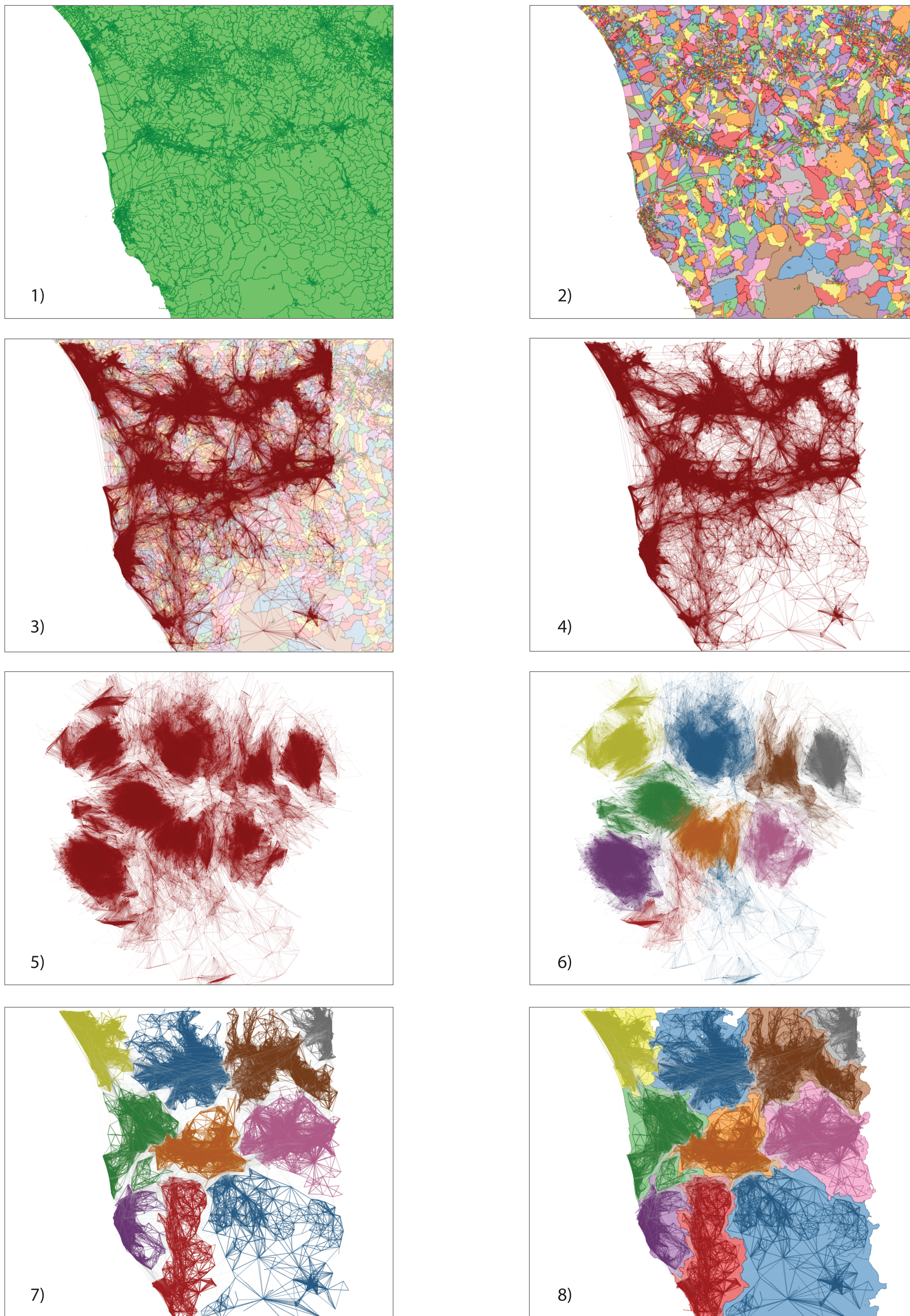# Discovering the Geography of Human Mobility

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The availability of massive mobility data has fostered the analysis of human behaviors. We propose a general method to determine the influence of mobility behaviours over a territory to evaluate to what extent the geographical borders that emerge from the movement activities of people can be compared with the existing administrative borders of cities, municipalities and provinces. Do people move and interact within specific areas? Are those areas bounded somehow? Do the borders change during the day, or during the week? Can we spot some seasonality?

Motivated by the questions above, we apply network analysis techniques to mobility data. Starting from the territory (1) we firstly divide it in small areas according to Census data (2).

We try to reach a better understanding of human mobility patterns, using a perspective based on the underlying, hidden connections that resides among different places (3). The data used are the GPS tracks of a set of 17k vehicles.

We forget about the geography (4) and we end up with a graph G(V, E) where each region R is mapped to the vertex vR ϵ V and the flow from R to another region Q is mapped to the edge (vR,vQ) whose weight is proportional to the density of movements between the regions (5).
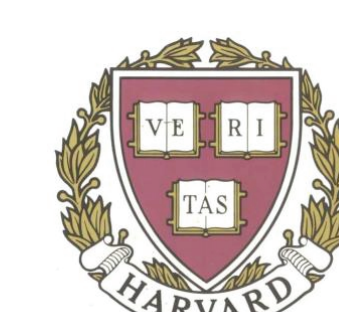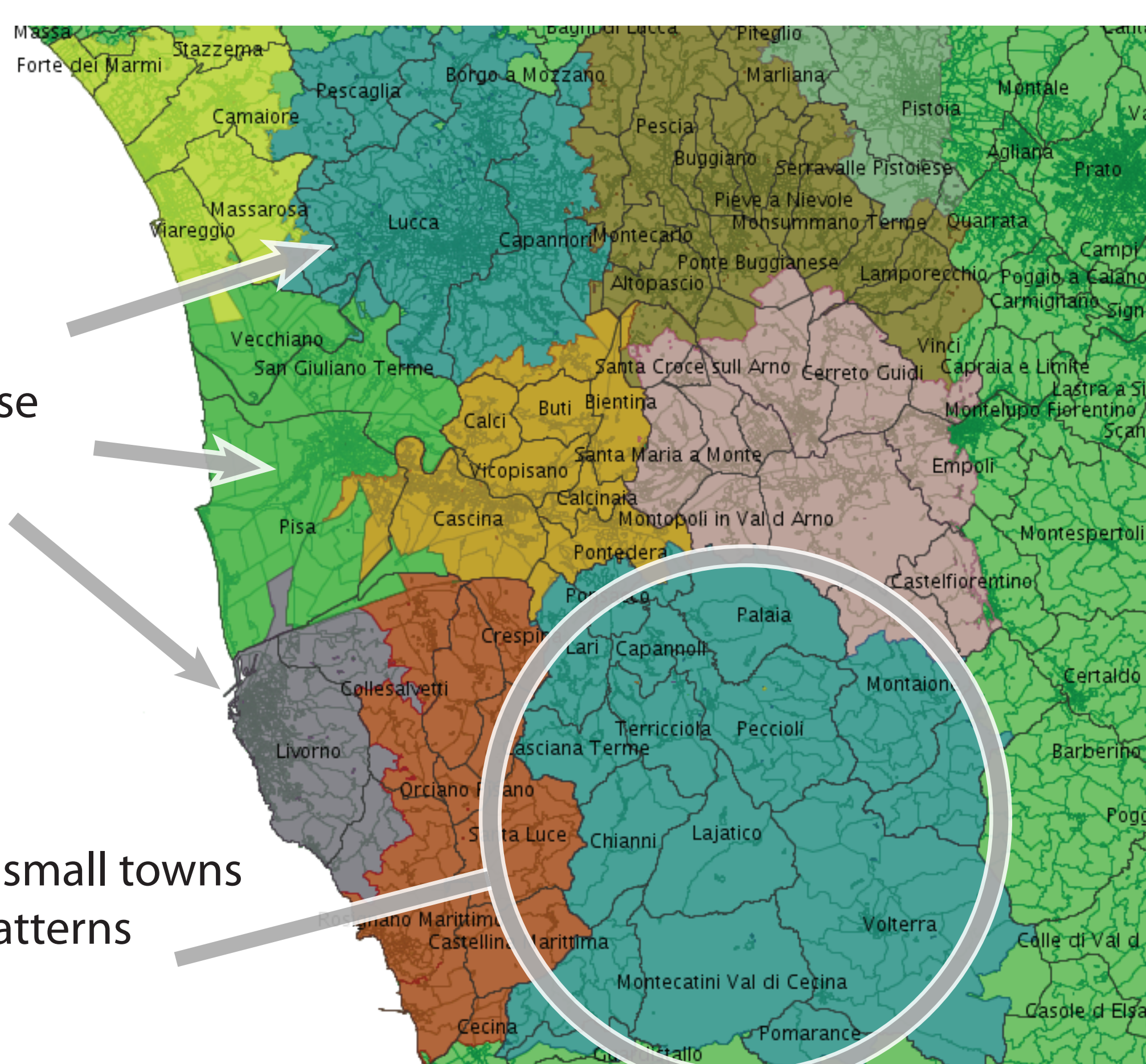
Then we apply community discovery algorithms (6), with the aim of finding areas that are densely connected by the visits of different users.

Finally we reconstruct the relationship between each node to its census regional position (7) and we map the network clusters in the territory (8).

The result figure shows the boundary of each town. The zones belonging to the urban centers maintain a strong cohesion. This phenomenon is due to a larger proportion of intra-city trips rather than longrange movements. Another property of the clustering is an empirical proof that a single city cannot be considered an "island". On the contrary the mobility of a city strictly depends on the mobility of the surrounding towns. In fact, each cluster can be described as an enumeration of a series of cities.

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Lucca, Pisa and Livorno three big towns relativley close are correctly separated in three different clusters

A collection of separated small towns with common mobility patterns among their inhabitants, is correctly identified