



Dynamic accessibility analysis using big data

Juan Carlos García Palomares

Javier Gutiérrez

María Henar Salas-Olmedo

Borja Moya-Gómez

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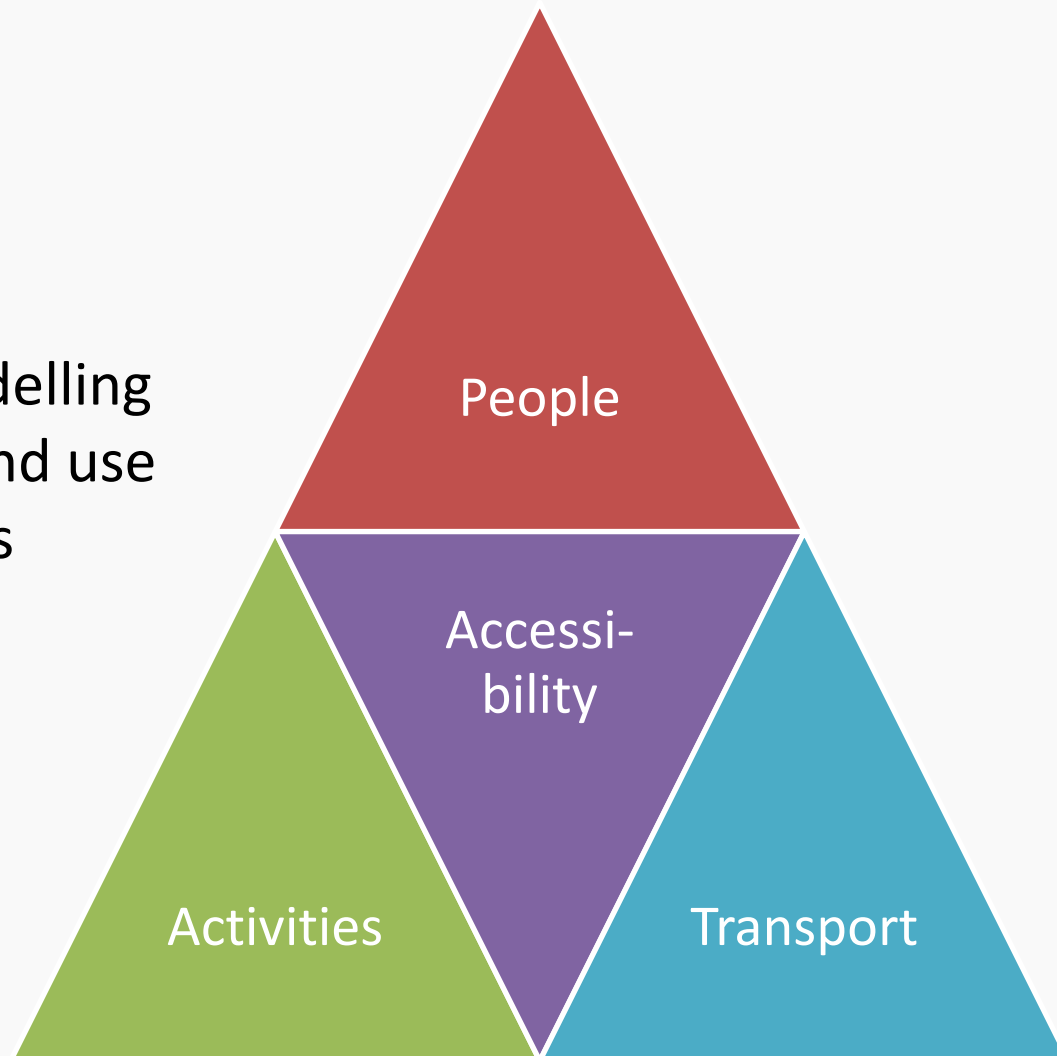
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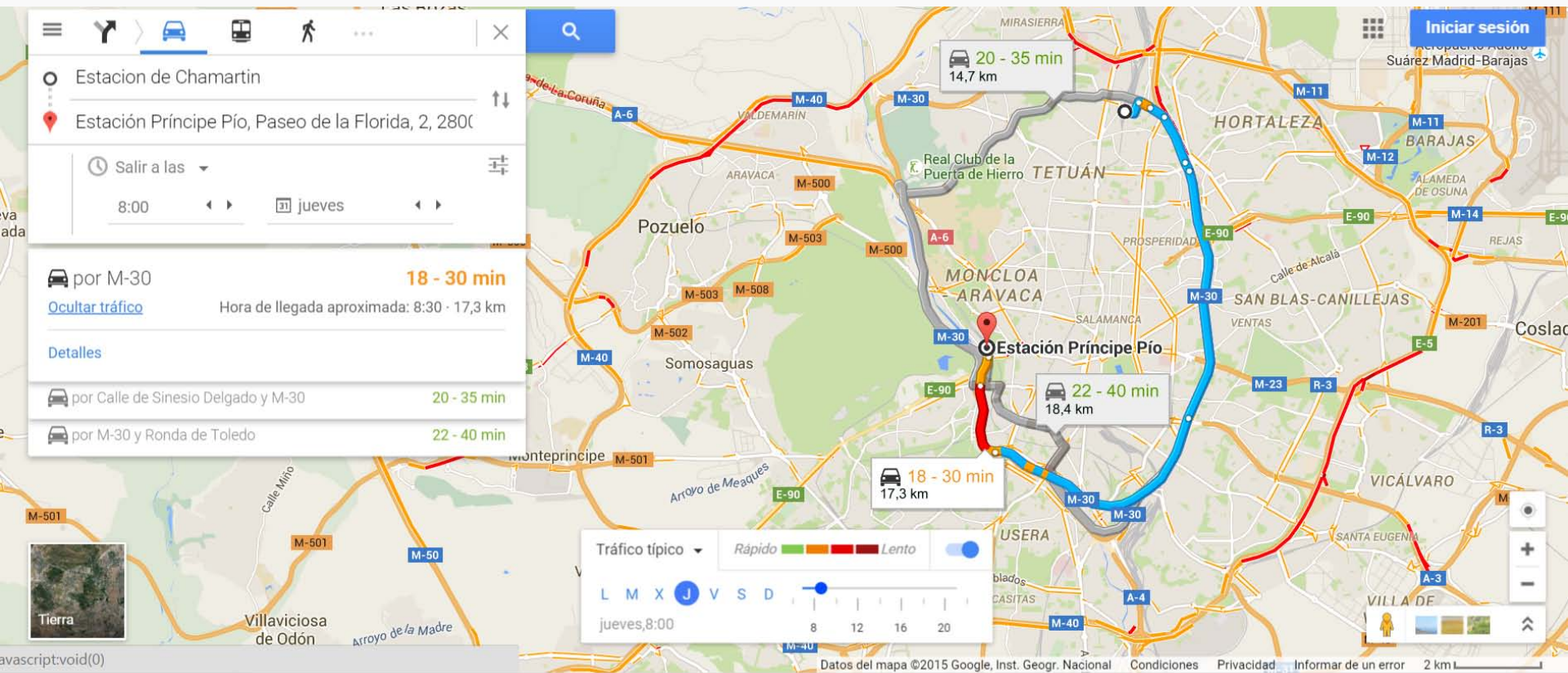
Accessibility facilitates modelling
the interaction between land use
and transport systems

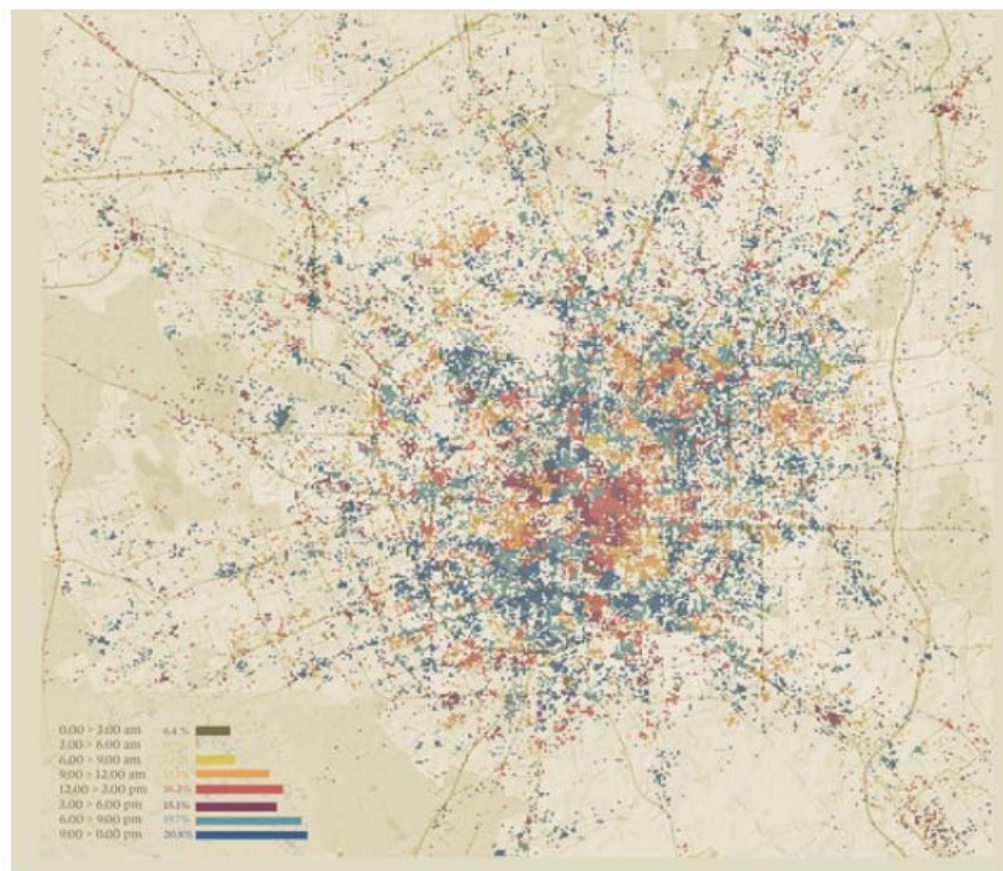




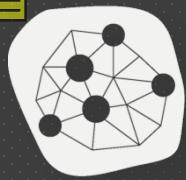
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Ciuccarelli, P., Lupi, G., & Simeone, L. (2014): Visualizing the Data City (pp. 17-22). Springer International Publishing.



Our objective

Mapping the **dynamics of accessibility** along the day in order to provide **policy makers** with a **closer vision of accessibility issues** that are otherwise masked in static accessibility analysis.



Our data



TomTom Speed profiles



Geo-located tweets



INE 2011 Census

Control data



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TomTom collects data since 2007

With over 400 million users worldwide

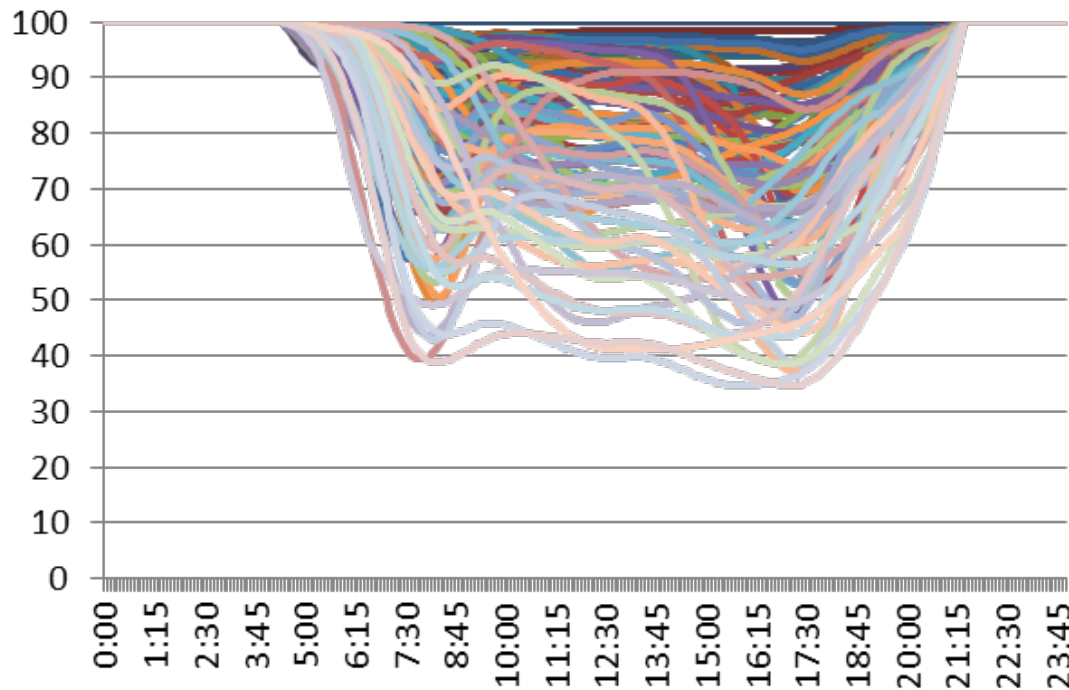
Gets over 7 billion speed and distance measurements per day



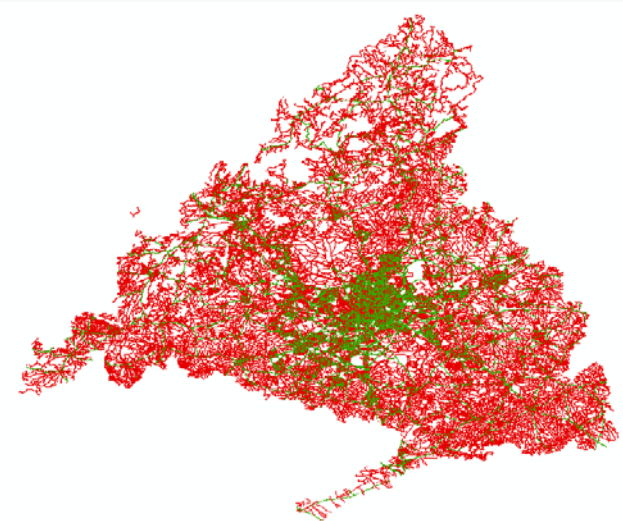


TomTom Speed profiles

98 speed profiles according to speed data recorded every 5 minutes



Speed profile data on every street segment with over 1,000 observations



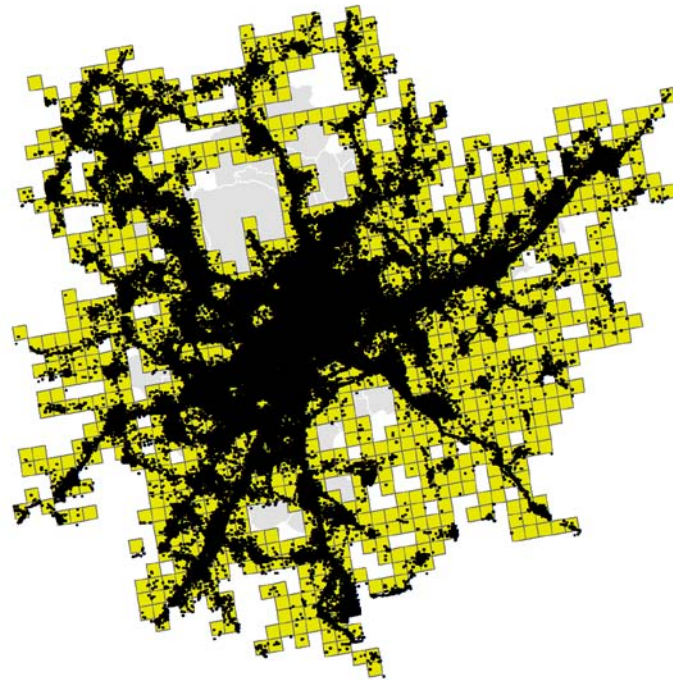


Initial dataset: +6 million tweets in Madrid along 2014

Madrid study area

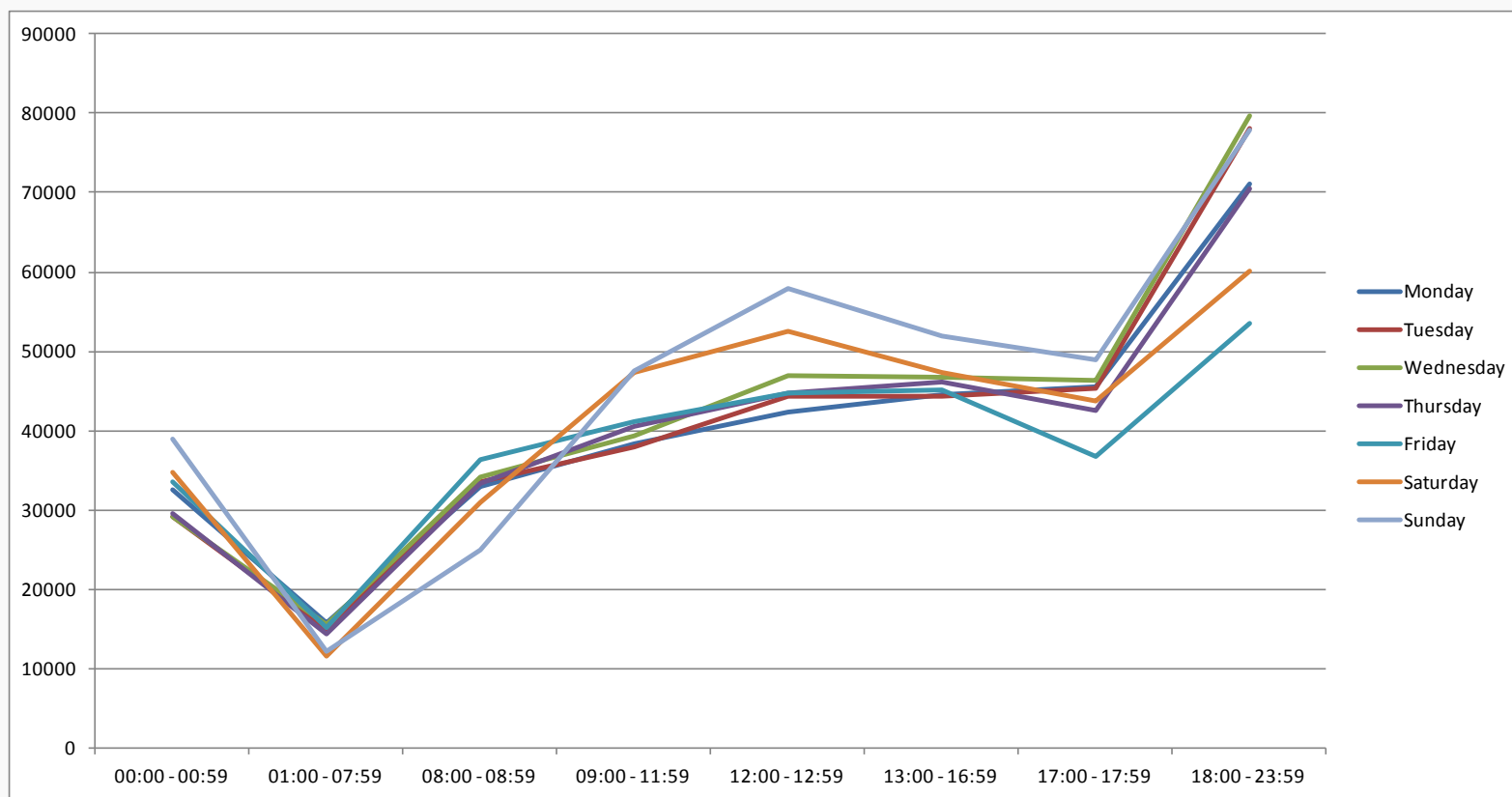
A grid of 1236 cells (2x2 km) covering:

- a) All populated areas in municipalities with an average density over 500 inhabitants/sq.km. (490 cells)
- b) Areas within 15 minutes of travel time (free flow) from any of the cells in a) (746 cells)



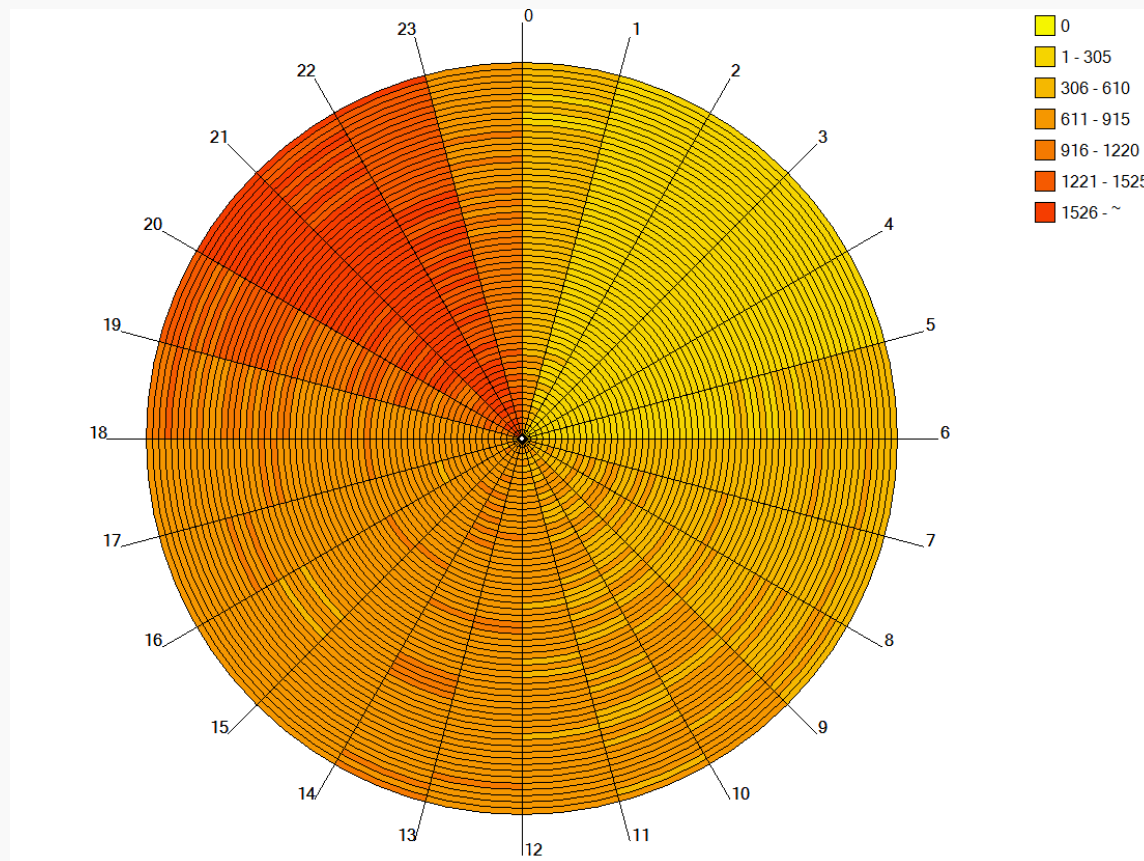


Number of tweets per hour in each time slot and day of the week Madrid, 2014





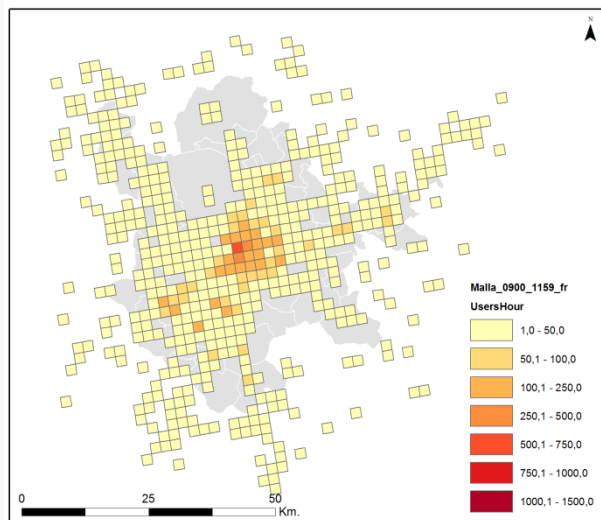
Number of tweets per hour on Wednesdays Madrid, 2014



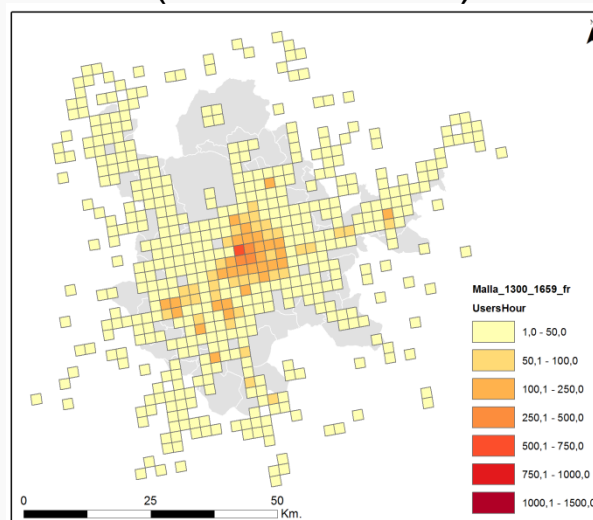


Number of Twitter users per hour on Wednesdays Madrid, 2014

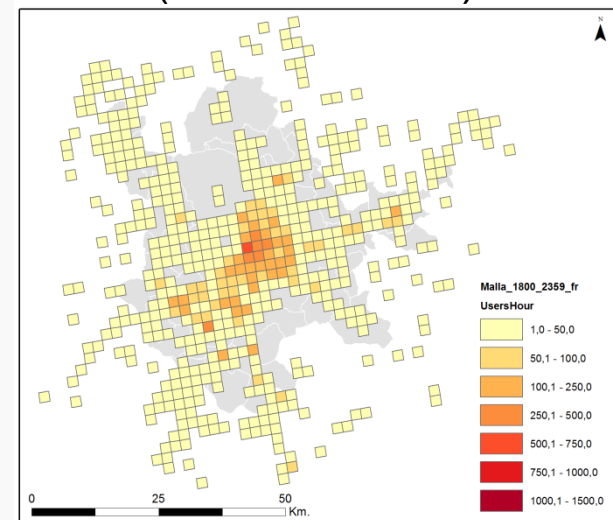
Morning
(09:00 – 11:59)



Afternoon
(13:00 – 16:59)



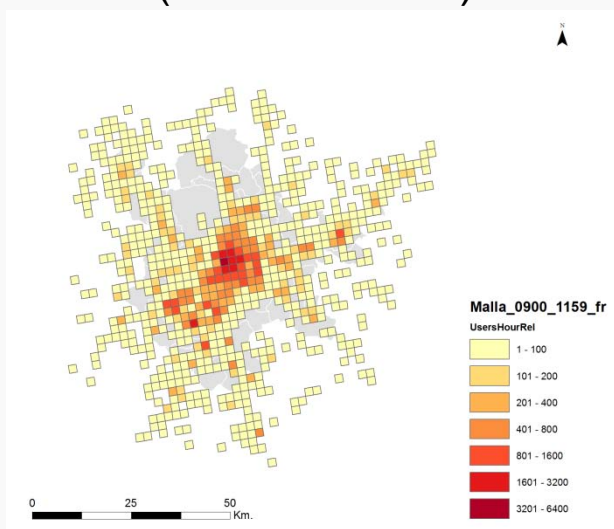
Evening
(18:00 – 23:59)



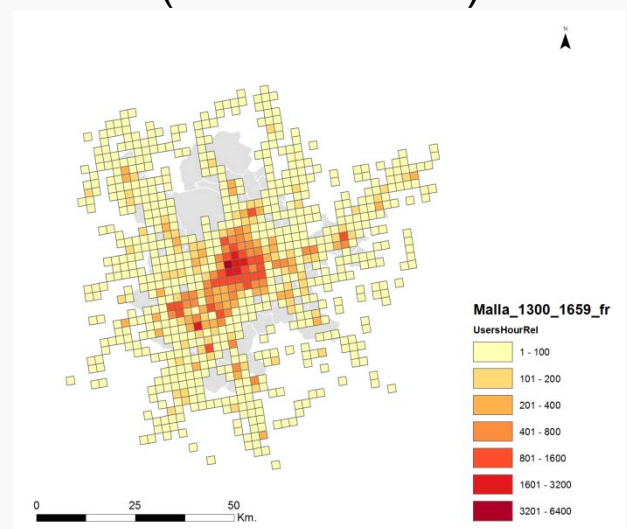


Number of Twitter users per hour (relative to total Twitter users) on Wednesdays, Madrid, 2014

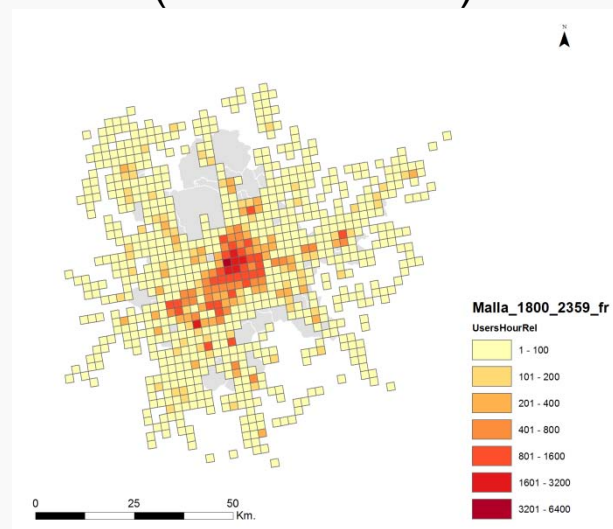
Morning
(09:00 – 11:59)

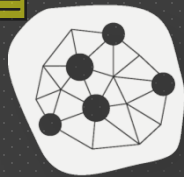


Afternoon
(13:00 – 16:59)

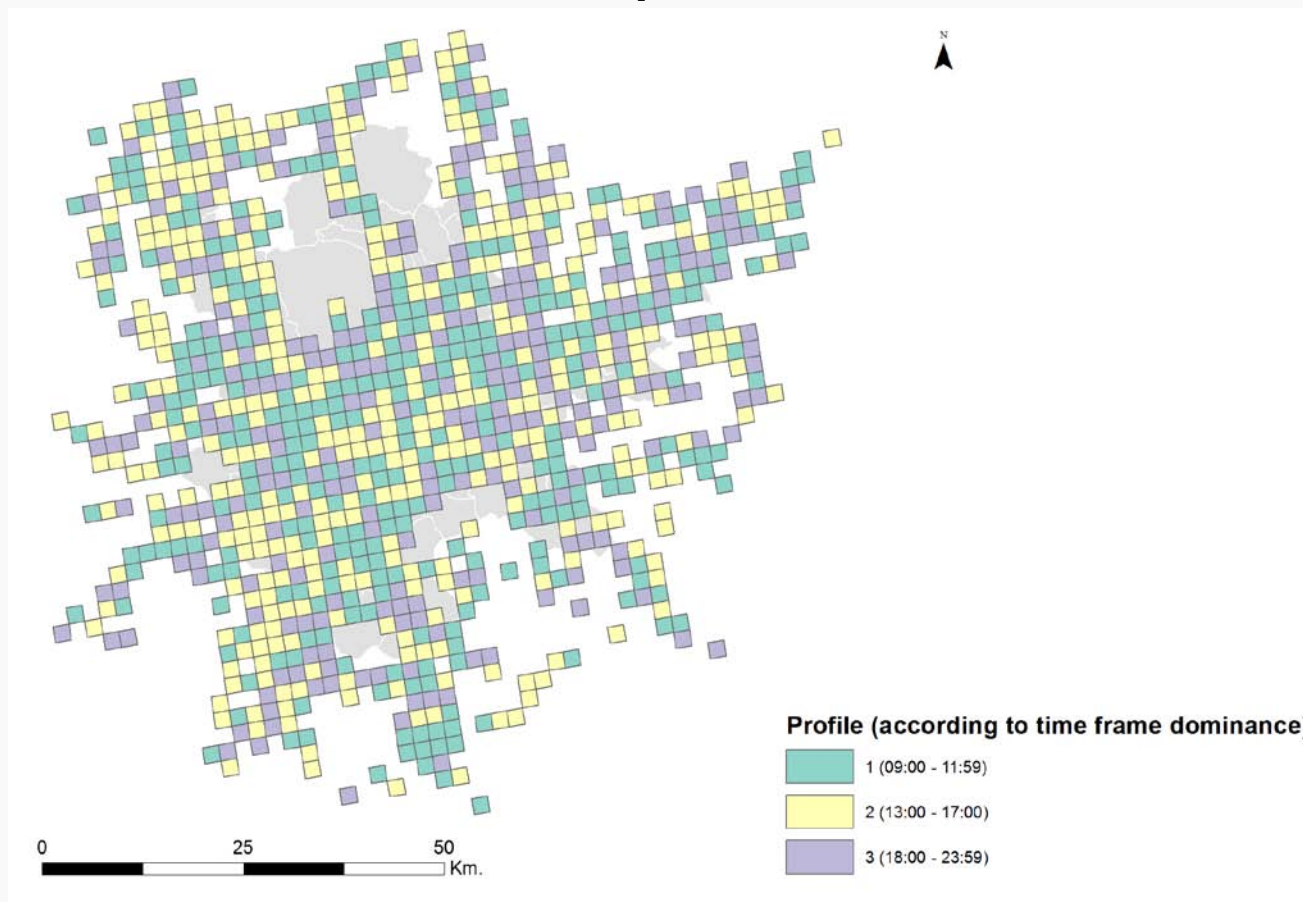


Evening
(18:00 – 23:59)



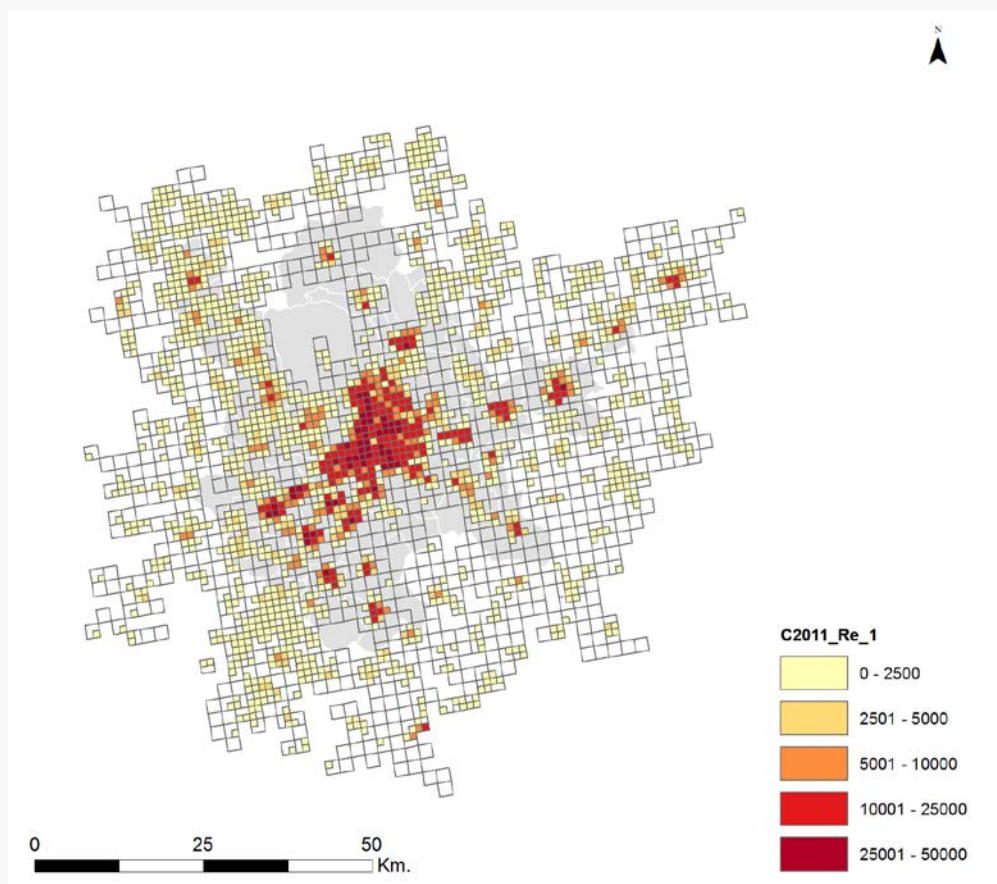


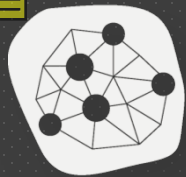
User profiles





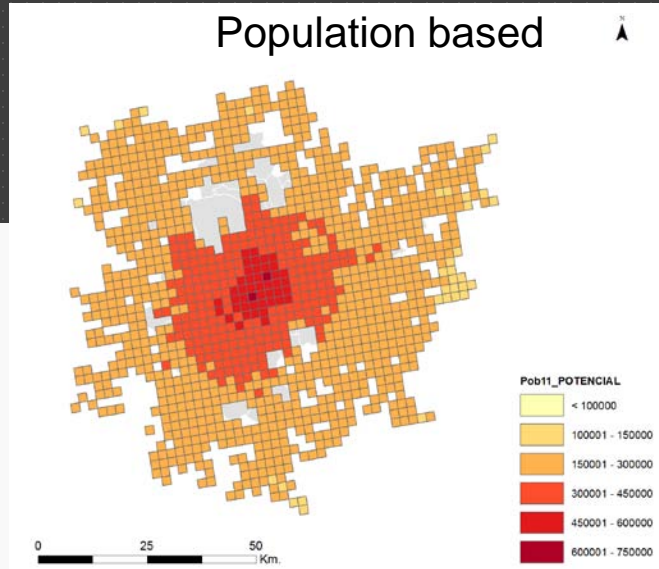
Population grid (2011 Census)



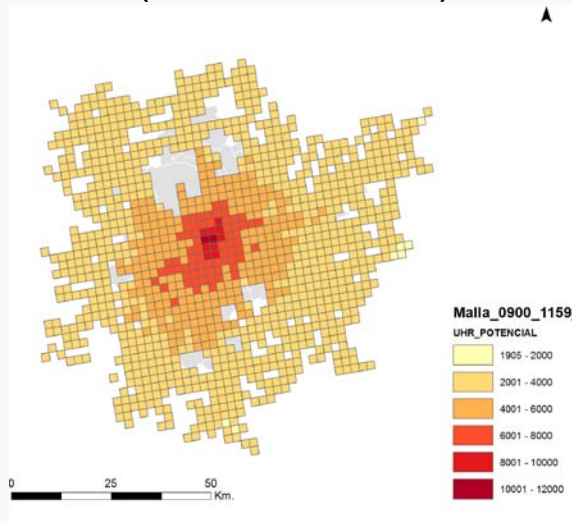


Preliminary results – potential accessibility

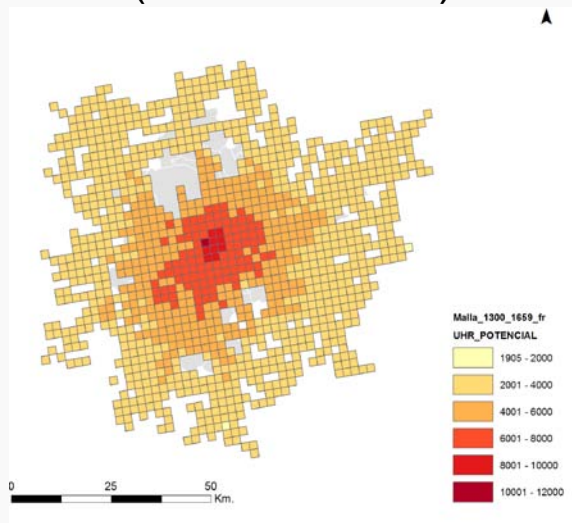
Work in progress



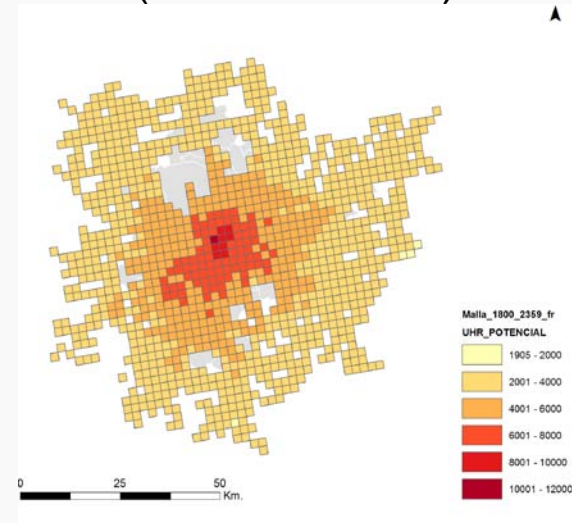
Morning (09:00 – 11:59)

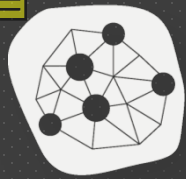


Afternoon (13:00 – 16:59)



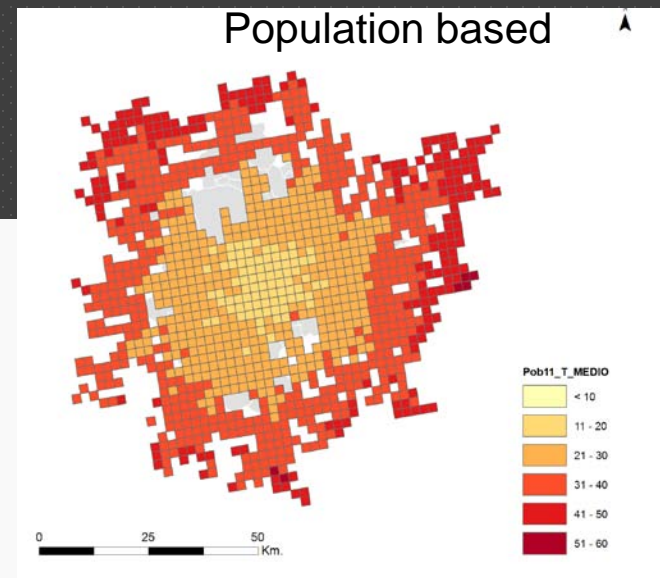
Evening (18:00 – 23:59)



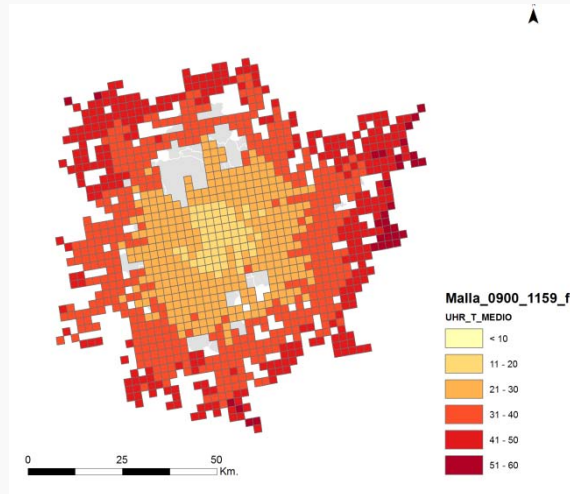


Preliminary results – average total travel time

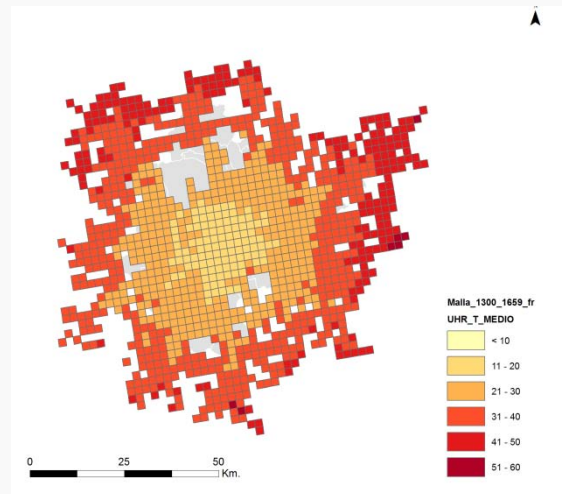
Work in progress



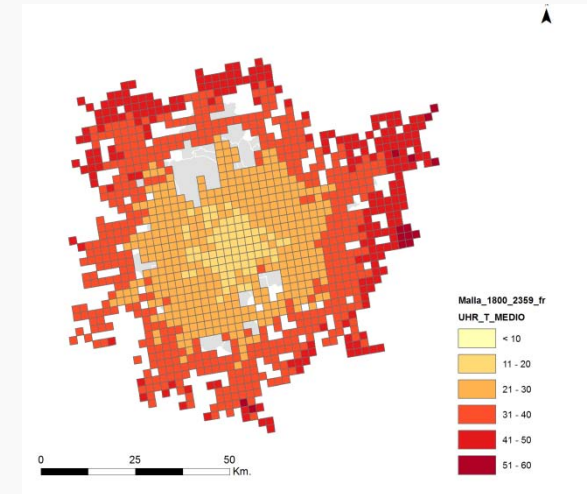
Morning (09:00 – 11:59)

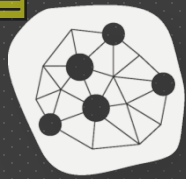


Afternoon (13:00 – 16:59)



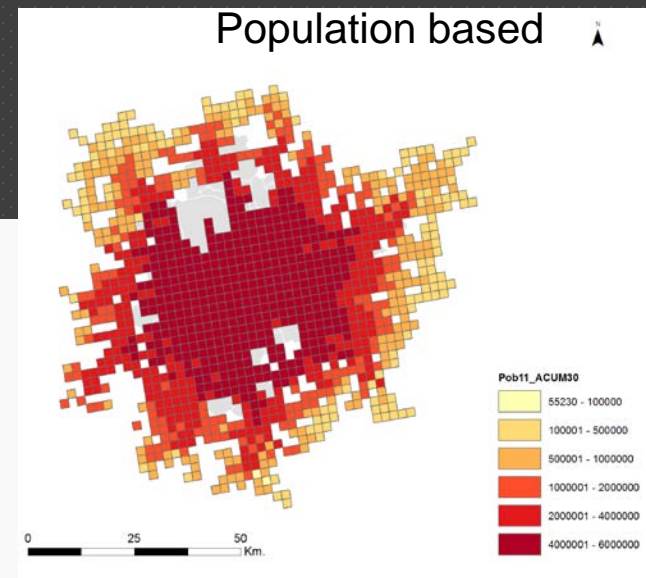
Evening (18:00 – 23:59)



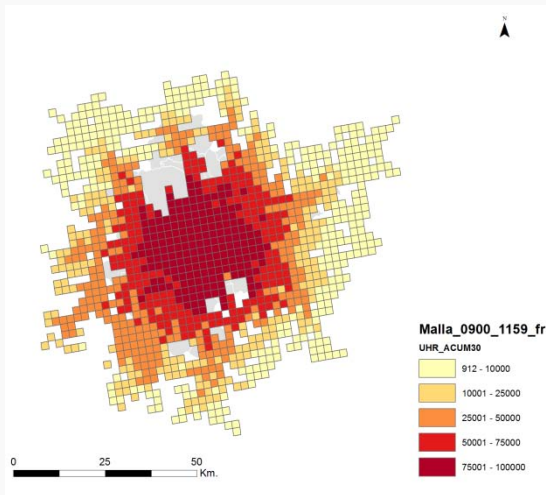


Preliminary results – accumulated opportunities (30 minutes)

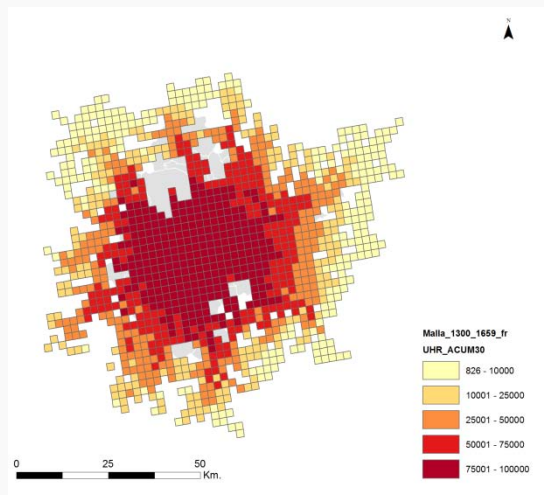
Work in progress



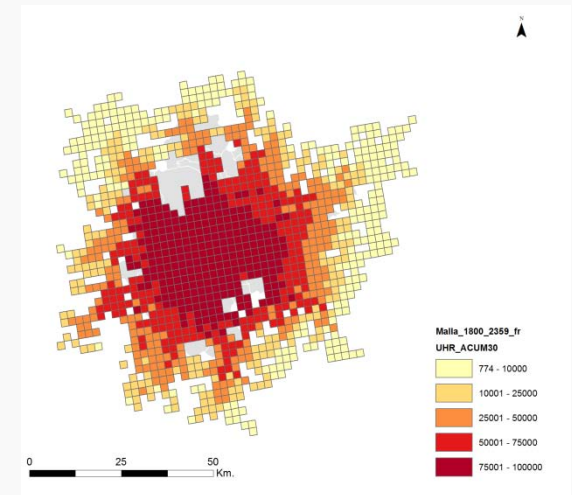
Morning (09:00 – 11:59)



Afternoon (13:00 – 16:59)



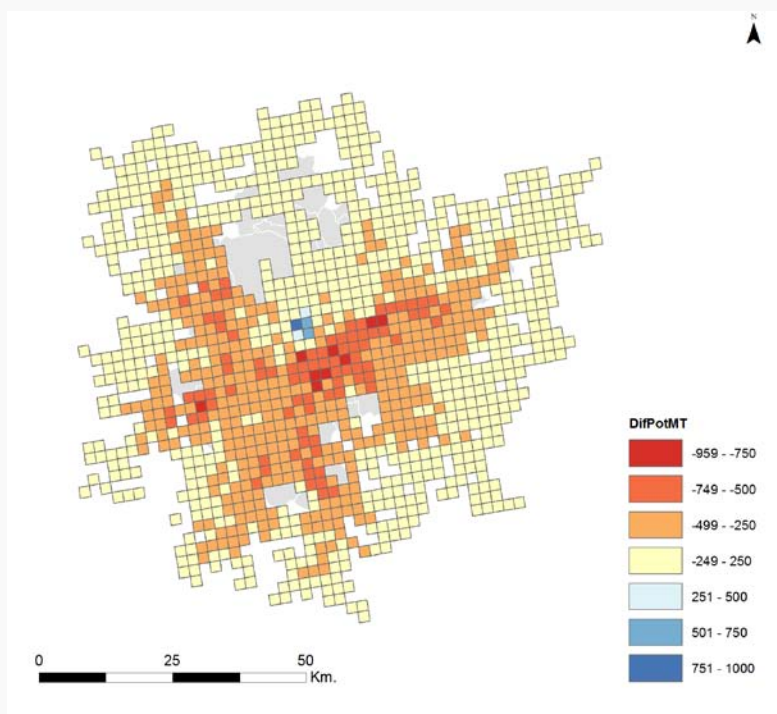
Evening (18:00 – 23:59)



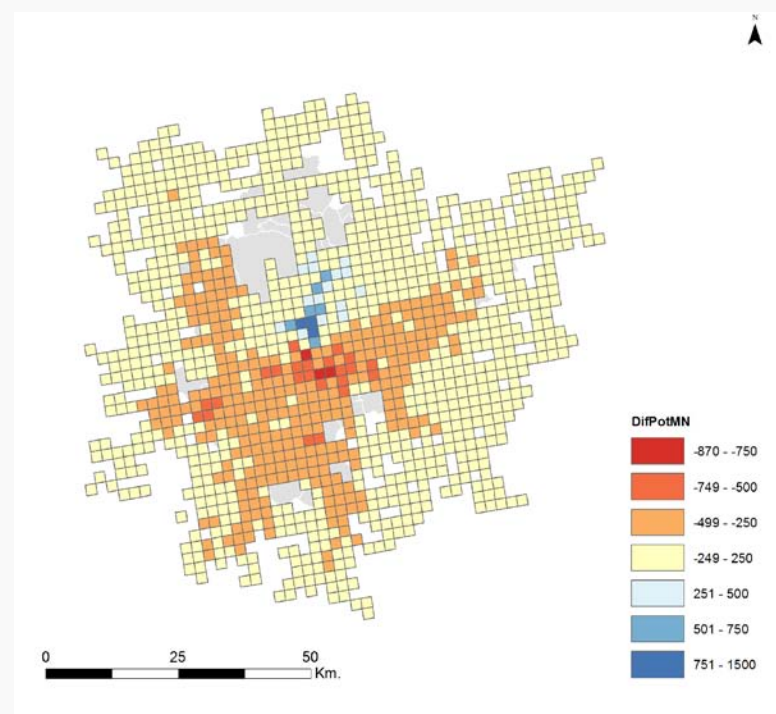


Preliminary results – Difference in potential accessibility

Morning minus afternoon potential



Morning minus evening potential





Some preliminary conclusions

- ❑ New data sources increase temporal and spatial resolution
- ❑ This data can be introduced in accessibility indices to evidence more accurate spatiotemporal patterns
- ❑ This will help urban and transport planners to make decisions for specific parts of the city at specific time frames
- ❑ Further analyses are required to find a better match of time slots and actual population daily travel patterns in Madrid



Some examples of further research

- ❑ To analyse the impact of the activity intensity (demand) and the circumstances of the transport system (offer) separately
- ❑ To make use of the information contained in each tweet:
 - ❑ Language detection for identifying migrant and tourist patterns
 - ❑ Replies and hashtags for mapping people networks
- ❑ To integrate public transport data



Thank you for your attention!

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