

Spatial microsimulation, 'Big Data' and **saving the world**

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University of Canberra, 14th **January 2015**

Structure

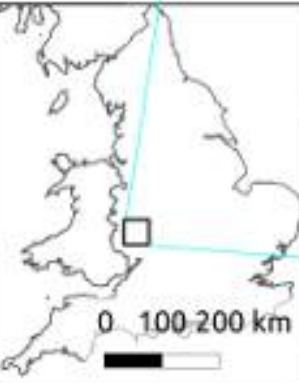
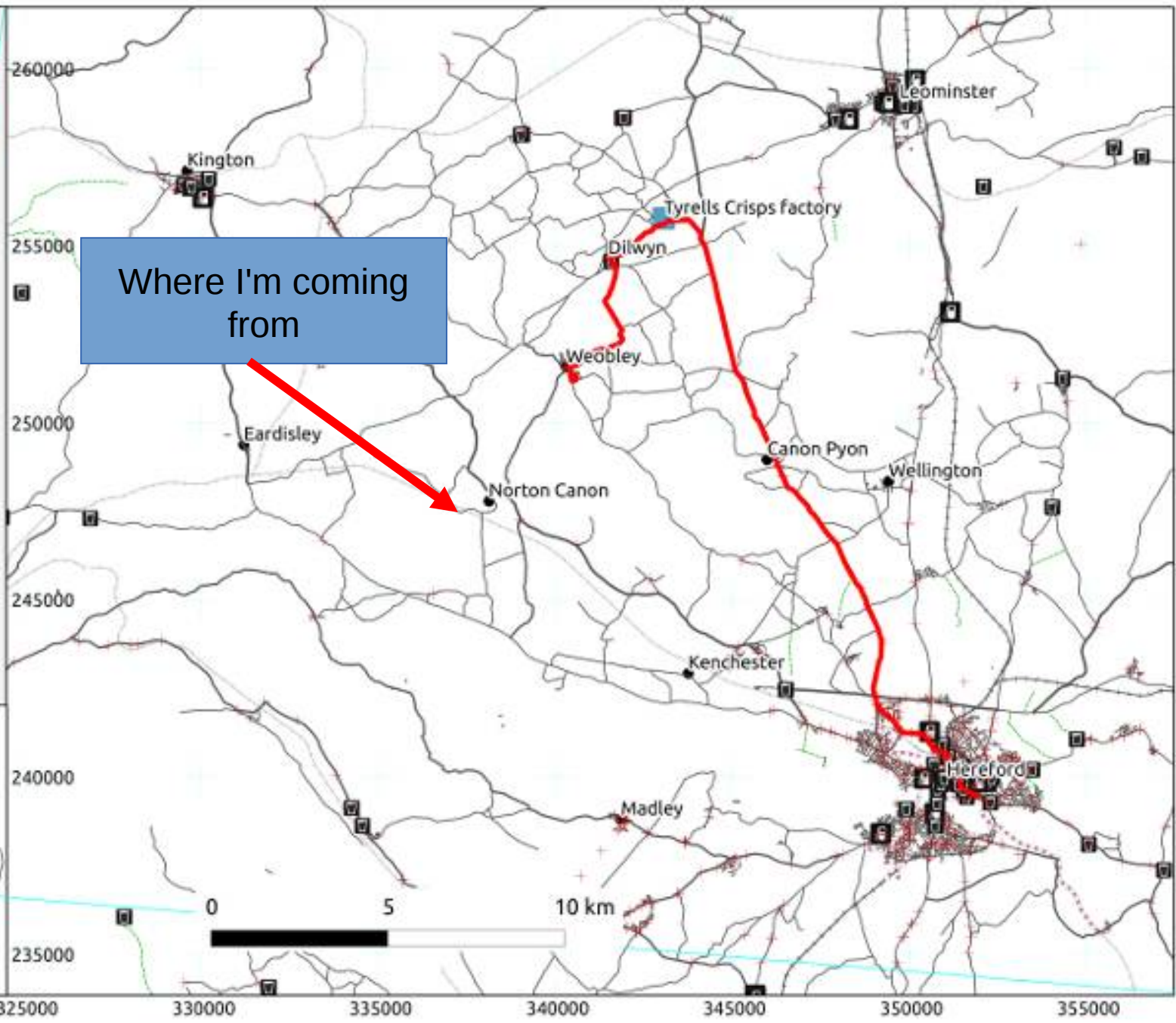
- Context
- Spatial microsimulation
- Big data
- Applications
- Discussion/practical

Part 1: Background



- Legend**
- points
- bus_stop
 - fuel
 - pub
- roads
- bridleway
 - cycleway
 - motorway
 - primary
 - residential
 - road
 - secondary
 - tertiary
 - trunk
- Railways
- Railways (abandoned)

Where I'm coming from



Where I've been (UK)

Robin's places

Age of arrival

★	0	Area Proportional to n. years
★	5	
★	16	
★	18	
☆	20	
☆	22	
☆	23	
★	27	

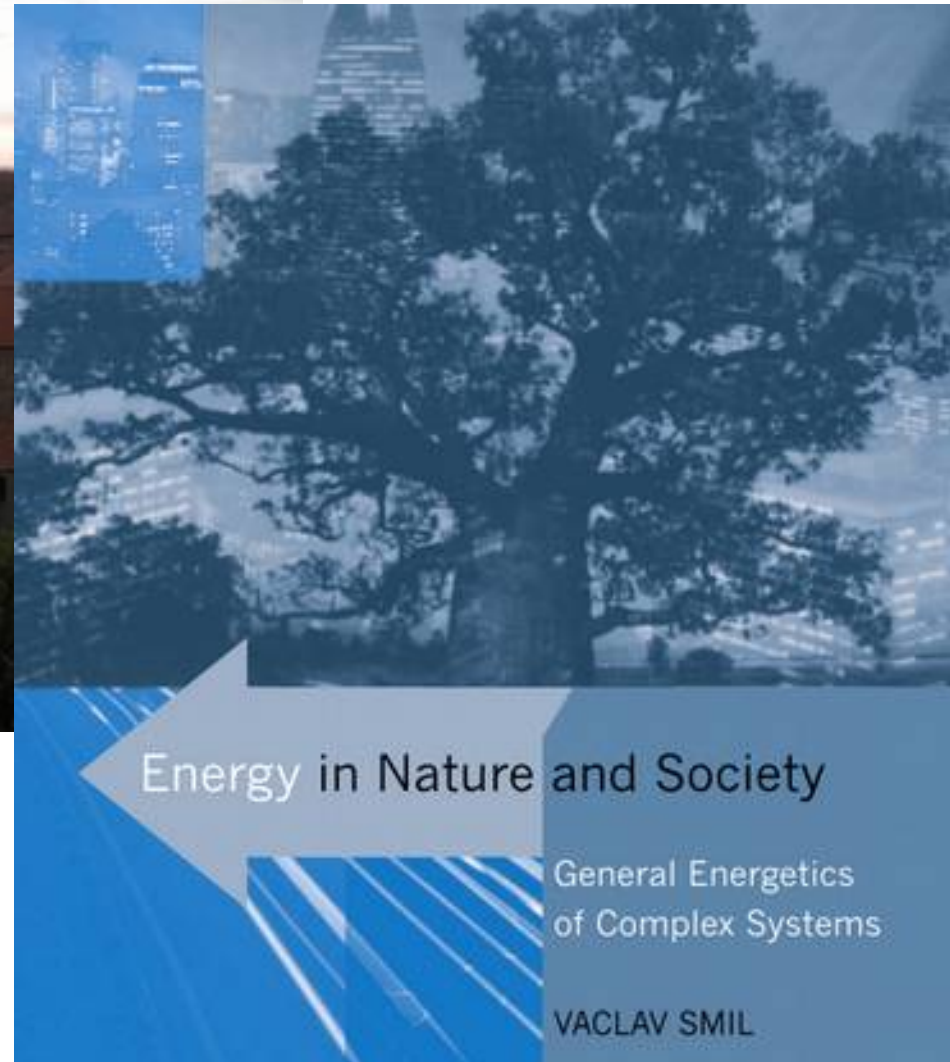


Erasmus year in Salamanca



Above: view from my 'piso' and where I learned Castilian

Below: a book that heavily influenced my thinking



1 Yr MSc in Environmental Science (York), PhD in 'E-futures' (Sheffield)

- Growing interest in behaviour + environment
- Energy: root of many problems



FEATURE

<http://campfire.theoil drum.com/node/6396>

A safe operating space for humanity

Identifying and quantifying planetary boundaries that must not be transgressed could help prevent human activities from causing unacceptable environmental change, argue **Johan Rockström** and colleagues.

Energy costs of modal shift

Author's personal copy

Energy Policy 39 (2011) 2075–2087



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Assessing the energy implications of replacing car trips with bicycle trips in Sheffield, UK

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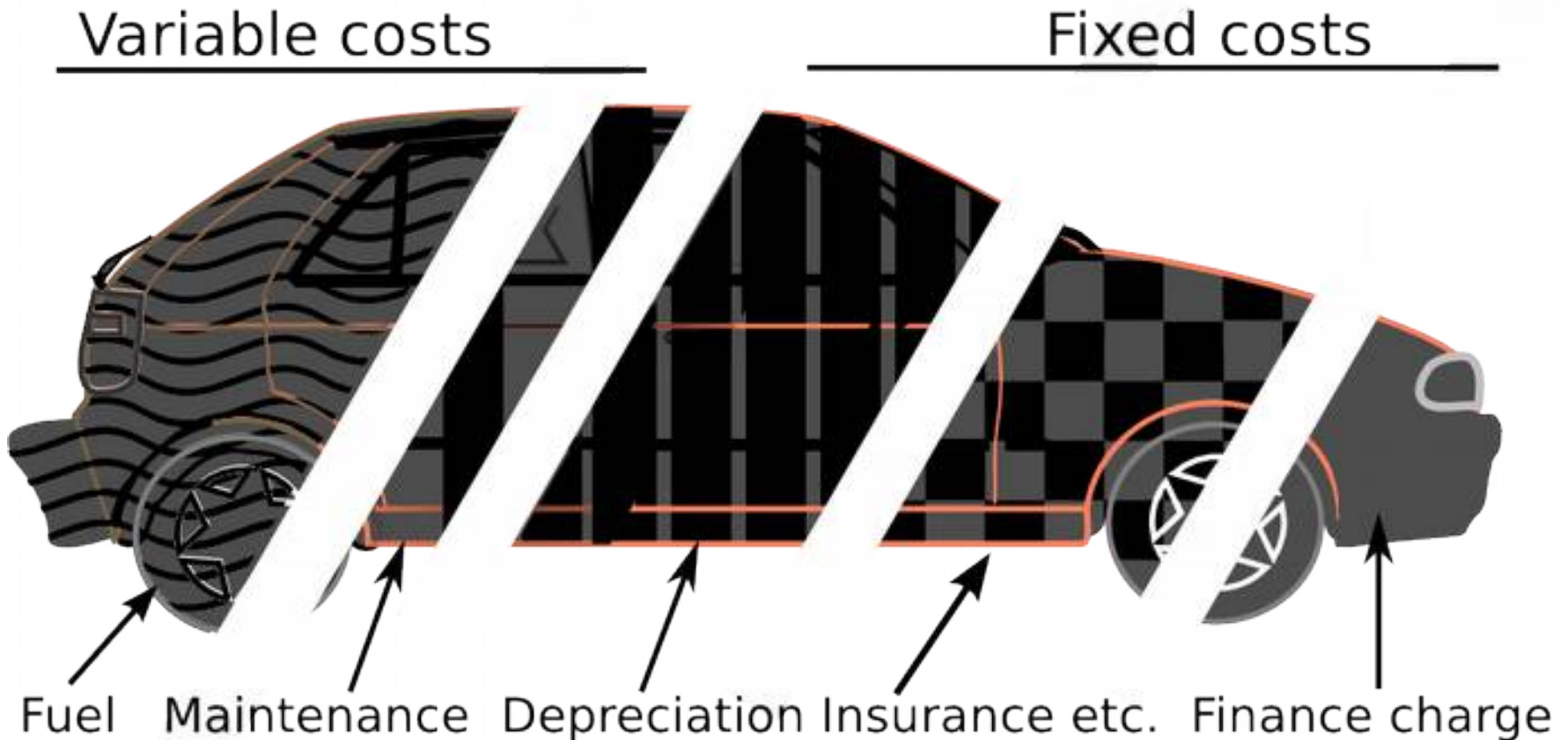
Modal shift

ABSTRACT

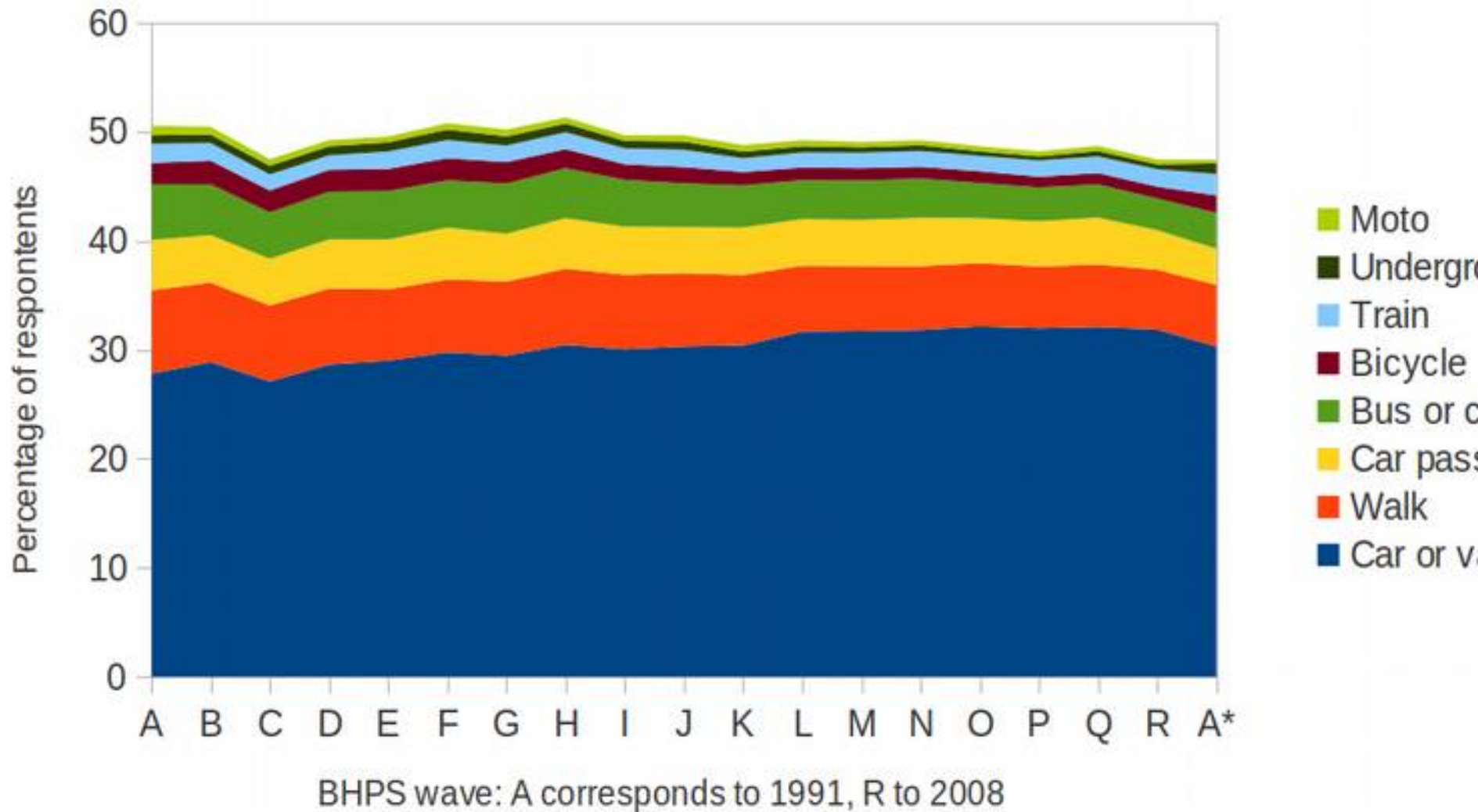
A wide range of evidence supports policies which encourage people to cycle more and drive less, for health and environmental reasons. However, the likely energy implications of such a modal shift have remained relatively unexplored. In this paper we generate scenarios for increasing the cycling rate in Sheffield between 2010 and 2020. This is done through the novel application of a simple model, borrowed from population ecology. The analysis suggests that pro-cycling interventions result in energy savings through reduced consumption of fuel and cars, and energy costs through increased demand for food. The cumulative impact is a net reduction in primary energy consumption, the magnitude of which depends on a number of variables which are subject to uncertainty. Based on the evidence presented and analysed in this paper, we conclude that transport policy has a number of important energy implications, some of which remain unexplored. We therefore advocate the

Conceptualising energy costs of transport

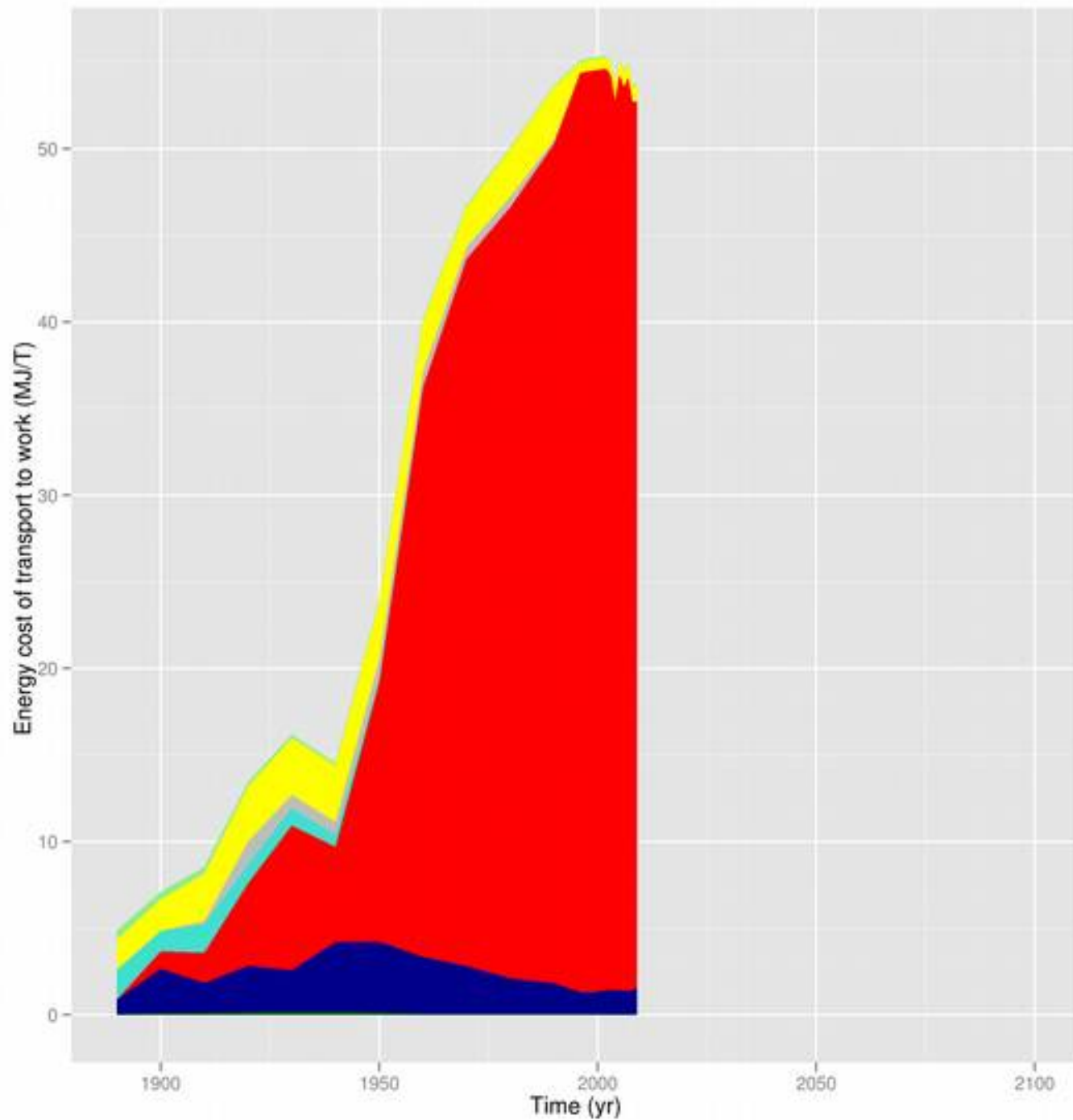
After Smil (1993)



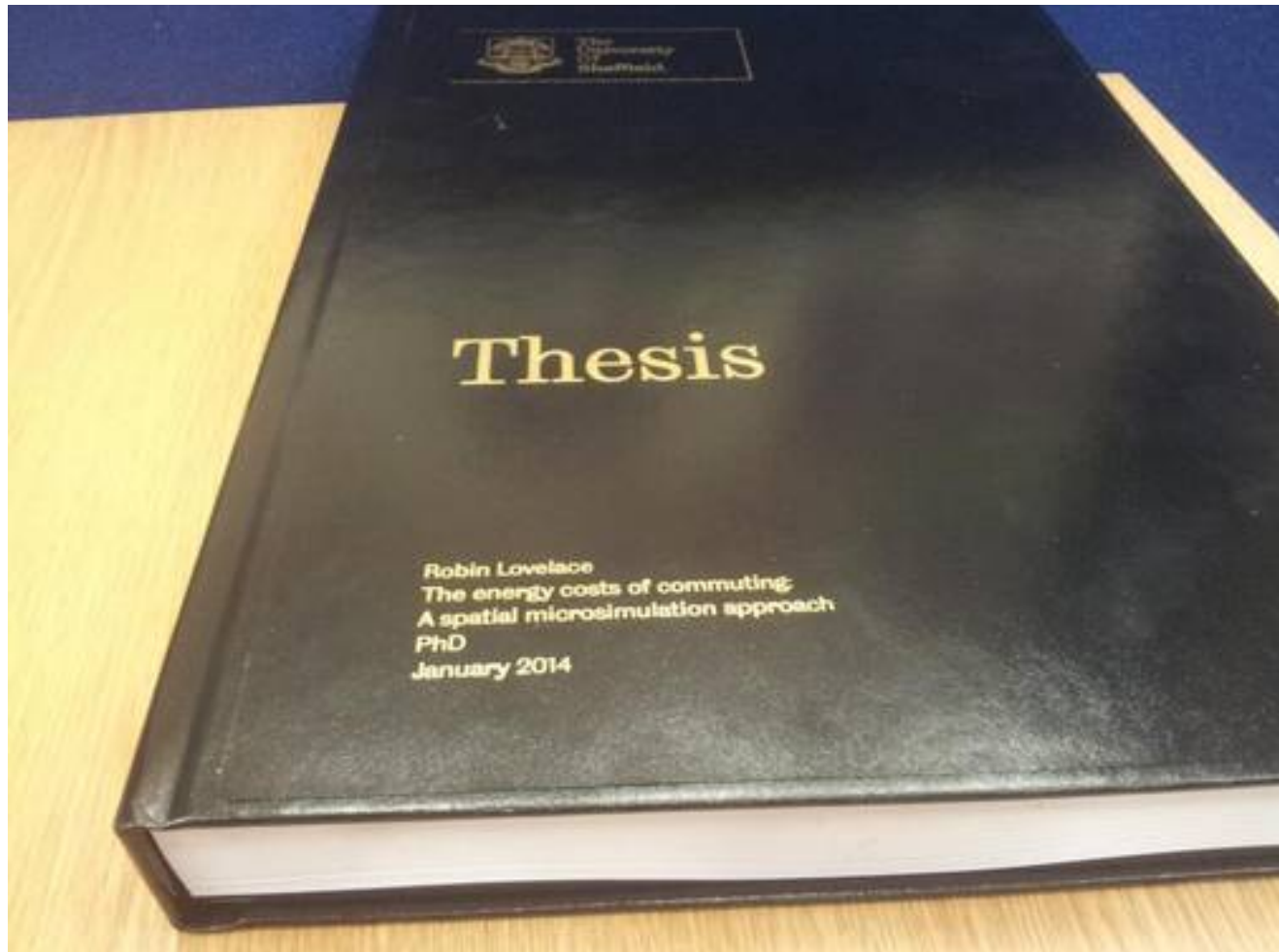
Time-series analysis



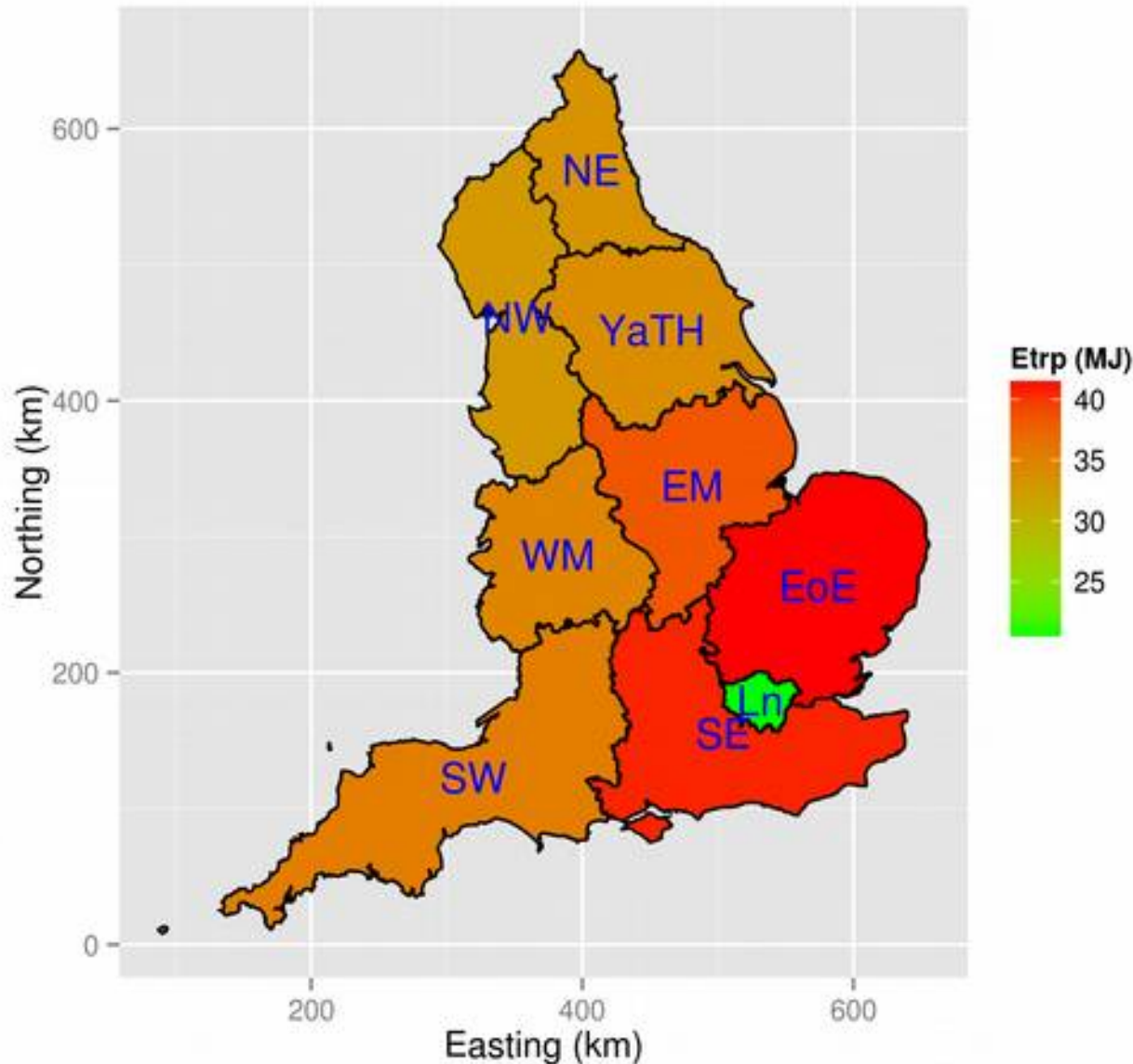
The big picture!

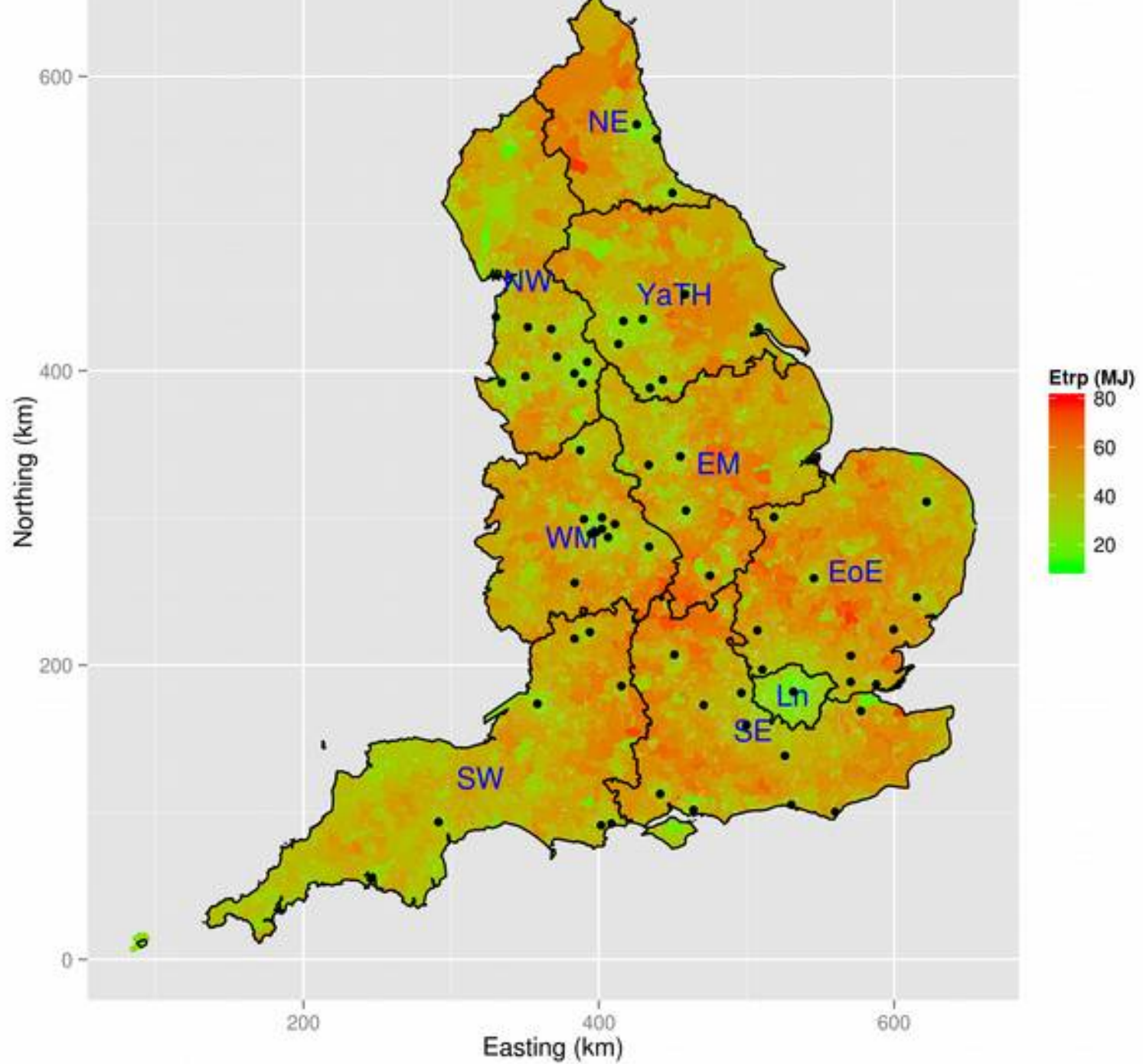


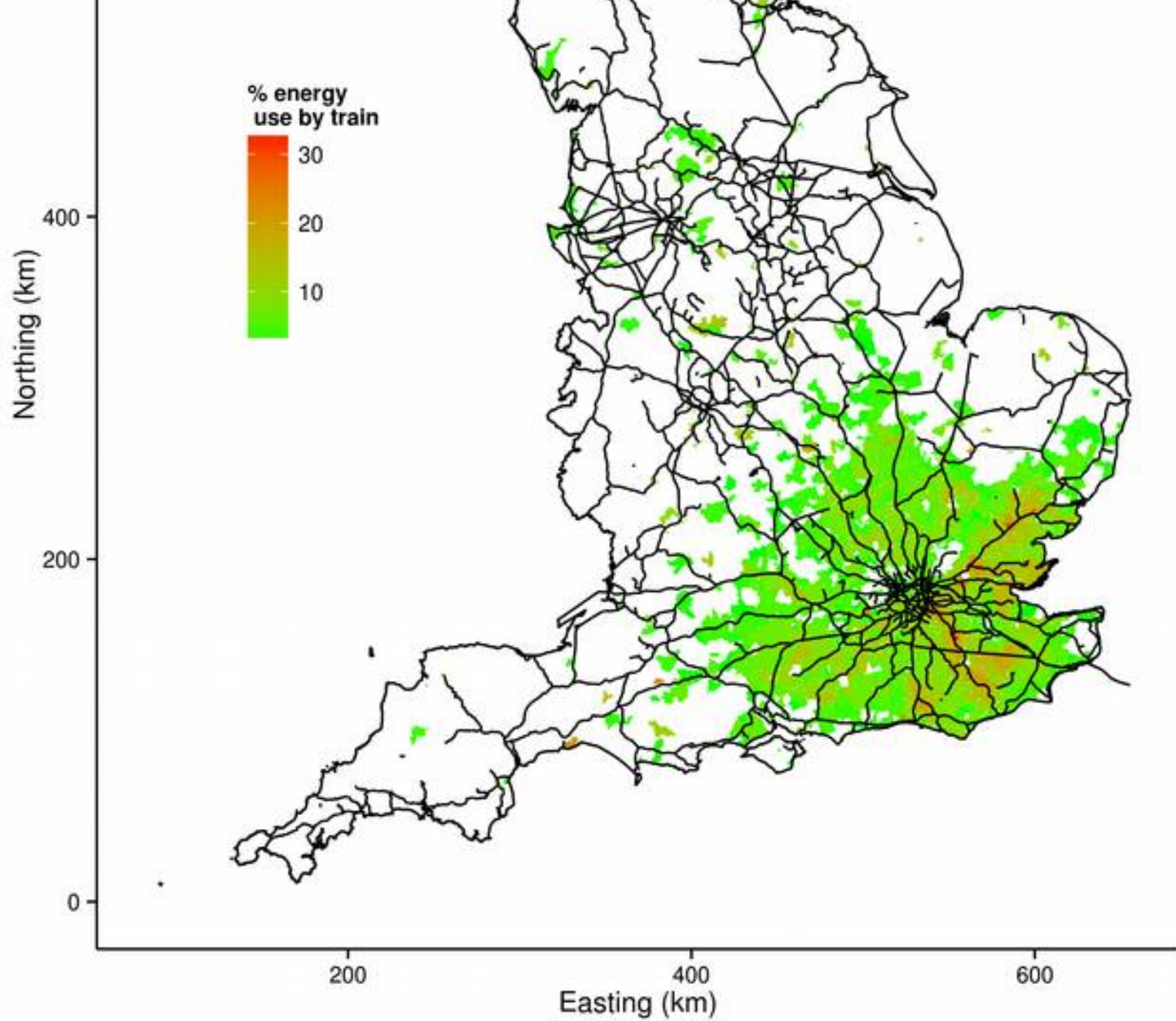
Thesis: Geography of transport energy use



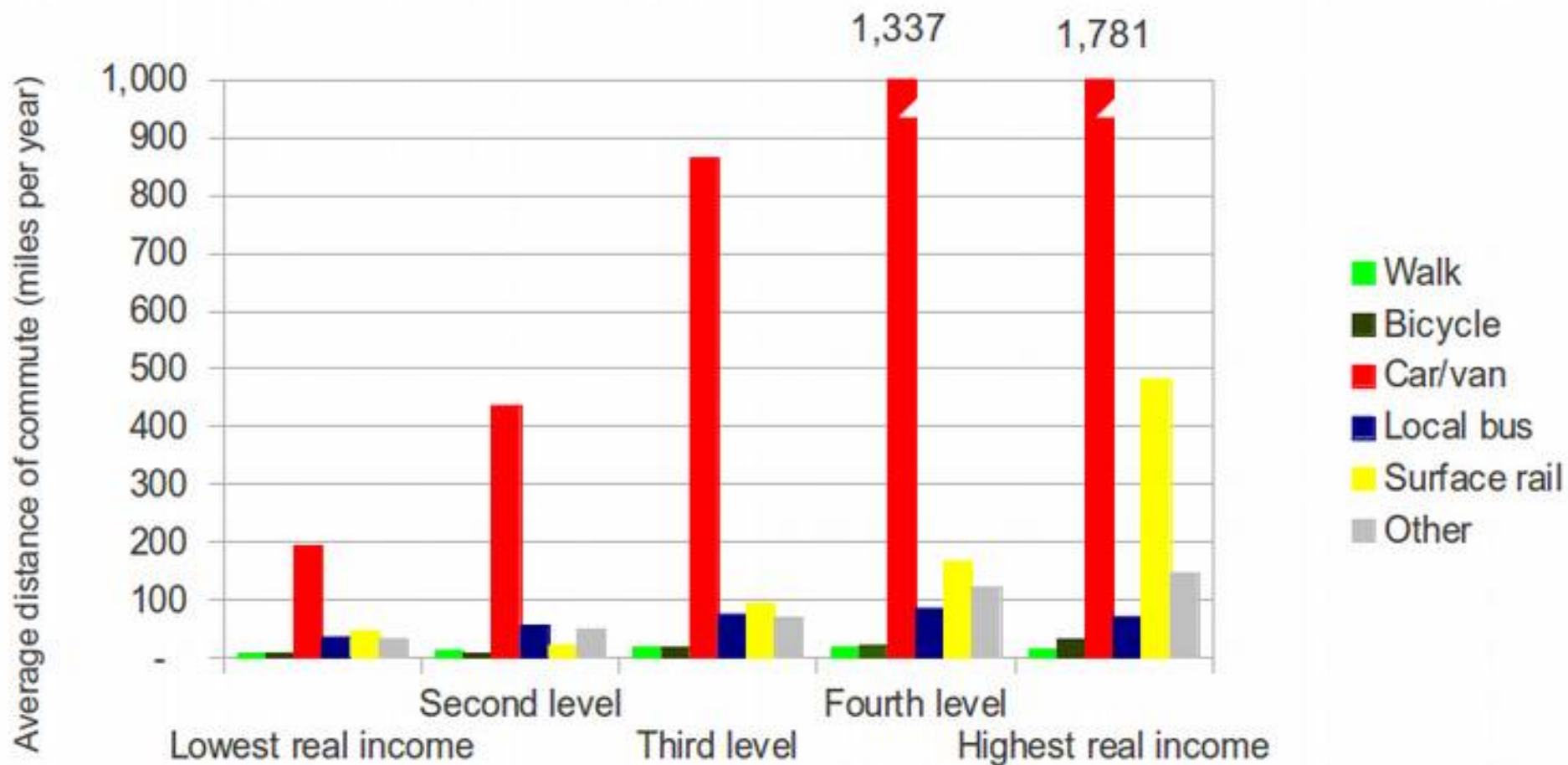
Key finding: energy use varies!



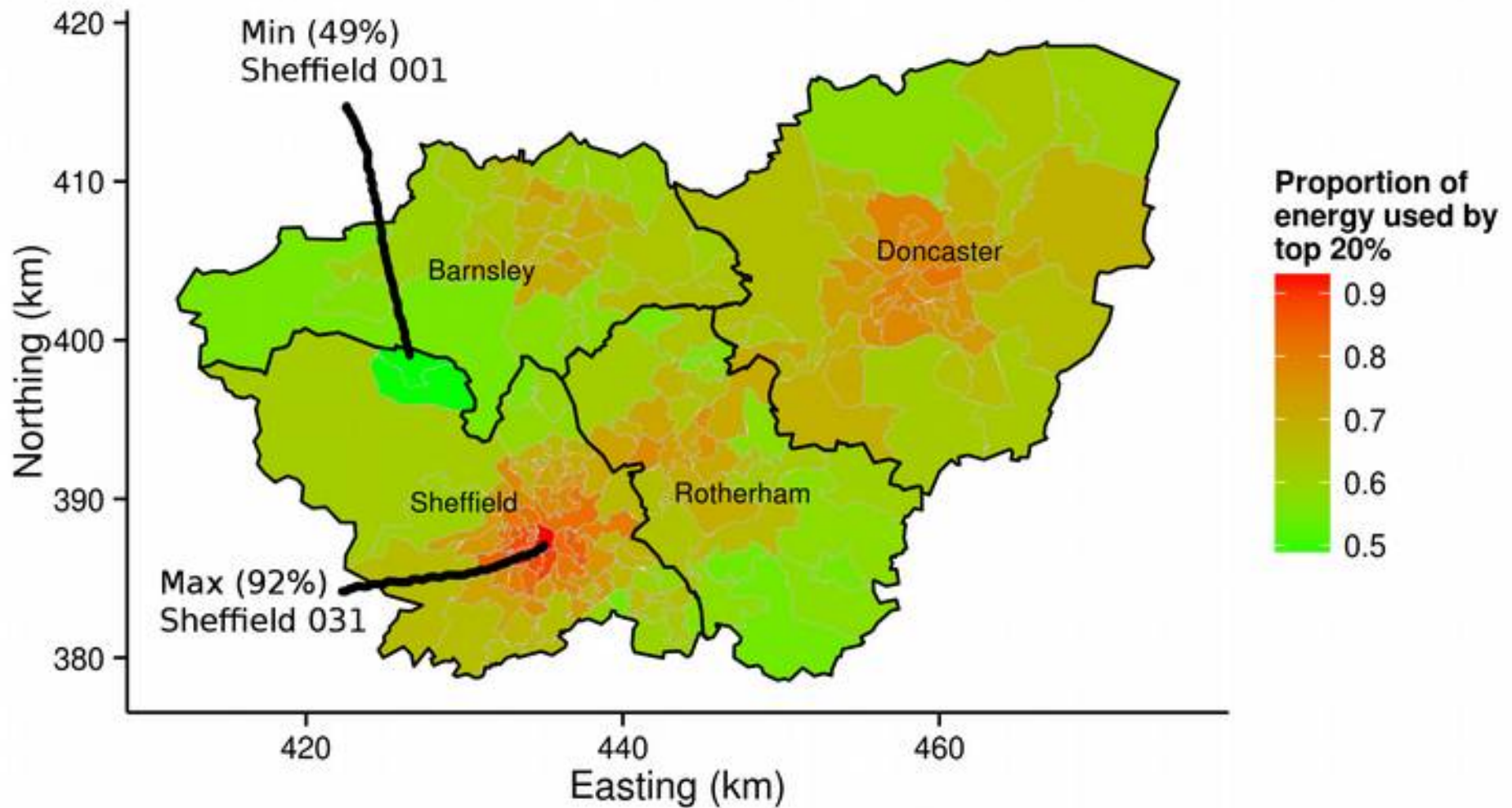




Individual-level variability



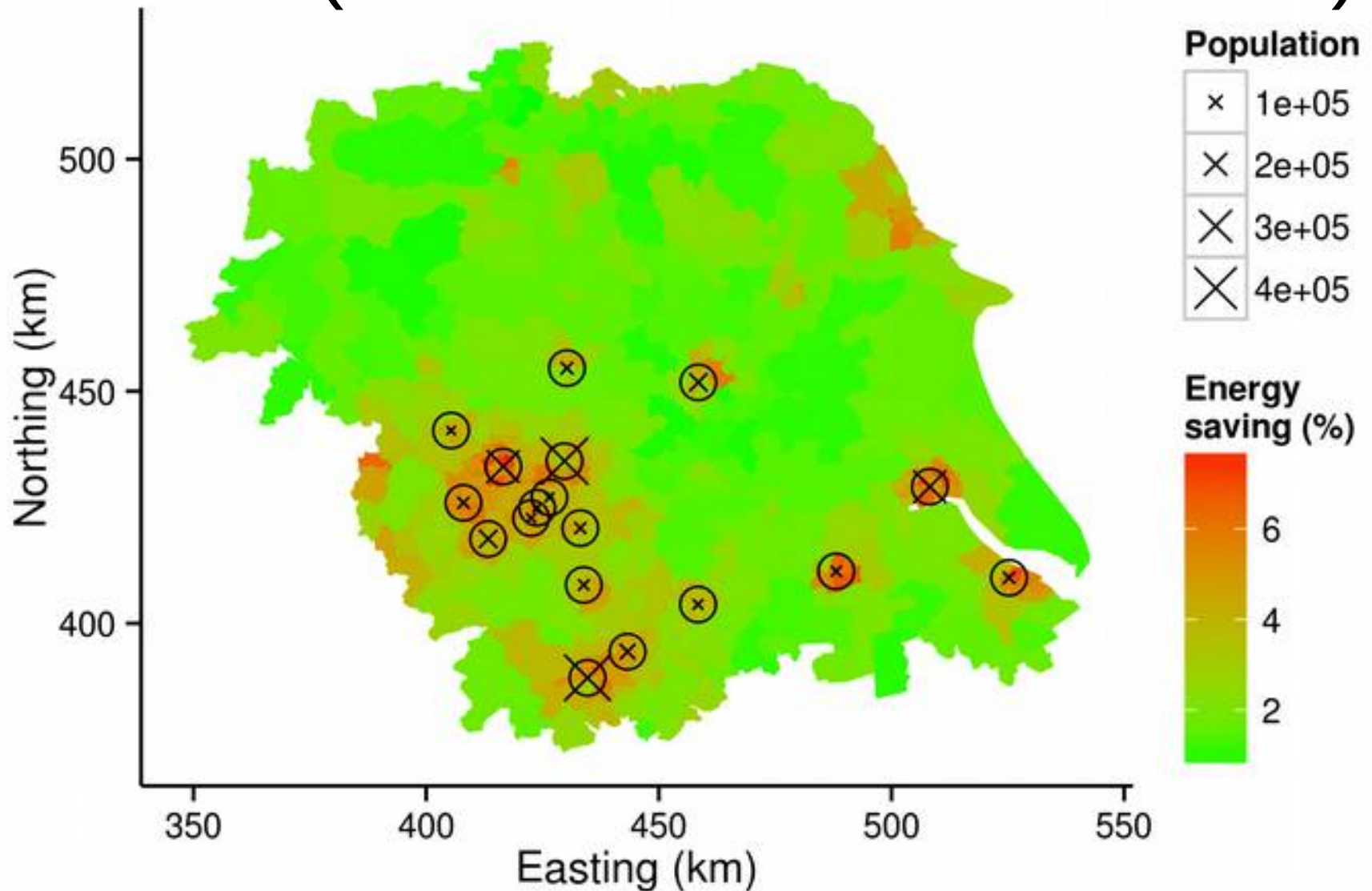
Inequalities within areas



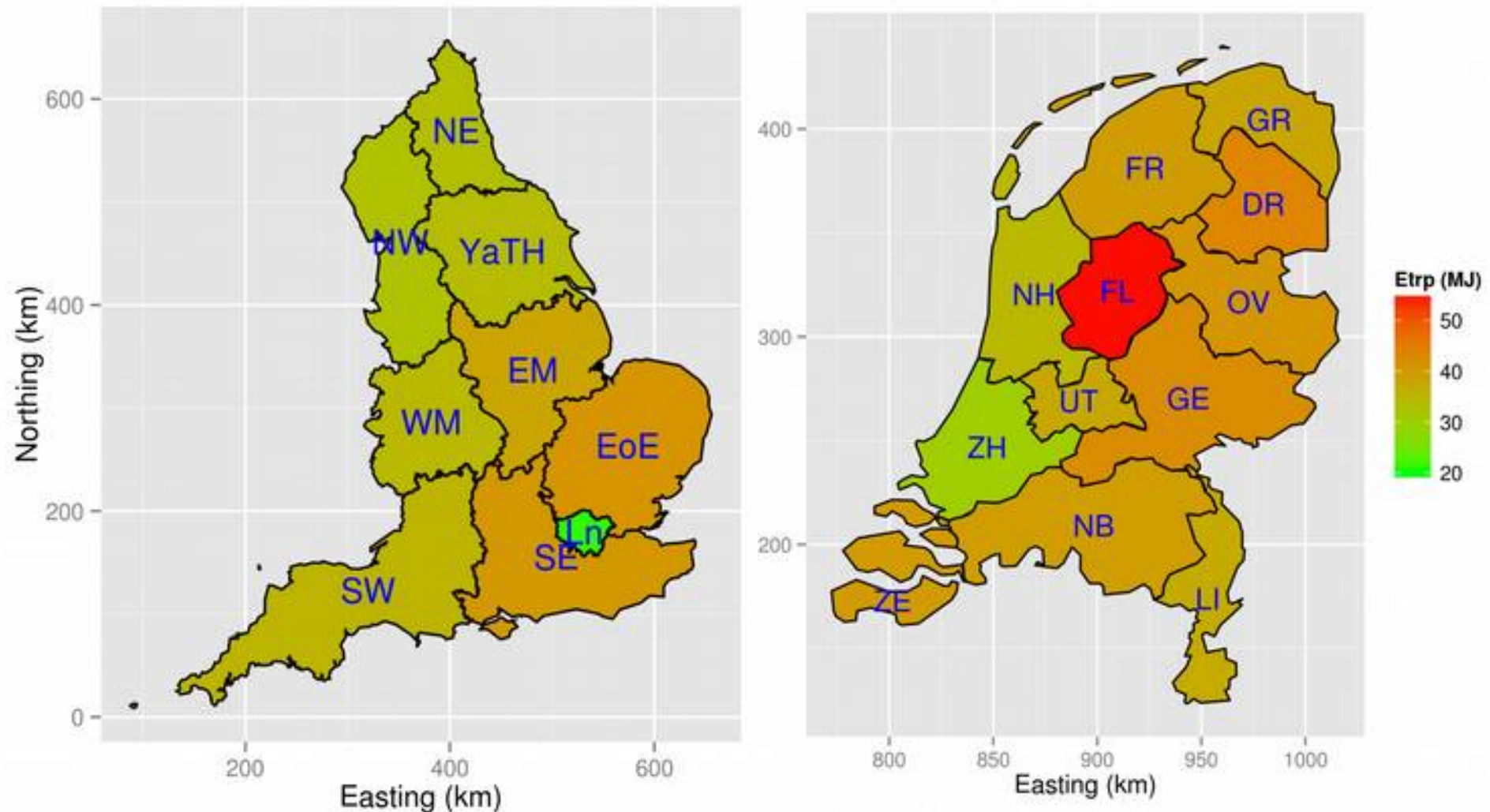
Love London, Go Dutch



Going Dutch: aggregate-level results (Yorkshire and the Humber)



National-level comparisons



Average energy costs per one way trip to work in English regions (2001) and Dutch provinces (2010)

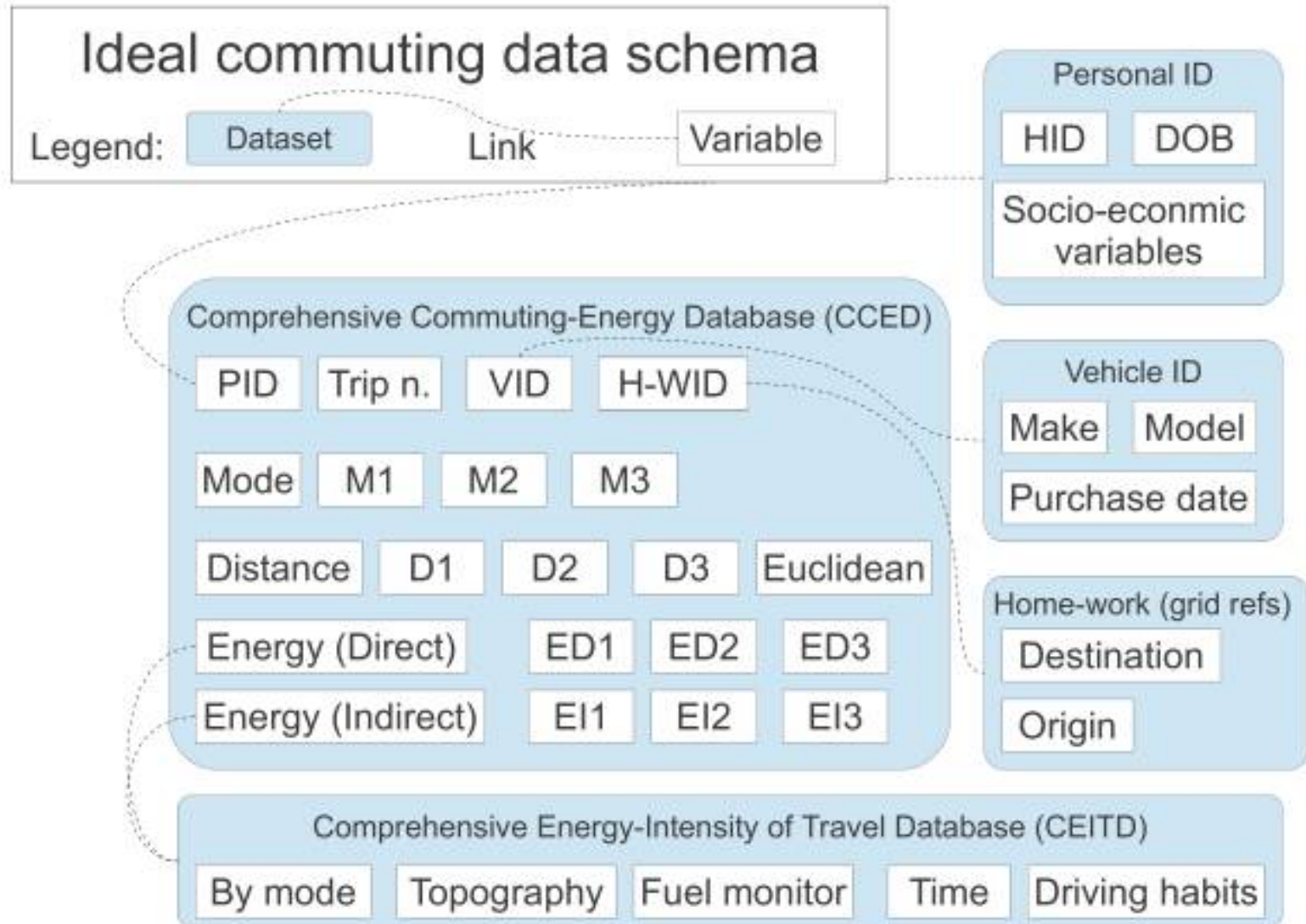
Going Finnish

NOKIA

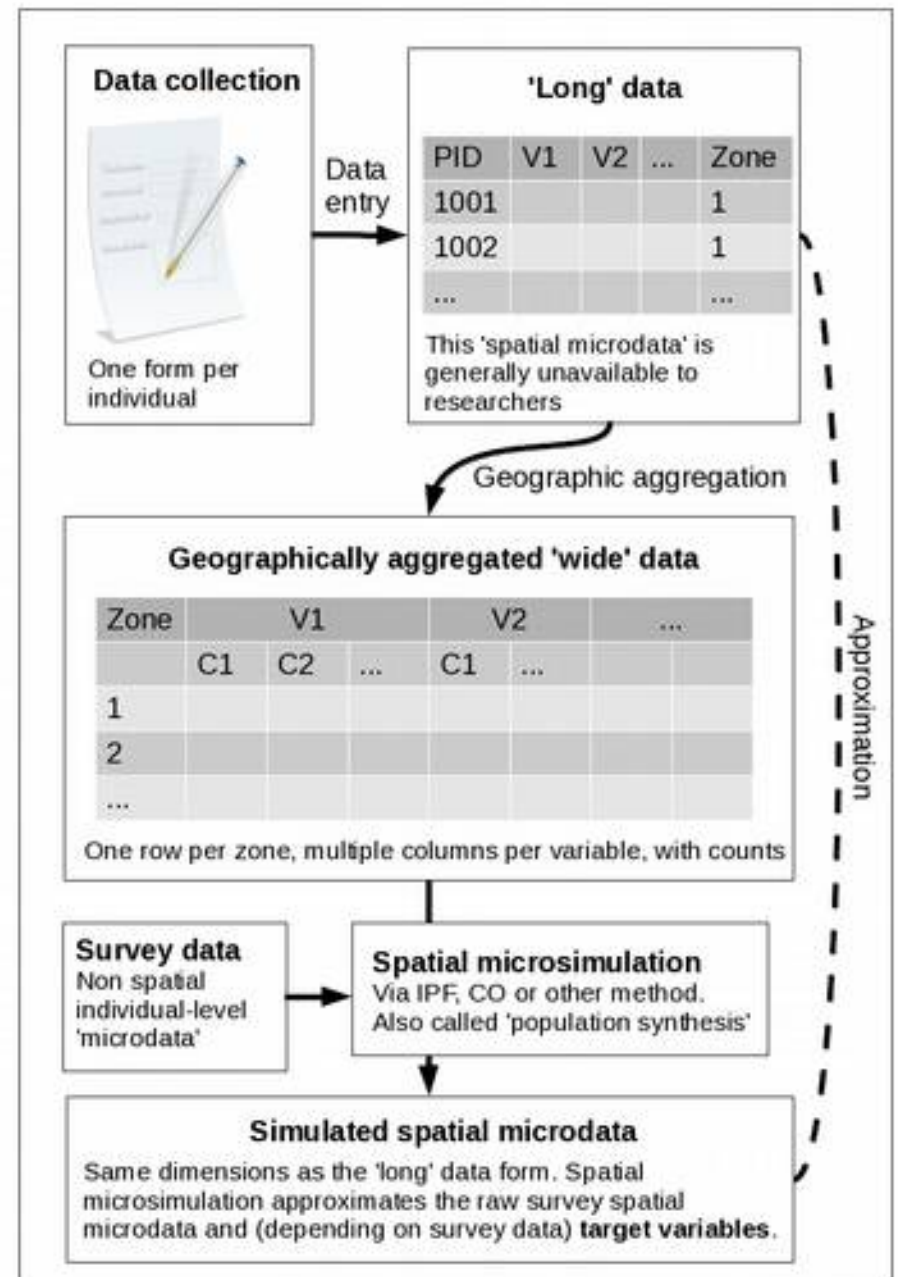
Connecting People

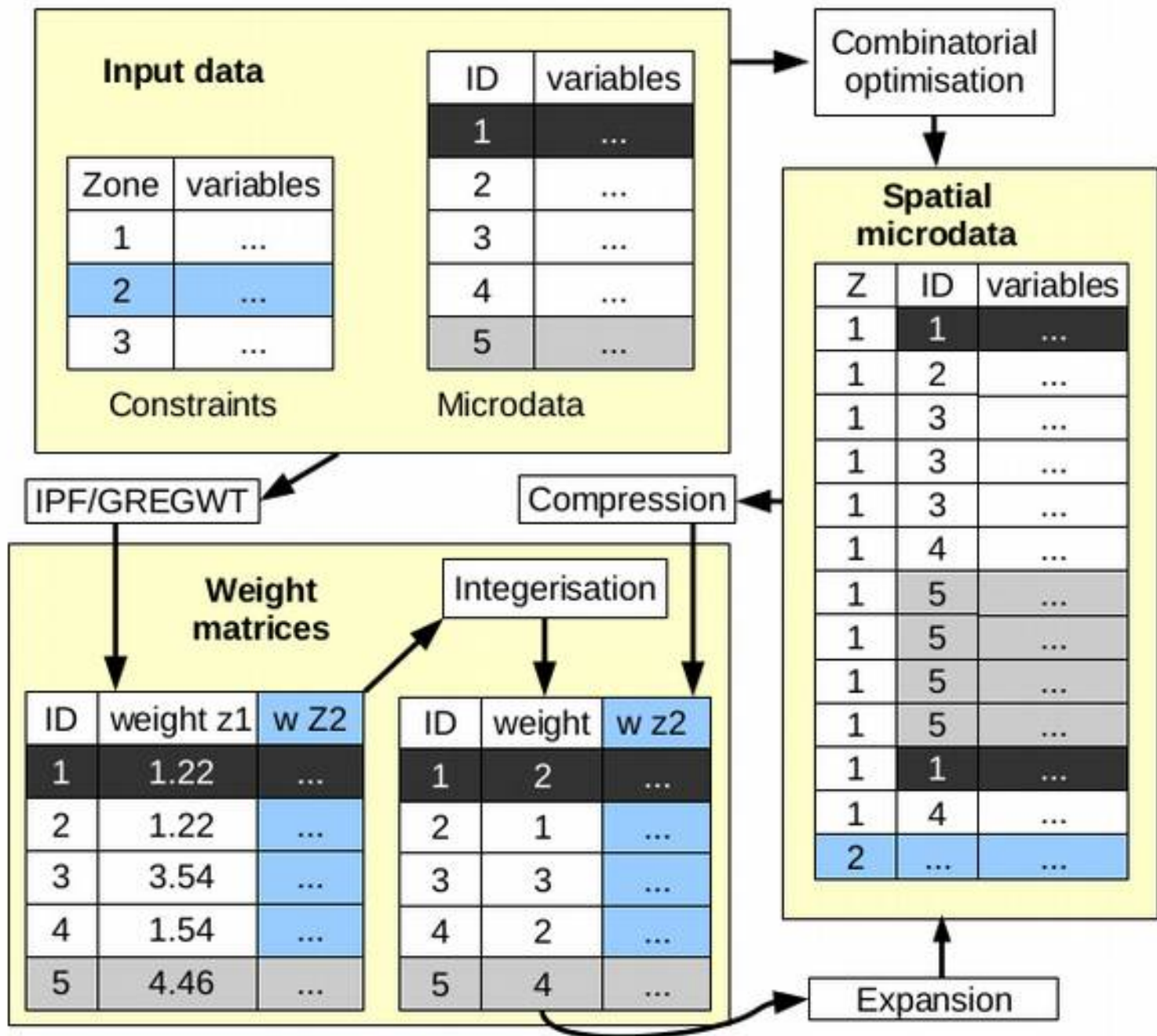


Part II: Spatial microsimulation

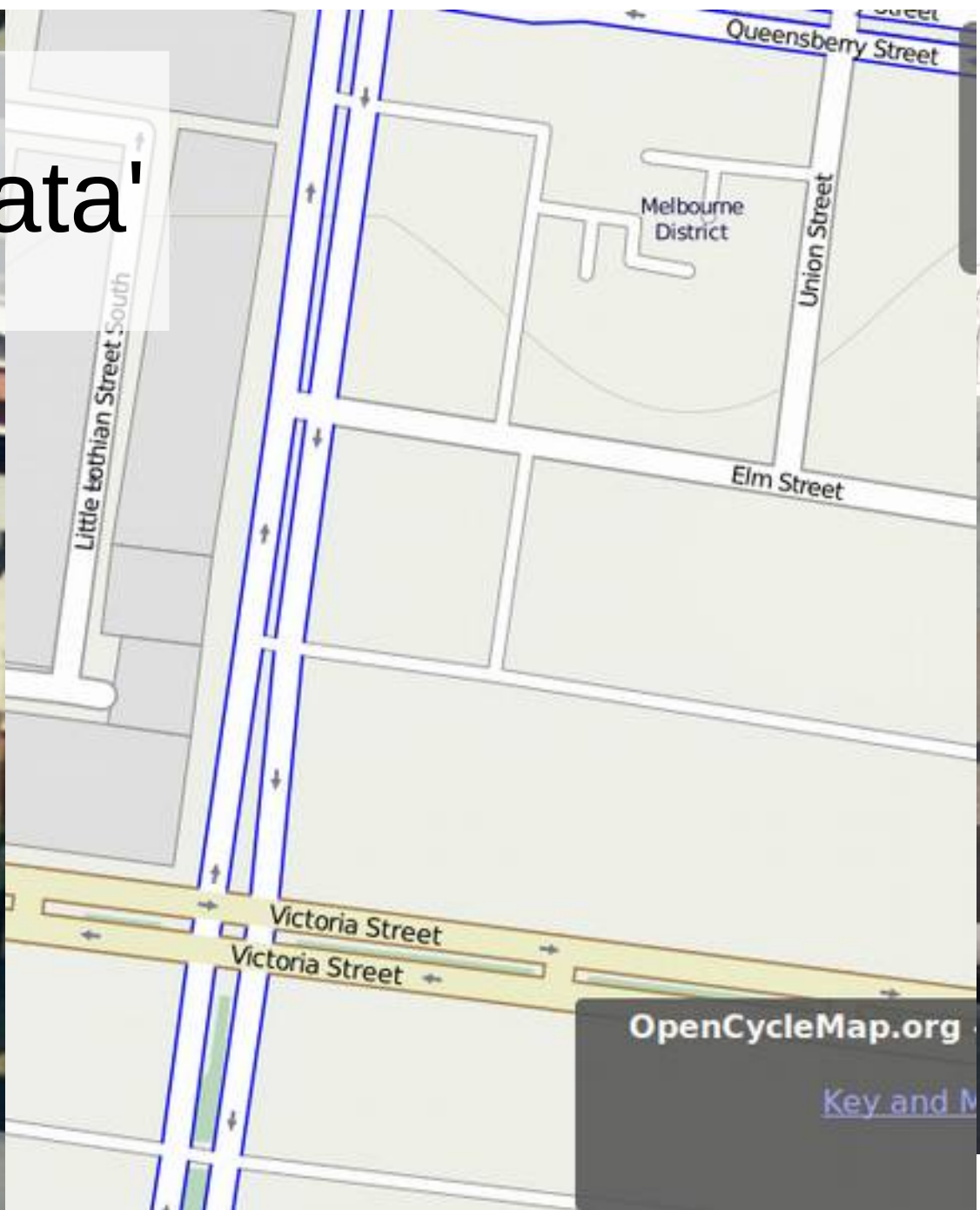


My approach to spatial msim





Part 3: 'Big Data'



Part 4: Saving the world



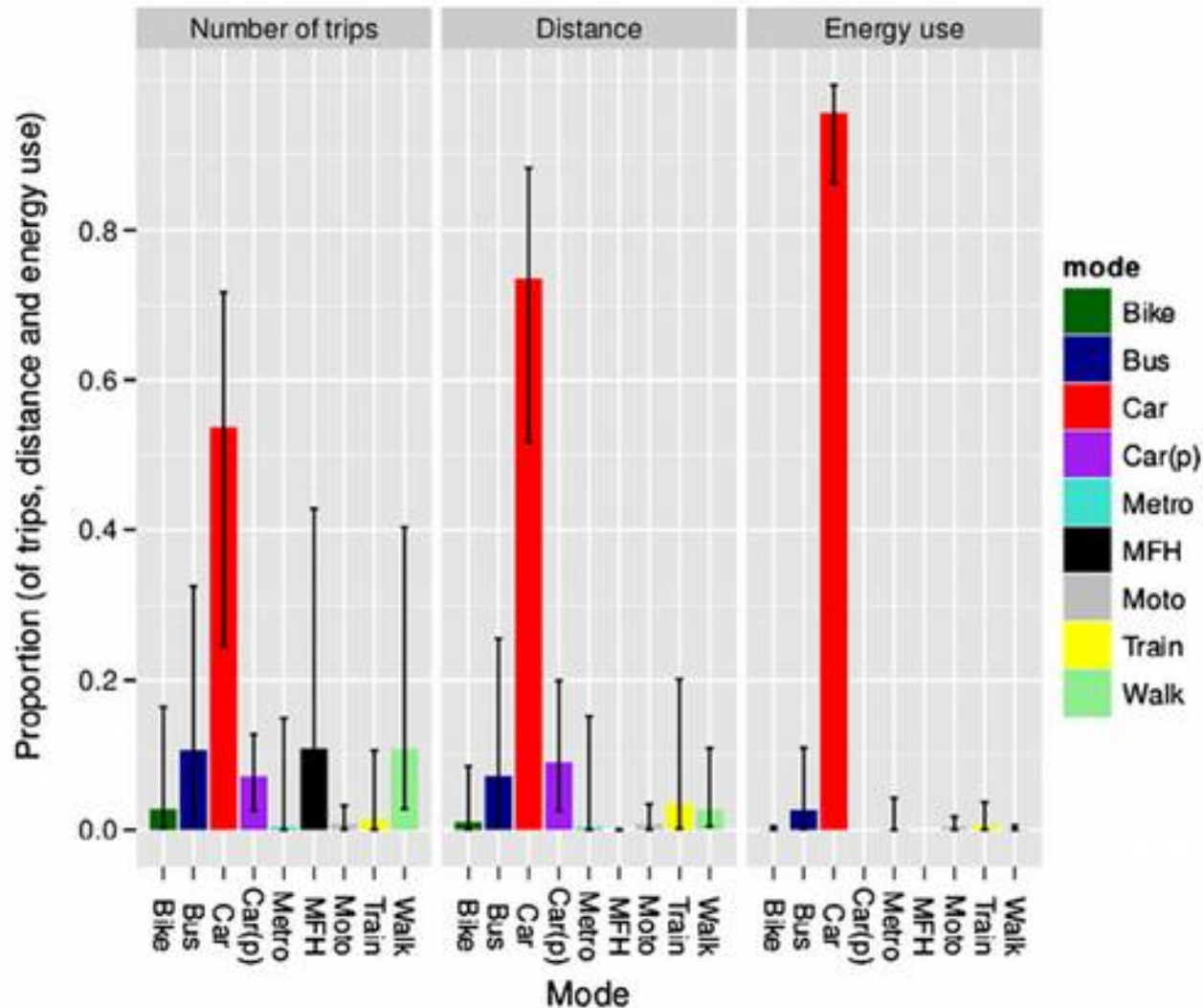
Pilbara, western Australia
<http://tinyurl.com/bde9y56>

Source: The energy costs of commuting: a spatial microsimulation approach
<http://etheses.whiterose.ac.uk/5027/>



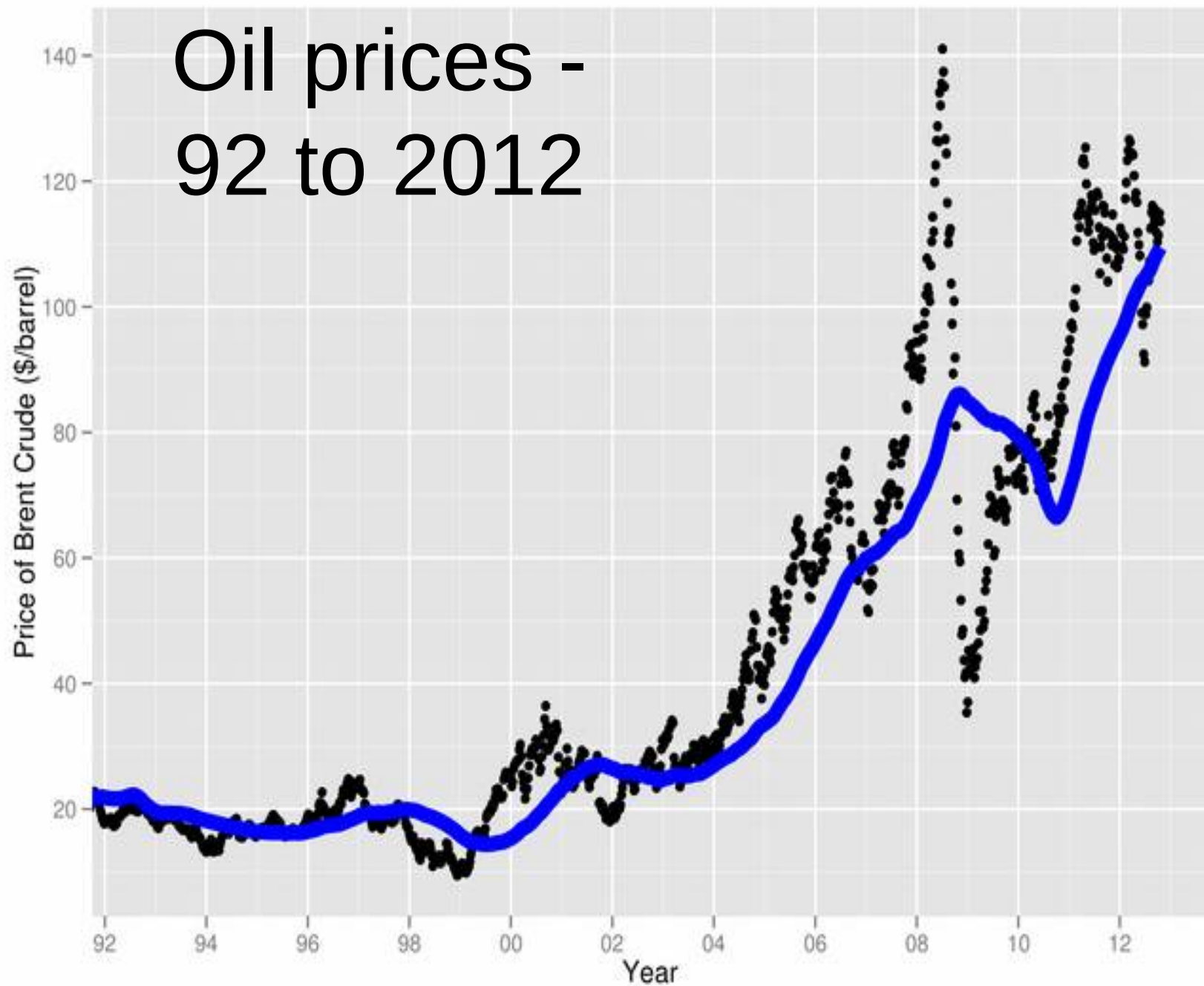
Application to the energy crisis

R. Lovelace, I. Philips/Geoforum 51 (2014) 169–182



Trips vs distance
vs energy use
measures of
transport system
performance. See
Lovelace and
Philips (2014).

Oil prices - 92 to 2012



Oil prices: 2009 until present



The threat of LOW oil prices!

Russia to fall into recession amid sanctions and plunging oil price

Economics ministry cuts its GDP growth forecast of 1.2% in 2015 to a 0.8% fall amid financial fallout over Ukraine and lower commodity prices



Local natural disasters



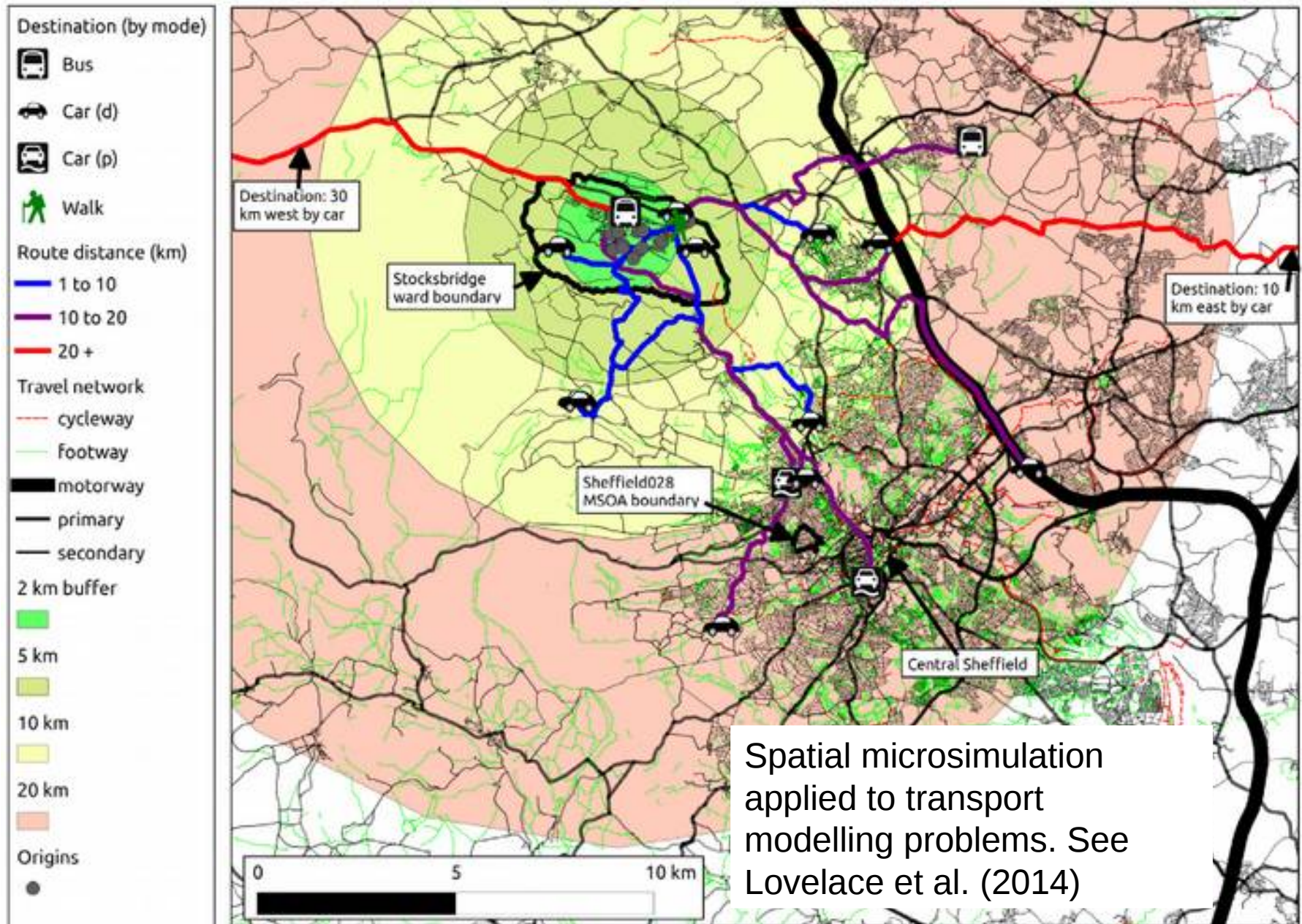
Coastlines in 3000 AD?

<http://ngm.nationalgeographic.com/2013/09/rising-seas/if-ice-melted-map>

Human-caused shocks



DfT bid + agent-based models



The wider picture: reducing the need for resilience

"We're not going to be able to burn it all. Over the course of the next several decades, we're going to have to build a ramp from how we currently use energy to where we need to use energy. And we're not going to suddenly turn off a switch and suddenly we're no longer using fossil fuels, but we have to use this time wisely, so that you have a tapering off of fossil fuels replaced by clean energy sources" (Obama, 2014)

References

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