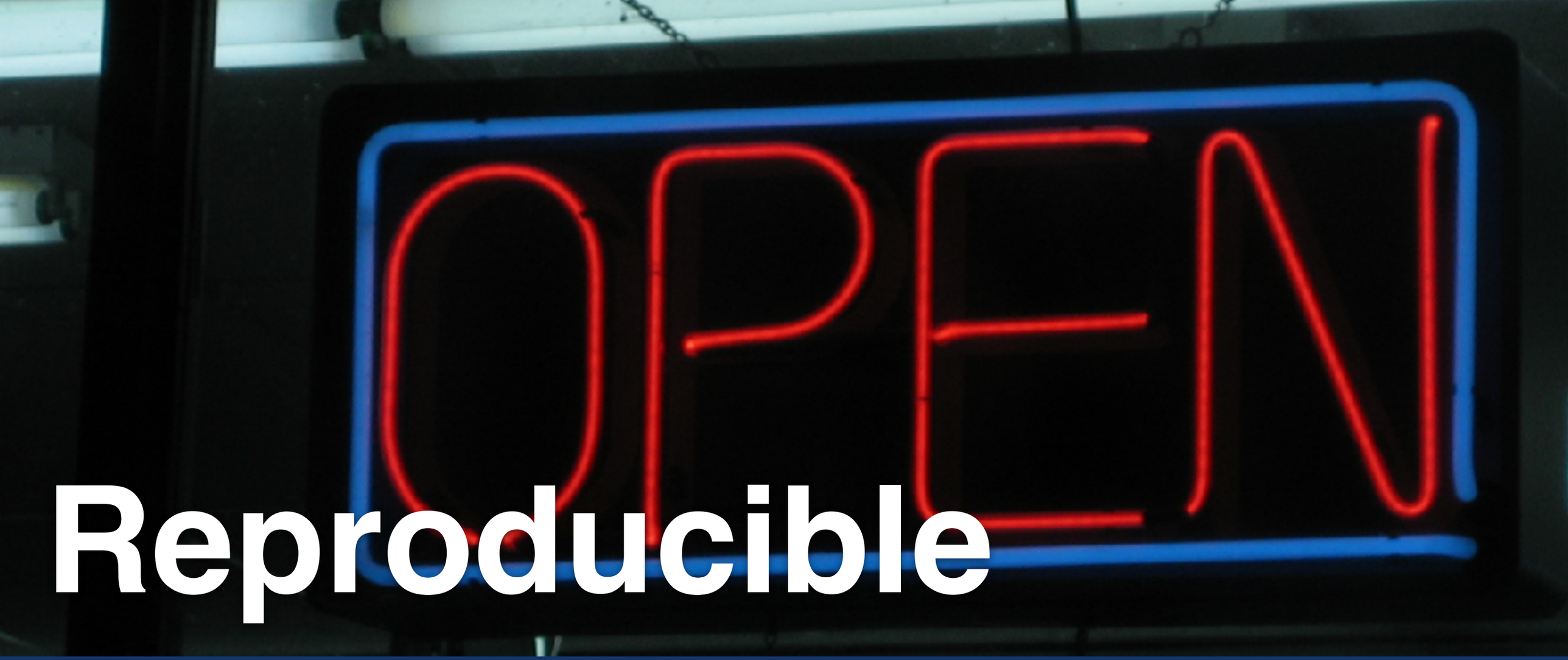

Reproducible Research

Alex Singleton
Professor of Geographic Information Science
Department of Geography and Planning

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Consumer Data Research Centre

Northern Regional Data Facility

www.cdrc.ac.uk
www.geographicdatascience.com
www.alex-singleton.com
@alexsingleton

LIFE CHANGING | World Shaping

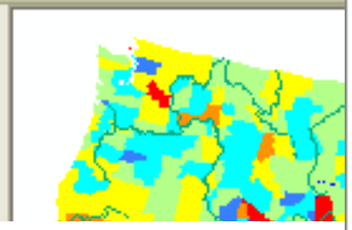
Untitled - ArcMap - ArcInfo

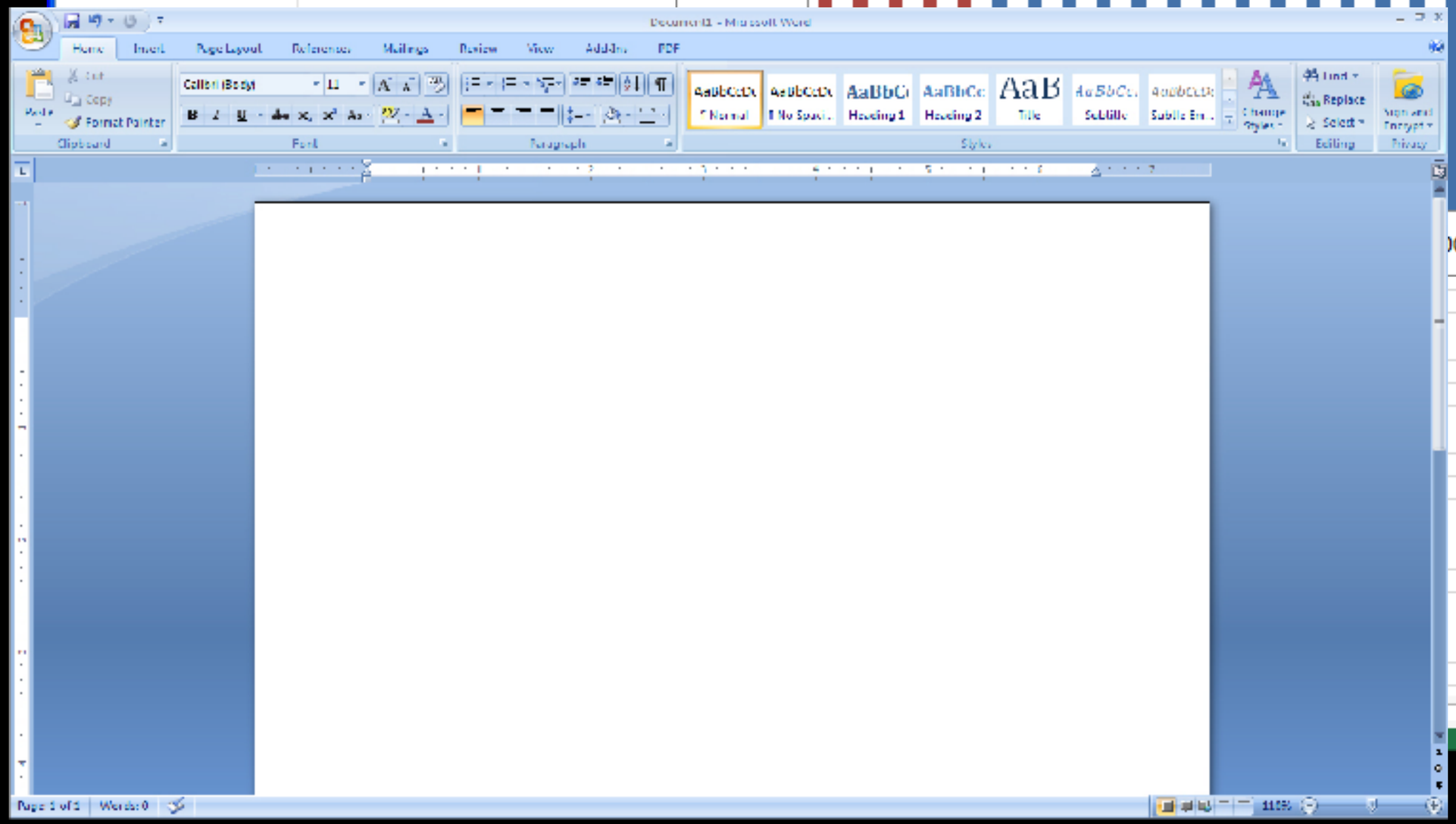
File Edit View Bookmarks Insert Selection Geoprocessing

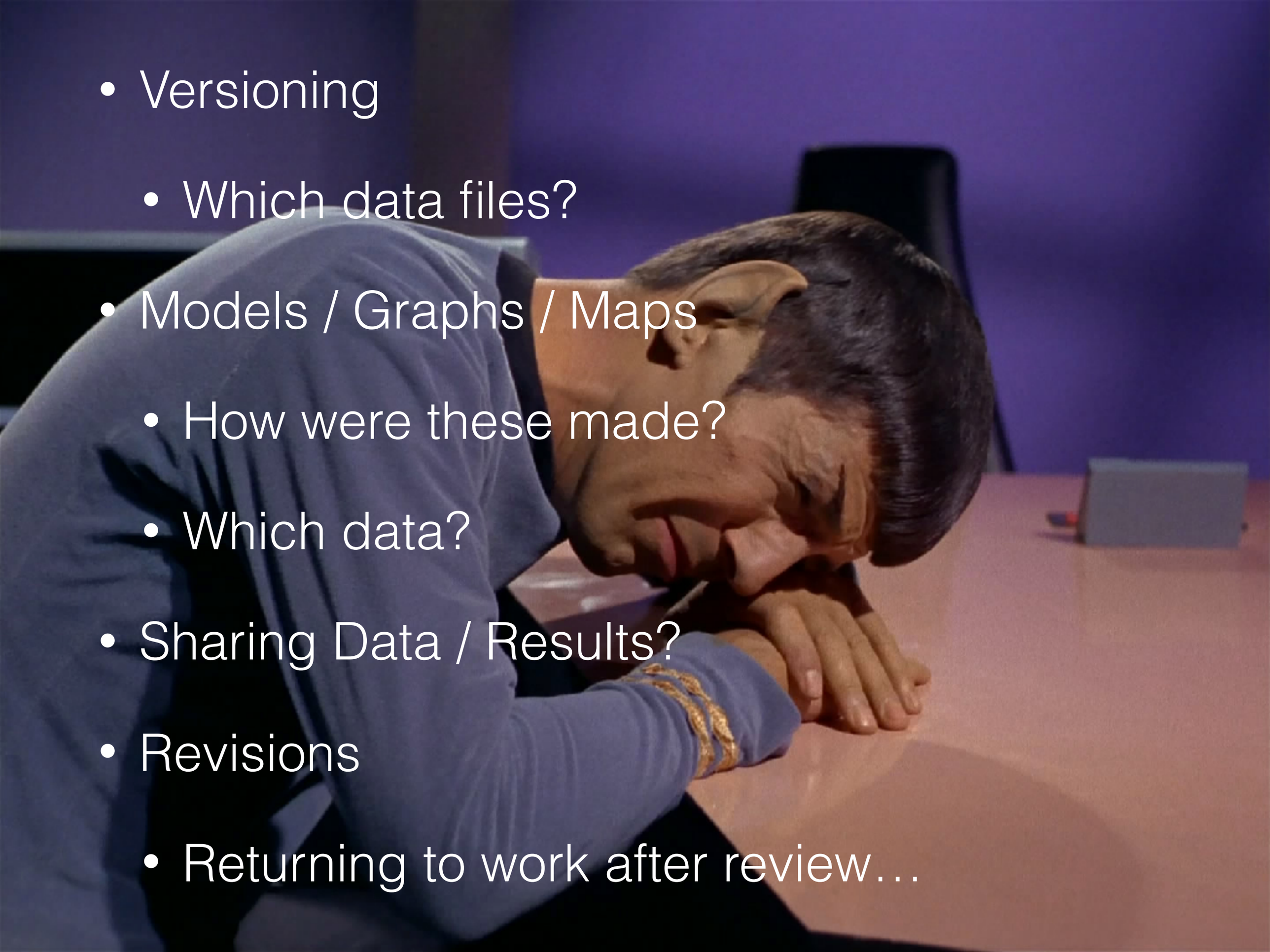
1:38,029,07

Table Of Contents

us_rivers







- Versioning
  - Which data files?
- Models / Graphs / Maps
  - How were these made?
  - Which data?
- Sharing Data / Results?
- Revisions
  - Returning to work after review…

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Does High Public Debt Consistently
Stifle Economic Growth?
A Critique of Reinhart and Rogoff

Thomas Herndon, Michael Ash and Robert Pollin

April 2013

WORKINGPAPER SERIES
Number 322

POLITICAL RESEARCH

Does High Public Debt Consistently Stifle Economic Growth? A Critique of Reinhart and Rogoff

Thomas Herndon* Michael Ash Robert Pollin

April 15, 2013

JEL CODES: E60, E62, E65

Abstract

We replicate Reinhart and Rogoff (2010a and 2010b) and find that coding errors, selective exclusion of available data, and unconventional weighting of summary statistics lead to serious errors that inaccurately represent the relationship between public debt and GDP growth among 20 advanced economies in the post-war period. Our finding is that when properly calculated, the average real GDP growth rate for countries carrying a public-debt-to-GDP ratio of over 90 percent is actually 2.2 percent, not −0.1 percent as published in Reinhart and Rogoff. That is, contrary to RR, average GDP growth at public debt/GDP ratios over 90 percent is not dramatically different than when debt/GDP ratios are lower.

We also show how the relationship between public debt and GDP growth varies significantly by time period and country. Overall, the evidence we review contradicts Reinhart and Rogoff's claim to have identified an important stylized fact, that public debt loads greater than 90 percent of GDP consistently reduce GDP growth.

American Economic Review: Papers & Proceedings 100 (May 2010): 573–578
http://www.aeaweb.org/articles.php?doi=10.1257/aer.100.2.573

Growth in a Time of Debt

By CARMEN M. REINHART AND KENNETH S. ROGOFF*

In this paper, we exploit a new multi-country historical dataset on public (government) debt to search for a systemic relationship between high public debt levels, growth and inflation.[1] Our

especially against the backdrop of graying populations and rising social insurance costs? Are sharply elevated public debts ultimately a manageable policy challenge?

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http://scholar.harvard.edu/files/rogoff/files/growth_in_time_debt_aer.pdf

UEA University of East Anglia

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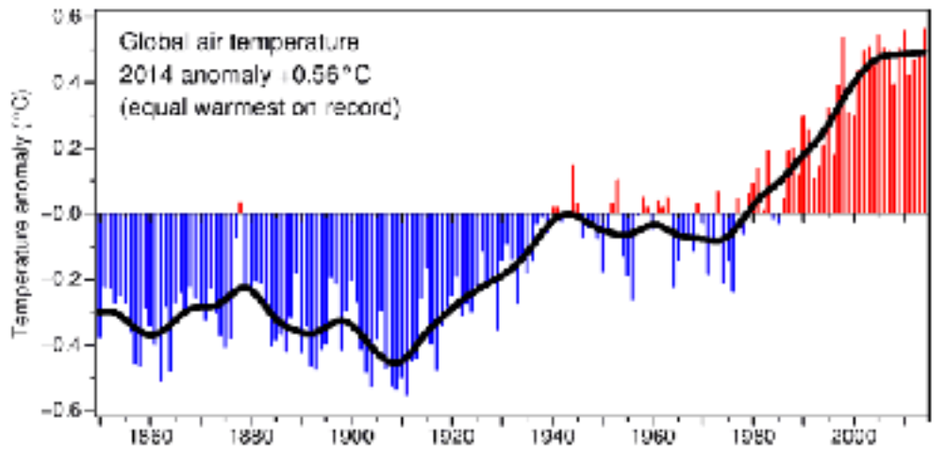
The aim of the Climatic Research Unit (CRU) is to improve scientific understanding in

- past climate history and its impact on humanity
- the course and causes of climate change during the present century
- prospects for the future



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- Winter is coming: British weather set to become more unsettled
- Avoiding overconfidence in climate projections
- Mona Lamb

UEA University of East Anglia

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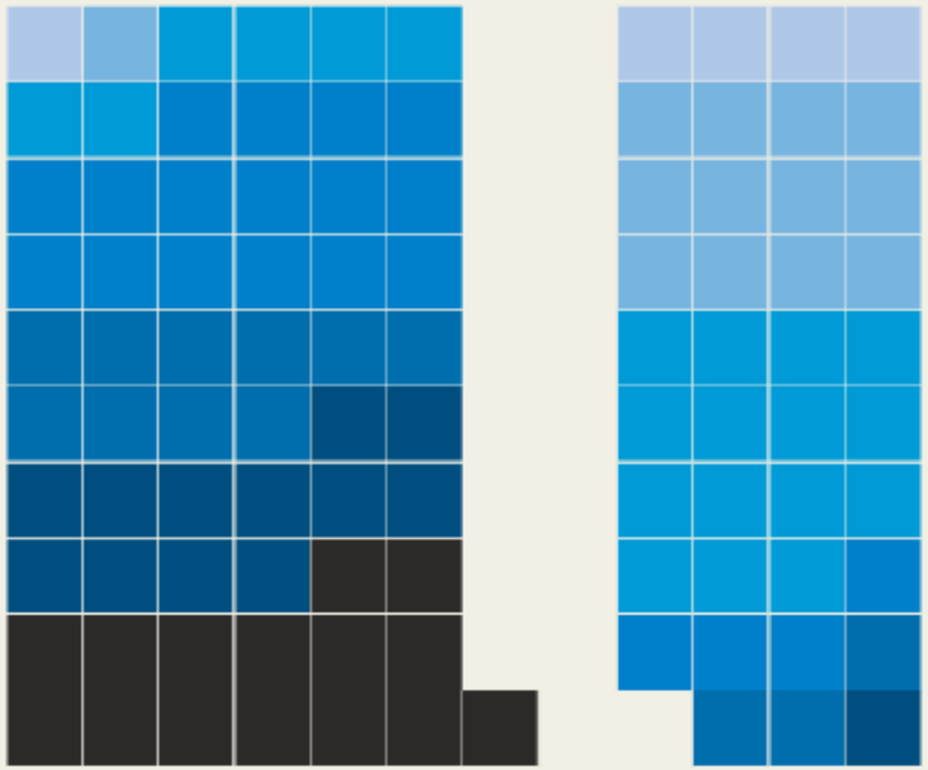
2009 Email Hack - “Climategate”

RELIABILITY TEST

An effort to reproduce 100 psychology findings found that only 39 held up.* But some of the 61 non-replications reported similar findings to those of their original papers.

Did replicate match original's results?



Replicator's opinion: How closely did findings resemble the original study:

- Virtually identical
- Extremely similar
- Very similar
- Moderately similar
- Somewhat similar
- Slightly similar
- Not at all similar

* based on criteria set at the start of each study

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http://www.nature.com/news/first-results-from-psychology-s-largest-reproducibility-test-1.17433

Reproducible Research

Data → Methods → Results → Findings / Conclusions

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Reproducible Research

- Help mitigate potentially erroneous conclusions
- Give public greater assurance
- Publicly funded should mean public
- It is happening already…

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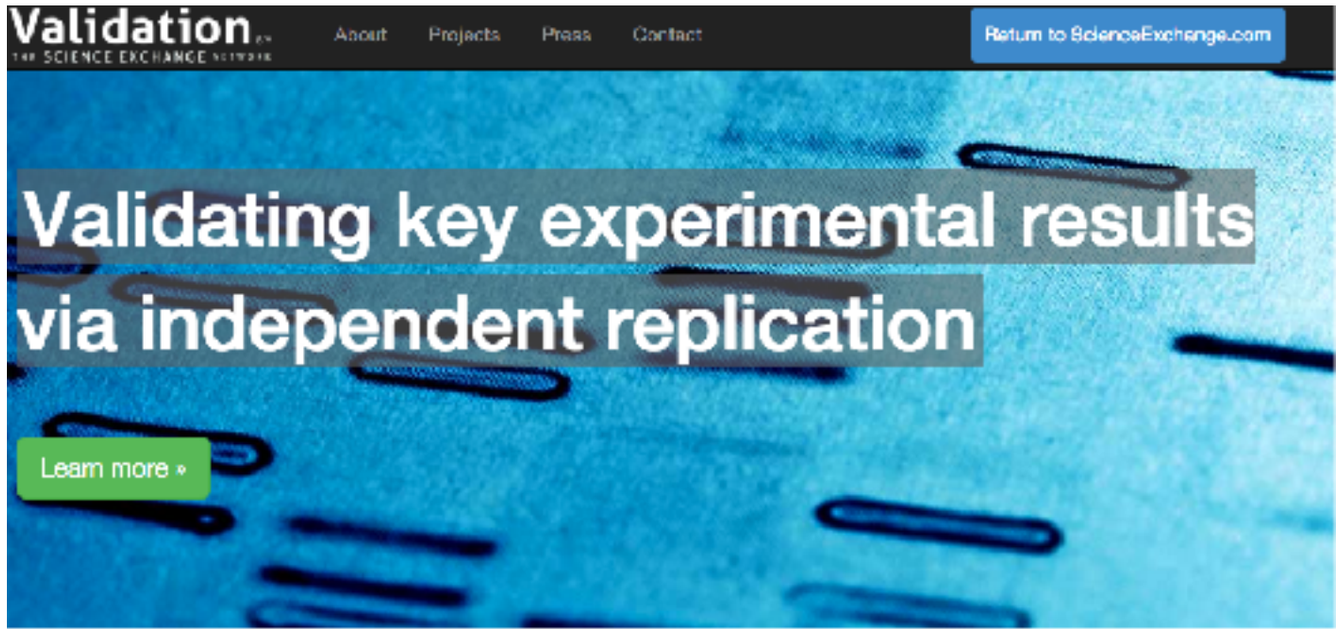
Reproducible Research

Number of initiatives to test reproducible research



As seen in

Science BBC nature The Economist nature biotechnology REUTERS

Major projects

Reproducibility Initiative

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http://validation.scienceexchange.com

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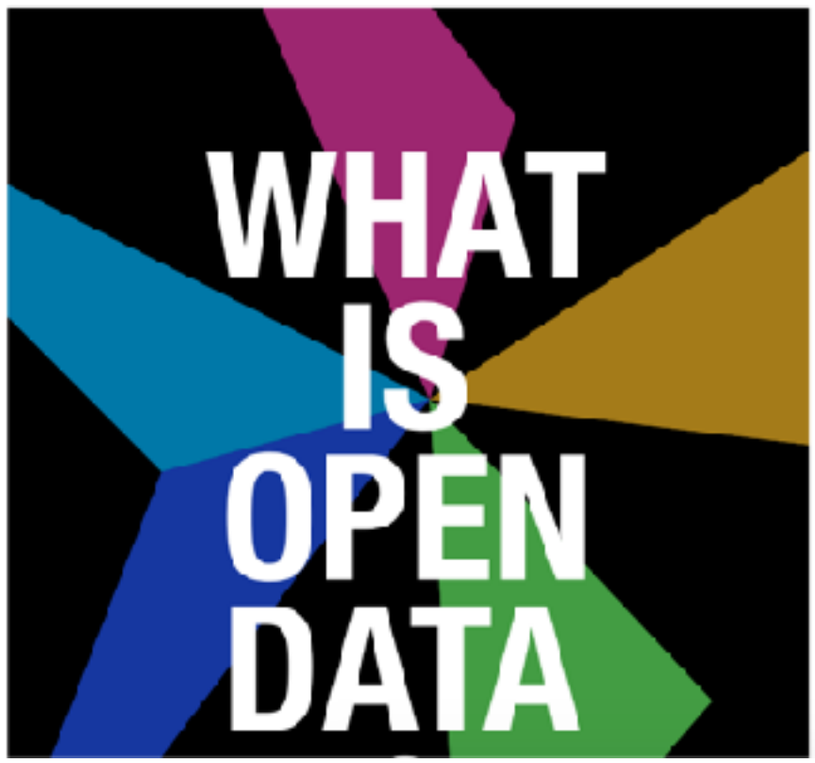

5 reasons to come to the ODI Summit 2015

Open Data Institute

23 September 2015

BLOG

ODI and Future Cities Catapult share joint vision for

NYC OpenData **1300+** Data Sets Available

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Taxis, Taxis, Everywhere

This data set contains information on the millions of trips taken by New York City's taxis on an annual basis. Records include pick-up and drop-off dates/times, pick-up and drop-off locations, trip distances, itemized fares, rate types, payment types, and driver-reported passenger counts. Click here to view Taxi Trip Data.

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The Administrative Data Research Network is a UK-wide **partnership** between universities, government departments and agencies, national statistics authorities, the third sector, funders and researchers.

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DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP)

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From 3/23/2015 to present. This information is automatically updated daily.

Zoom and click markers to explore.

http://meredithmmyers.com/ratmap/#/

An open source project.

Created by @meredithmmyers 2014.

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Queens Drive A5058

Allerton Road B5180

Greenbank Halls of Residence

Liverpool College (Senior and Nursery)

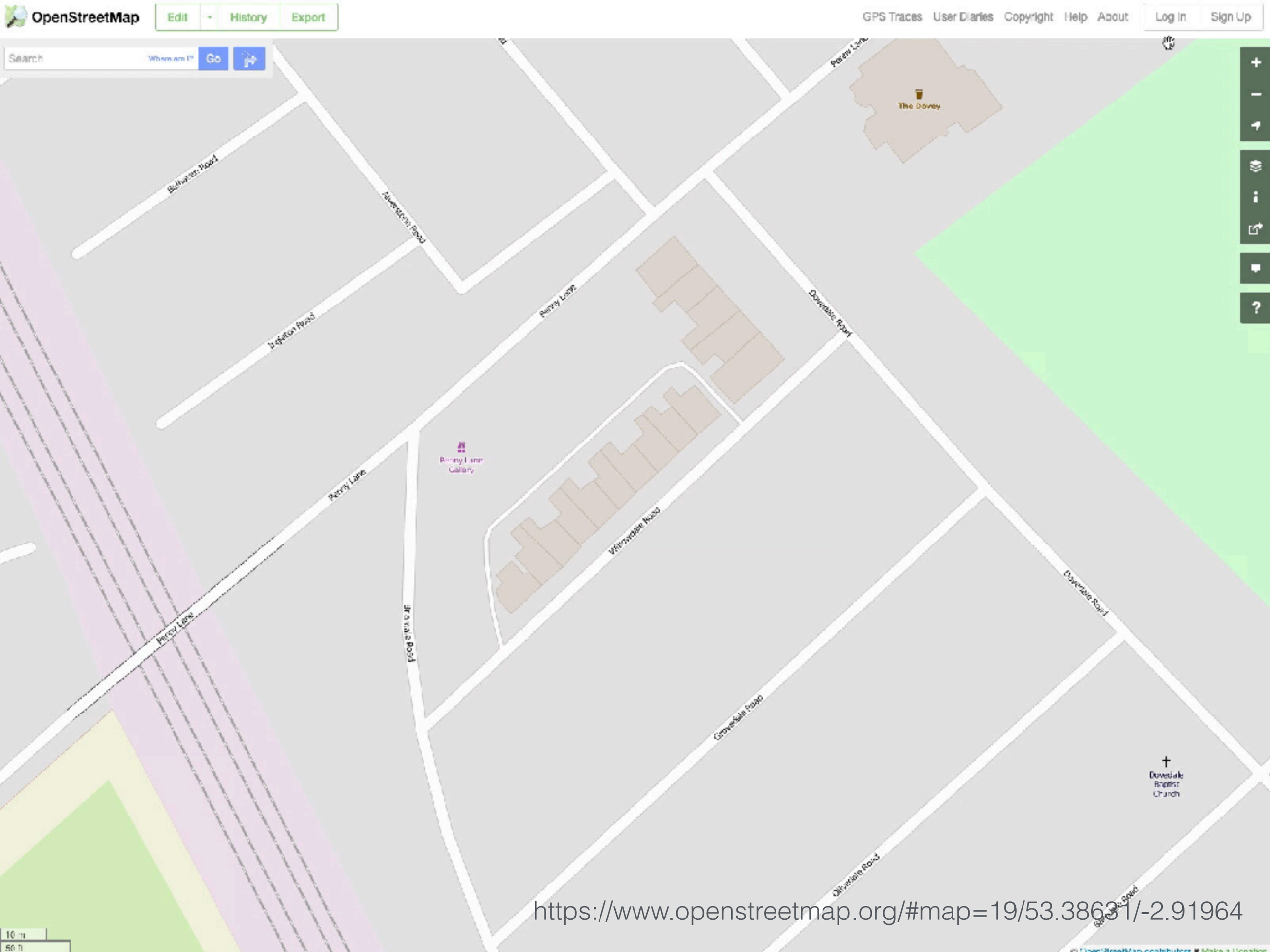
Liverpool College (Primary)

Sefton Park

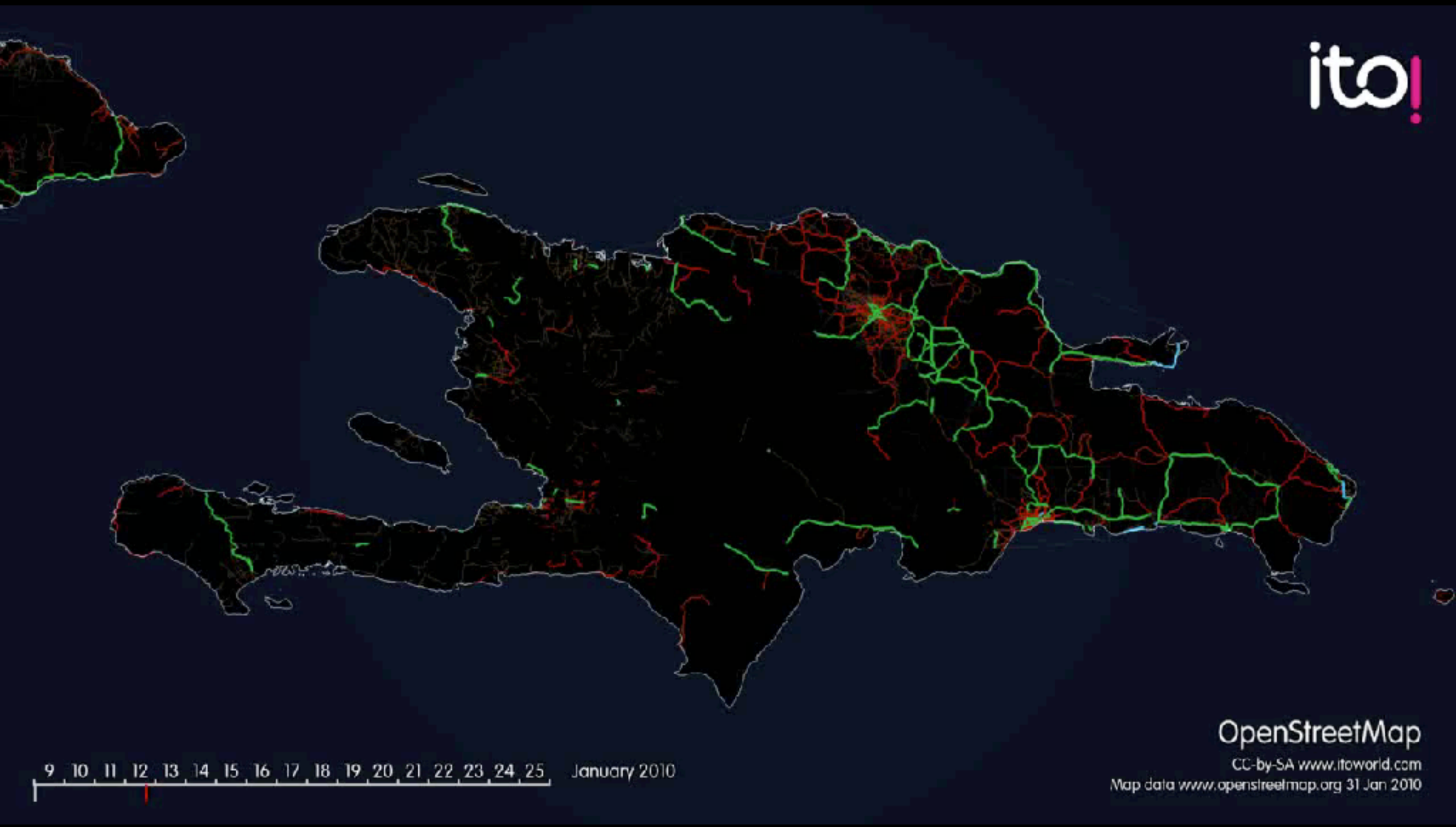
Allerton

Tesco

100 m



https://www.openstreetmap.org/#map=19/53.38631/-2.91964



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An ESRC Data Investment

Alex Singleton 0

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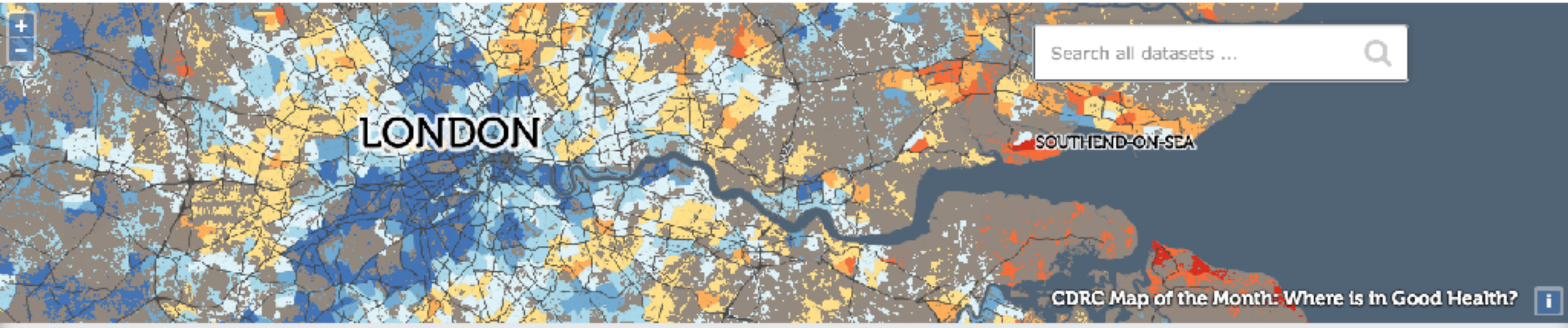

CDRC Data statistics

11	30	27.6GB	3.9k
topics	products	data	downloaded

Welcome to CDRC Data

We are an academic led, multi-institution laboratory which discovers, mines, analyses and synthesises consumer-related datasets from around the UK. The CDRC is an ESRC Data Investment.

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CDRC 2011 Census Data Packs for Local Authority District: Liverpool (E08000012) Open

This census data pack provides 2011 Census estimates for the 'Key Statistic' and 'Quick Statistic' tables within the Local Authority District: Liverpool (E08000012) at the...

ZIP

CDRC 2015 OS Geodata Pack - Liverpool (E08000012) Open

This CDRC 2015 OS Geodata Pack provides Ordnance Survey Open Map Shapefiles for the Local Authority District: Liverpool (E08000012) Contents: RoadTunnel...

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CDRC Maps Retail Centre Locations Open

These data represent the retail centre centroids used on the CDRC Maps website. They were created as centroid locations taken from those definitions of retail cores defined as...

ZIP

https://data.cdrc.ac.uk/

var requestUrl = app.baseURL + "/w/api.php";
$.ajax({
type: 'GET',
url: requestUrl,
data: {
action: 'opensearch',
search: term,
format: 'json'
},
success: function(data) {
renderResults(data);
}
});
} else {
chrome.showNoConnectionMessage();
chrome.showContent();
}
Methods

The R Project for Statistical Computing

[Home]

Other

Links

Bioconductor
Related Projects

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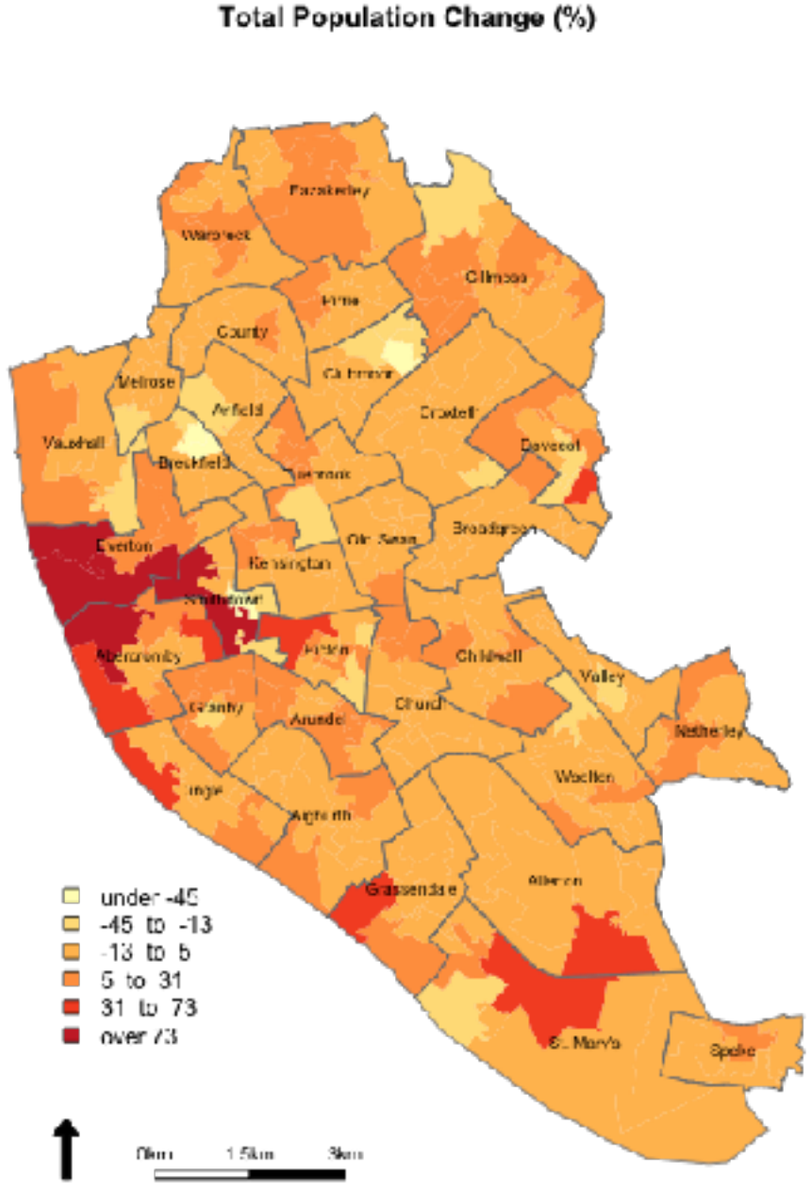
https://www.r-project.org/

as a GIS



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as a GIS

breaks <- classIntervals(**variable_to_map**, n = 6, style = “fisher”)

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 [36] 3 3 3 4 4 4 4 4 3 3 4 3 2 1 3 1 3 3 3 3 3 3 4 3 3 3 3 3 3 3 3 4 4 3 3
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[246] 4 3 3 2 4 3 4 3 3 3 3 4 3 3 2 3 3 3 3 3 4 2 3 3 3 4 3 3 3 4 4 3 4 3 3
[281] 3 3 4 3 3 3 3 3 4 2 3
```

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as a GIS

my_colours <- c(“#FFFFB2”,”#FED976”,”#FEB24C”,
”#FD8D3C”,”#F03B20","#BD0026")

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as a GIS

my_colours[findInterval(**variable_to_map**, **breaks**)]

```
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  [8] "#FD8D3C" "#FEB24C" "#FEB24C" "#FEB24C" "#FEB24C" "#FEB24C" "#FD8D3C"
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[288] "#FEB24C" "#FD8D3C" "#FED976" "#FEB24C"
```

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as a GIS

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plot(LSOA, col = my_colours[findInterval(variable_to_map,
breaks)], axes = FALSE, border = NA)
```

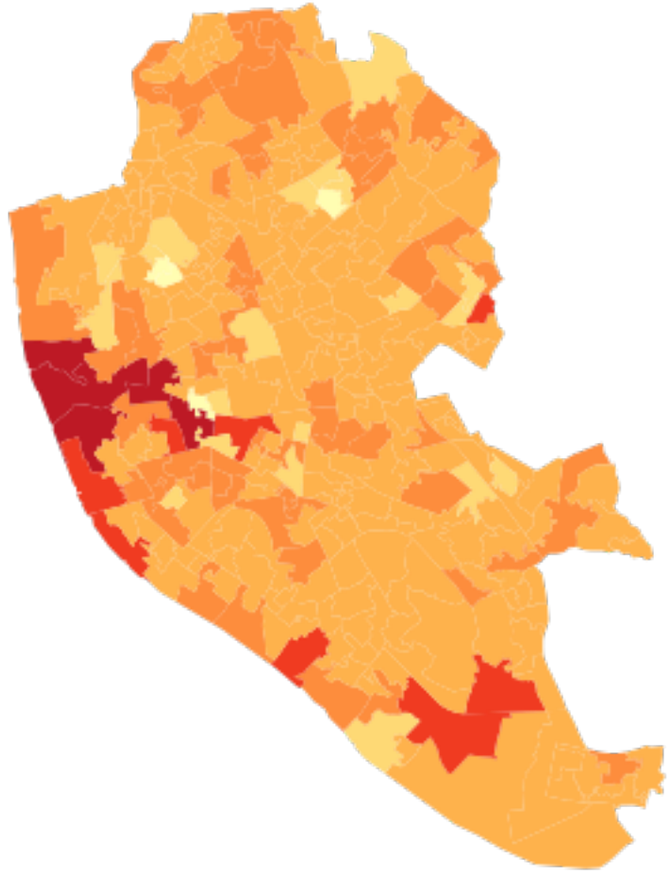

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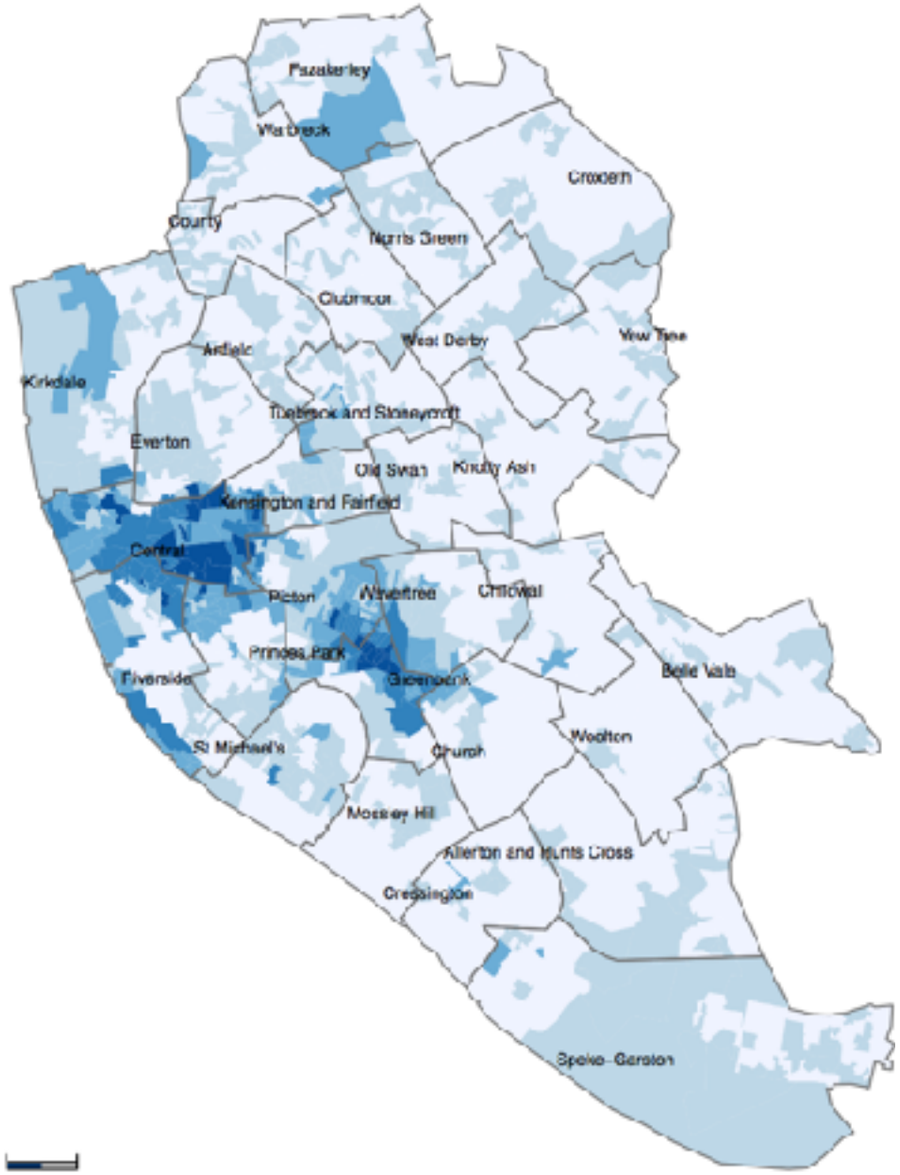


Figure 15: Age structure (Age 20 to 24)

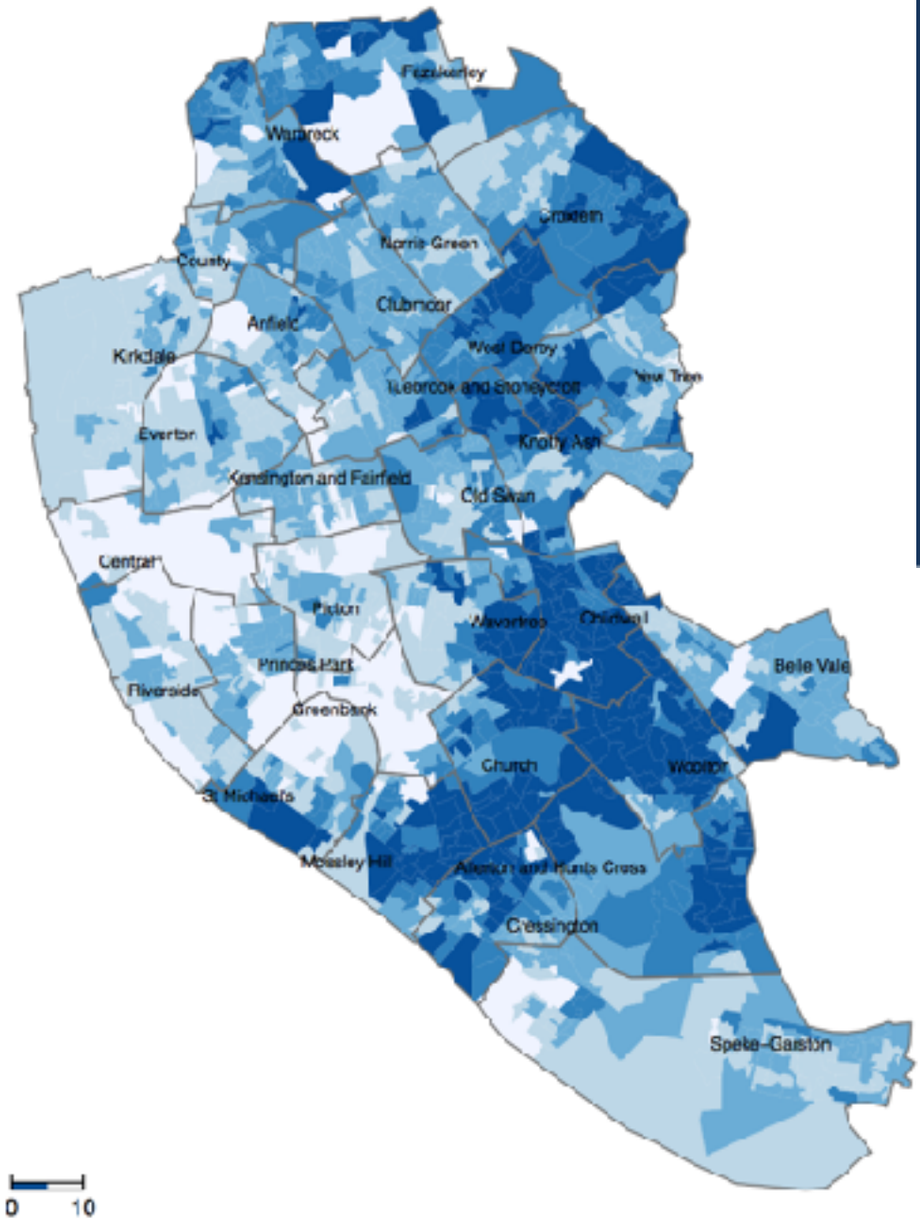
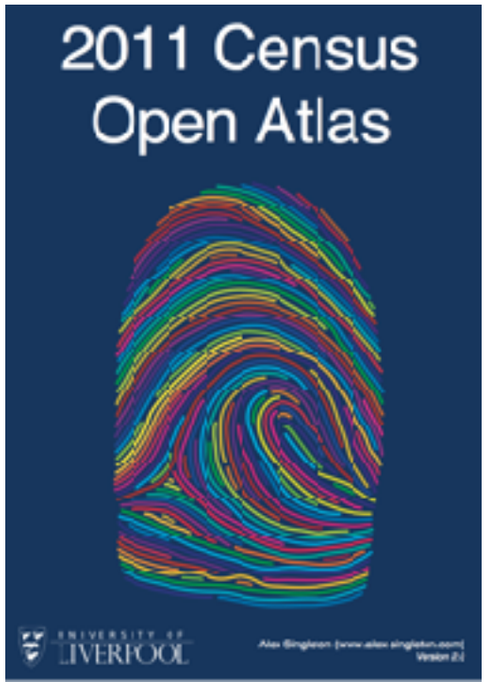


Figure 25: Marital and civil partnership status (Married)



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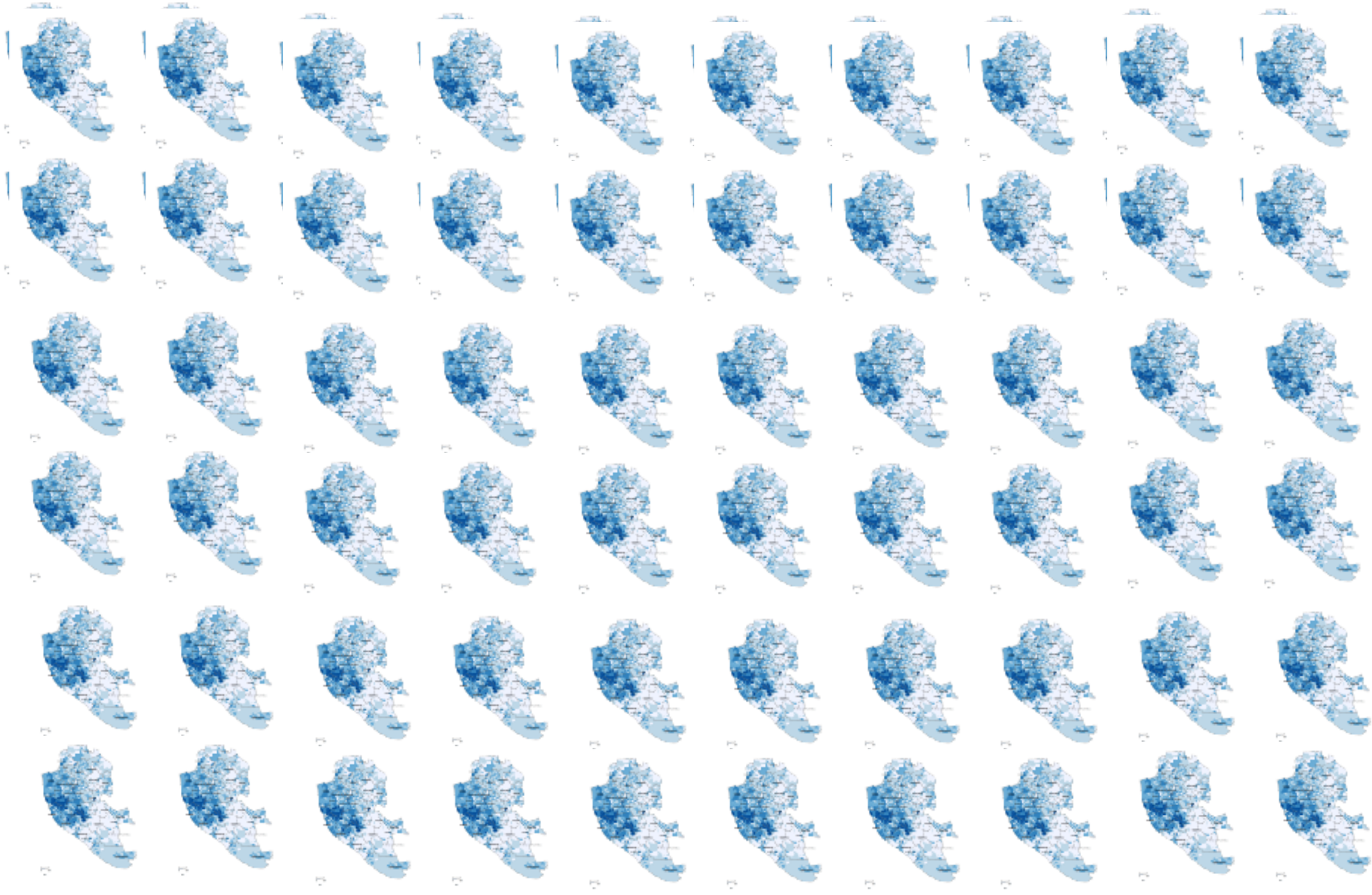
http://www.alex-singleton.com/r/2014/02/05/2011-census-open-atlas-project-version-two/



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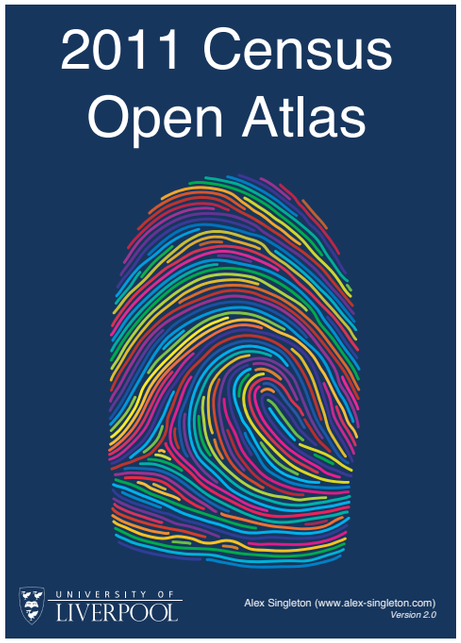
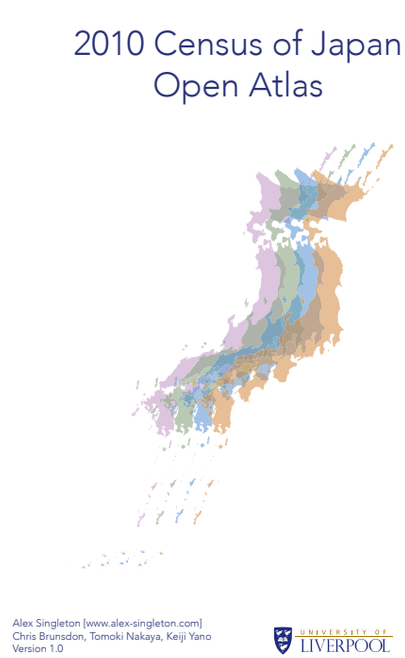
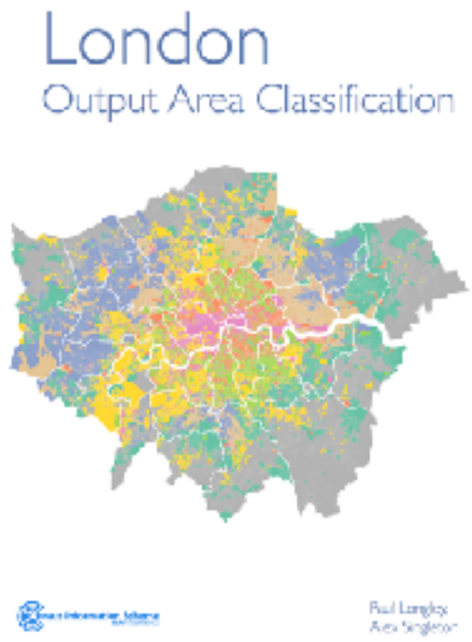
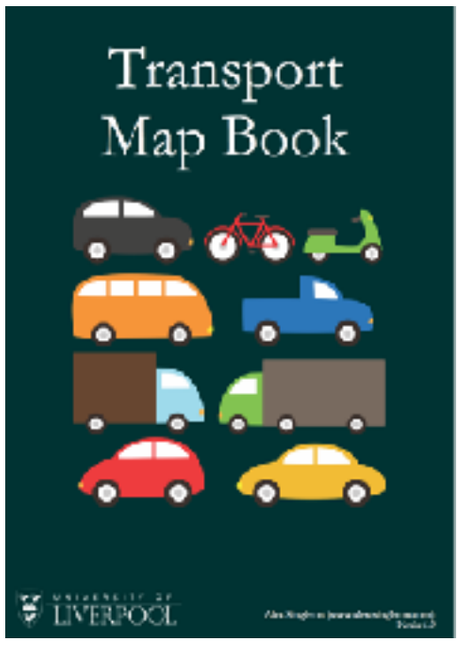
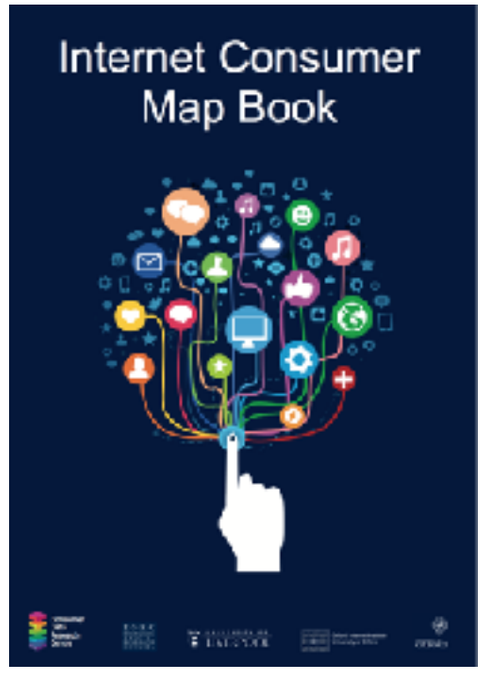
134,567 maps; 6.9 years; £138,207











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Version Control

Atlassian Bitbucket

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PUBLIC alexsingleton / **Open-Atlas**

Unwatch 1 | Star 0 | Fork 0

Description

Short description of this repository

Website

Website for this repository (optional)

Save or cancel

3 commits | 2 branches | 0 releases | 1 contributor

branch: **master** **Open-Atlas** /

minor change

alexsingleton authored 3 days ago — latest commit b78e3d93bb

Code	Minor changes	3 days ago
atlas	Initial Commit	3 days ago
README.md	minor change	3 days ago

README.md

2011 Census Open Atlas

Aim

The code contained in this repository was used to create version two of the England and Wales 2011 Open

HTTPS clone URL

https://github.com

You can clone with HTTPS, SSH, or Subversion.

Clone in Desktop

Download ZIP

2011 Census Open Atlas - England and Wales

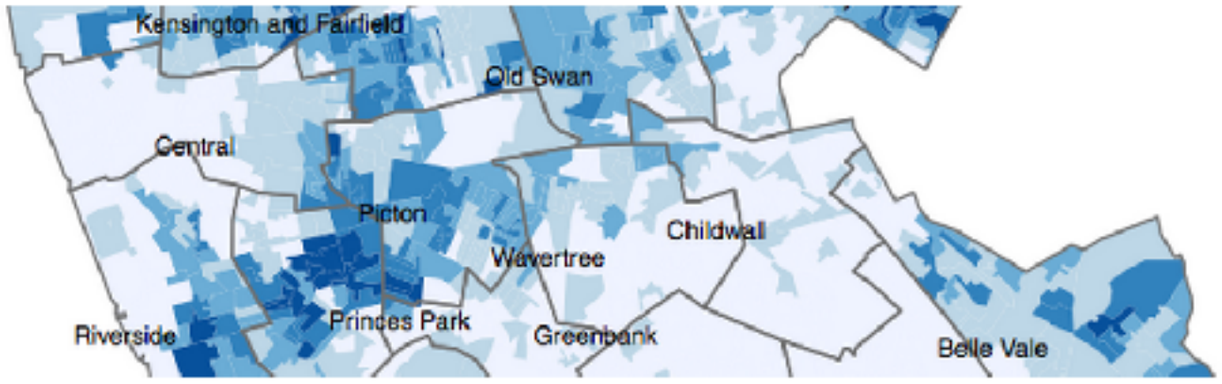
Output Area level census atlases by local authority district

View the Project on GitHub
alexsingleton/Open-Atlas

Download ZIP File | Download TAR Ball | View On GitHub

This project is maintained by alexsingleton

Hosted on GitHub Pages — Theme by orderedlist

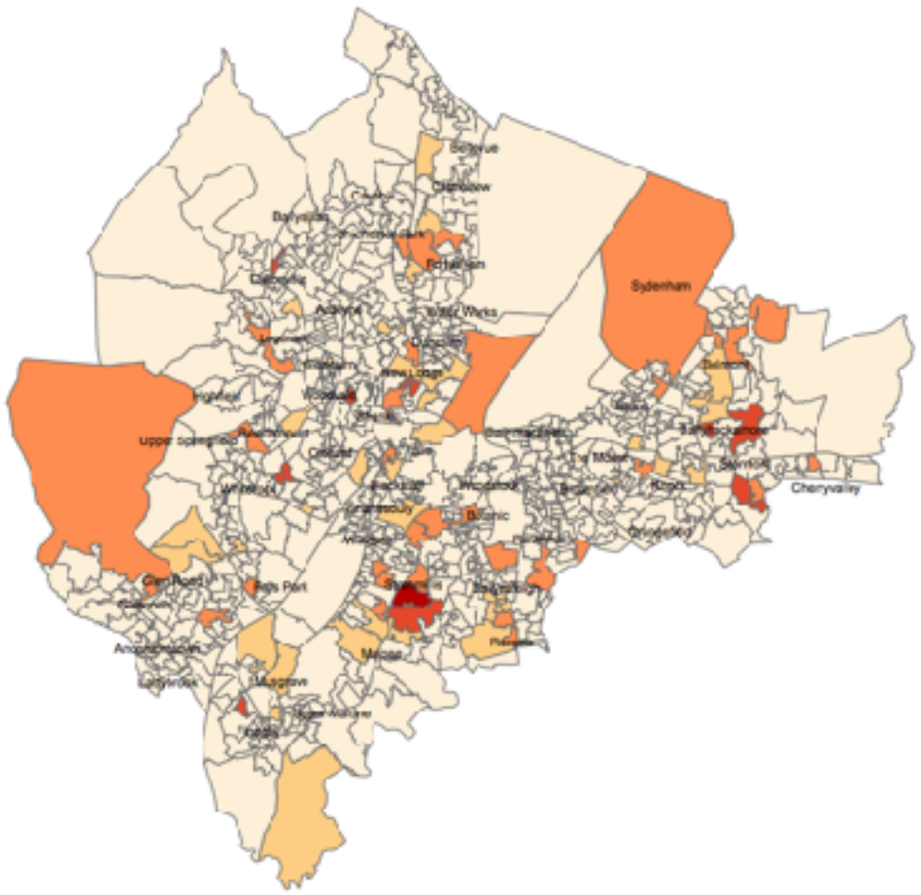


For further details about the open atlas project see the blog post; or for the R code, click the link on the left.

Atlas Downloads

- E07000223 : Adur
- E07000026 : Allerdale
- E07000032 : Amber Valley
- E07000224 : Arun
- E07000170 : Ashfield
- E07000105 : Ashford
- E07000004 : Aylesbury Vale
- E07000200 : Babergh
- E09000002 : Barking and Dagenham
- E09000003 : Barnet
- E08000016 : Barnsley
- E07000027 : Barrow-in-Furness
- E07000066 : Basildon
- E07000084 : Basingstoke and Deane
- E07000171 : Bassetlaw
- E06000022 : Bath and North East Somerset
- E06000055 : Bedford
- E09000004 : Bexley
- E08000025 : Birmingham

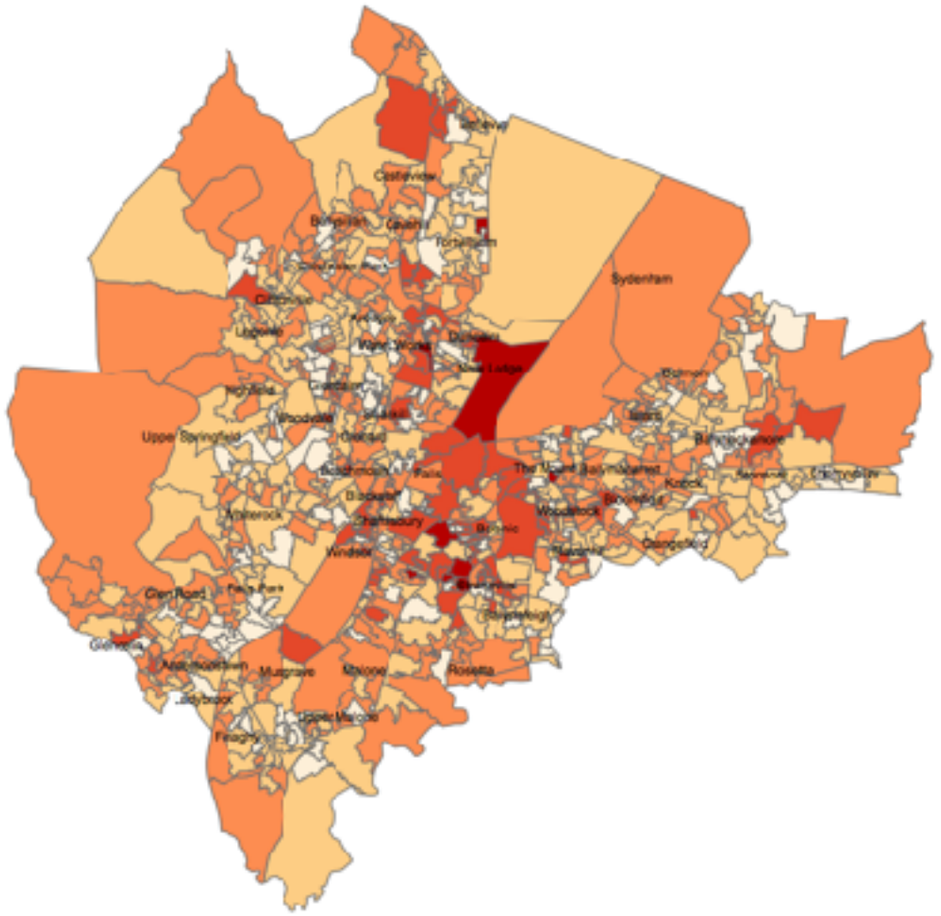
2011 Census Maps for:Belfast
Table: KS101NI
Variabe:KS101NI0009 (Usual residents: Lives in a communal establishment)
Geography:Statistical Areas



Map created by James Reid (james.reid@ed.ac.uk) derived from original code created by A.Singleton as part of Open Census Atlas (http://www.alex-singleton.com/2011-census-open-atlas-project/)

Source: NISRA - Website: www.nisra.gov.uk. NISRA Digital boundaries are supplied under the Open Government Licence.
This work is licensed under a Creative Commons Attribution 3.0 Unported License.

2011 Census Maps for:Belfast
Table: KS101NI
Variable:KS101NI0006 (Usual residents: Males)
Geography:Statistical Areas



Map created by James Reid (james.reid@ed.ac.uk) derived from original code created by A.Singleton as part of Open Census Atlas (http://www.alex-singleton.com/2011-census-open-atlas-project/)

Source: NISRA - Website: www.nisra.gov.uk. NISRA Digital boundaries are supplied under the Open Government Licence.
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Results

Untitled

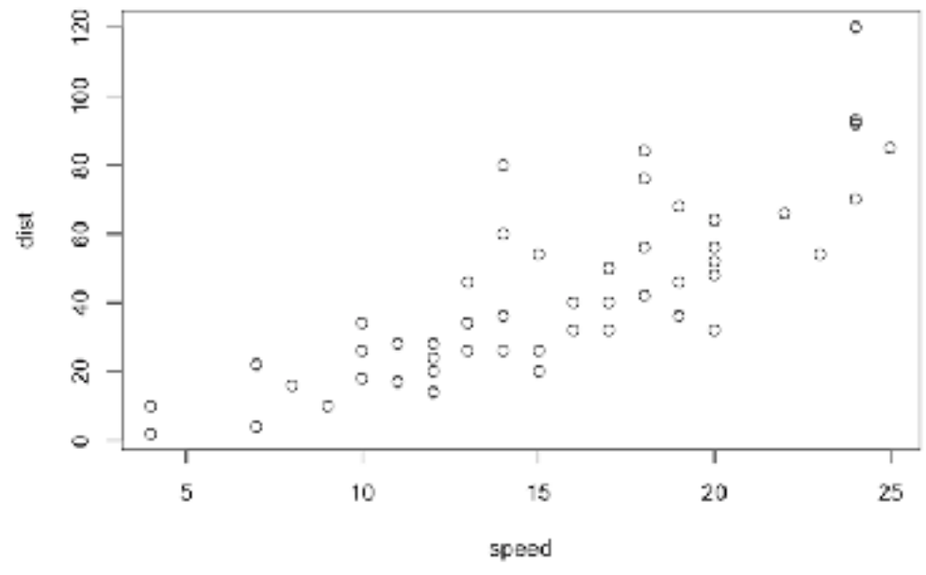
This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed           dist       
##  Min.   : 4.0   Min.   :  2.00  
##  1st Qu.:12.0   1st Qu.: 26.00  
##  Median :15.0   Median : 36.00  
##  Mean   :15.4   Mean   : 42.98  
##  3rd Qu.:19.0   3rd Qu.: 56.00  
##  Max.   :25.0   Max.   :120.00
```

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

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Regional Science

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http://www.tandfonline.com/loi/rsrs20

Example

CO^2 Emissions

- ~7.5 million school trips
  - 2007-2012 - Usual Travel Mode
- Data Department for Education; Department for Transport (*DVLA*)
- Suite of open source software

Singleton, A. (2013) A GIS Approach to Modelling CO2 Emissions Associated with the Pupil-School Commute. International Journal of Geographical Information Science, 28(2):256–273.

CO^2 Emissions

$$k_p = 2\left(d\left(i_p j_p t_p\right) e\left(t_p g_p\right) w\left(t_p\right)\right)$$

- *d* distance
- *p* pupil
- *i* pupil home postcode
- *j* school postcode
- *e* CO2g/km
- *t* transport mode
- *g* location

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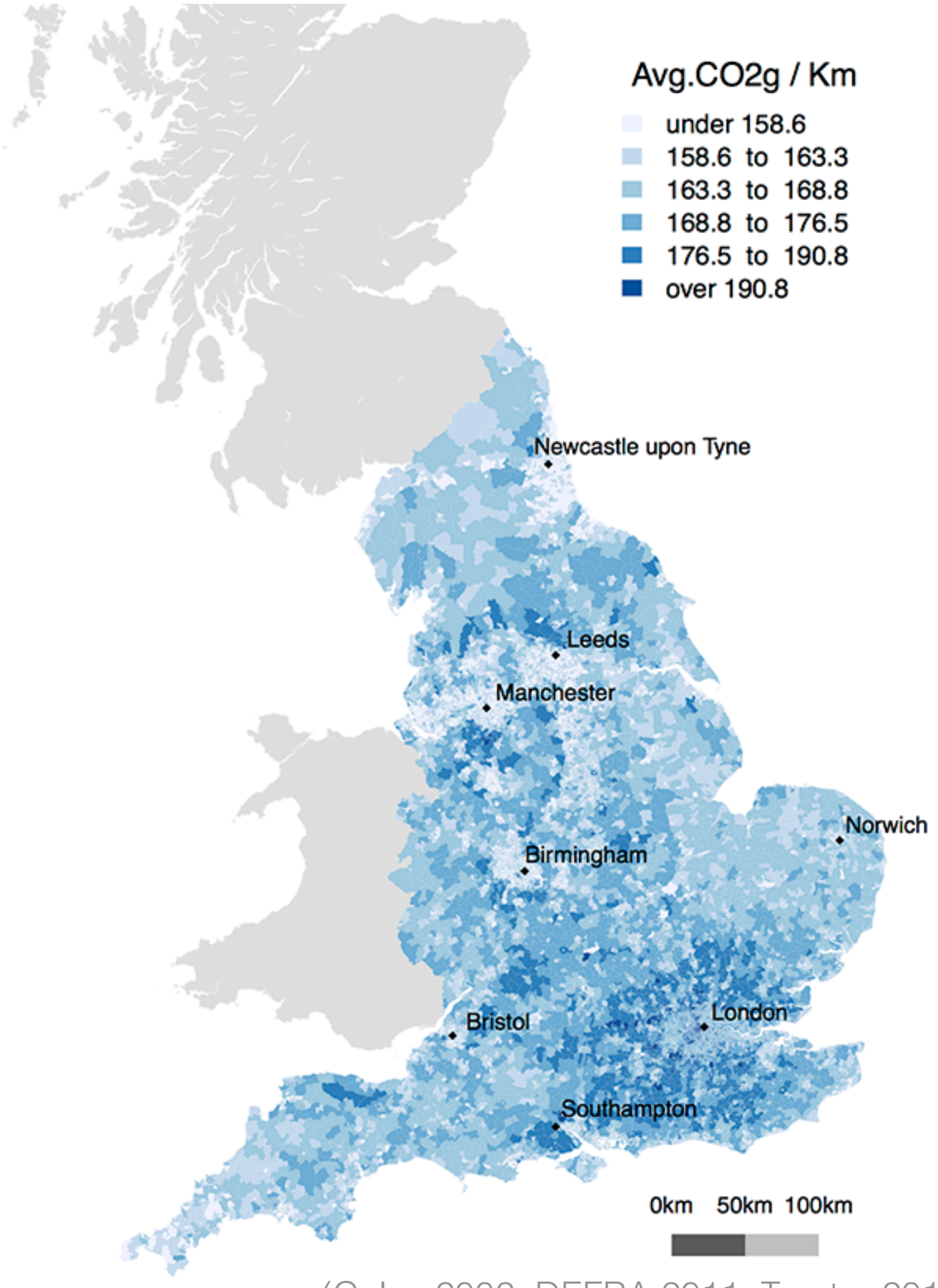
Transport Mode	Average
Taxi	150.3
Bus (London)	85.7
Bus (Non	184.3
Coach	30.0
Light Rail -	71
London (DLR)	68.3
Birmingham /	70.5
Newcastle	103.0
Croydon	44.3
Manchester	39.5
Nottingham	#
Sheffield	96.8
National Rail	53.4
London	73.1
Cycling	8.3
Walking	11.4



(Coley 2002, DEFRA 2011, Tranter 2012)

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Data Processing

OpenStreetMap

Roads / Paths
.osm XML

Light Rail / Tube
railway=light_rail
railway=subway

Routino

QGIS

Cleaning
1) Single lines
2) Nodes join
3) Nodes at stations

OS OpenData™

Meridian2

Railways

QGIS

PostgreSQL

Department for Transport

Department for Education

Office for National Statistics

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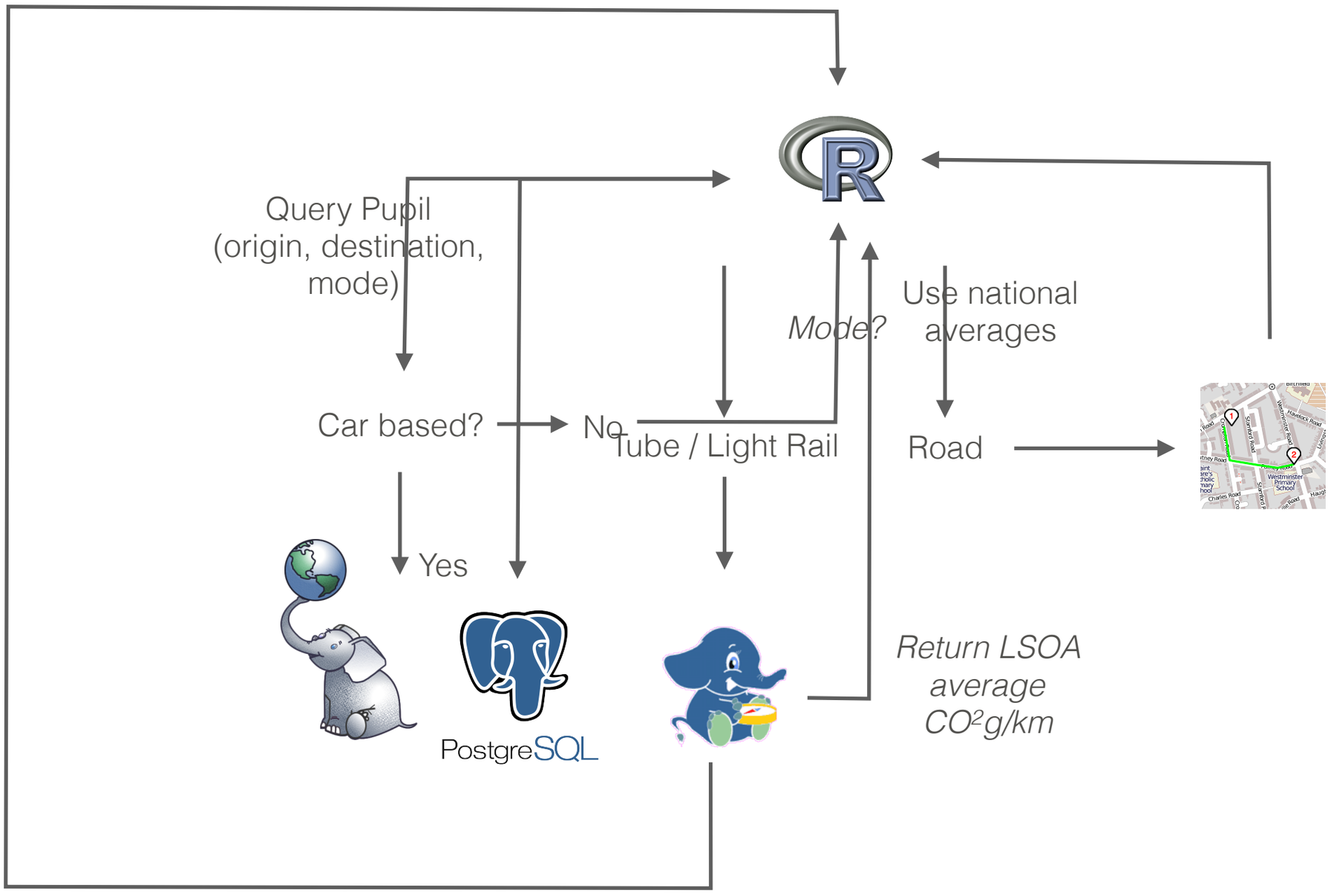
Software Infrastructure



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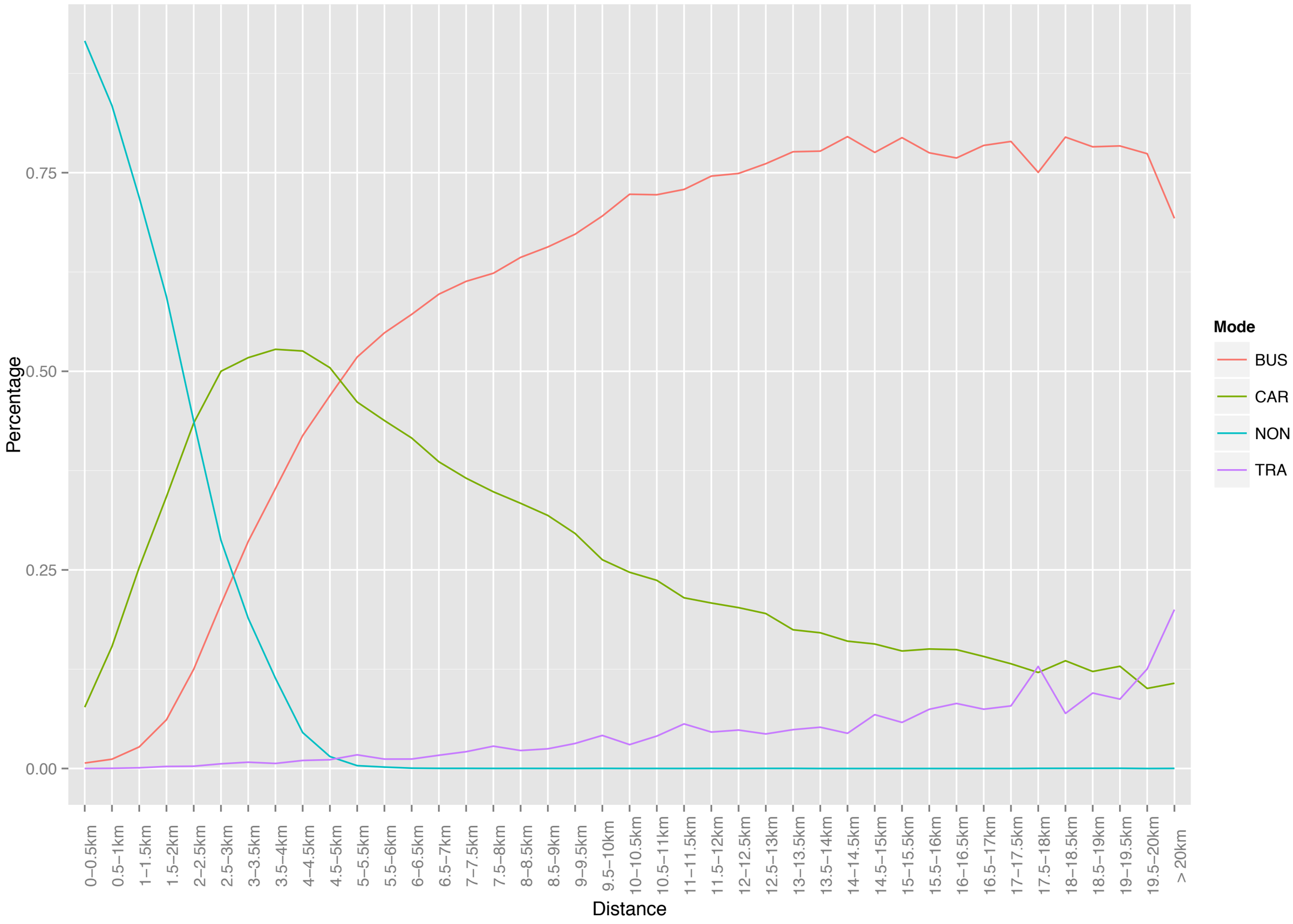
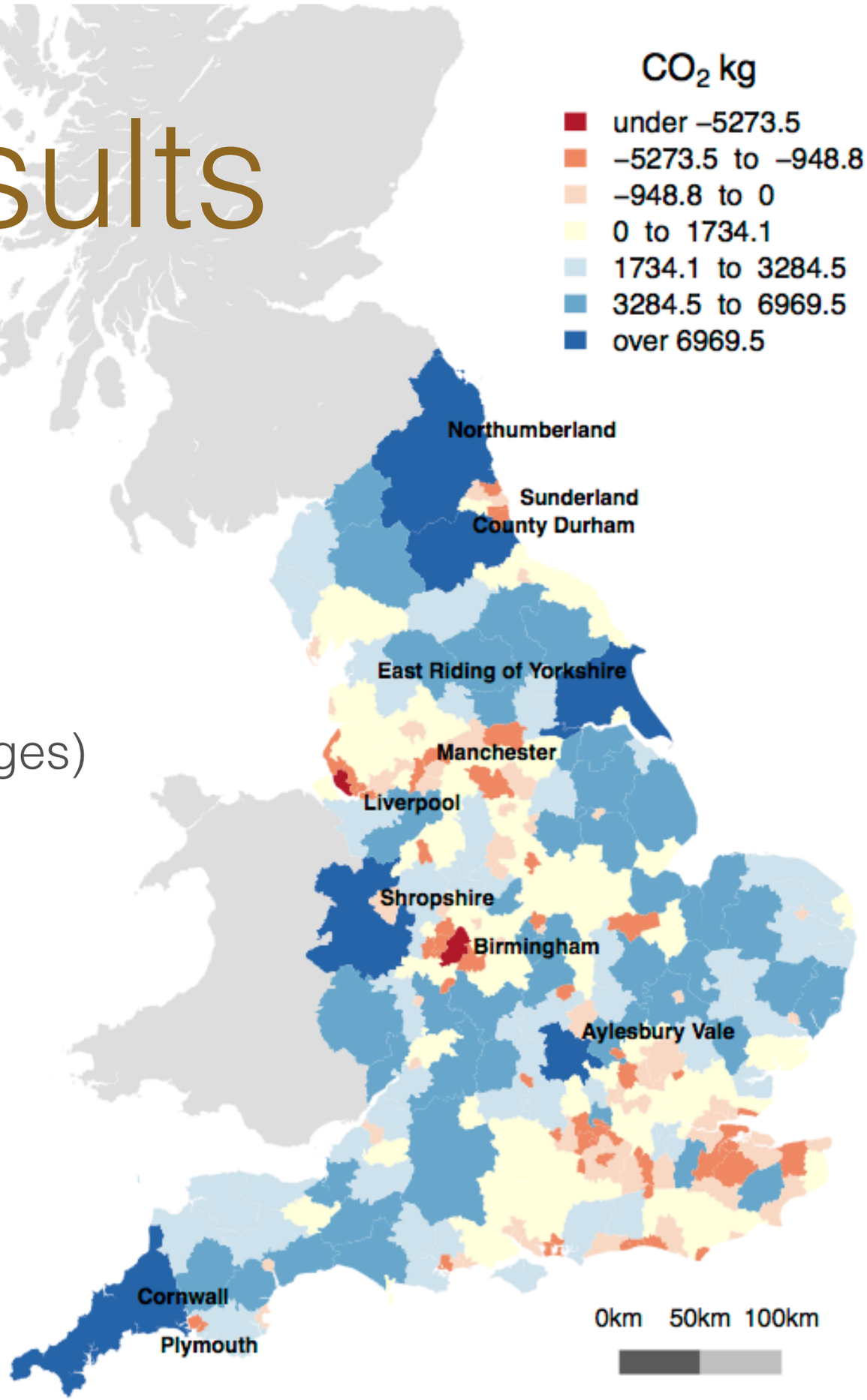

Percentage
0.75
0.50
0.25
0.00
0–0.5km
0.5–1km
1–1.5km
1.5–2km
2–2.5km
2.5–3km
3–3.5km
3.5–4km
4–4.5km
4.5–5km
5–5.5km
5.5–6km
6–6.5km
6.5–7km
7–7.5km
7.5–8km
8–8.5km
8.5–9km
9–9.5km
9.5–10km
10–10.5km
10.5–11km
11–11.5km
11.5–12km
12–12.5km
12.5–13km
13–13.5km
13.5–14km
14–14.5km
14.5–15km
15–15.5km
15.5–16km
16–16.5km
16.5–17km
17–17.5km
17.5–18km
18–18.5km
18.5–19km
19–19.5km
19.5–20km
> 20km
Distance
Mode
BUS
CAR
NON
TRA

Results

Versus a simple model
(straight line, vehicle national averages)
+ve = simple model overestimating



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International Journal of Geographical Information Science, 2014
Vol. 28, No. 2, 256–273, http://dx.doi.org/10.1080/13658816.2013.832765

Taylor & Francis

A GIS approach to modelling CO_2 emissions associated with the pupil-school commute

Alex Singleton*

Department of Geography and Planning, University of Liverpool, Liverpool, UK

(Received 12 November 2012; final version received 22 July 2013)

Commutes have been raised in numerous countries over declining rates of active transport to school. In a UK context, the pupil-school commute is estimated to contribute around 658 kilotonnes of CO_2 per year; however, tackling this issue effectively requires an improved understanding of how emissions can be modelled and mapped over a variety of scales. This paper implements a new estimation technique for the modelling of CO_2 emissions linked with the school commute that integrates both transport network-level routing and geographically disaggregate vehicle emissions data. The model is then applied to a national cohort of pupils in England. Areas demonstrating the highest emissions were typically more rural and/or comprising more affluent resident populations. Emissions were also shown to increase with school year, with large step changes between educational stages reflecting the different geography of school locations. Furthermore, where secondary school entry policies were selective or based on a religious denomination, overall emissions were typically higher than in non-selective schools.

Keywords: GIS; CO2 emissions; schools; vehicle routing

Downloaded by [University of Liverpool] at 03:56 20 October 2015

Introduction

Internationally, the rates of travelling to school by active transport (e.g. cycling or walking) are in decline (Tudor-Locke et al. 2001, Schlossberg et al. 2006, McMillan 2007, Trang et al. 2012), and the corollary switch to less sustainable modes of travel have been linked to negative effects on the environment in terms of increased emissions (Von Rietell et al. 2012), increasing traffic congestion around schools (Collins and Kearns 2001) and health impacts related to lower physical activity levels (Faulkner et al. 2009, Mitra et al. 2011) or pollutant exposure (McConnell et al. 2010).

In a UK context, schools account for 15% of total public sector emissions (DCFS 2010), which in England are estimated to be the equivalent of around 9.4 million tonnes of CO_2 per year (SDC 2006). Seven per cent (658 kilotonnes) of this total is associated with the pupil-school commute, and as such, there are significant environmental benefits for pupils to adopt more sustainable travel behaviour.

International research on commuting to school reveals that mode choice is impacted by multiple interacting factors including actual and perceived distance to the school (McDonald 2007, Miller *et al.* 2008, Lang *et al.* 2011), road infrastructure (Ewing *et al.* 2004, Bejleri et al. 2010), urban form (McMillan 2007, Mitra *et al.* 2010, Panter et al.

*Email: alex.singleton@liverpool.ac.uk

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http://www.tandfonline.com/doi/pdf/10.1080/13658816.2013.832765

Many thanks….

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