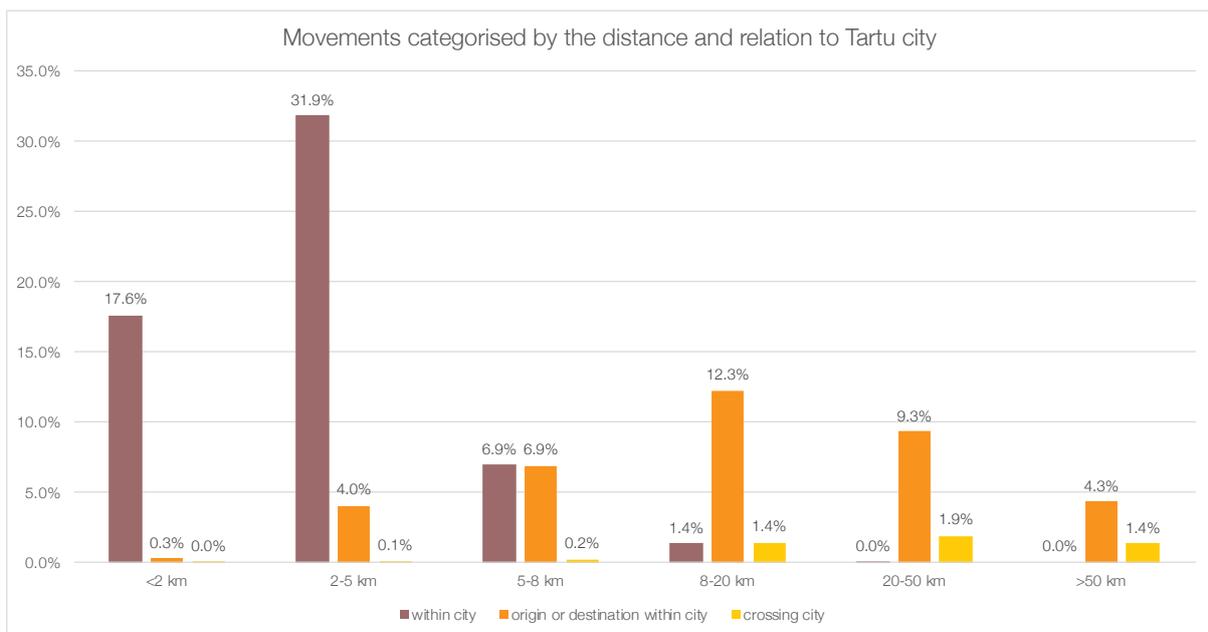


Ratios for the movements based on distance:

- 18% of all the movements are shorter than 2km
- 36% of all the movements are 2–5km
- 14% of all the movements are 5–8km
- 15% of all the movements are 8–20km
- 11% of all the movements are 20–50km
- 6% of all the movements are longer than 50km



Categorising the movements based on the distance and relation to Tartu city shows the following distribution:



3. Additional results and explanations

From the results file: 'tartu_moves_20220510.xlsx', it is possible to do additional data exploration, for this purpose the fields of the file are explained based on the table header.

month	day	distance_categories	tartu_county_locality	tartu_city_locality	total_move_counts	avg_move_counts
1	Friday	<2 km	inside_county	crosses_city	91	22.95

- month – month of the year
- day – day of the month
- distance categories – movements categorised by the distance:
 - <2km
 - 2–5km
 - 5–8km
 - 8–20km
 - 20–50km
 - >50km
- tartu_county_locality – movements categorised by their relation to Tartu county
 - inside_county – movements which are made within Tartu county borders, have their origin and destination within Tartu county borders
 - outside_county – movements which have either origin or destination within Tartu county borders OR have both origin and destination outside Tartu county borders
- tartu_city_locality – movements categorised by their relation to Tartu city
 - city_move – movements made entirely within Tartu city borders
 - outside_city_move – movements that have either their origin or destination within city borders
 - crosses – movements that are crossing the city, without having their origin or destination within the city borders
- total_move_counts – number of movements (extrapolated to general population) in the applicable day and categories
- avg_move_counts – average number of movements (extrapolated to general population) per weekday in a month and category (e.g., all Fridays in January)