

Estimating Material Usage of Road Infrastructure in US Cities

August 12, 2010 - SimBuild:
Modeling on a Large Scale II

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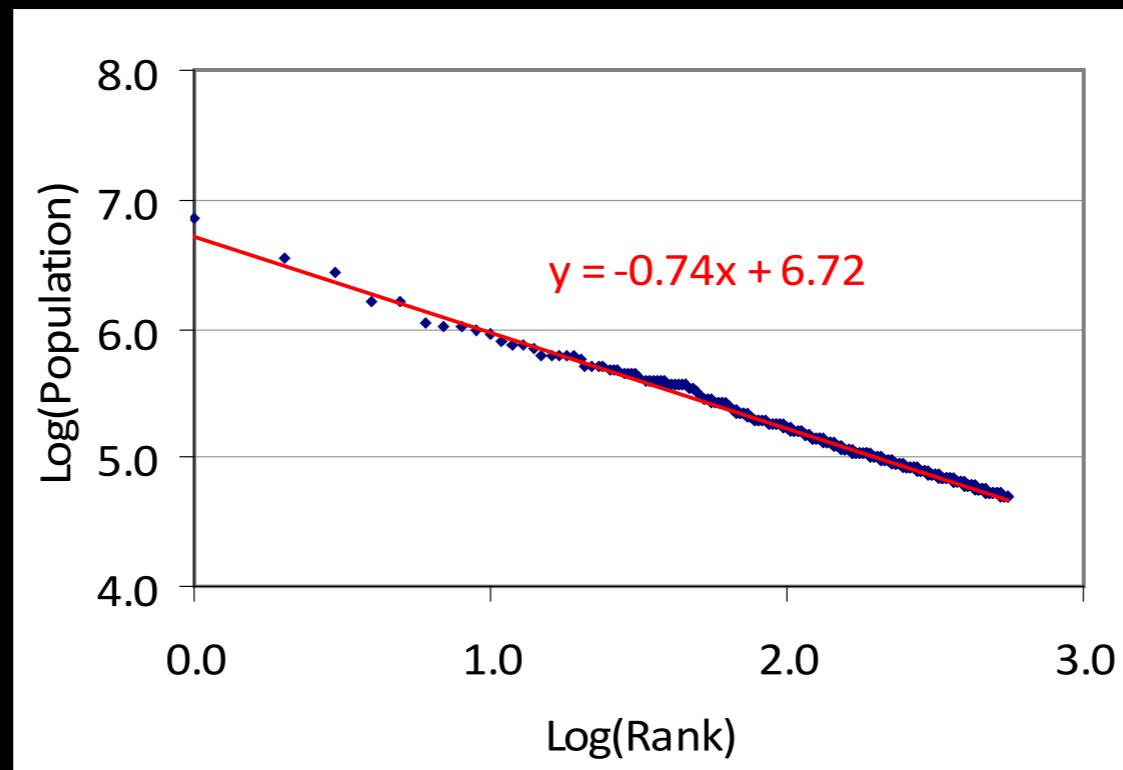
Background: Cities and Complexity



Image source: <http://earthobservatory.nasa.gov/>

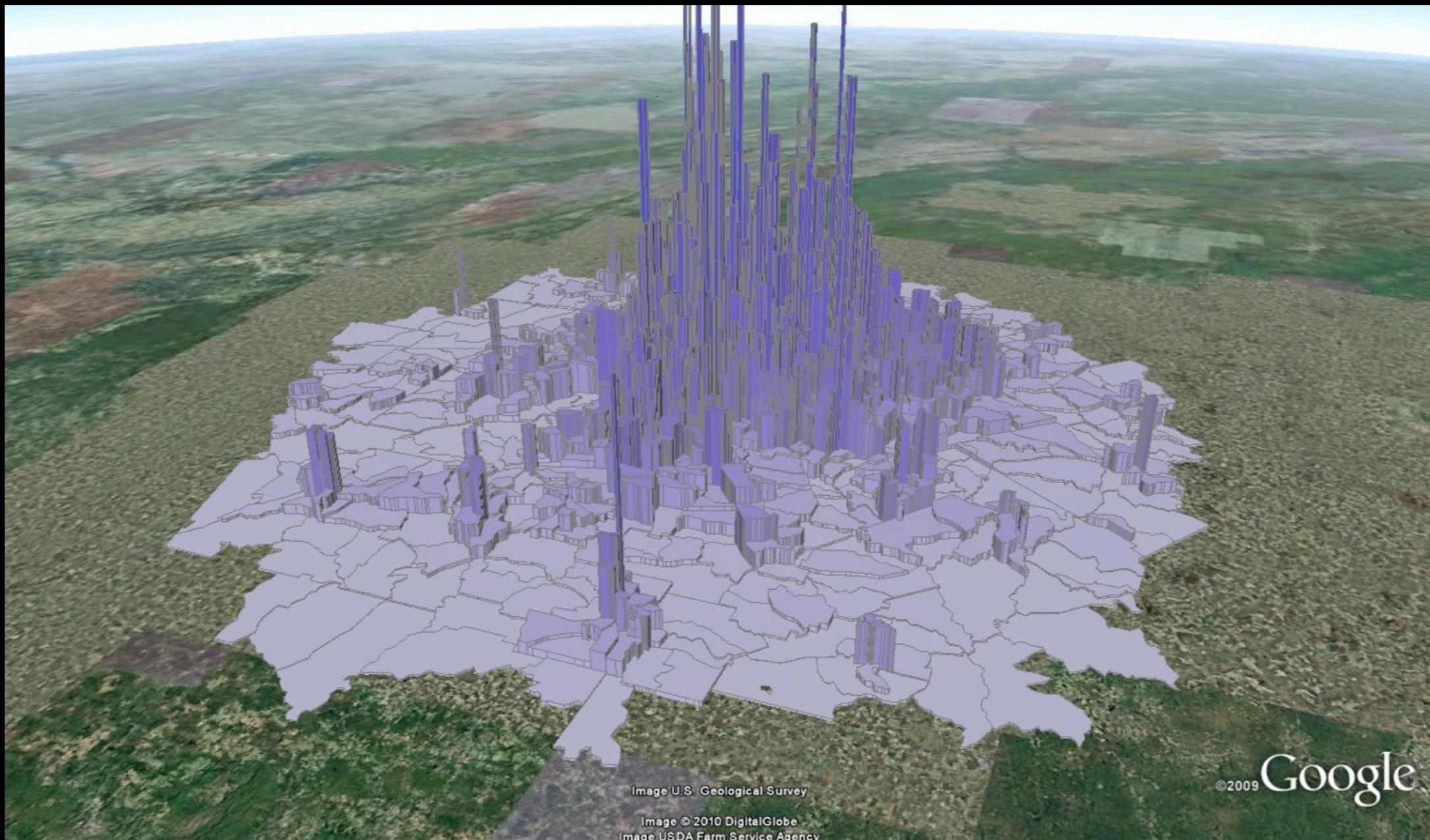
Background: Cities and Complexity

Macro: patterns can describe collections of cities

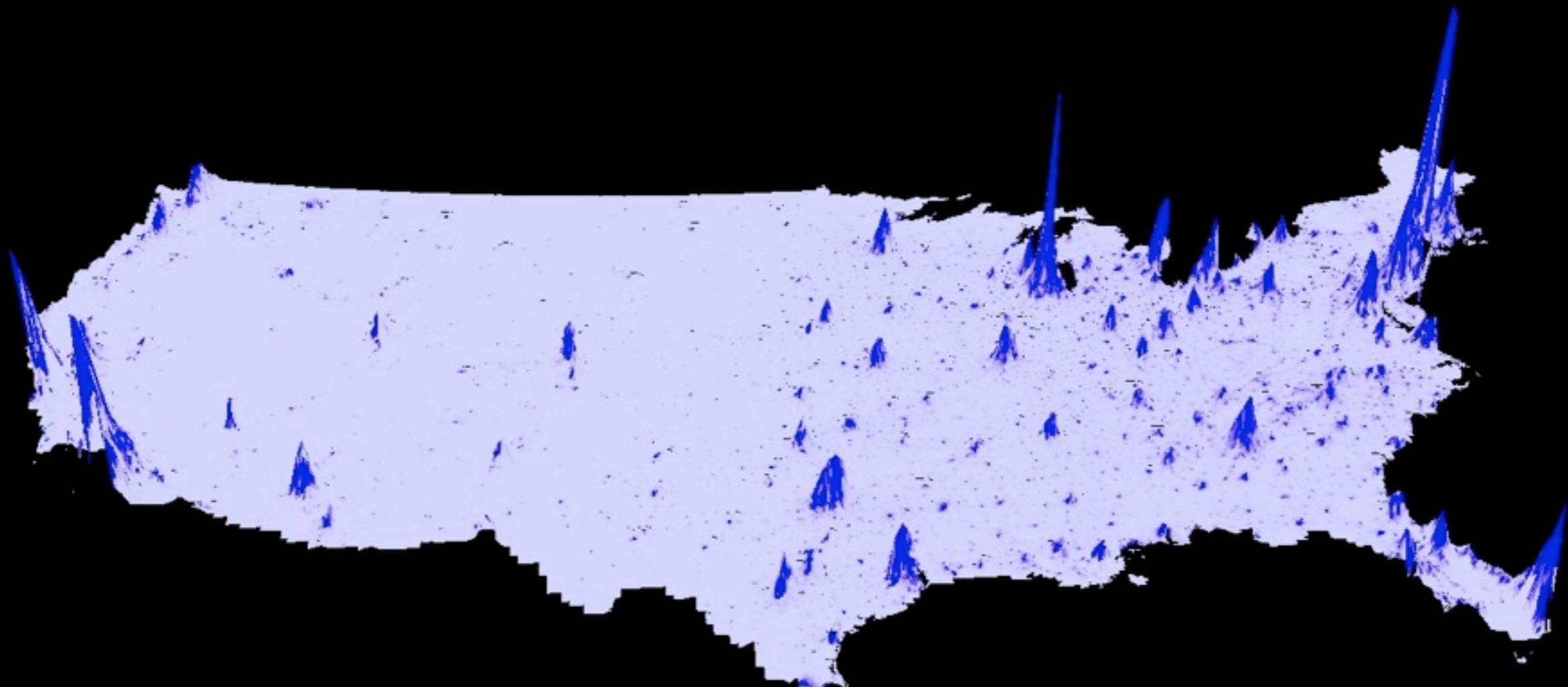


Background: Cities and Complexity

Micro: population density gradient

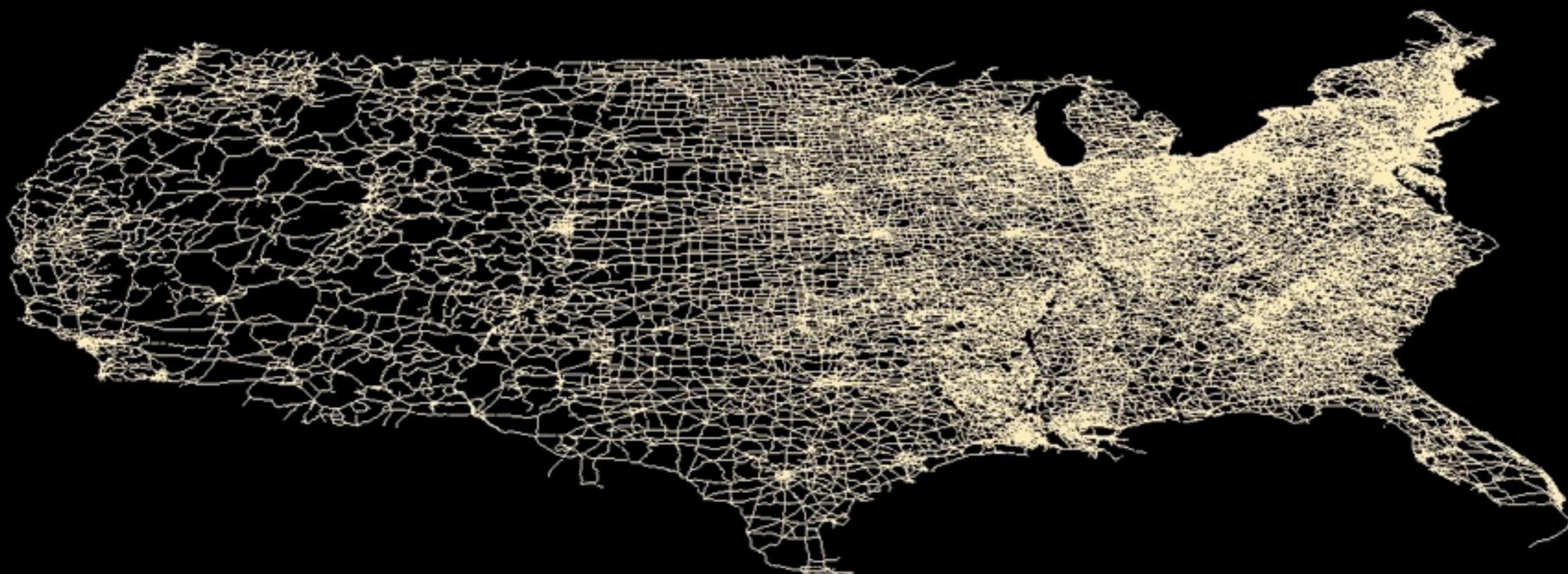


Methodology: Population of USA



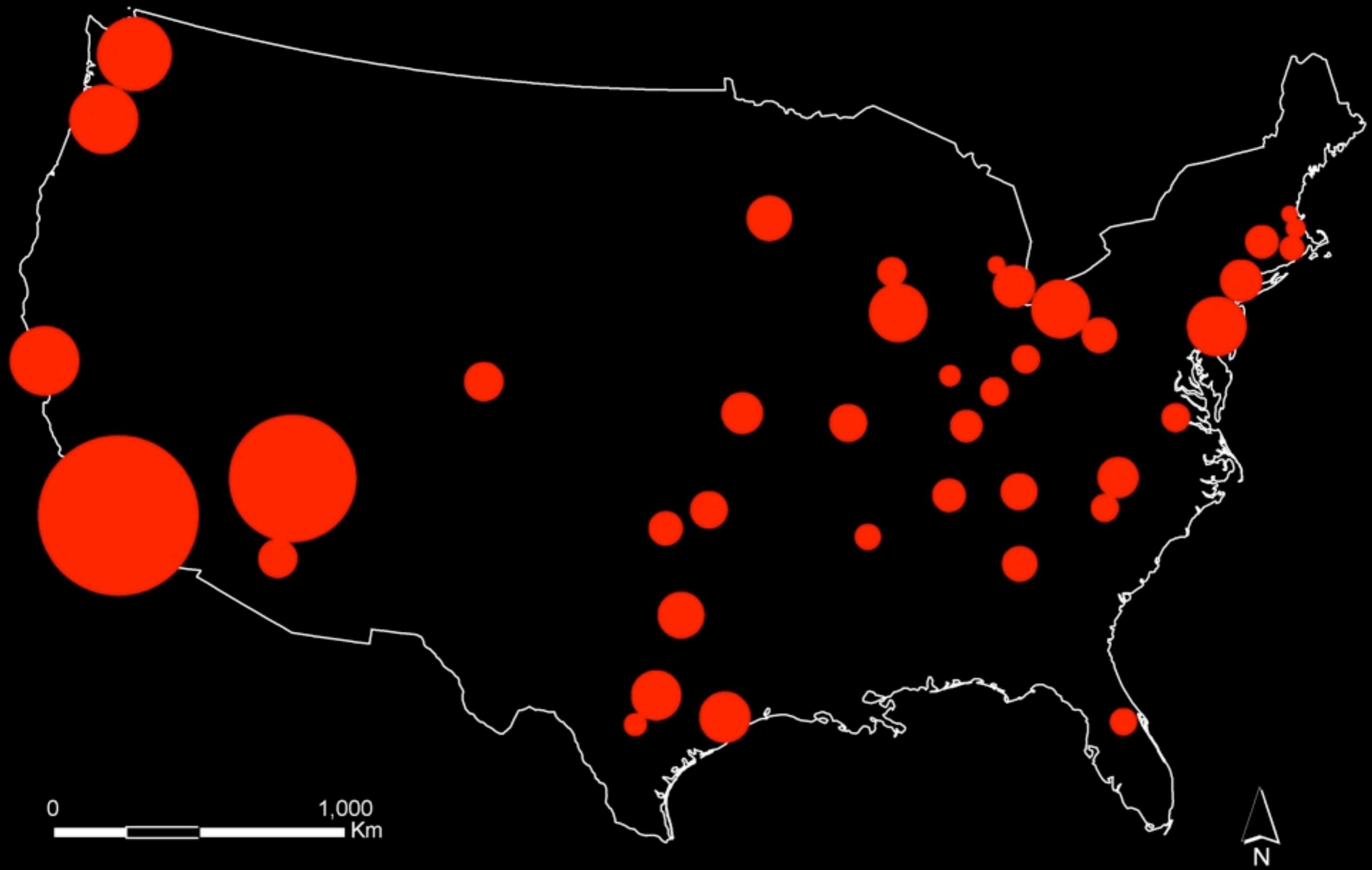
Data Source:
US Census
(2000)

Methodology: Road network of USA

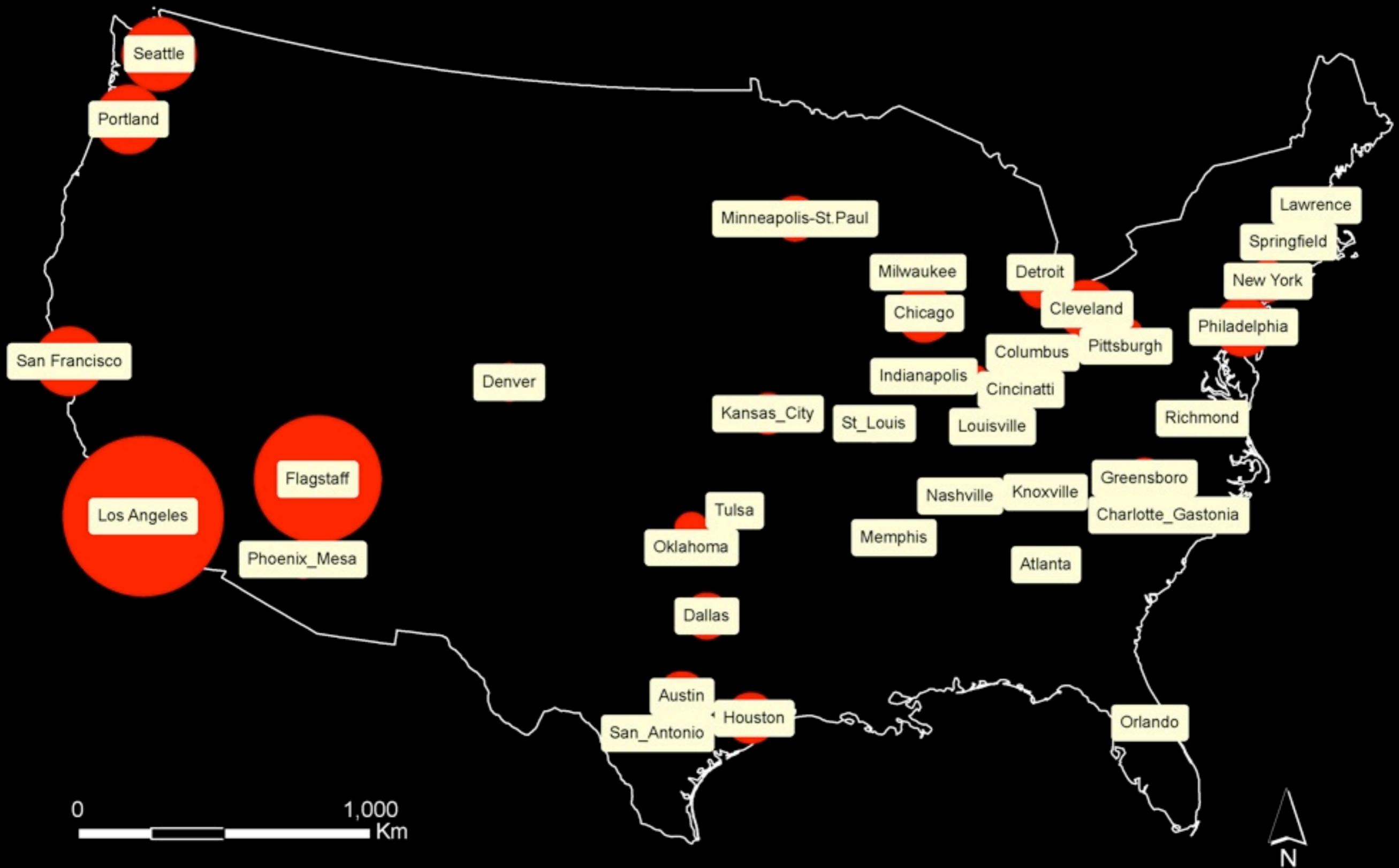


Data Source:
US Tiger Line
Files (2009)

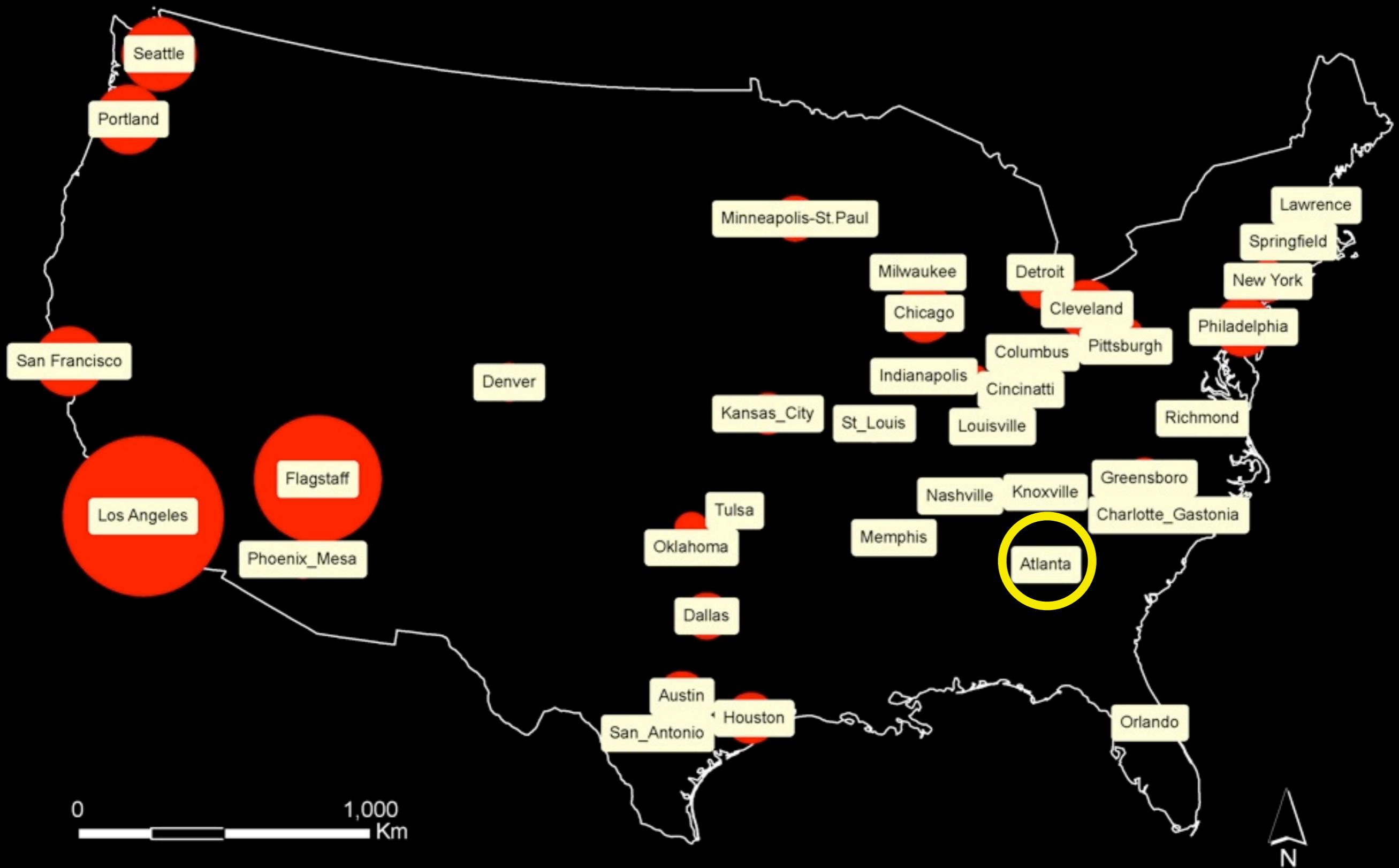
Methodology: Examine 40 Cities from USA



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Methodology: Atlanta

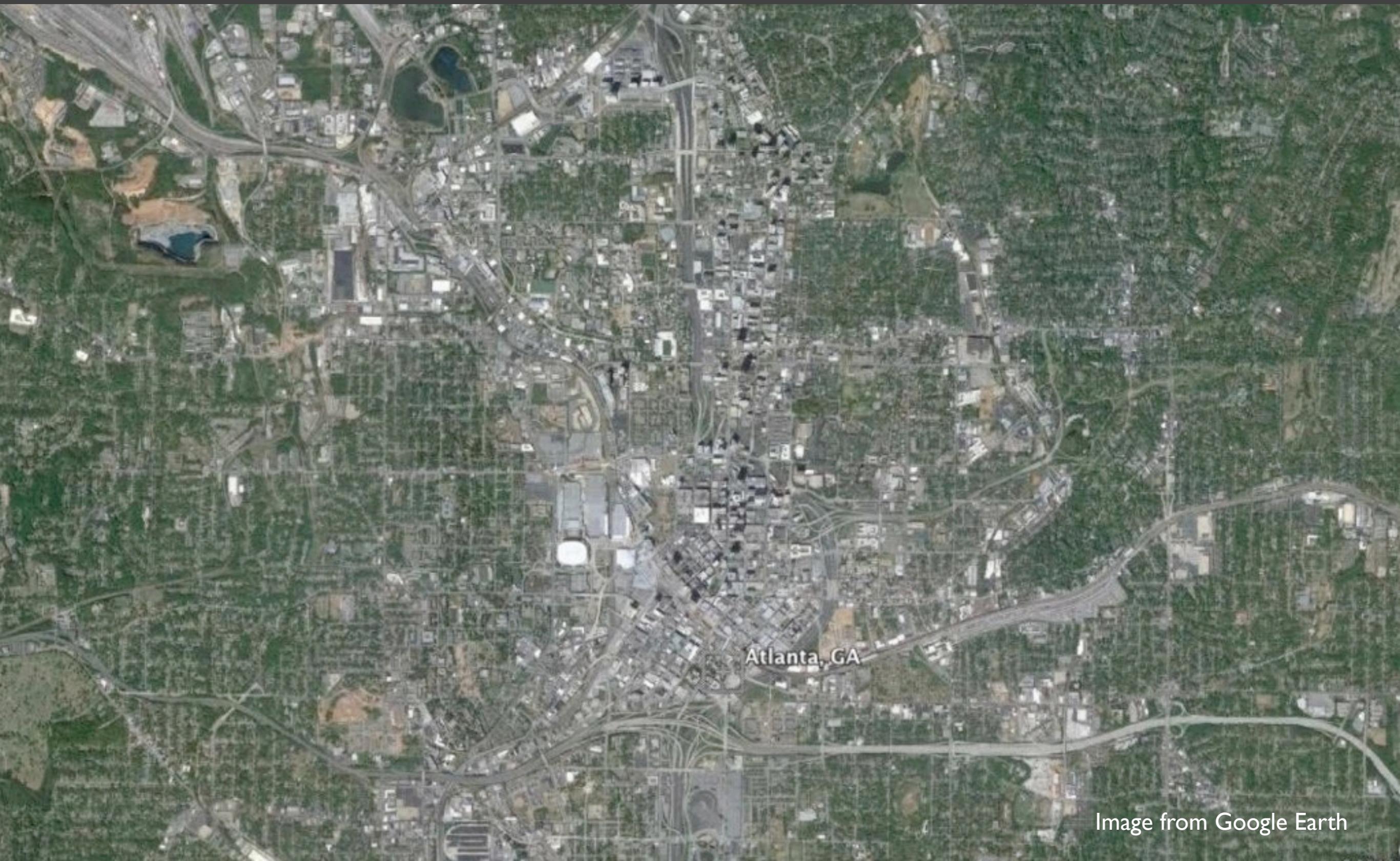
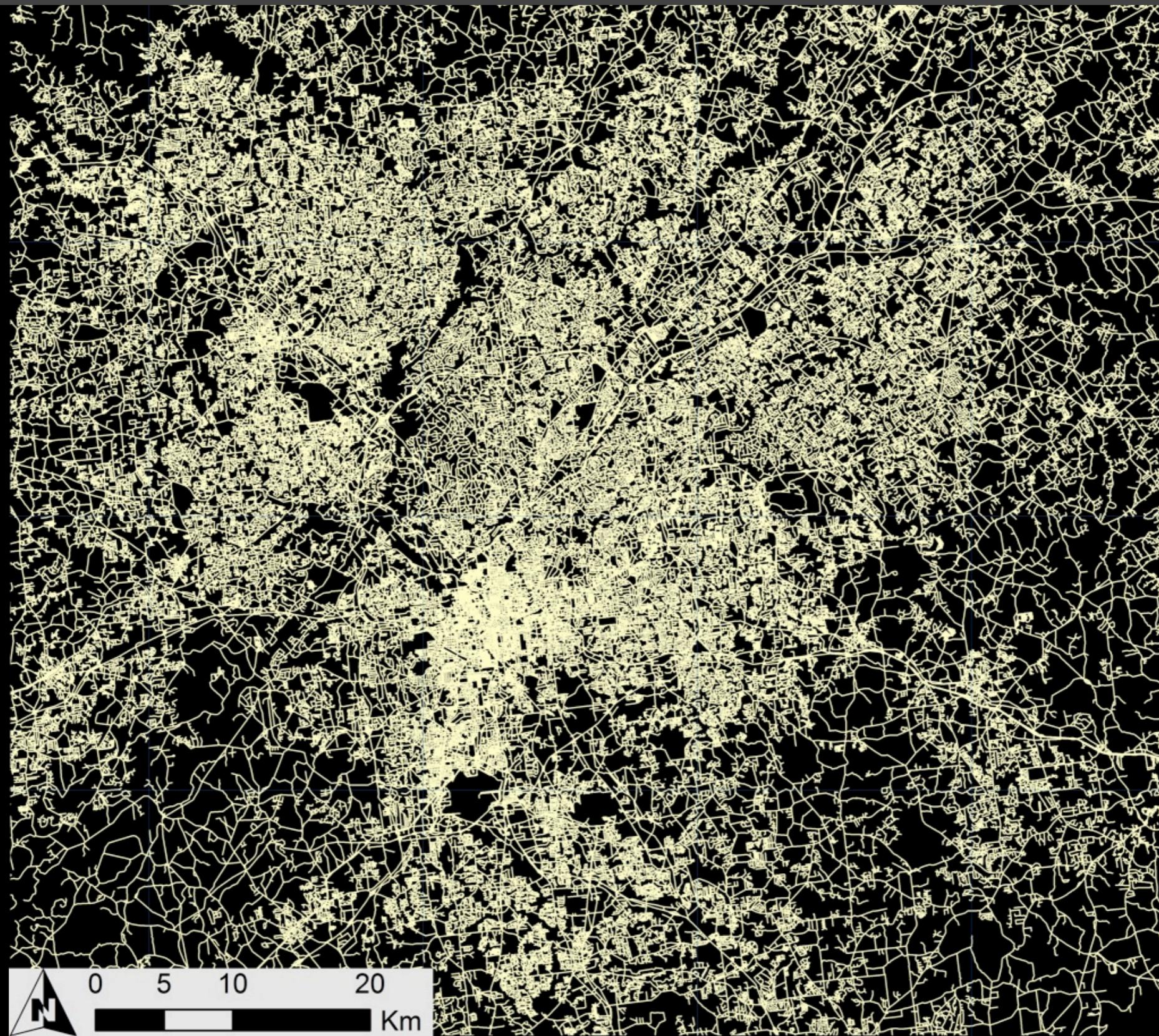
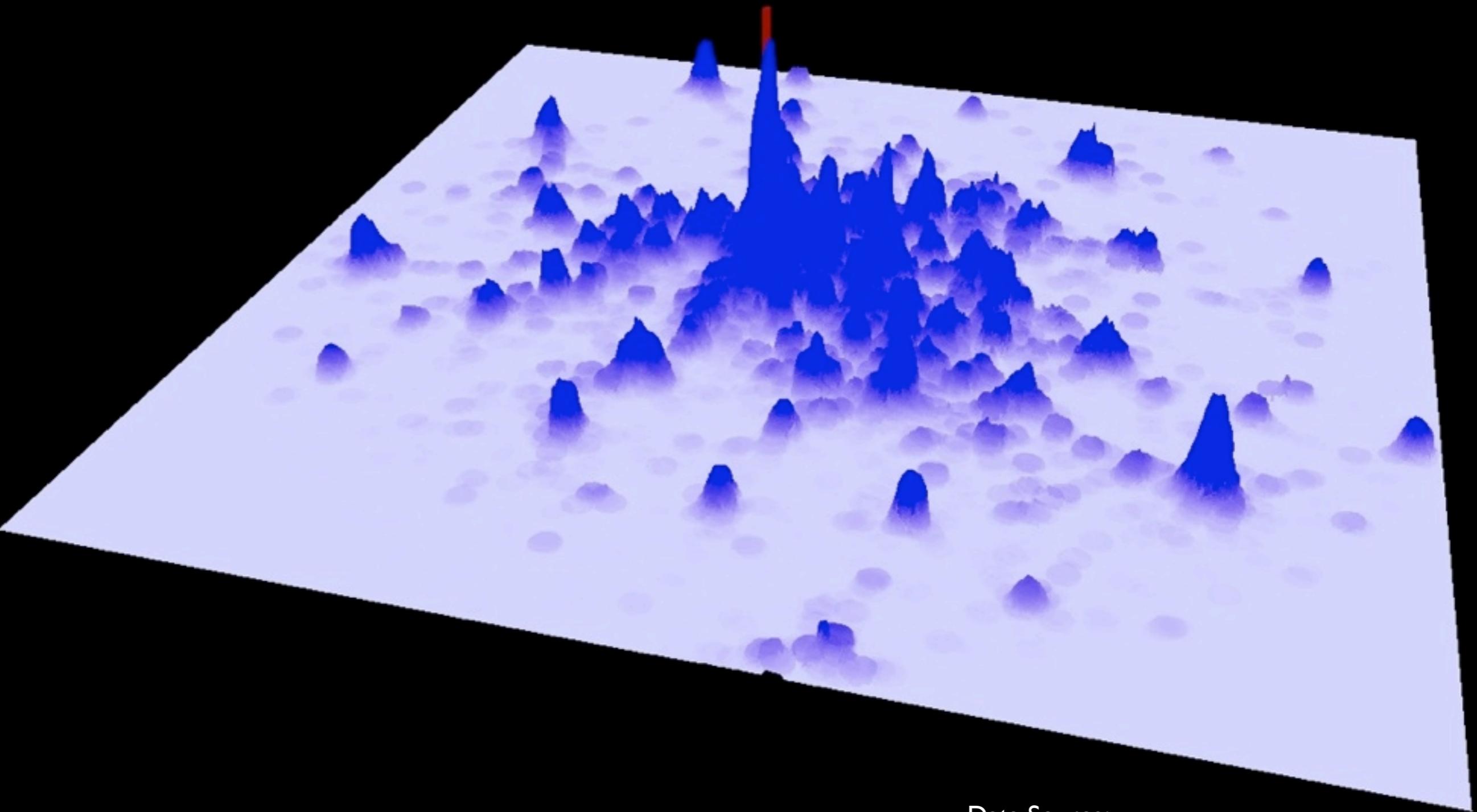


Image from Google Earth

Methodology: Atlanta



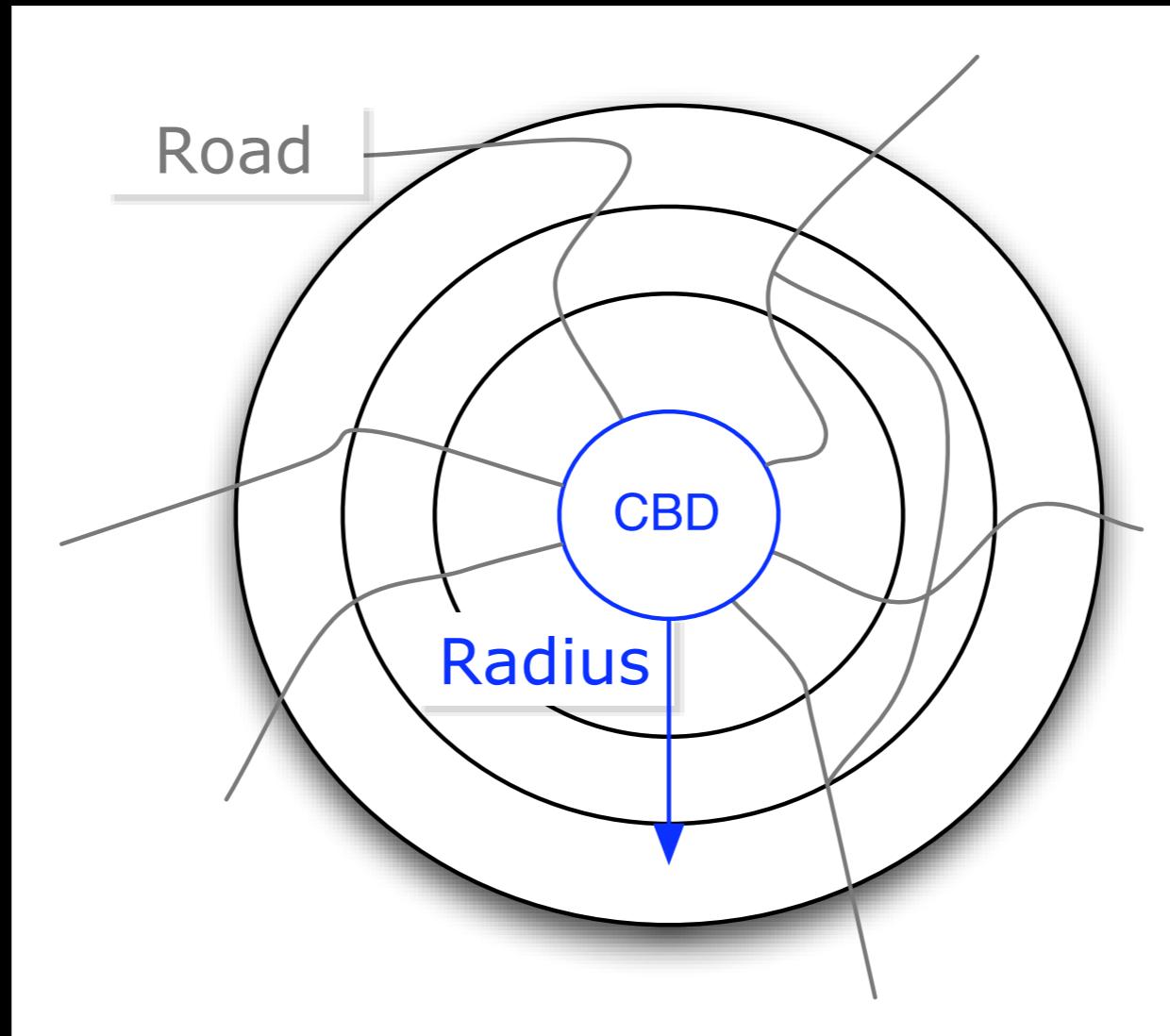
Methodology: Identify CBD using density of services



Data Source:
ESRI Business
Analyst 2009

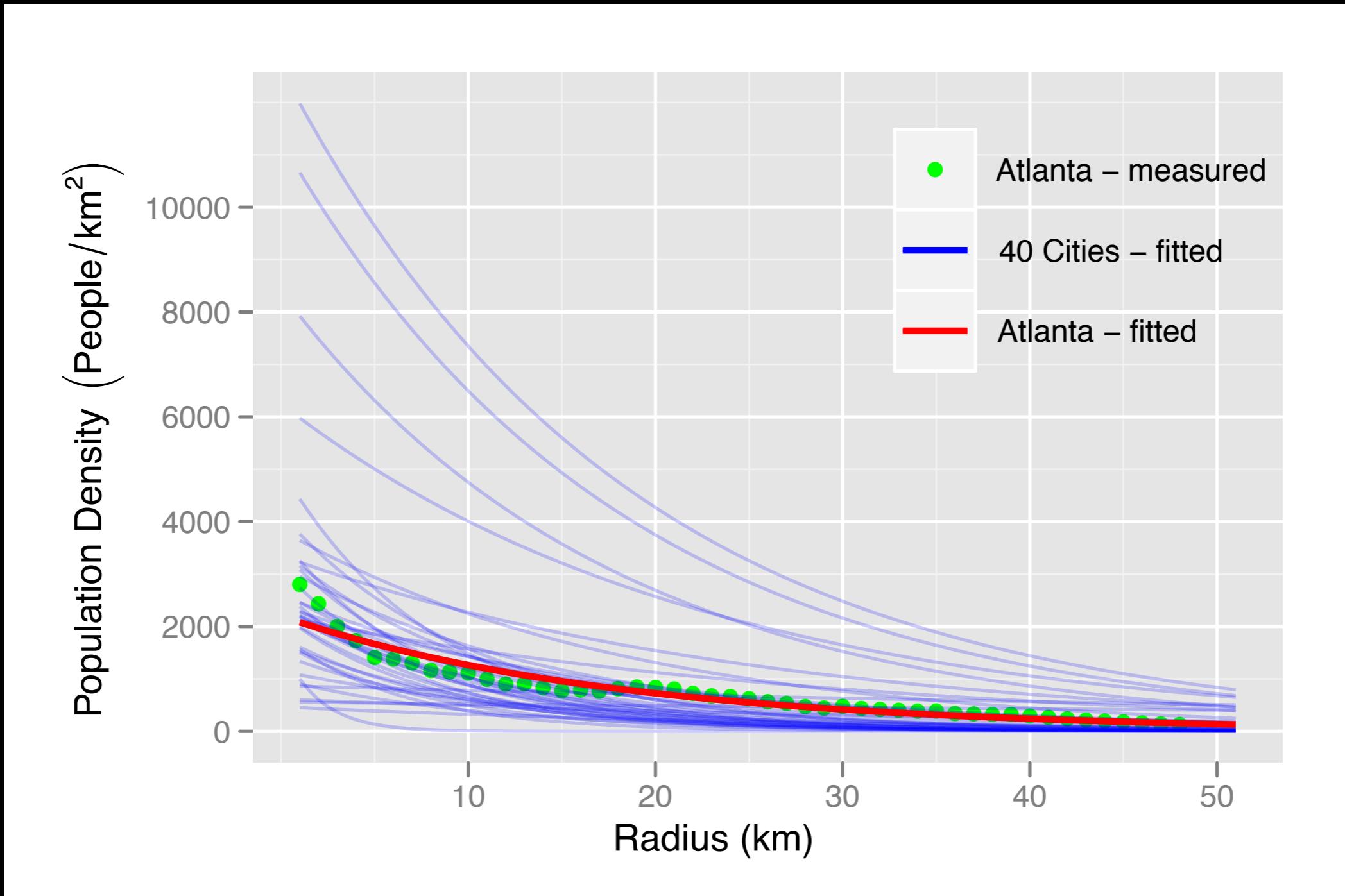
Methodology:

Use CBD as center point for measurement



Results:

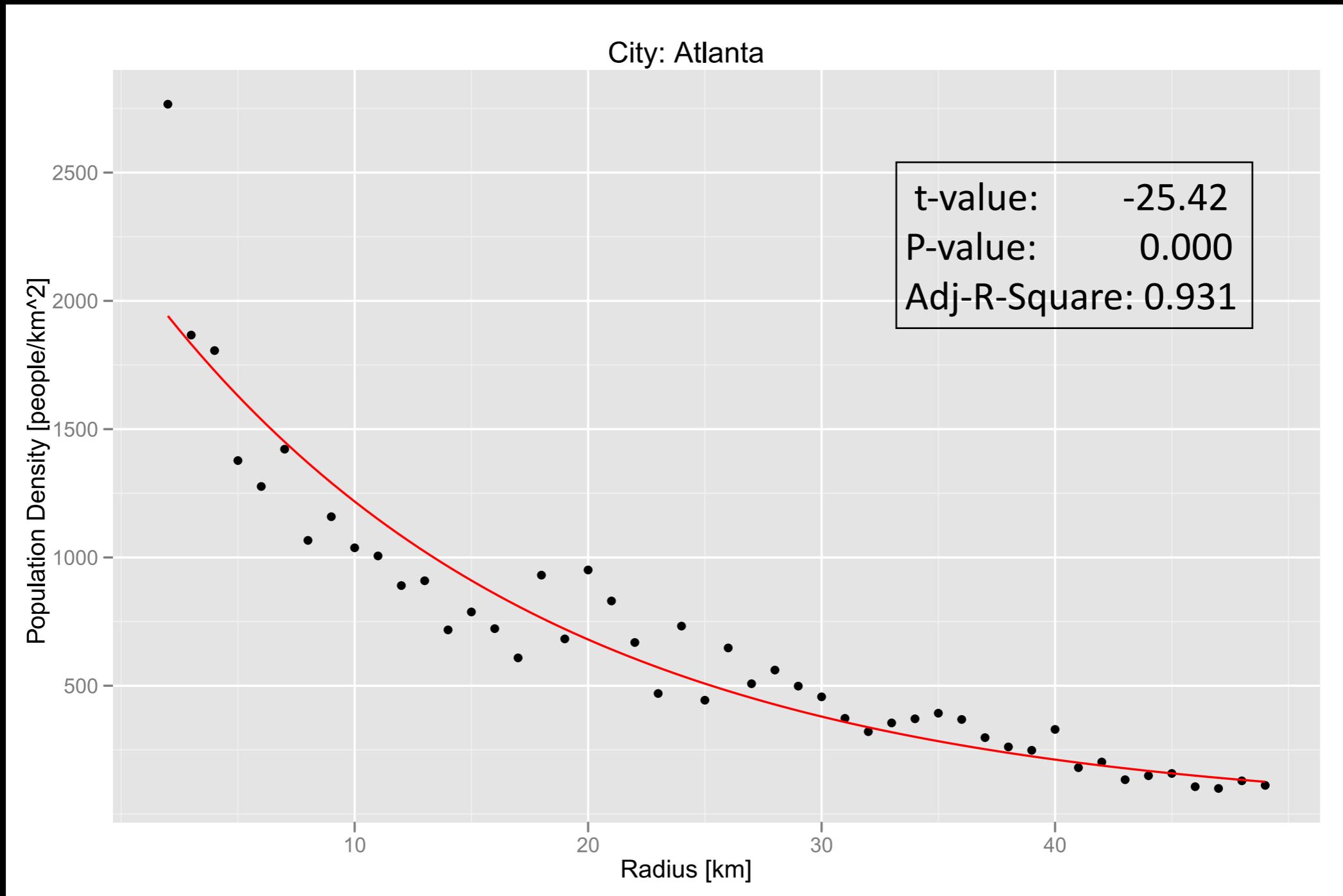
Population Density: $y = Ae^{br}$



Data Source:
US Census
(2000)

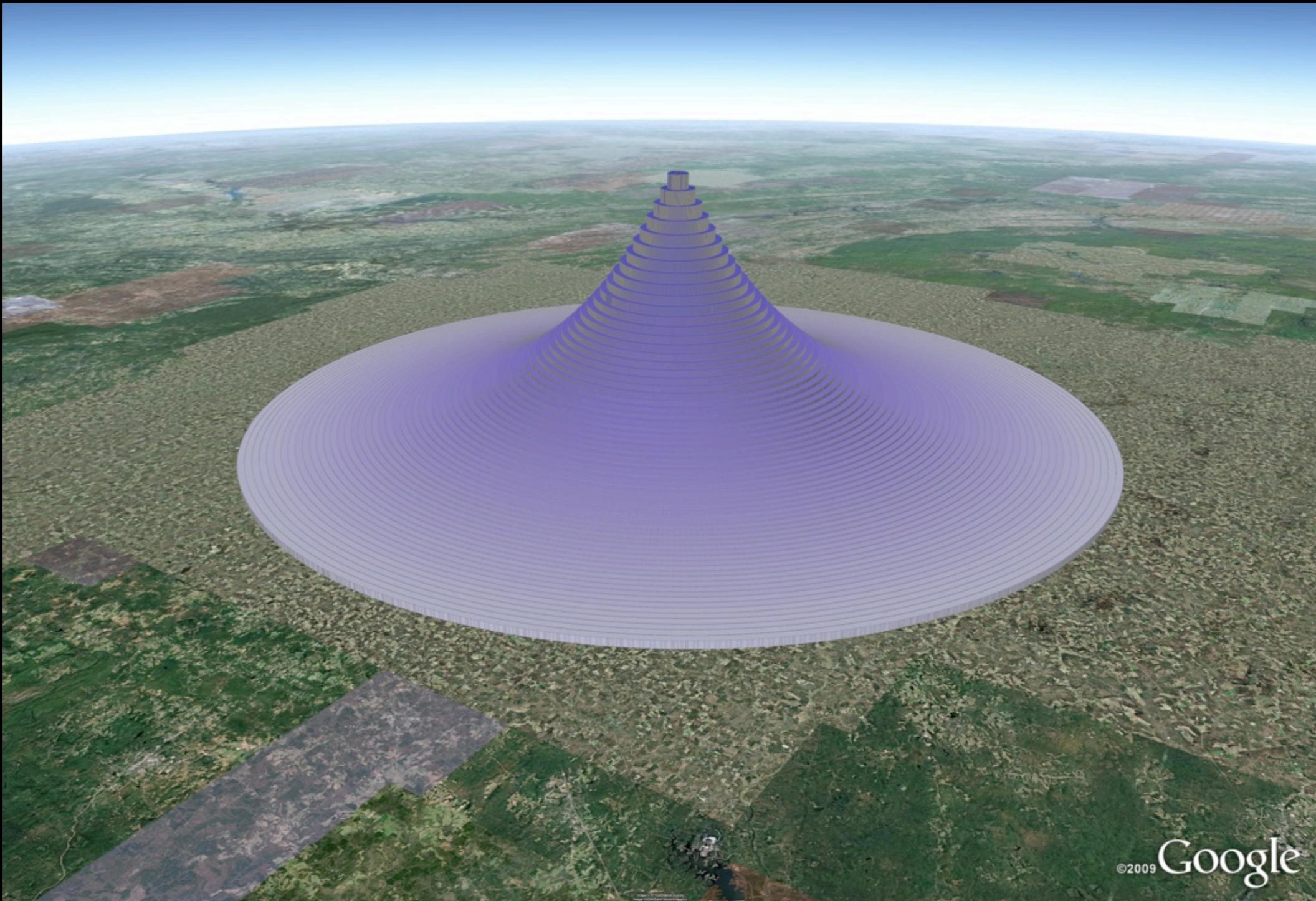
Results:

Population Density: $y = Ae^{br}$



Data Source:
US Census
(2000)

Results:
Population Density: $y = Ae^{br}$

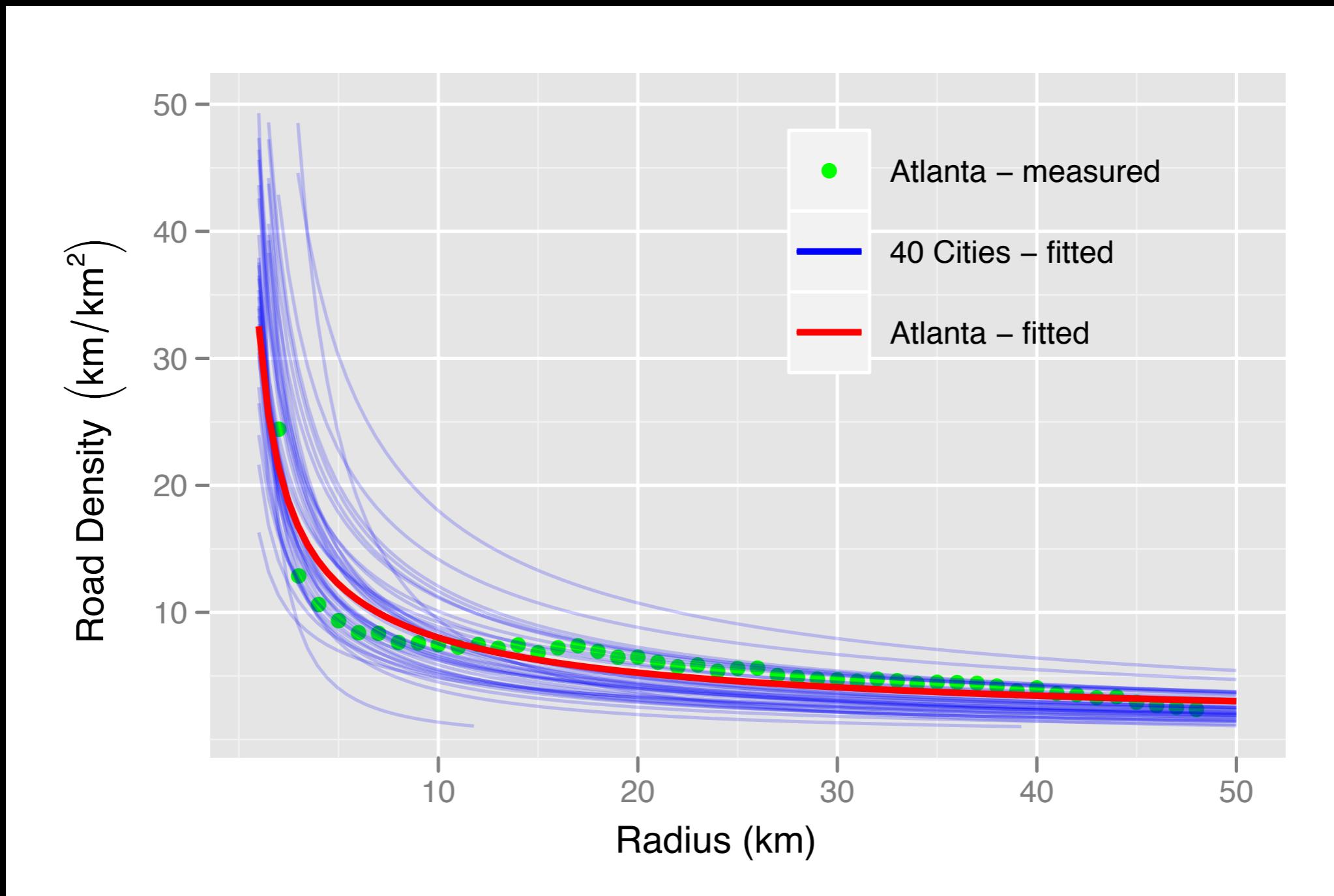


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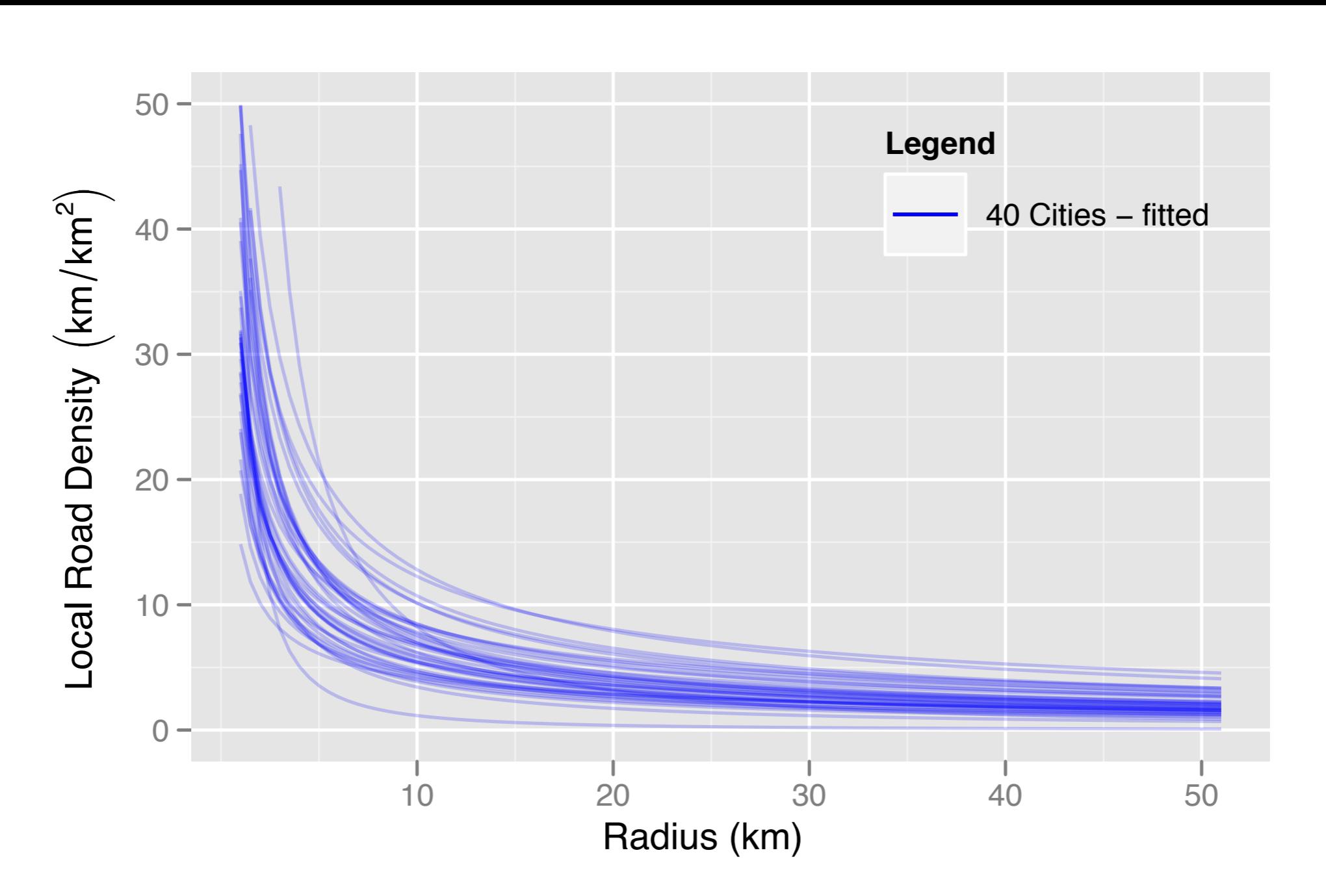
Data Source:
US Census
(2000)

Results: Road Density (all): $y = Ar^b$



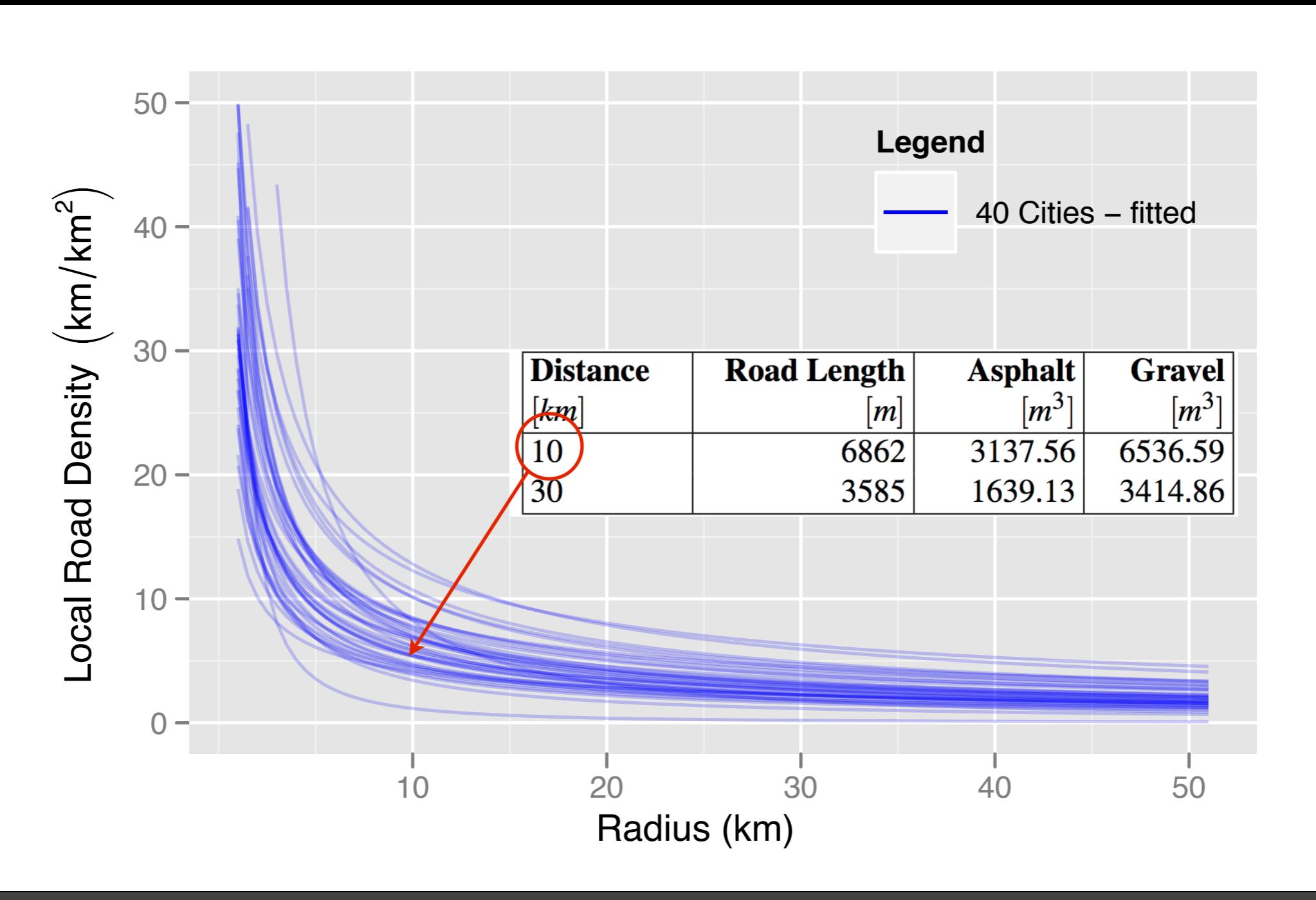
Results:

Local Road Density: $y = Ar^b$



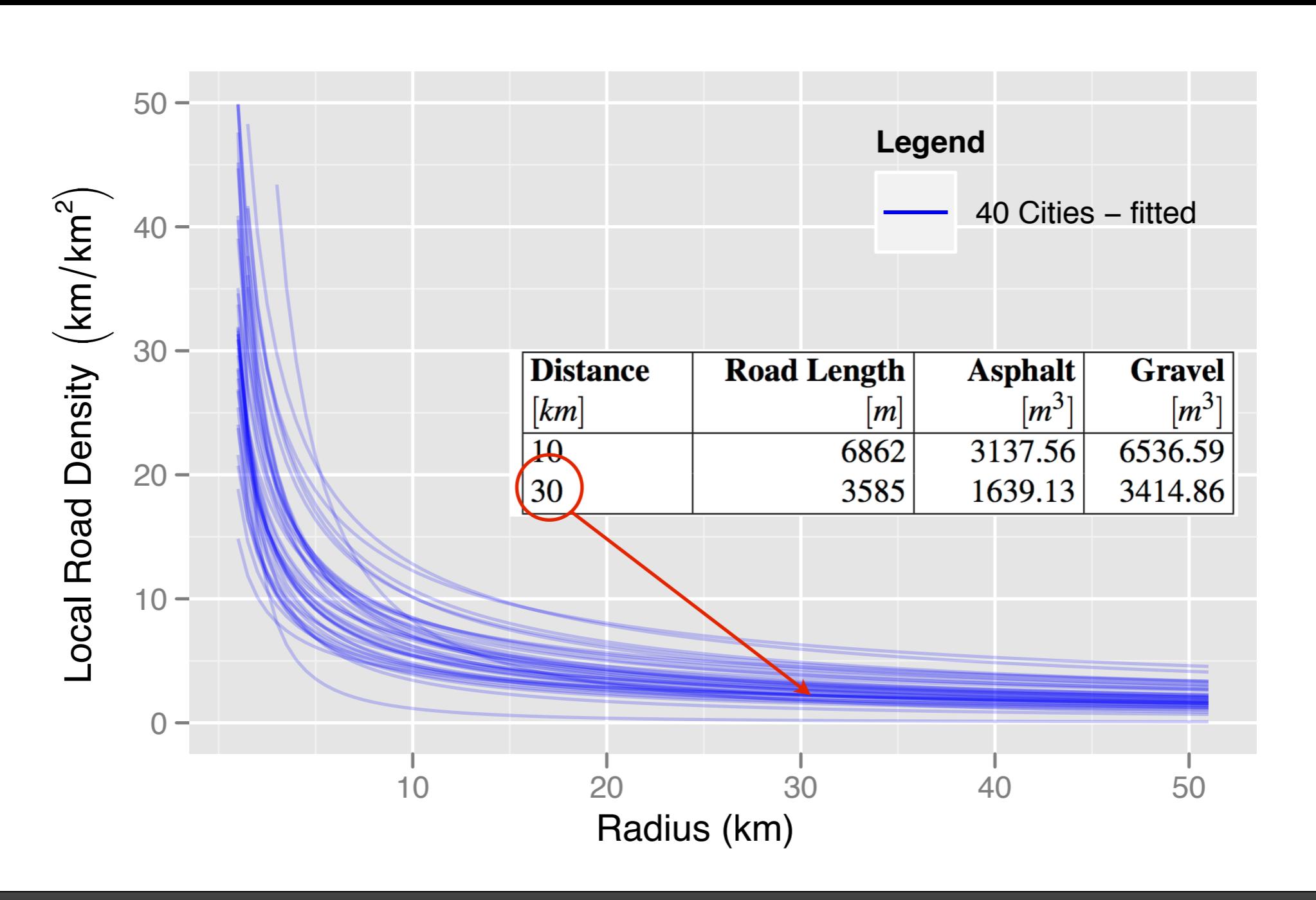
Results:

Local Road Density: $y = Ar^b$

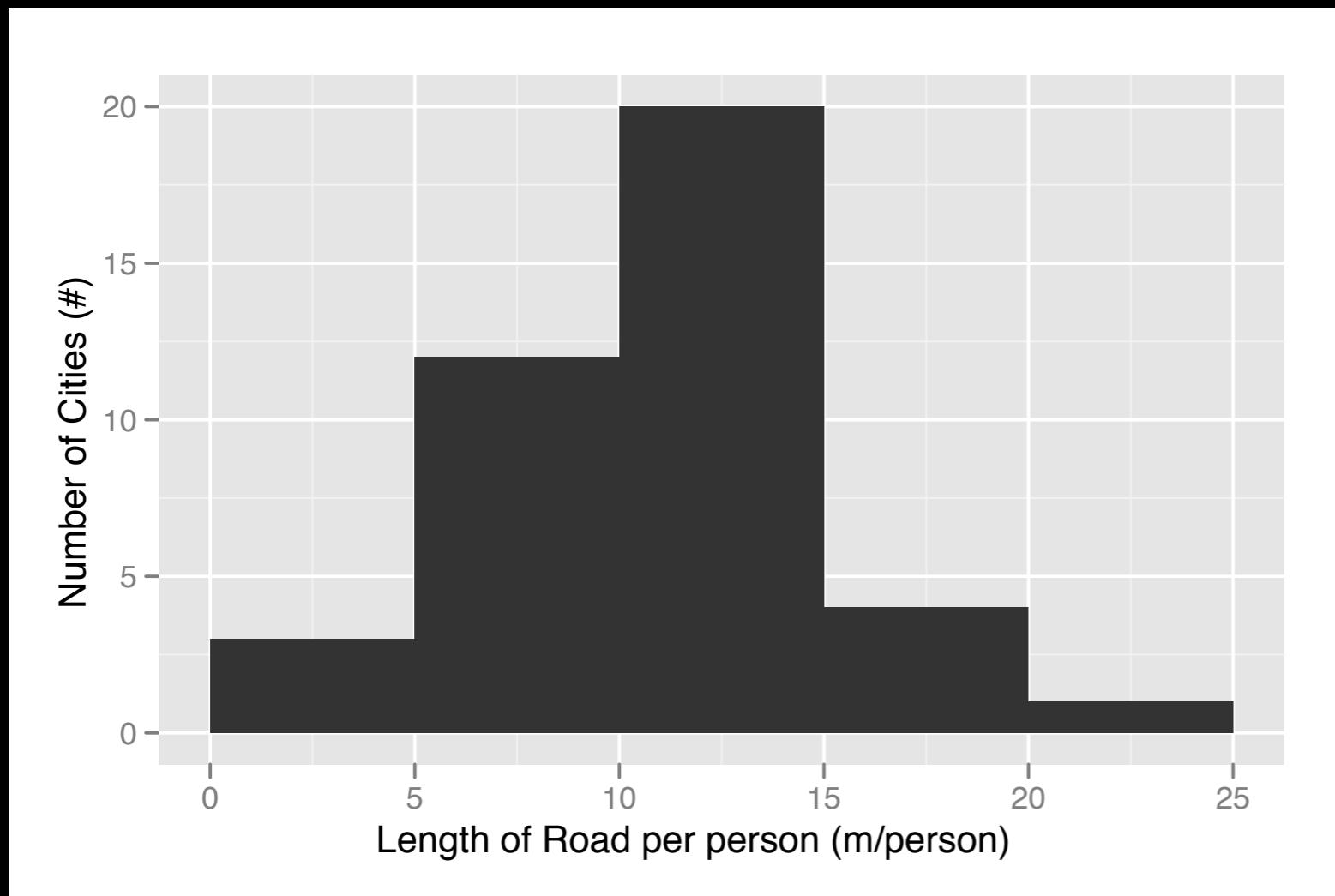


Results:

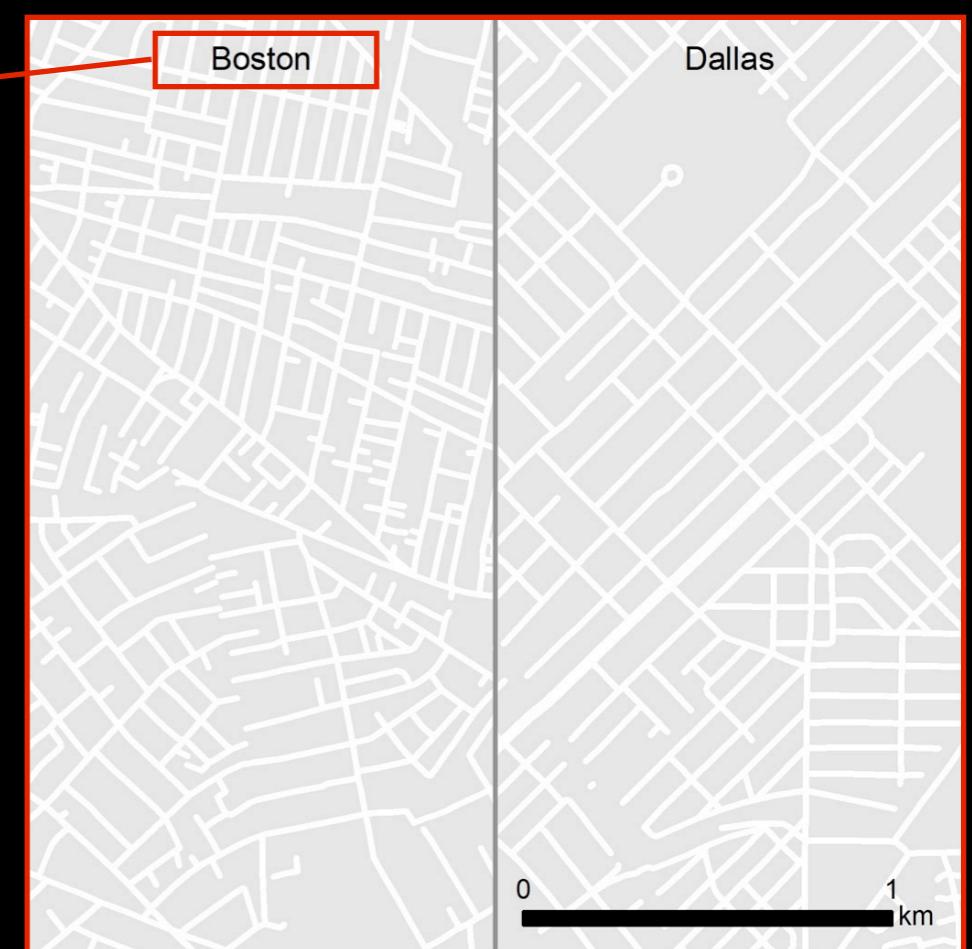
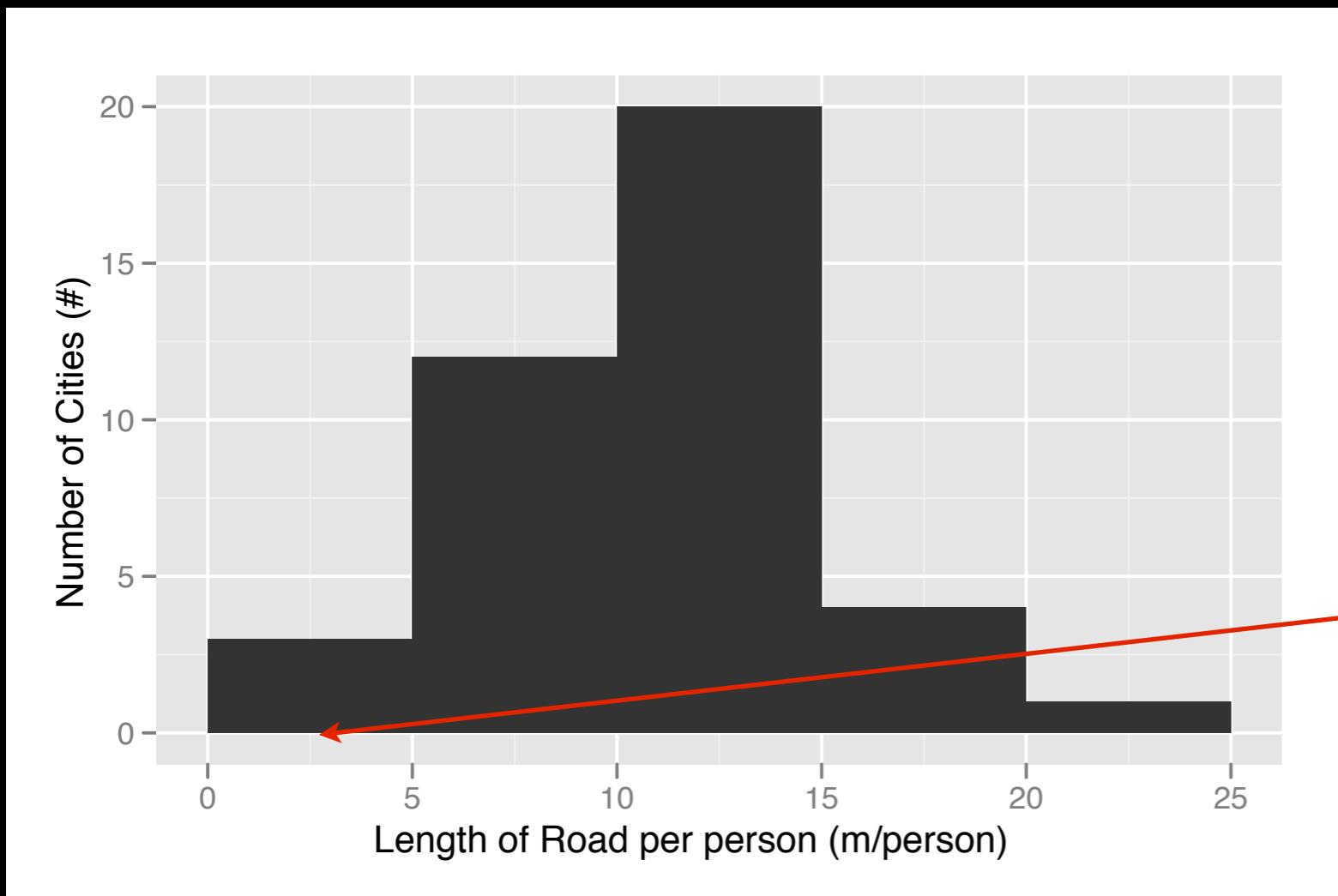
Local Road Density: $y = Ar^b$



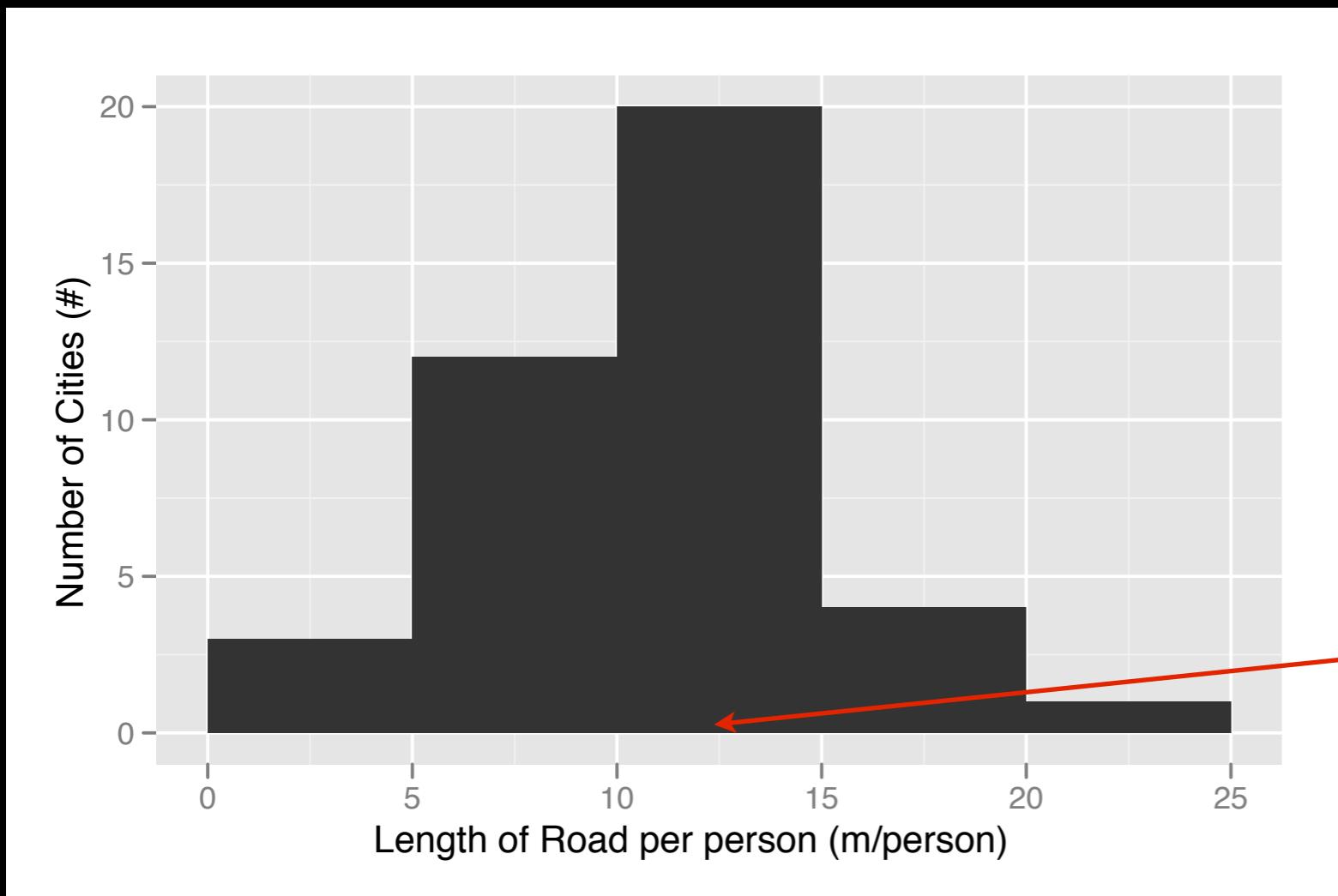
Results: City Typologies



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Further research:

Use remote sensing to accurately calculate surface area and material type

Explore relationship with Urban Heat Island calculations

Using maintenance estimates (and LCA) estimate material flows resulting from infrastructure

Questions?

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www.urbmet.org