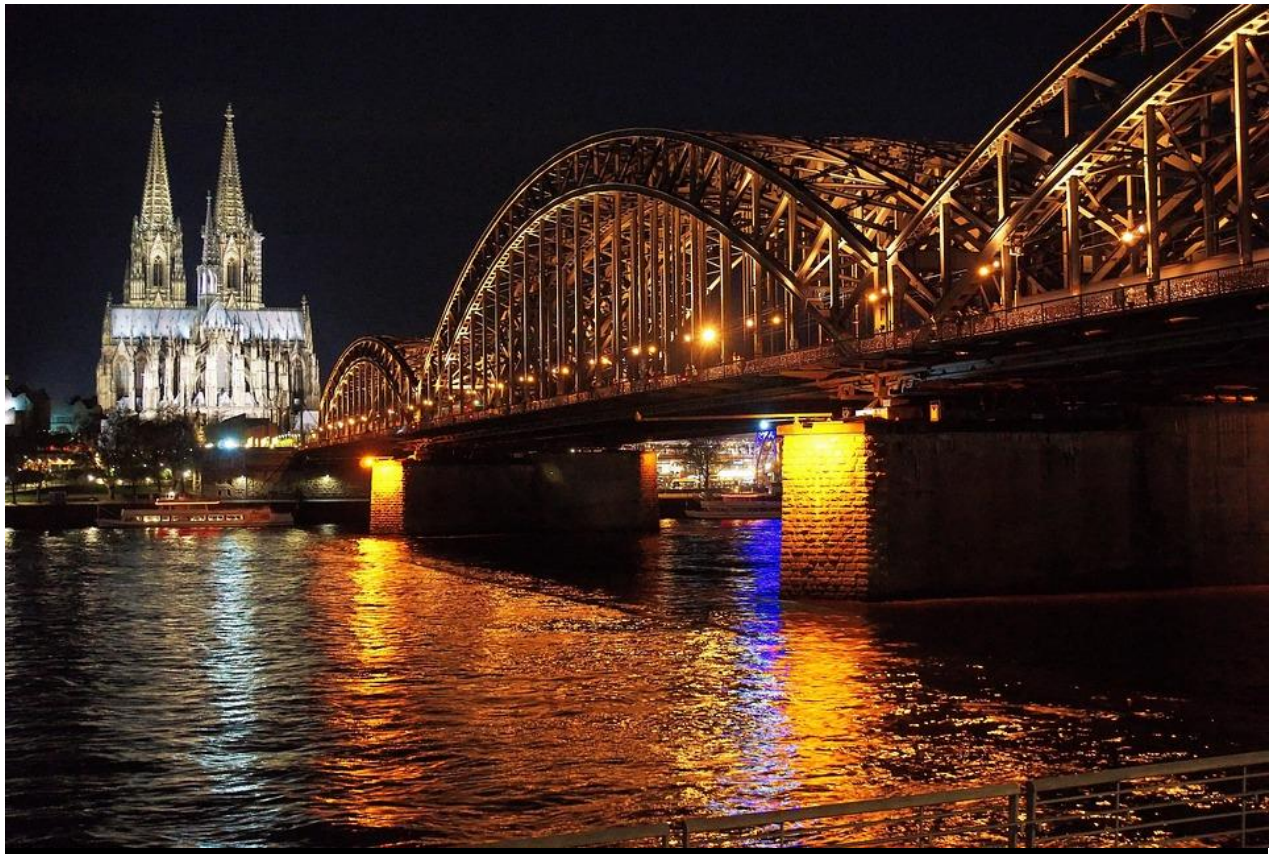
Investigation on Population Migration within Cologne



Question

What makes people move to other districts within Cologne?

Why are districts growing or shrinking?

Introduction

- Cologne is the 4th biggest city in Germany
- City seems to be very heterogeneous in culture and environment
- Districts of Cologne can be seen as small sub-cities and show individual characteristics

Aspects of Living

- The final target is to find districts that are growing/shrinking and to connect that to the districts' characteristics

We will use the following aspects to characterize districts:

Location

Venues Nearby

Land Use

Land Utilization around the district

Age Distribution

Distribution of ages within the district

Household Size

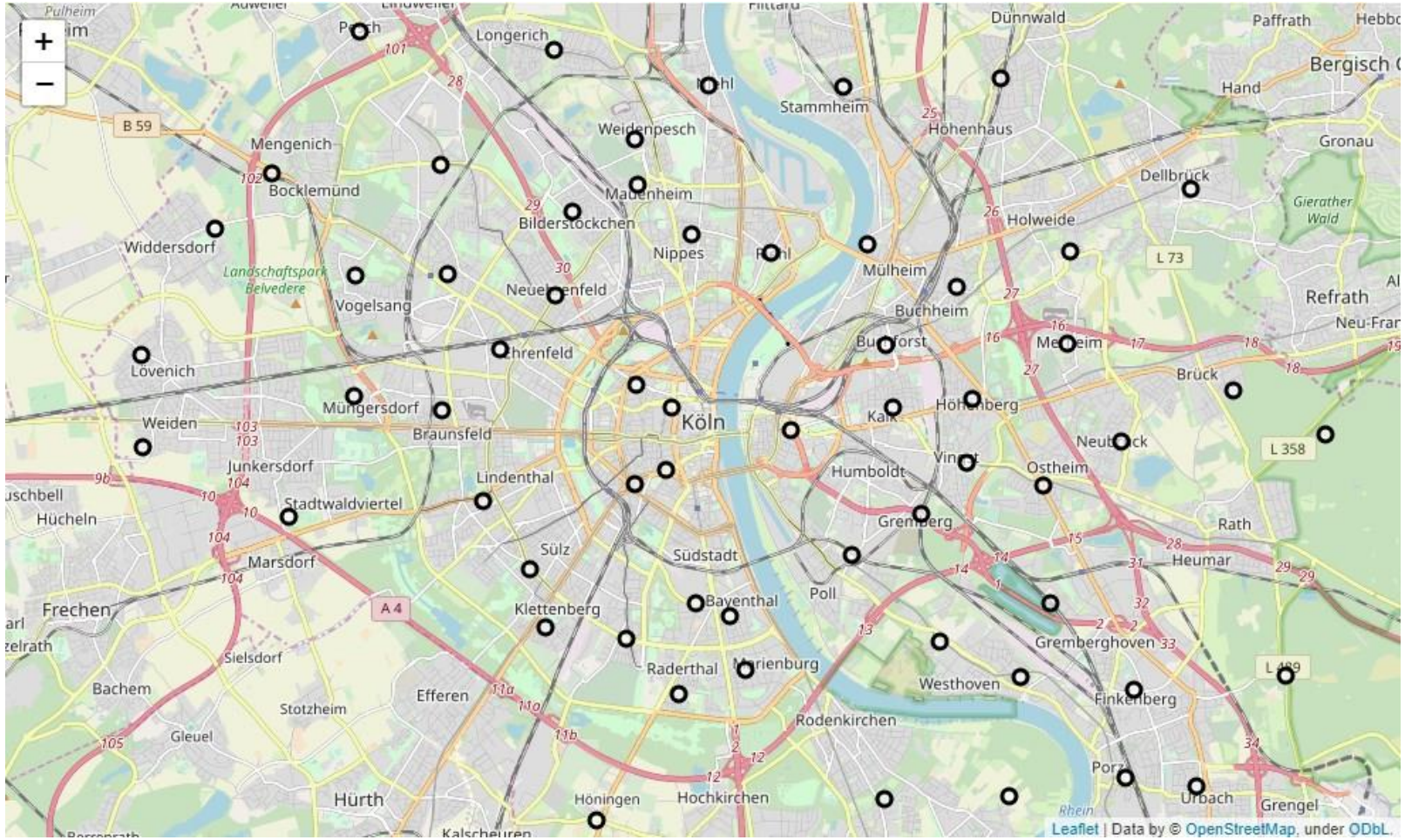
Ratio of people living in households with x other people

Migration

Net migration within districts in Cologne

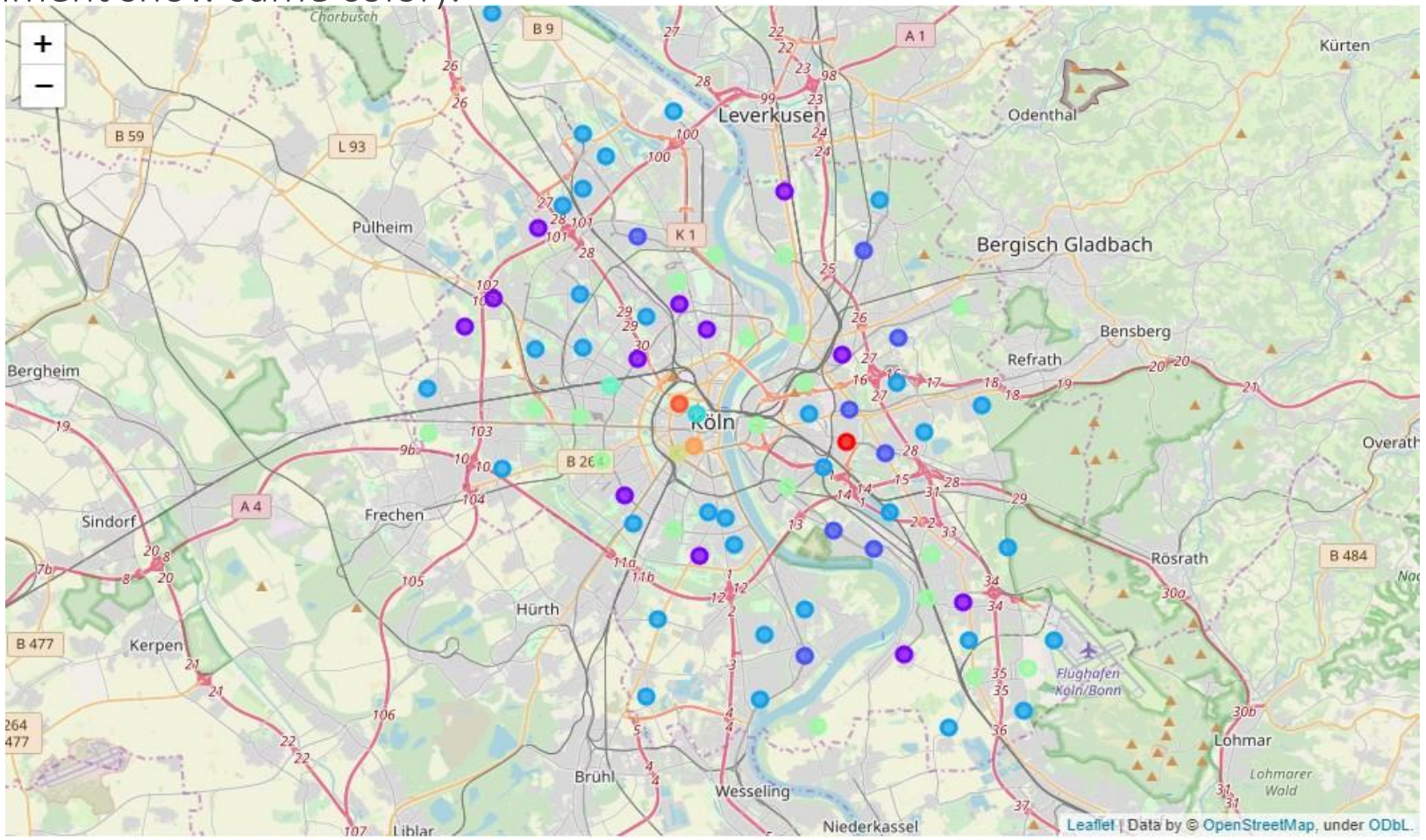
Venue Environment

Cologne can be sub-divided into several districts:



Venue Environment

Cluster analysis based on the venue environment (districts with similar venue environment show same color):



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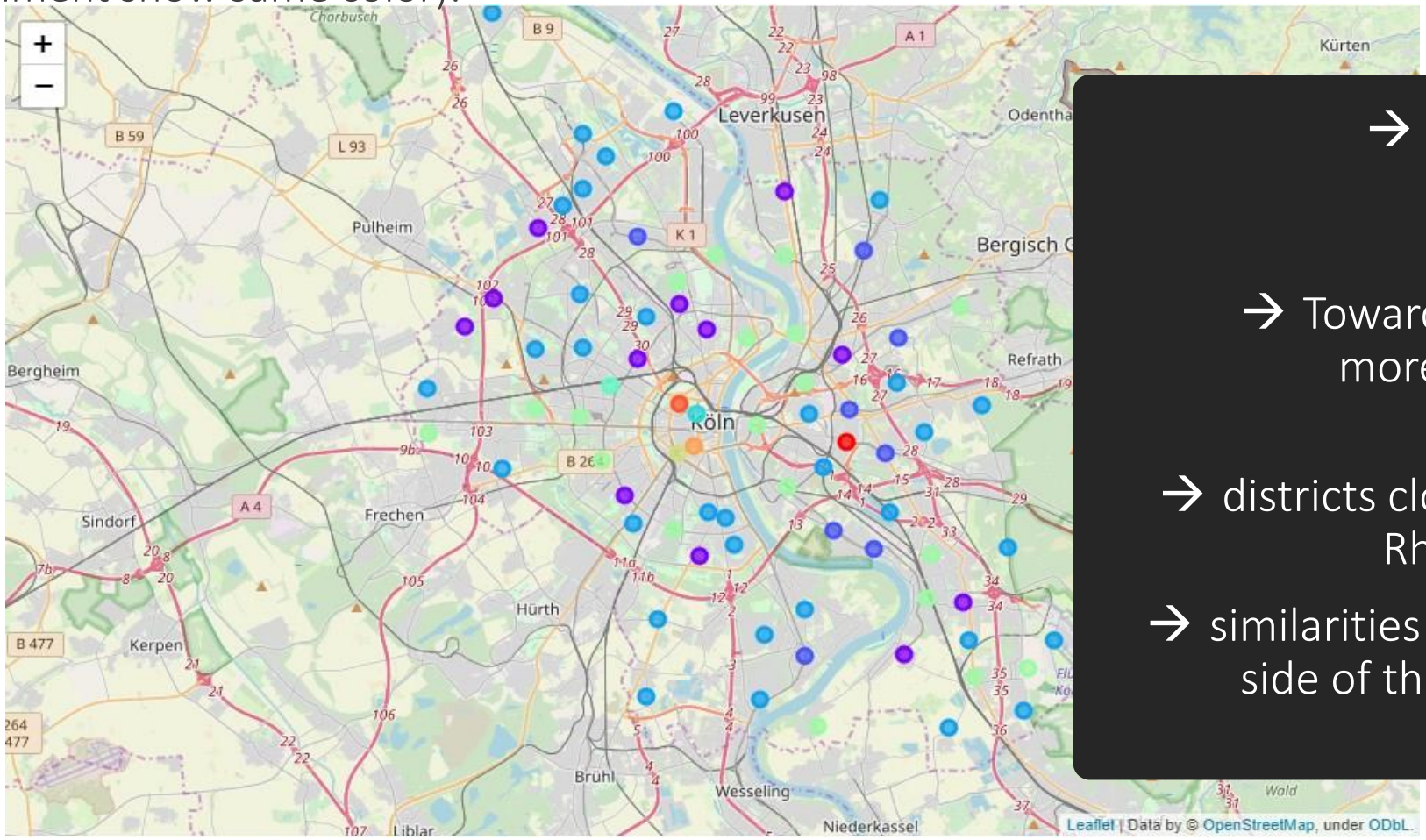


→ City center the venue distribution is very heterogeneous

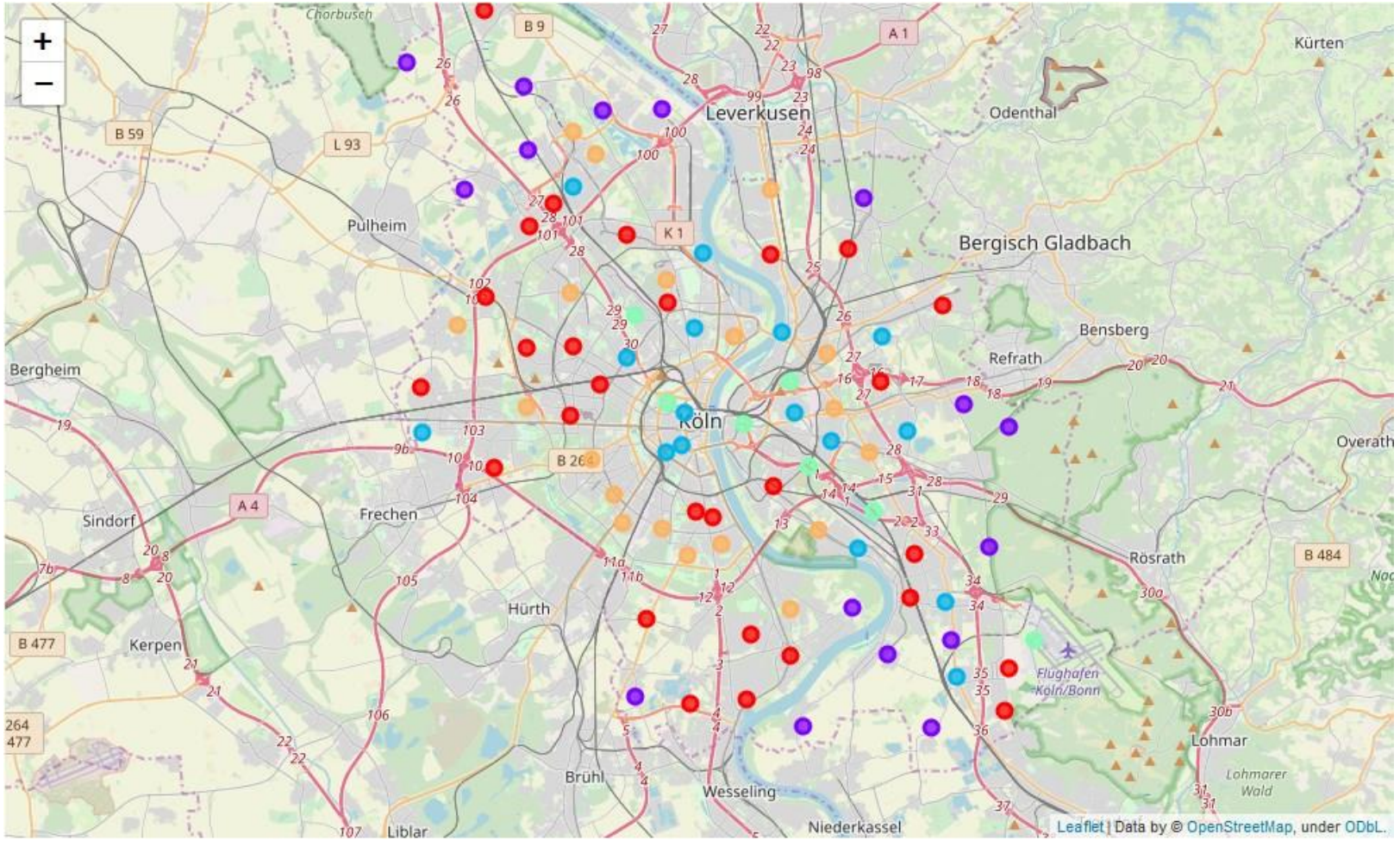
→ Towards outer rings, we see more similarities between districts

→ districts close to but right of the Rhein river quite similar

→ similarities to clusters on the left side of the river, as it's industry governed

Land Utilization

Cluster analysis based on the land use (districts with similar venue environment show same color):



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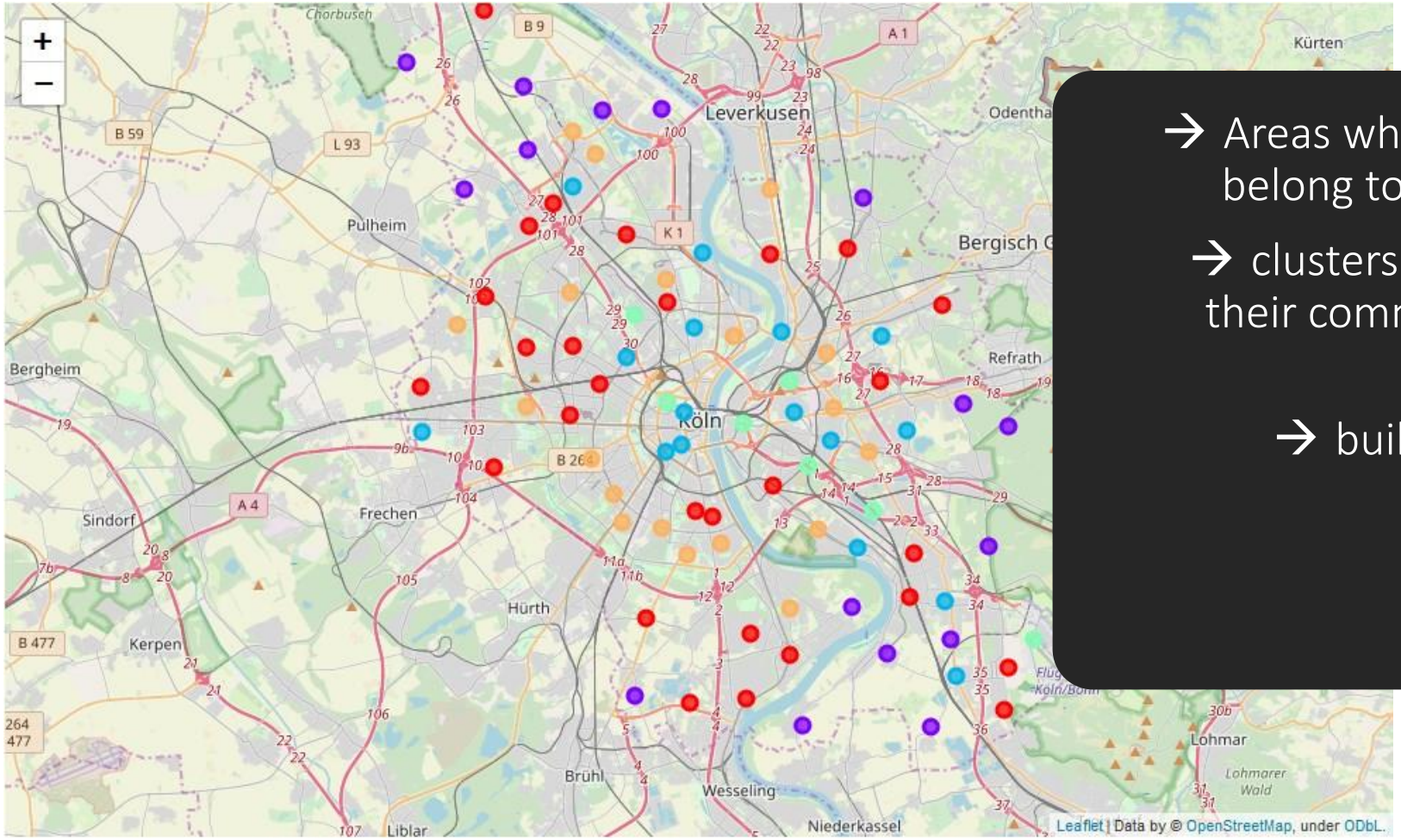


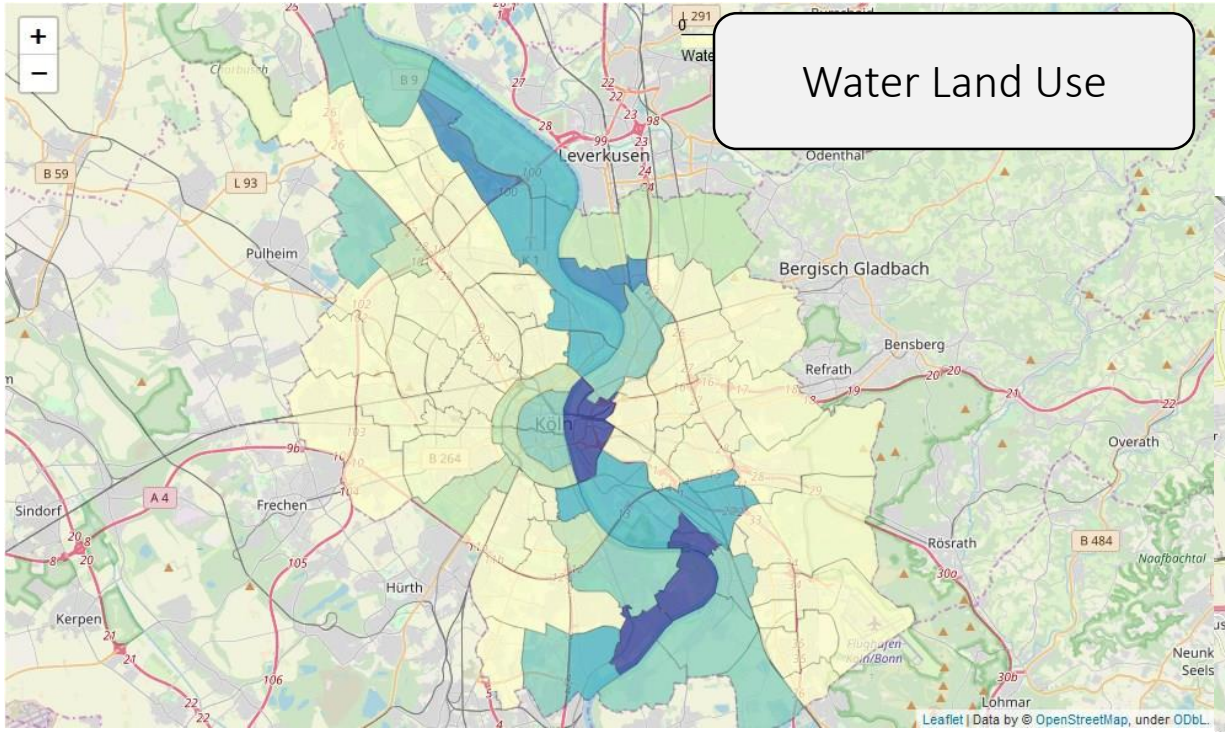
→ Areas which are close to rivers belong to one cluster category

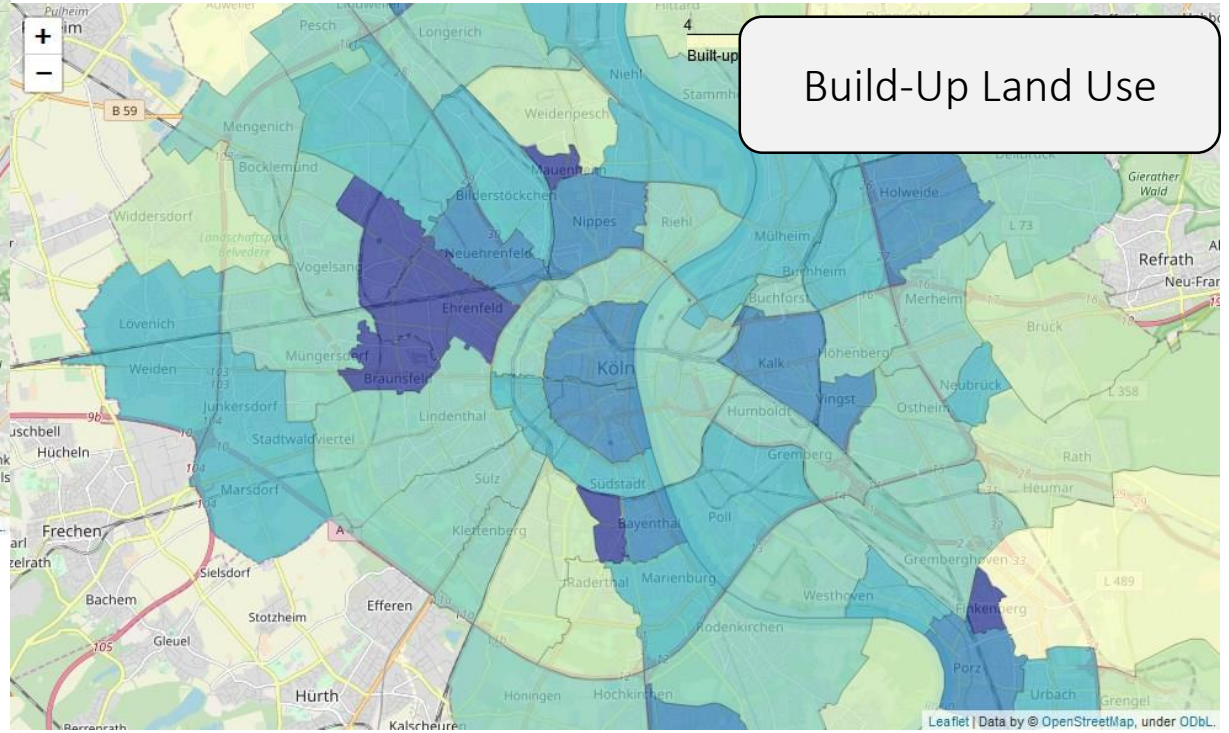
→ clusters are ring-shaped with their common center being the city center

→ built-up areas and traffic decreases radially

Land Utilization

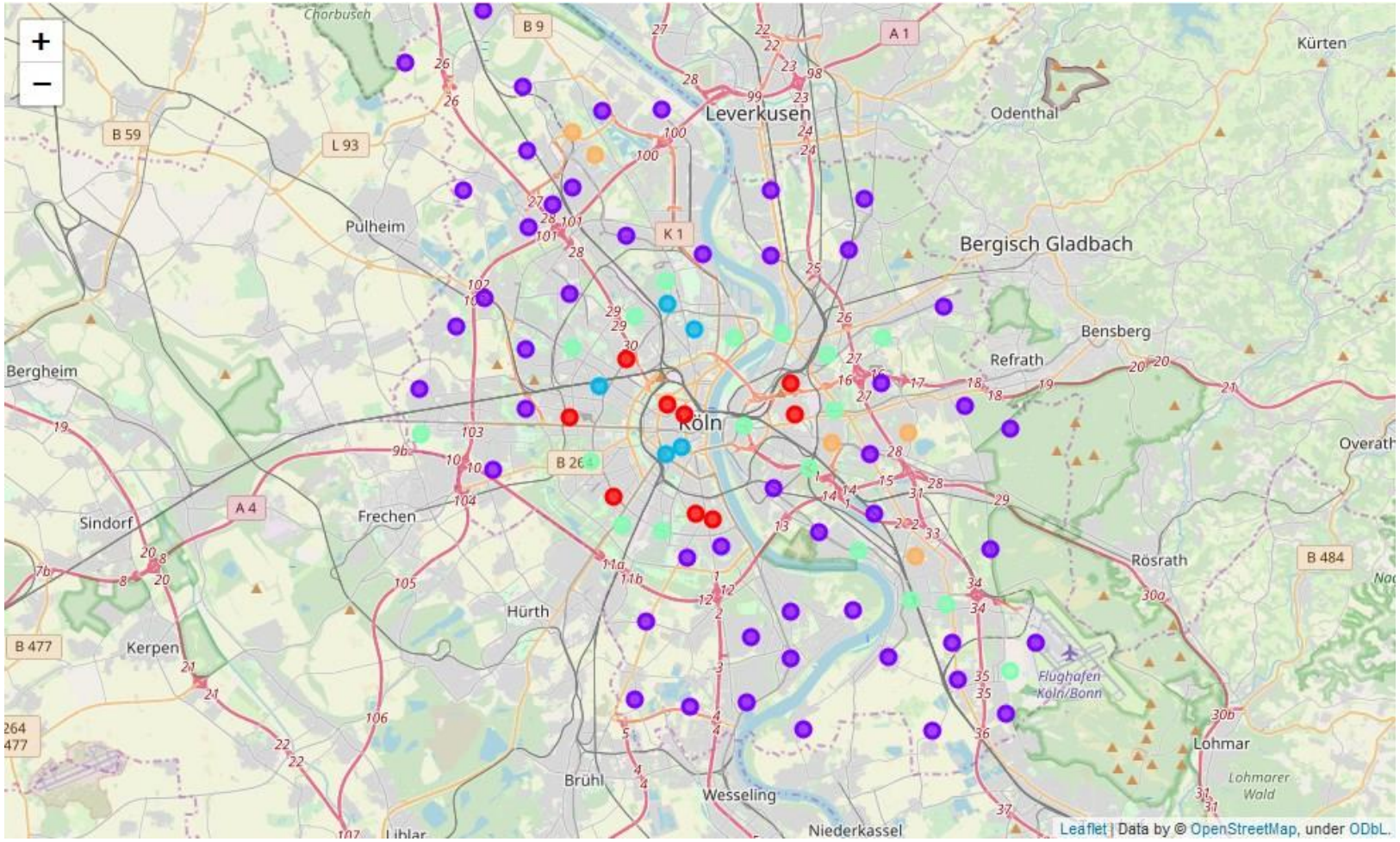
Land Use Choropleth maps for water and build-up match the cluster distribution:





Household Sizes

Cluster analysis based on household size (districts with similar venue environment show same color):



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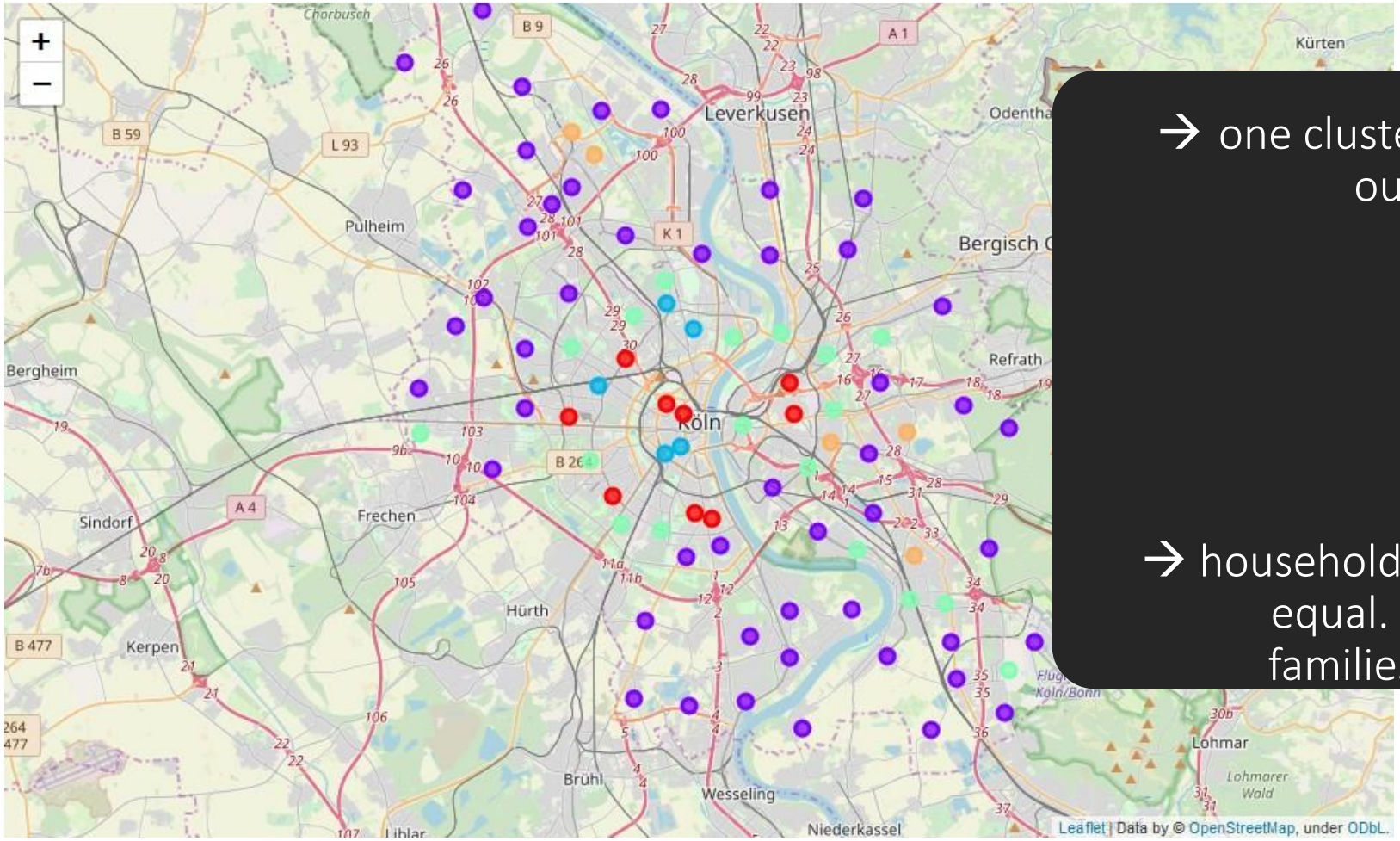

→ one cluster which contains the outer areas of Cologne:

ratio-1P	38.726531
ratio-2P	31.510204
ratio-3P	14.404082
ratio-4P	10.777551
ratio-5P+	4.581633

→ household distribution is rather equal. This speaks for larger families living in these areas

Household Sizes

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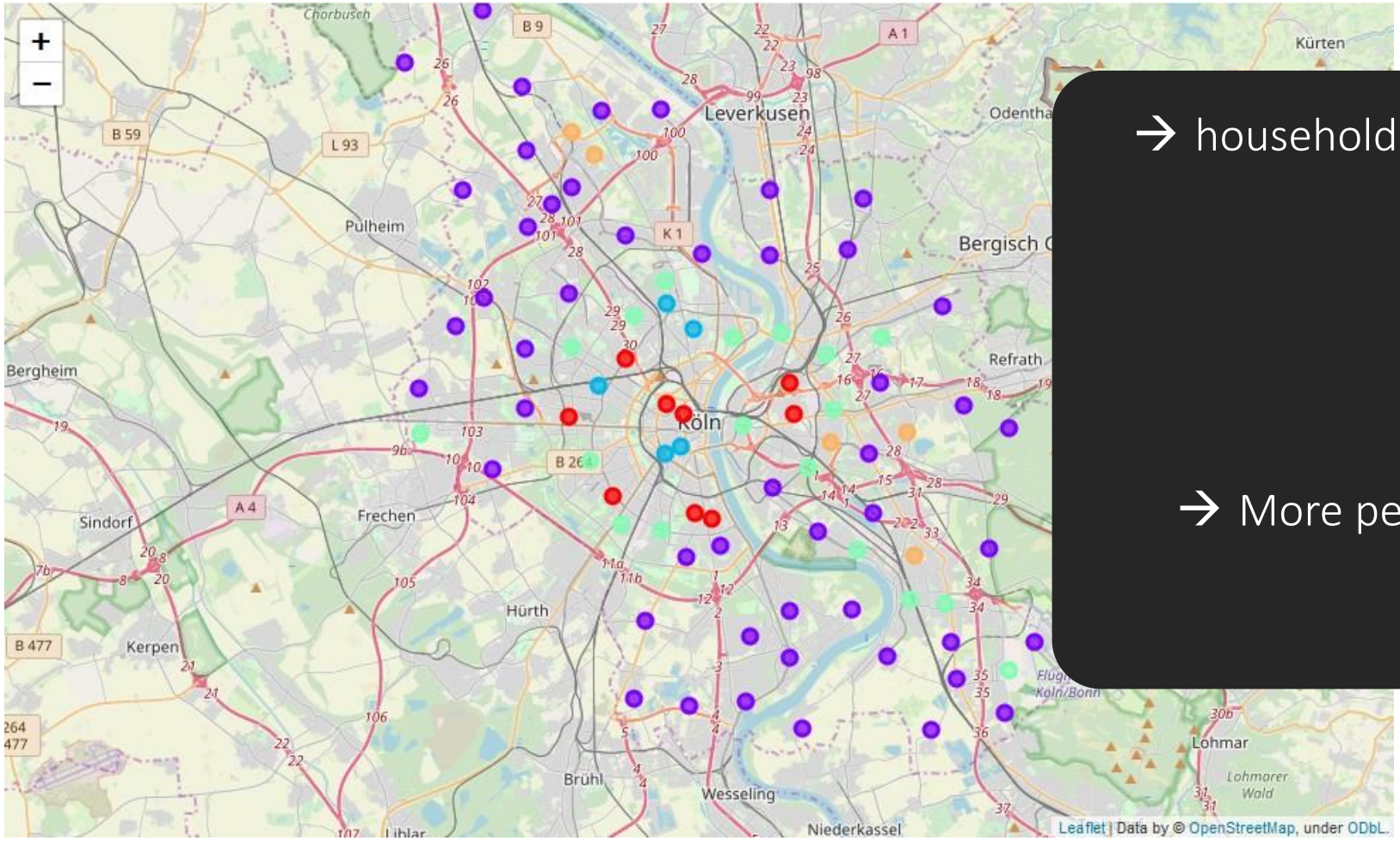


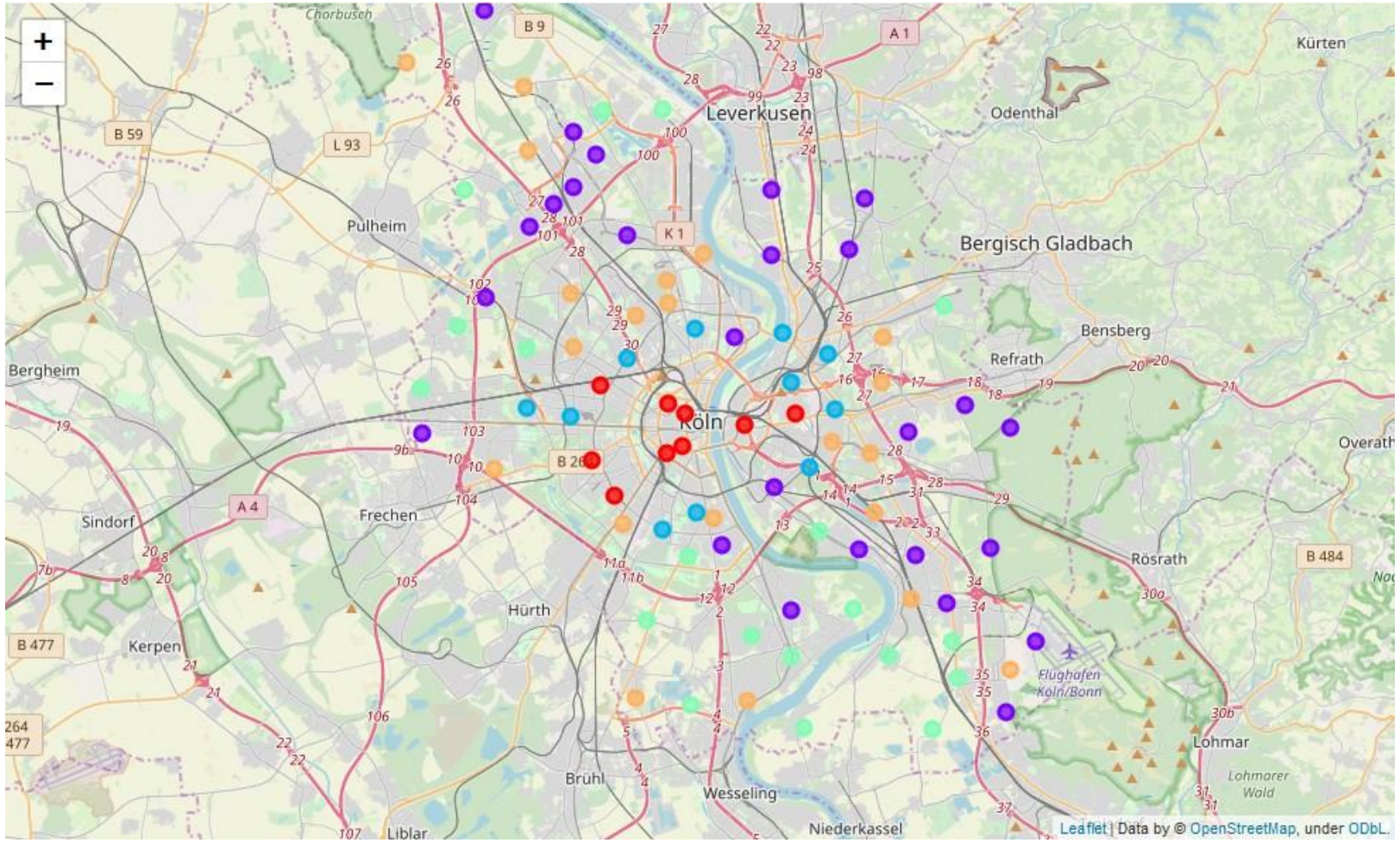
→ households near the city center

ratio-1P	61.86
ratio-2P	22.50
ratio-3P	8.32
ratio-4P	5.44
ratio-5P+	1.88

→ More people in single-person households

Age Distribution

Cluster analysis based on age distribution (districts with similar venue environment show same color):



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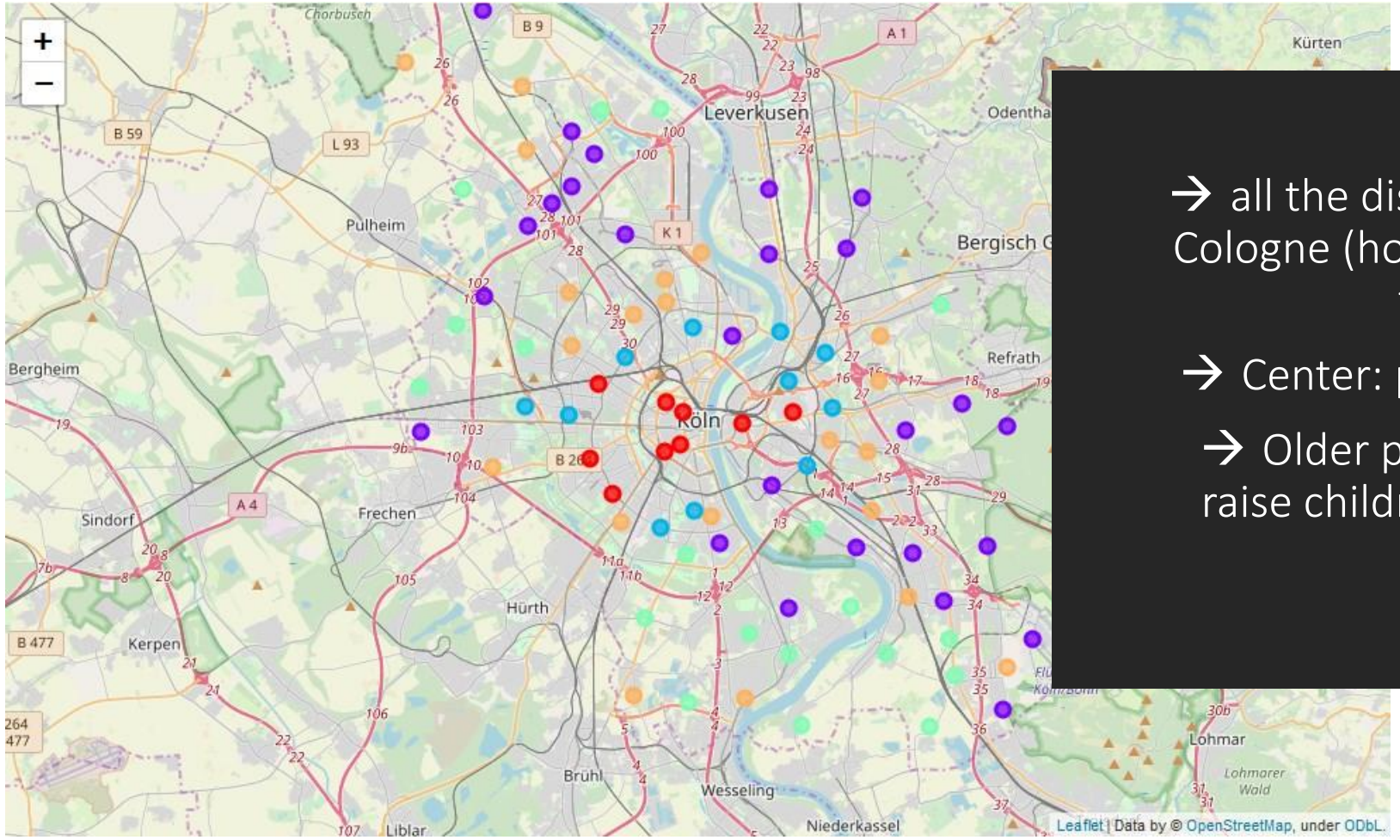


→ radial clustering

→ all the districts in the center of Cologne (horizontal center) are in the same cluster class

→ Center: people in working age

→ Older people or who want to raise children move more to the outer districts

Investigating net Migration

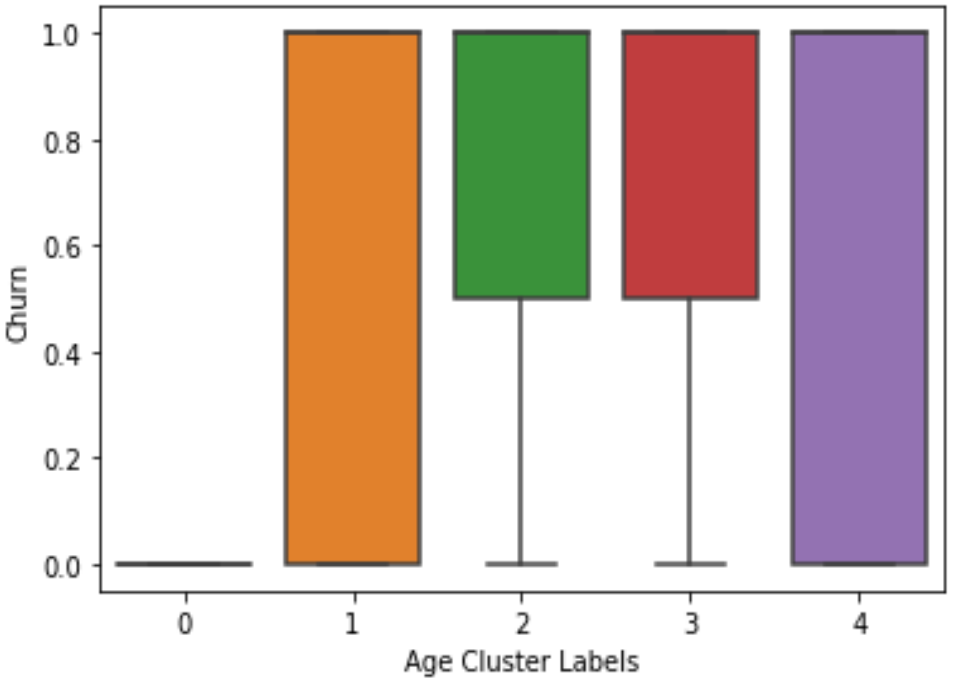
After characterization of districts: how is their impact on net migration?

	District	Latitude	Longitude	Venue Cluster Labels	Age Cluster Labels	Area Cluster Labels	HH Cluster Labels	Churn
0	Godorf	50.852610	6.982218	3	4	5	1	1
1	Weiden	50.934514	6.824246	6	1	2	3	1
2	Junkersdorf	50.923891	6.859688	3	4	0	1	1
3	Widdersdorf	50.967660	6.841605	1	3	4	1	1
4	Vogelsang	50.960676	6.875571	3	3	0	1	0

$$\text{Churn} = \begin{cases} 1 \; if \; net \; migration > 0 \\ 0 \; if \; net \; migration \leq 0 \end{cases}$$

Investigating net Migration

Age Distribution Impact:



→ City center cluster labels have a shrinking population

→ costs of living high

→ high ratio of younger people living in 1Person households

→ Family founders will move to outer district

Conclusion

→ biggest impact on the growth of a district was given by the age distribution of the district

→ A negative net migration can be associated to districts with younger (pre-family-founding) persons

→ positive net migration can be found in districts with older age distributions

→ In shrinking districts, there is a vast majority of people living in single person households.

As soon as people decide to found a family, they will move to the outer districts of Cologne, where the costs of living are lower whereas people already living there, will stay. This leads to a growth of the outer districts of Cologne and a negative net migration of people in the inner districts of Cologne.