A Multiscale Approach to Neighbourhood Effects on Individual Income

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TU Delft

Workshop

Addressing Methodological Challenges in the Neighbourhood Effects Research

Nuffield Foundation, London

22 March 2019

RELOCAL Resituating the Local in Cohesion and Territorial Development

RELOCAL has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement Nº 727097

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This presentation is based on research in collaboration with Maarten van Ham (TU Delft), Eva Andersson (Stockholm University), Bo Malmberg (Stockholm University) and Patricia Melo (ISEG).

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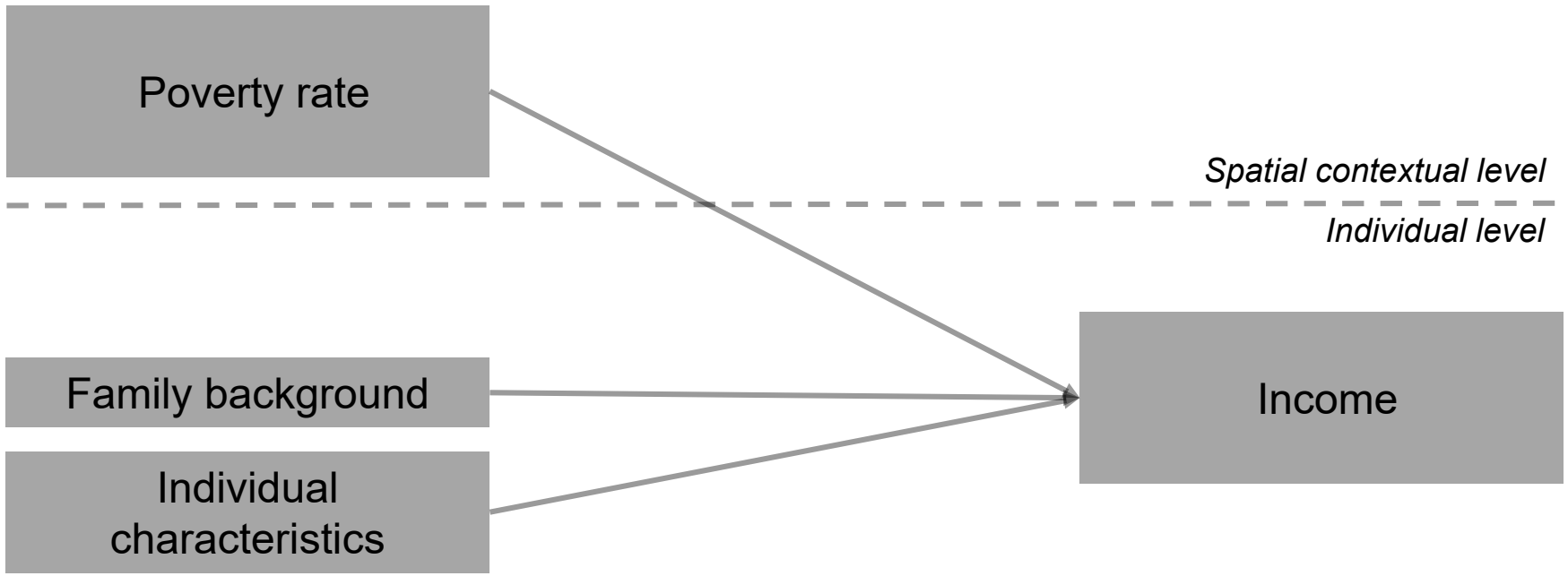
Neighbourhood effects

- The idea that living in deprived areas has a negative effect on individuals' socio-economic outcomes, over and above the effect of their individual and family characteristics: so-called neighborhood effects.

- Concentrated disadvantage is related to individual socio-economic outcomes throughout the life course.

- To what extent does the residential area where you live as teenager shape your obtained income in your late 20s?

Conceptual model



Defining neighbourhoods

We want to understand the effects of the spatial context on individual outcomes.

- Therefore, we need measures of the spatial context and define spatial units.
- Neighbourhood definitions vary widely.
- How are estimated neighbourhood effects affected by the method and scale used to define neighbourhoods?
- The choice of spatial units affect the results.

- This is known as the Modifiable Areal Unit Problem (MAUP).

Modifiable Areal Unit Problem (MAUP)

The same data yield different results when aggregated in different ways.

- Problem of Scaling (or aggregation)

  Results may differ depending on the size of the geographical units.

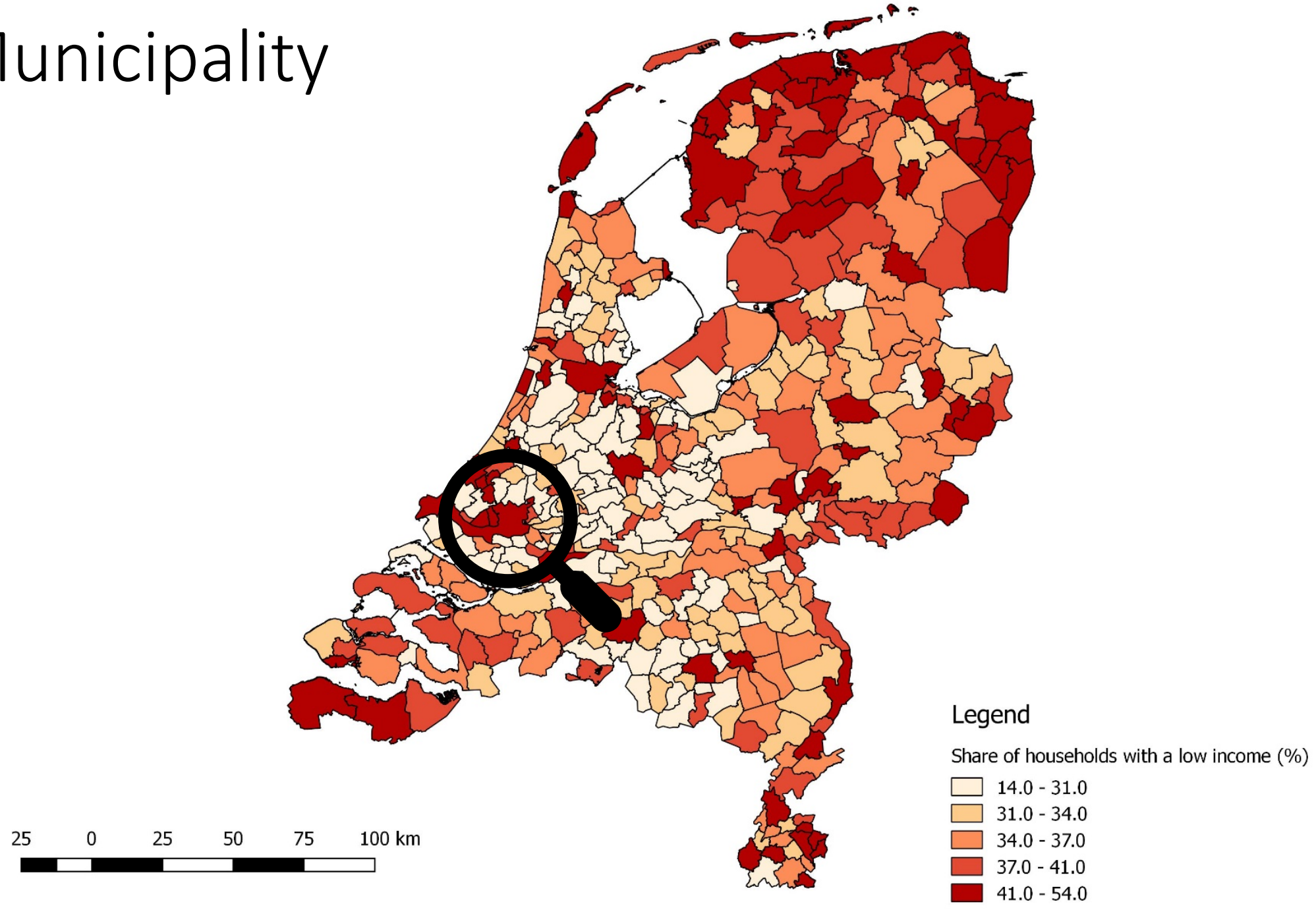
- Problem of Zoning (or grouping)

  Results may differ depending on how the study area is divided up (even at the same geographical scale).

Consequences

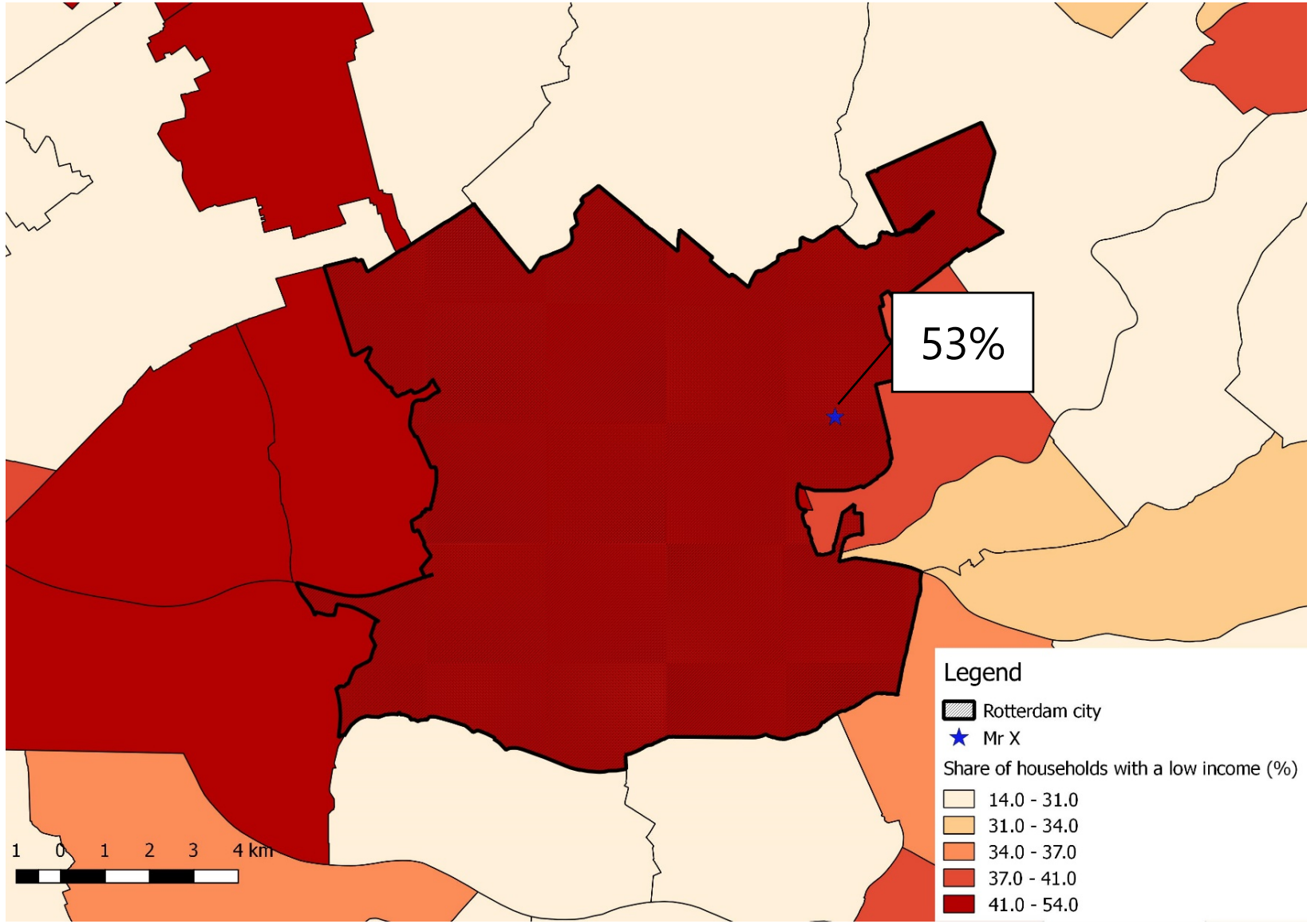
- Contextual effects are dependent on the boundaries that have been drawn.
- Measurement of contextual characteristics can be in accurate.

Municipality



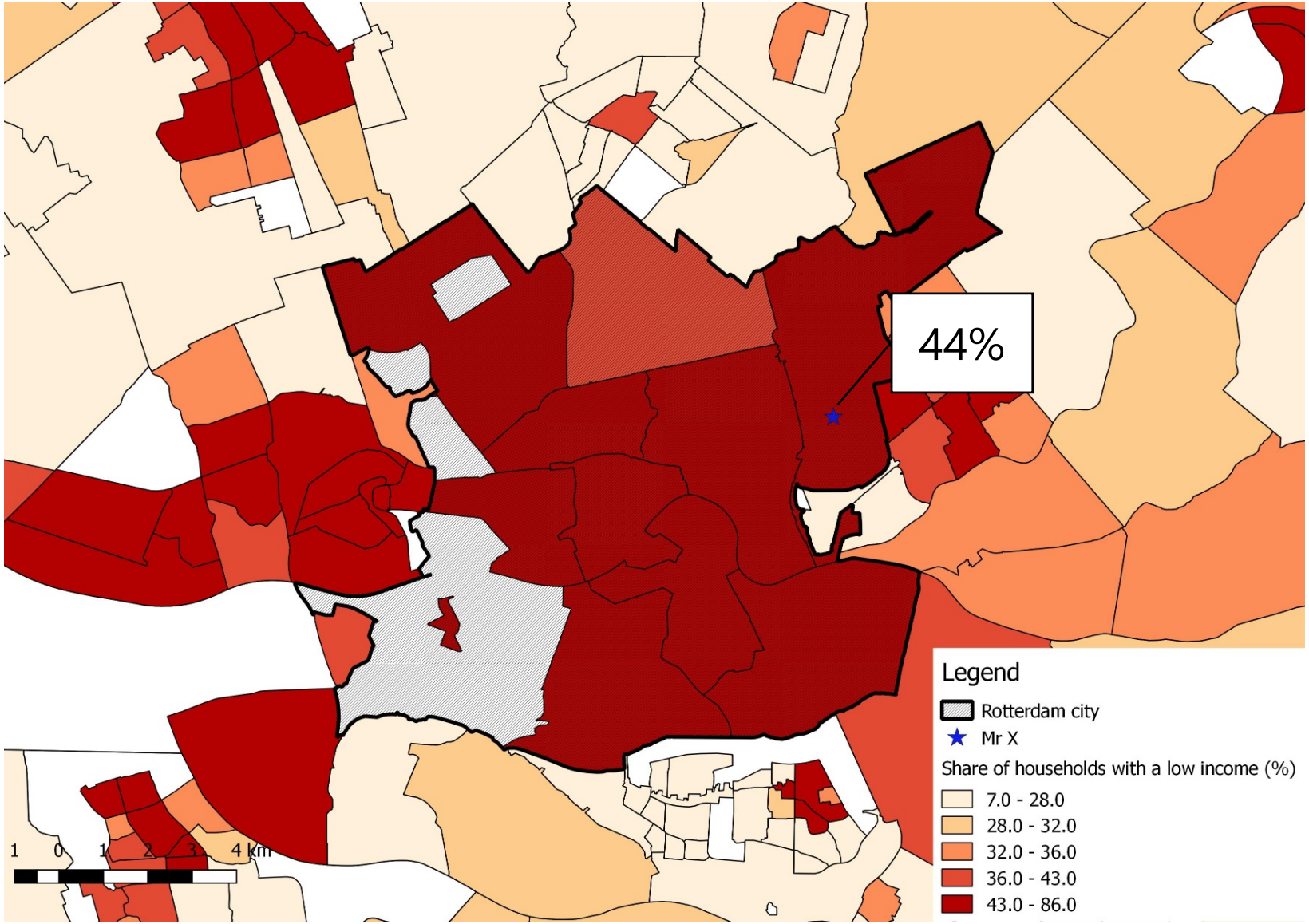
Municipality

Using municipalities as the geographical unit, Mr X is living in an area with a poverty rate of 53%.



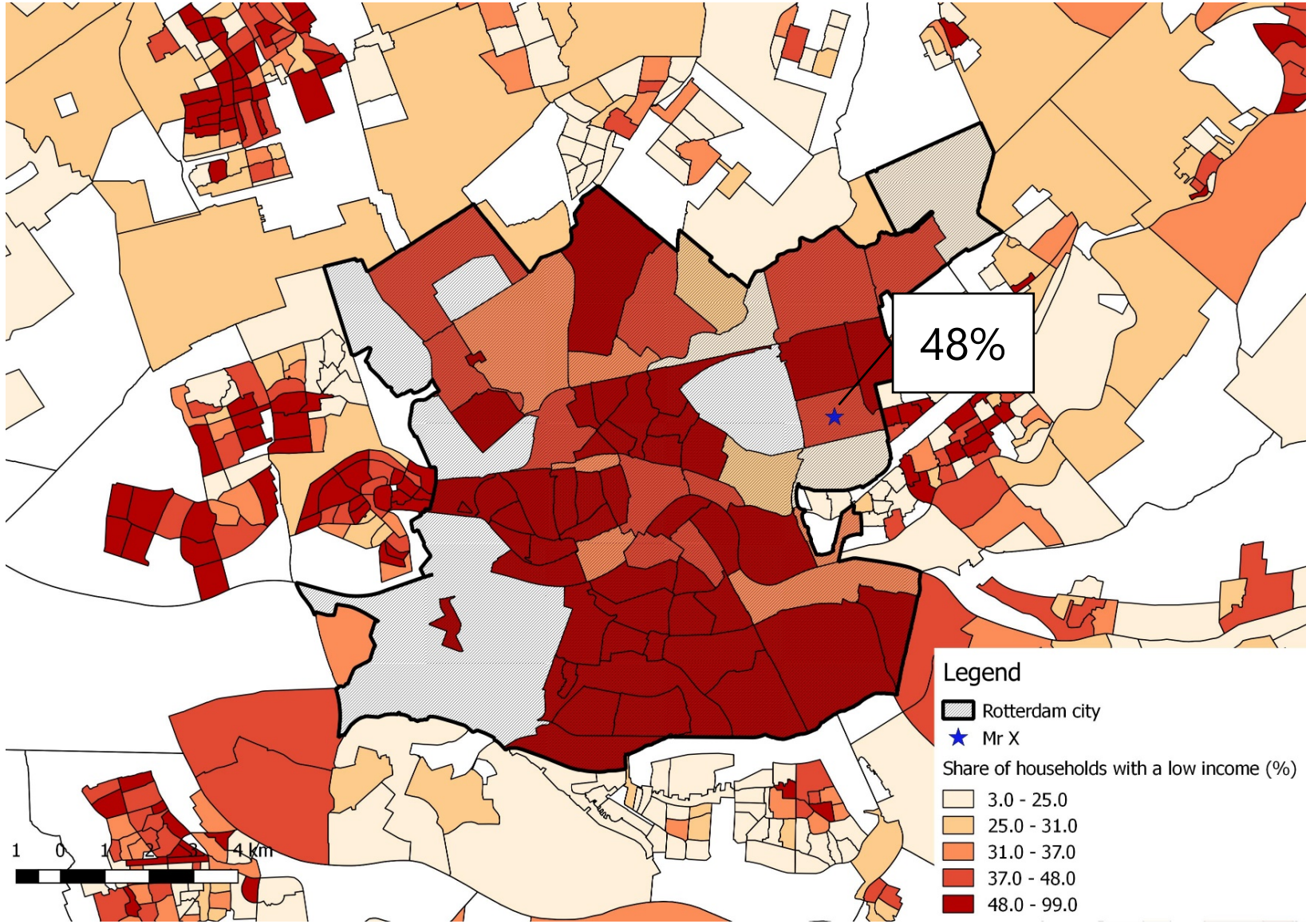
District

Using districts as the geographical unit, Mr X is living in an area with a poverty rate of 44%.



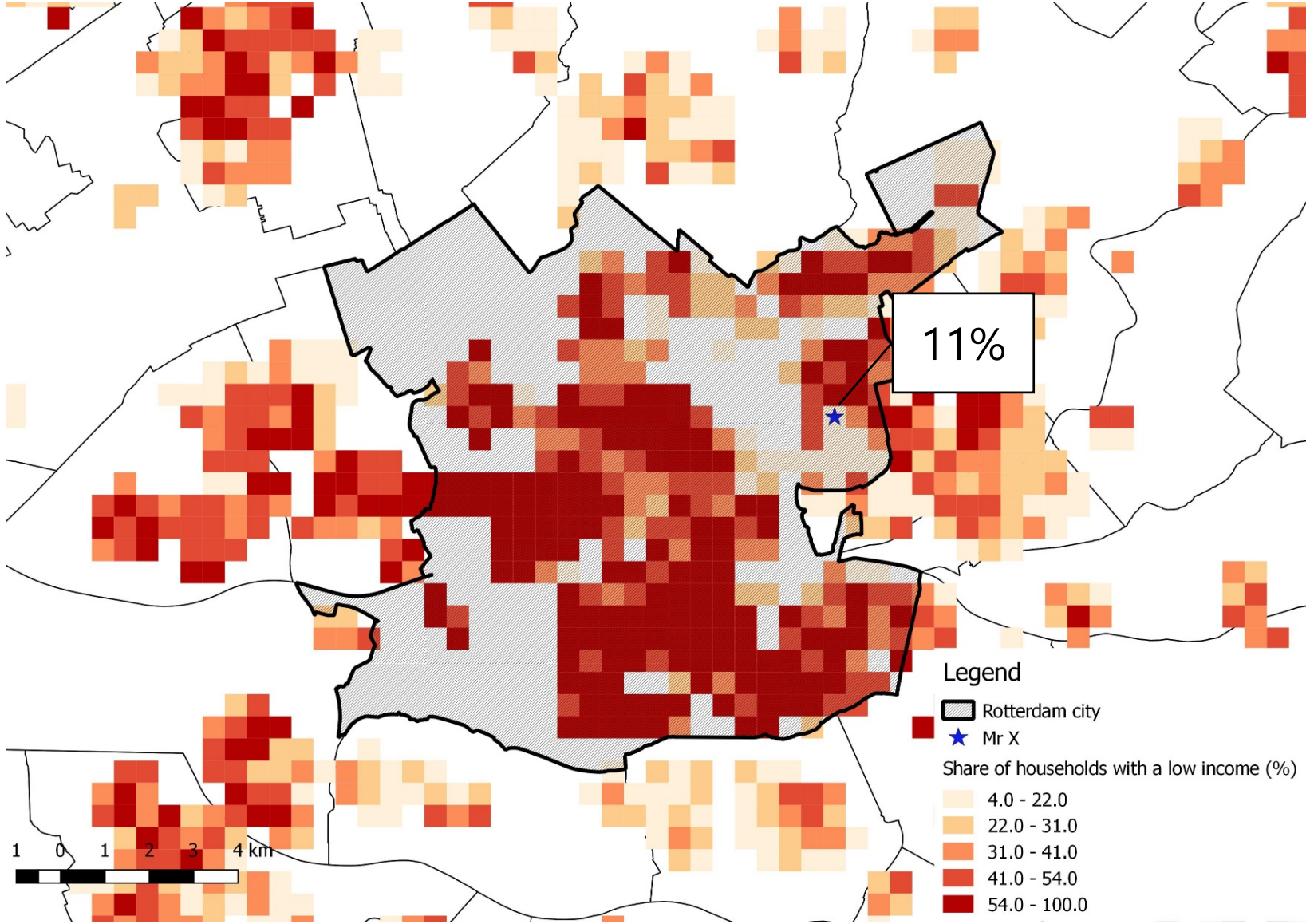
Neighbourhood

Using neighbourhoods as the geographical unit, Mr X is living in an area with a poverty rate of 48%.



500 by 500 meter grid cell

Using 500 by 500 meter grid cells as the geographical unit, Mr X is living in an area with a poverty rate of 11%.



How to circumvent the MAUP?

We need more flexible measures of "neighbourhoods" that are

- not dependent on pre-defined administrative areas,
- individualised,
  - Contexts are egocentric and every individual gets its own "neighbourhood".
- and scalable.
  - From very micro to high spatial scale, as the mechanism through which the residential environment affects individual outcomes may operate at different spatial scales.

>>> Bespoke neighbourhoods

Bespoke neighbourhoods

- Different terms are used to label bespoke neighbourhood, including
  individualised neighbourhoods, scalable neighbourhoods, egocentric neighbourhoods, egocentric buffers, egohoods, overlapping neighbourhoods
- First study using bespoke neighbourhoods was by MacAllister et al. (2001). Similar approaches have been suggested by Malmberg, Andersson, and Östh (2011) and by Hipp and Boessen (2013).
- Two approaches for constructing bespoke neighbourhoods:
  - Based on equal geographical sizes.
  - Based on equal population counts (used in the current study).

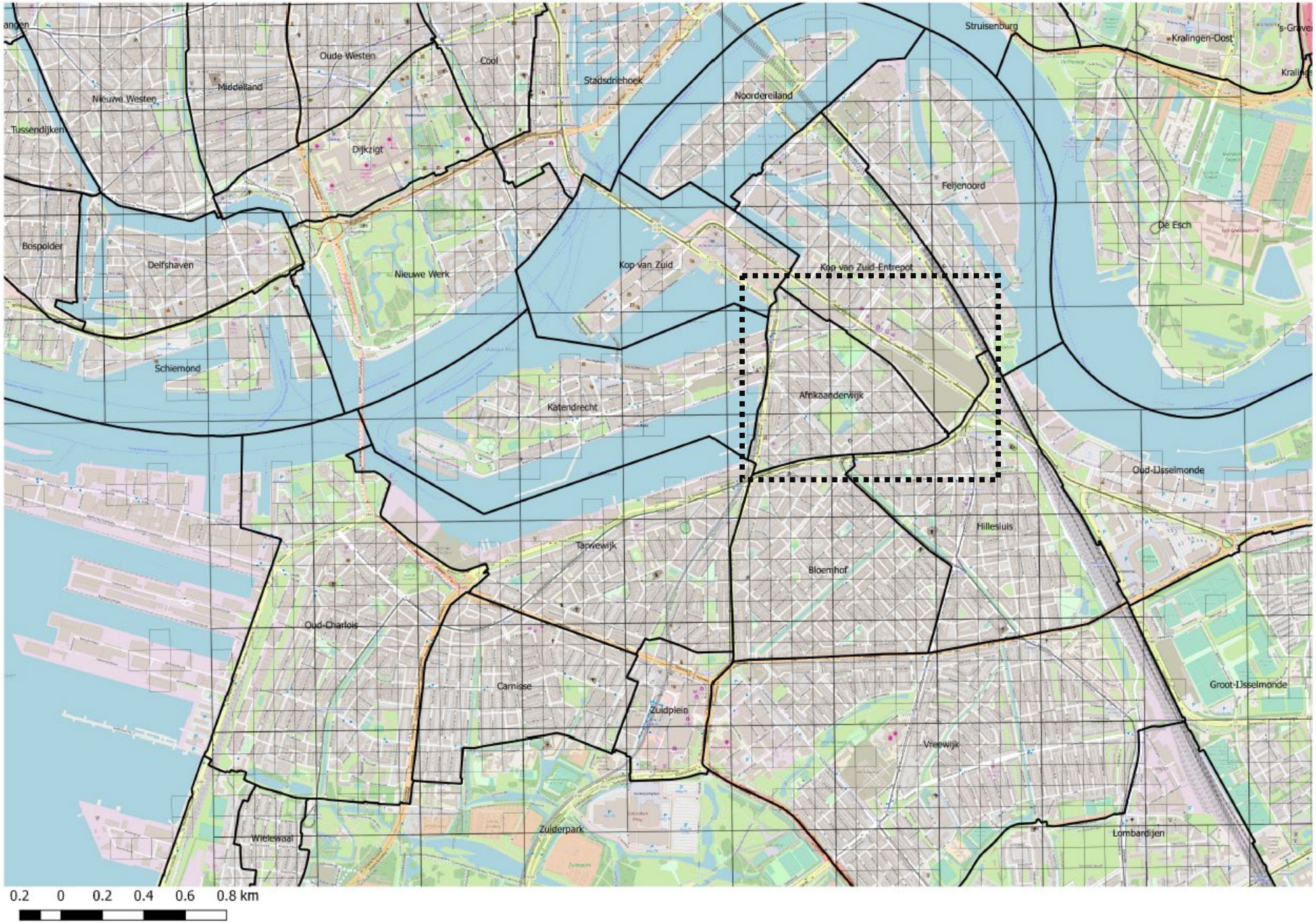
EquiPop

- Specialized software-program for the calculation of the *k*-nearest neighbours.
- Developed by John Östh at Uppsala University.
- http://equipop.kultgeog.uu.se/
- Preferably, the building blocks which are used as a starting point for the EquiPop analyses are very small and regular.

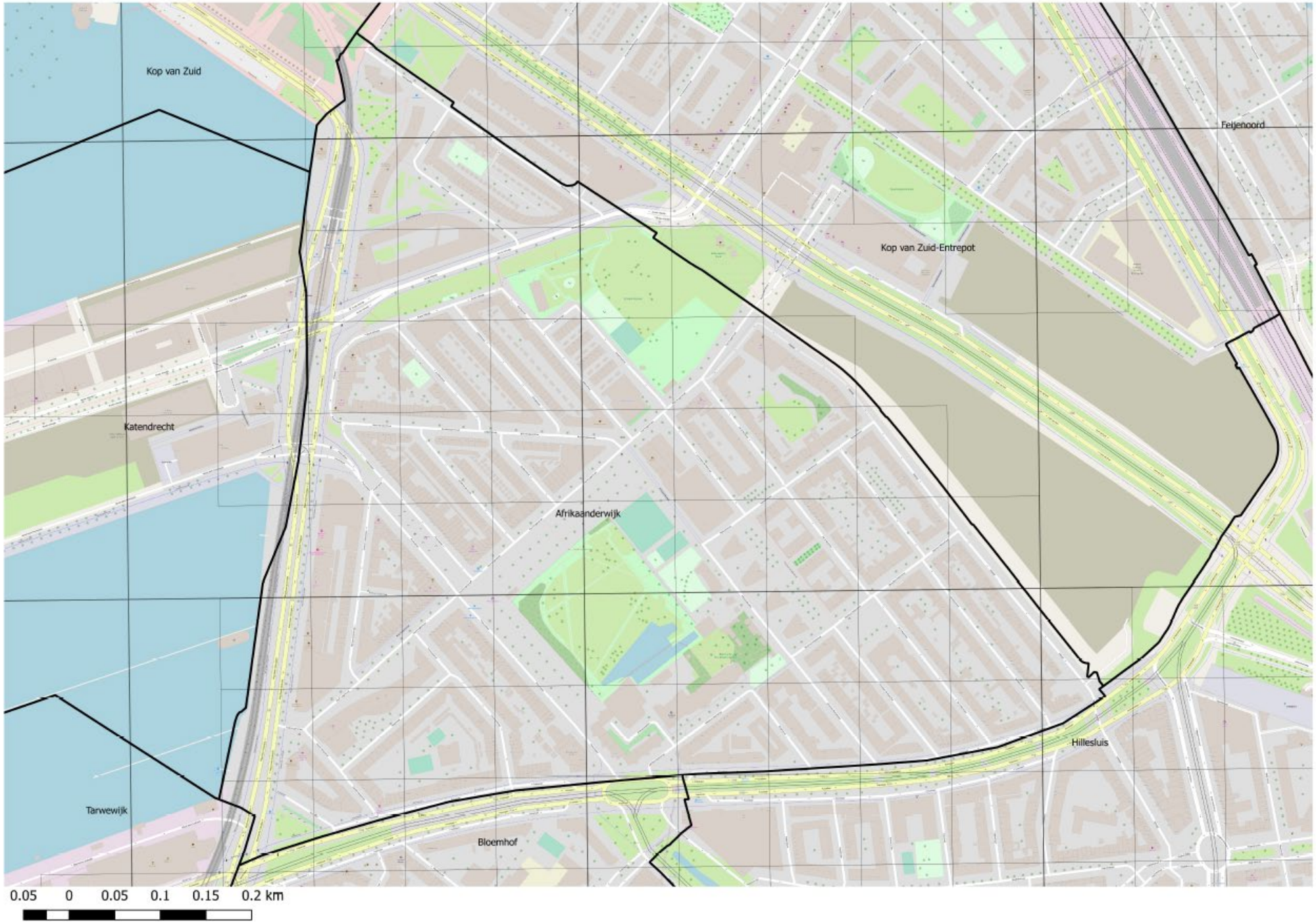
Register data

- Statistics Netherlands
- System of Social statistical Datasets(SSB)
- Full population of the Netherlands
- Micro data: individual level
- Longitudinal (from 1999 onwards)
- Geocoded at very low geographical scale: 100 by 100 meter grid cell

100 by
100 meter
grid cells



100 by
100 meter
grid cells



Area income deprivation

- Poverty rate
- Standardized disposable household income
- Proportion of individuals with an income below 60% of the median

- At five different spatial scales: number of nearest neighbours (*k)*=200, 1600, 12800, 51200, 204800
- For every 100 by 100 meter grid cell

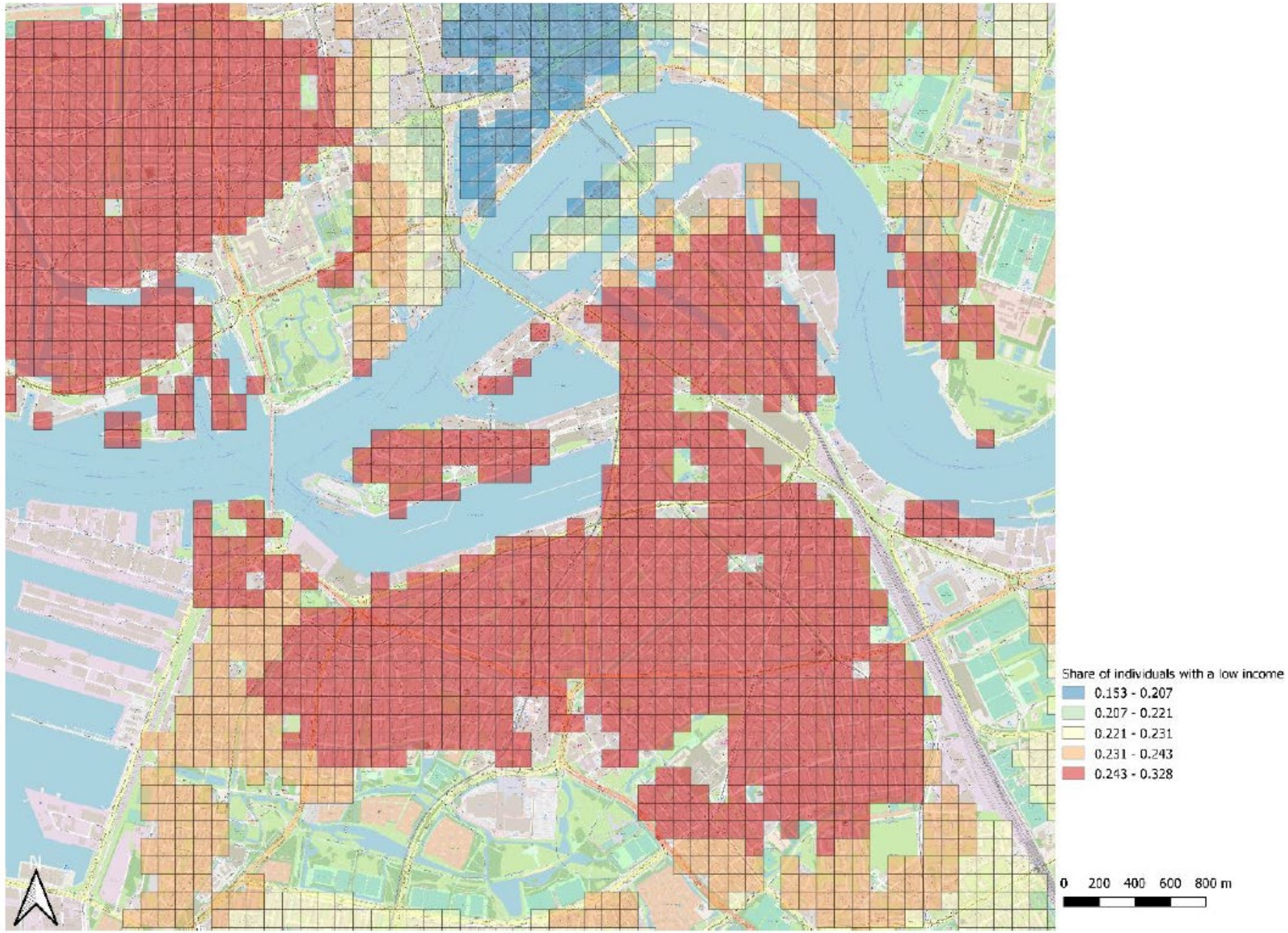


Figure 18 Share of individuals with a low income in Rotterdam Zuid for k=51,200

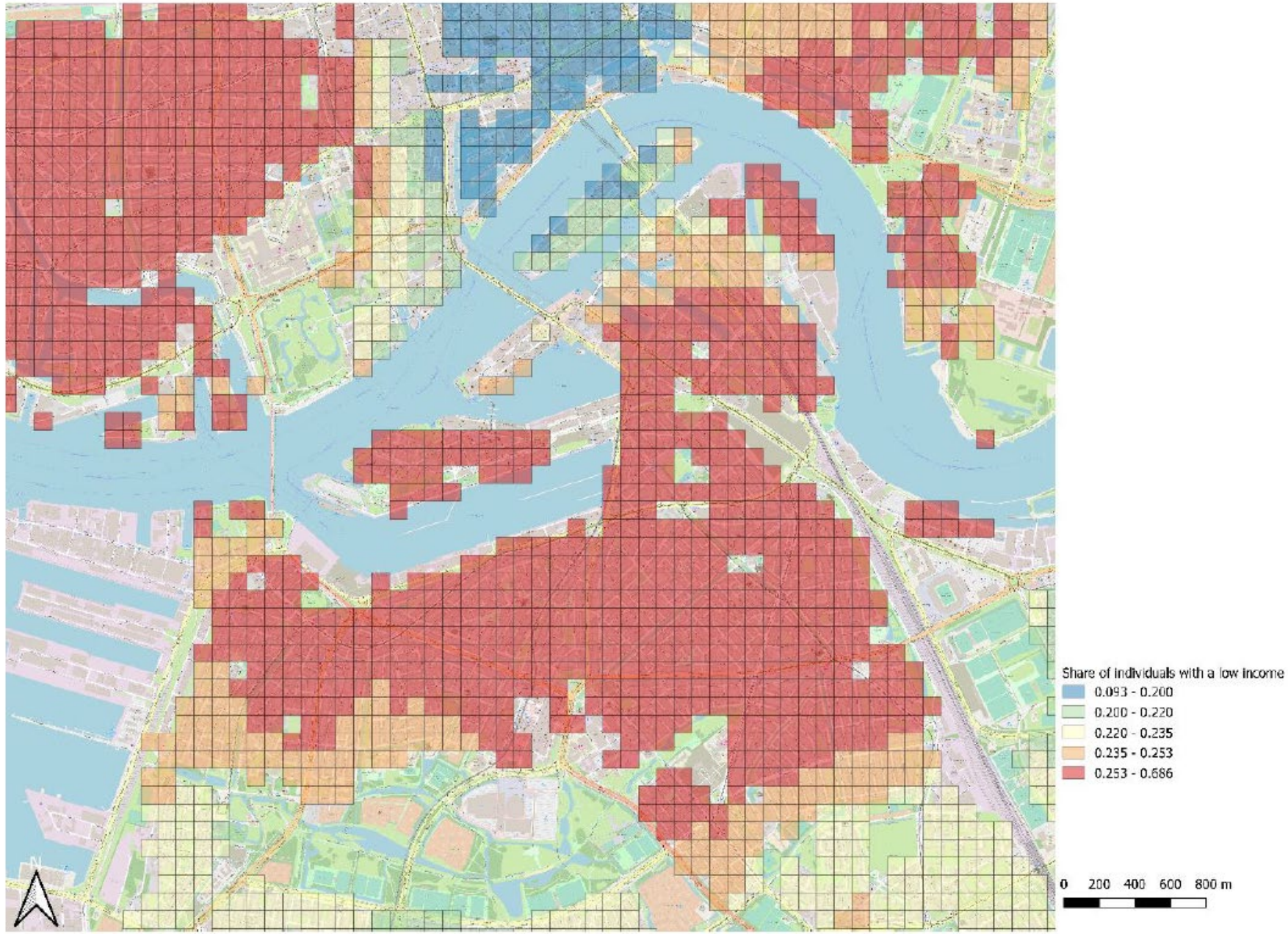


Figure 19 Share of individuals with a low income in Rotterdam Zuid for k=12,800

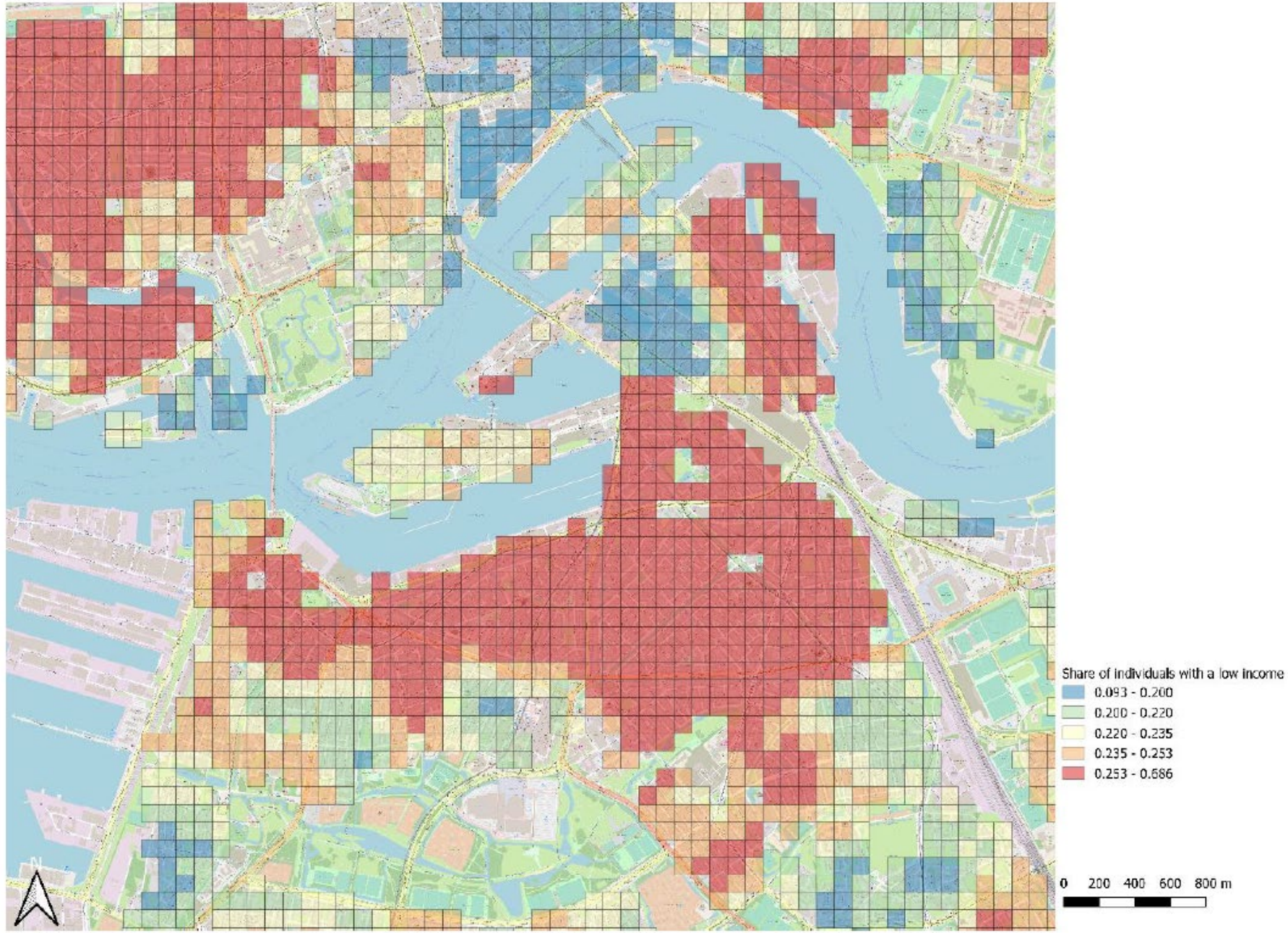


Figure 20 Share of individuals with a low income in Rotterdam Zuid for k=1,600

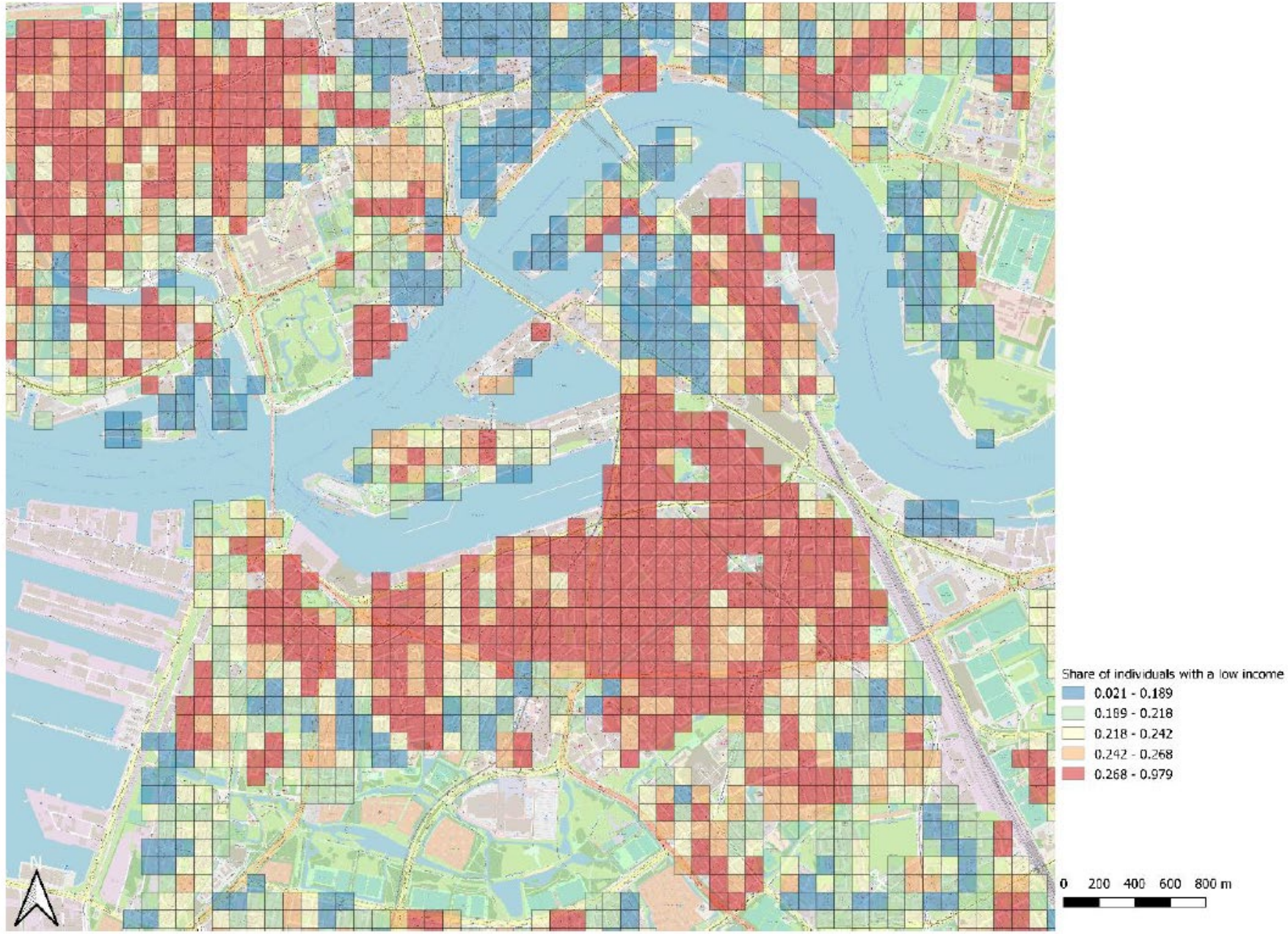


Figure 21 Share of individuals with a low income in Rotterdam Zuid for k=200

Analytical sample

- 1987 cohort (age 30 in 2017)
- $N_{individual}$ = 158,561
- $N_{100\ by\ 100\ meter\ square}$ = 111,184

- Outcome: individual income from work at age 30 (in percentiles)
  - Highest income percentile between age 25-30.

- Individual characteristics (sex and migration background).
- Family characteristics when the individual was 16 years old (parental education, parental unemployment, family type, household income).

Poverty rate at different spatial scales

- Most variation in the poverty rate at the lowest spatial scale (*k*=200) ranging from 0% in the most affluent area to 90% in the most deprived area.
- At the highest spatial scale the poverty rate ranges from 6% in the most affluent area to 21% in the most deprived area.

Individual income (percentile) at age 30 by individual and family characteristics at age 16

- Males have a higher income and individuals with a non-European background have a lower income.
- Individuals who had a single parent family at age 16 have a lower income compared to individuals who had a two-parent family.
- Having one or two parents with tertiary education is related to a higher income compared to having no parents with tertiary education.
- A higher household income at age 16 is related to a higher individual income at age 30.
- Parental unemployment at age 16 is also strongly related to individual income ate age 30.
- These characteristics explained 8.6% of the variance in individual income.

Individual income at age 30 by contextual area poverty at age 16 at different spatial scales

- Contextual income deprivation at age 16 is negatively related to individual income at age 30 at all five spatial scales.
- At first sight the effect sizes indicate that contextual poverty has a stronger effect on individual income with increasing scale.
- However, in order to get a better picture of this relationship at different geographical scales, the distribution of contextual poverty at each spatial scale needs to be taken in to account.

Difference in income percentile between an individual from poorest and richest area at age 16

- Using the effect sizes to calculate differences in individual income between individuals from the most affluent areas and the most deprived areas at all spatial scales we see that the effect is most pronounced at low spatial scale.
- At the lowest spatial scale (*k*=200), the difference in income at age 30 between an individual who lived in the poorest neighbourhood at age 16 and an individual who lived in the richest neighbourhood at age 16 is 22.3 percentiles.
- At the highest spatial scale (*k*=204800) this difference is 7.3 percentiles.

Additional analyses

- Obtained educational level as outcome variable
  - Contextual effect a bit stronger, but similar pattern.
- Same analysis in Sweden in collaboration with Eva Andersson and Bo Malmberg (Stockholm University)
  - Contextual effects weaker, but similar pattern.

Conclusions

- Living in a poor neighbourhood at age 16 is related to lower income in the late 20s, after controlling for family socio-economic characteristics.
- Although family socio-economic characteristics are strongly related to individual income, contextual poverty had an additional effect.
- The strength of the relationship between childhood contextual poverty and later life income differs depending on the geographical scale at which contextual poverty is measured.
- We find stronger effects of concentrated poverty at low spatial scale.

Conclusions

- The mechanisms through which the residential or environmental context affects individual outcomes may be different at different spatial scales. The mechanisms range from regional labour markets at larger spatial scales to social network and peer group effects within the immediate environment as captured by the smaller spatial scales.
- In order to come to a better understanding of the consequences of spatial inequality for individual socio-economic outcomes, it is important to look at spatial inequalities at different geographical scales.

Thank you!

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