



Mapping vulnerability to fuel price increases in England

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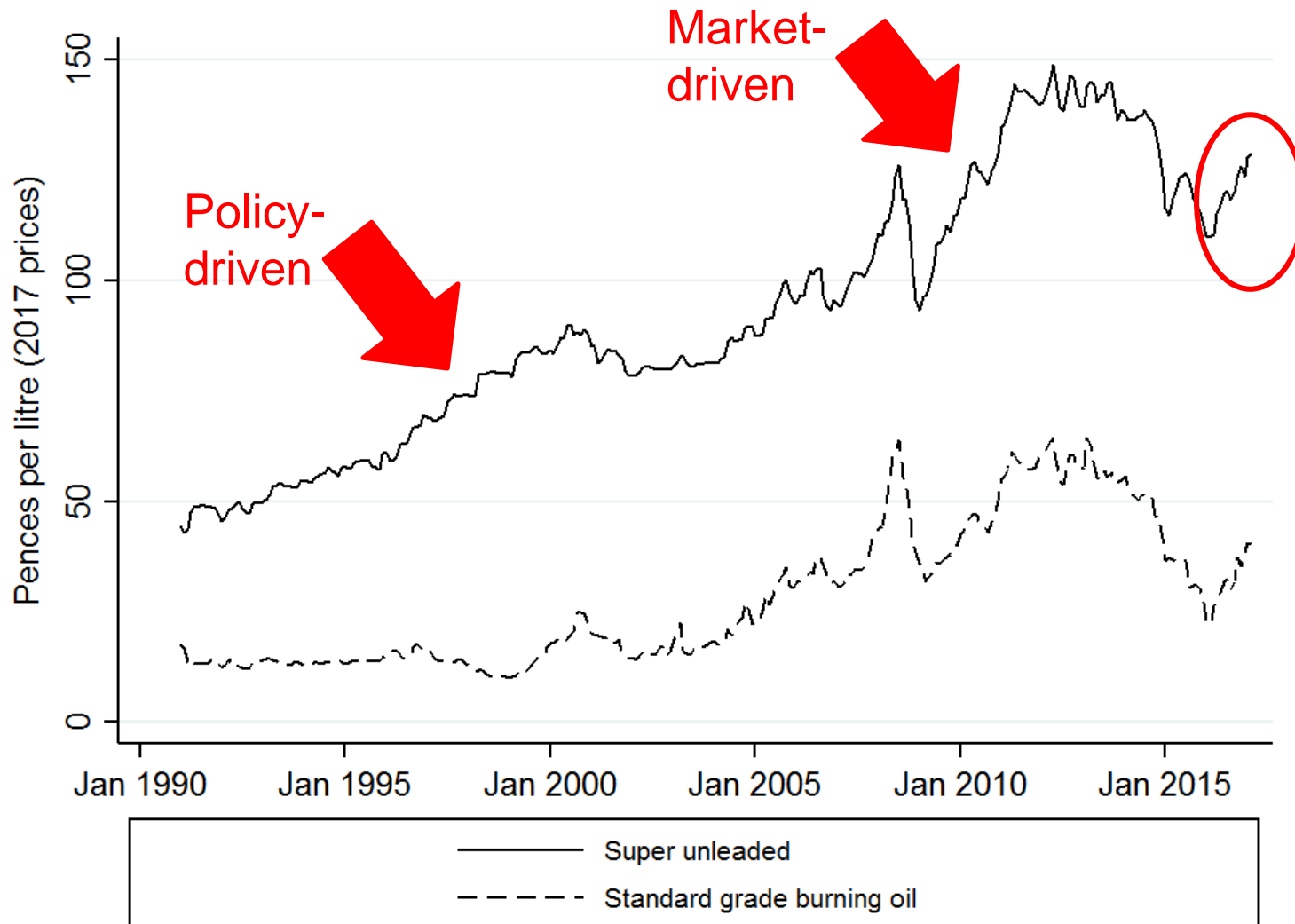
‘Valuing and financing the Infrastructure of Cities, Regions and Nations’ Conference

26 – 27th April, 2017

Motor fuel and oil prices, UK 1990-2017



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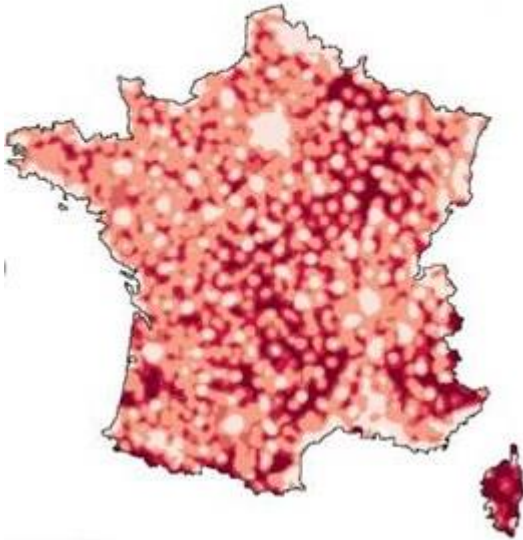


Source:
DBEIS, 2017

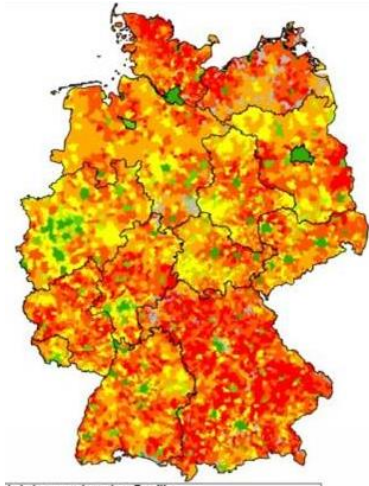
Policy interest



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(Cochez et al., 2015)



(Gertz et al., 2009)



The 'Oil vulnerability' debate



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Dodson et al. (e.g. Dodson & Sipe, 2007)

Australian city = “regressive city” – urban structural effect:

- “low socioeconomic status and high car dependence are strongly co-located” (Dodson & Sipe, 2007, p.57)

BUT “the socio-spatial structure of Australian cities differs from many overseas jurisdictions, particularly (...) Europe (...) given different socio-spatial and transport geographies” (Dodson & Sipe, 2007, p.58)

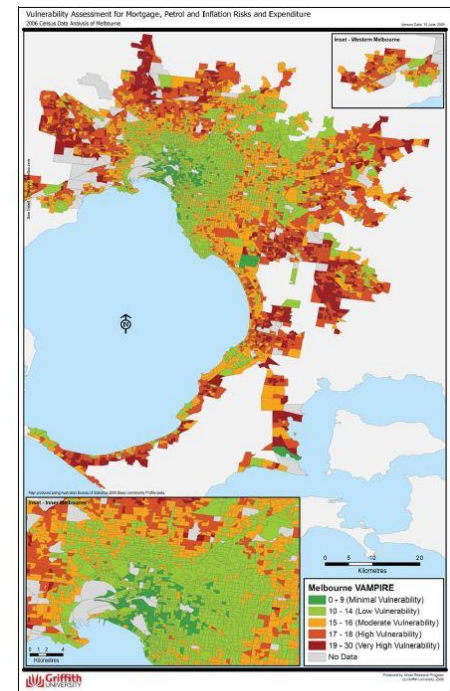


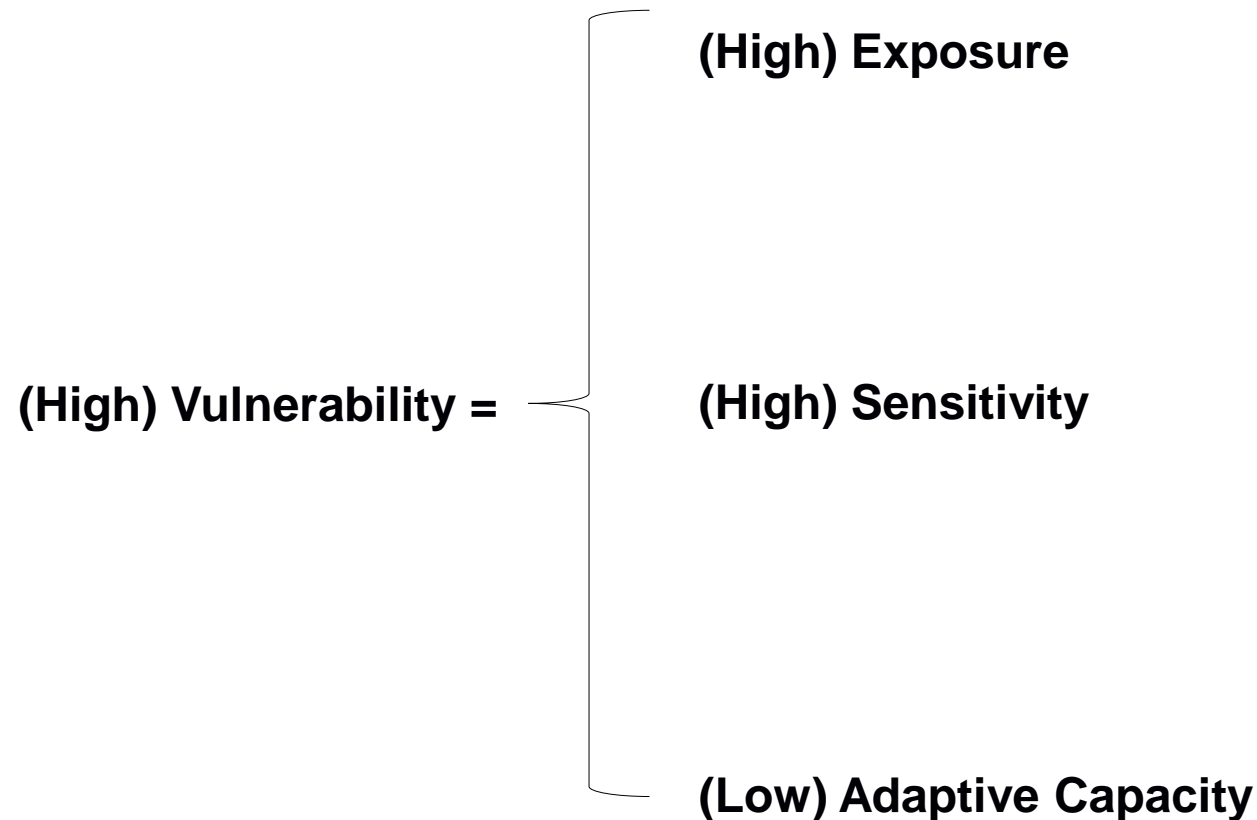
Figure 11: Oil and mortgage vulnerability in Melbourne, 2006.

(Dodson & Sipe, 2008)

Vulnerability: conceptual framework



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(see Adger, 2006; Brooks, 2003; Büttner et al., 2013; Leung et al., 2015)

1. Exposure



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Definition “the nature and degree to which a system experiences stress”
(Adger, 2006, p.268)

Indicator Cost burden ratio = per household expenditure on fuel / median income

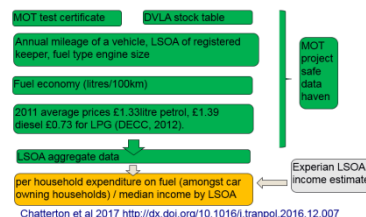
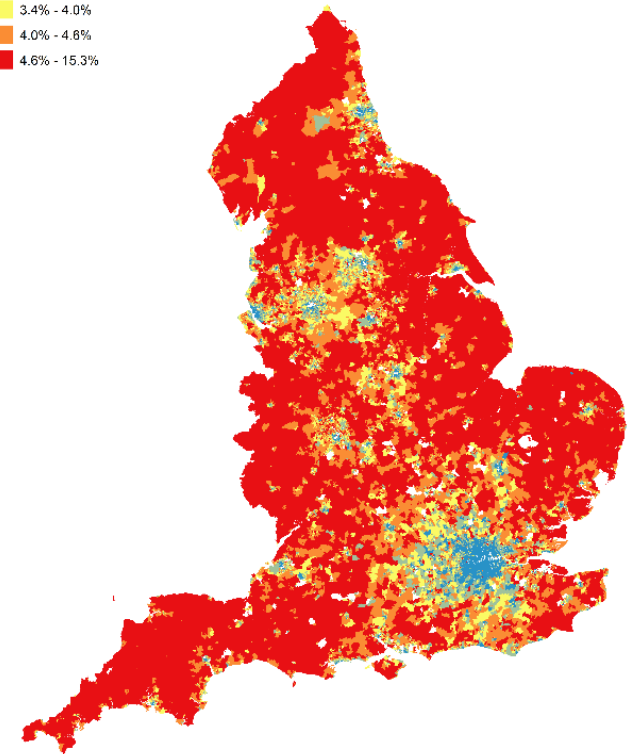
Data Anonymised MOT tests and results + Experian Demographic Data 

Year 2011

Spatial resolution LSOA (ca. 700 households)

Legend
Cost burden ratio
(quintiles)

- 0% - 2.7%
- 2.7% - 3.4%
- 3.4% - 4.0%
- 4.0% - 4.6%
- 4.6% - 15.3%



2. Sensitivity



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Definition “the degree to which a system is modified or affected by perturbations”
(Adger, 2006, p.268)

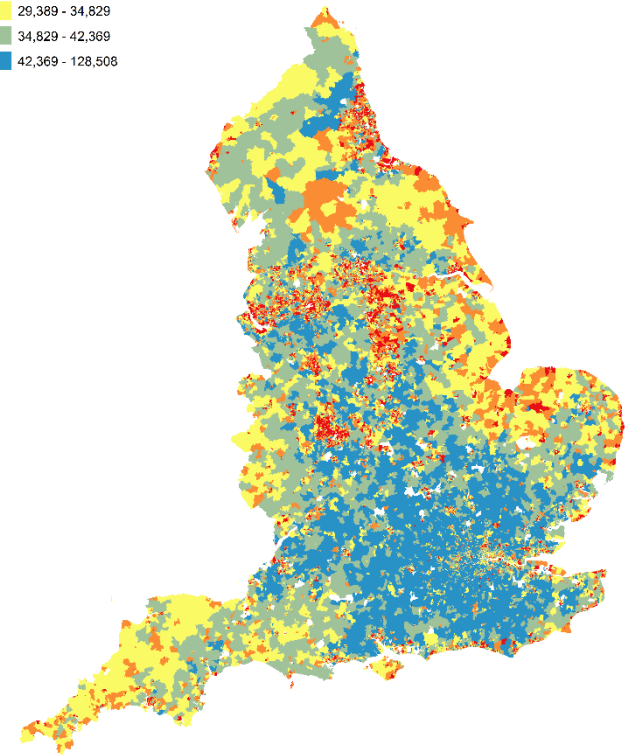
Indicator Median household income

Data Experian Demographic Data

Year 2011

Spatial resolution LSOA (ca. 700 households)

Legend
Median income (£)
(quintiles)
9,168 - 24,172
24,172 - 29,389
29,389 - 34,829
34,829 - 42,369
42,369 - 128,508



3. Adaptive Capacity



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Definition “the ability of a system to evolve in order to accommodate (stress) and and to expand the range of variability with which it ca cope”
(Adger, 2006, p.268)

Indicator Travel time to 8 key services by public transport / walking

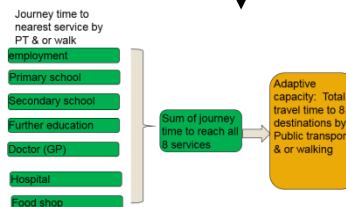
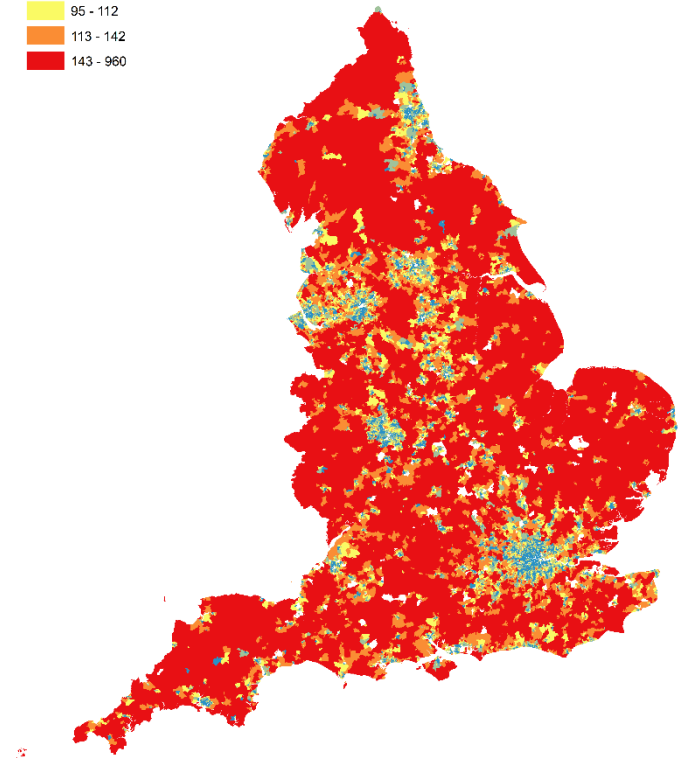
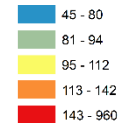
Data DfT Accessibility statistics

Year 2011

Spatial resolution LSOA (ca. 700 households)

Legend

PT/walk time to services (min.)
(quintiles)



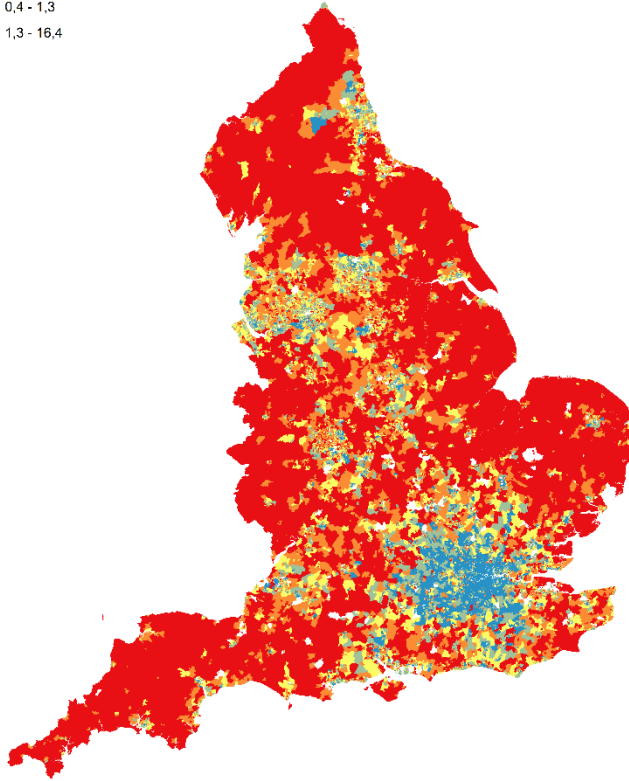
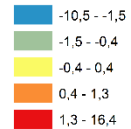
A spatial index of vulnerability to fuel price increases - England, 2011



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Legend

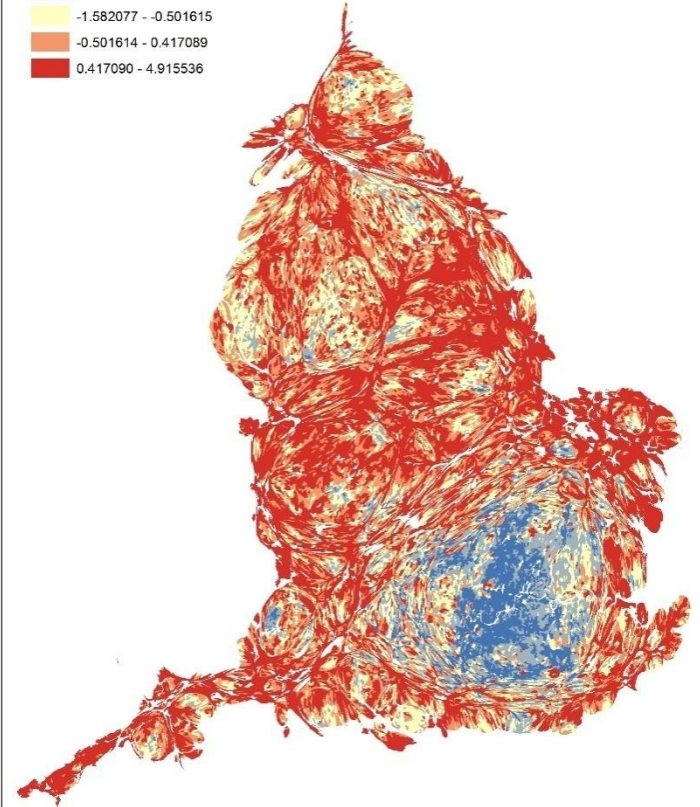
Vulnerability (index)
(quintiles)



Correlation with IMD rank: $r=-0.22$

Legend

vul260716
vul1507

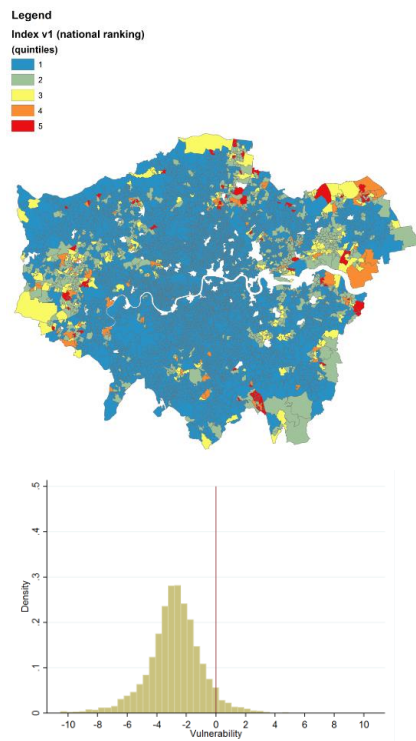


English city regions, 2011

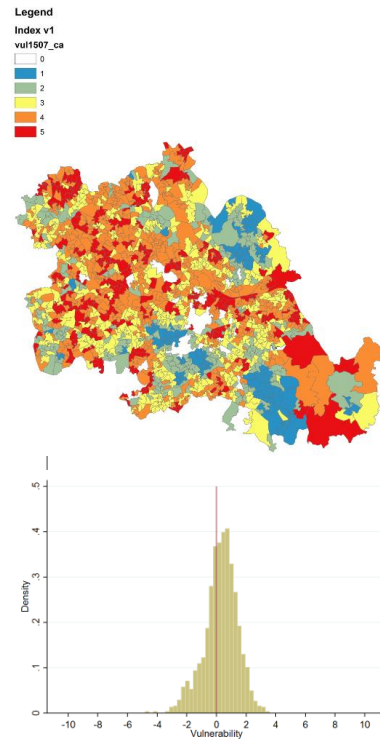


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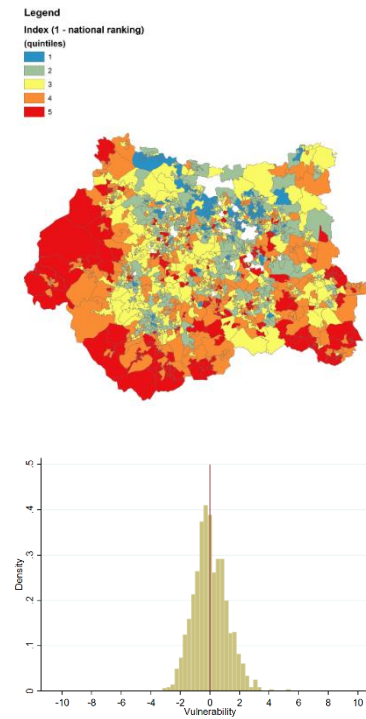
London



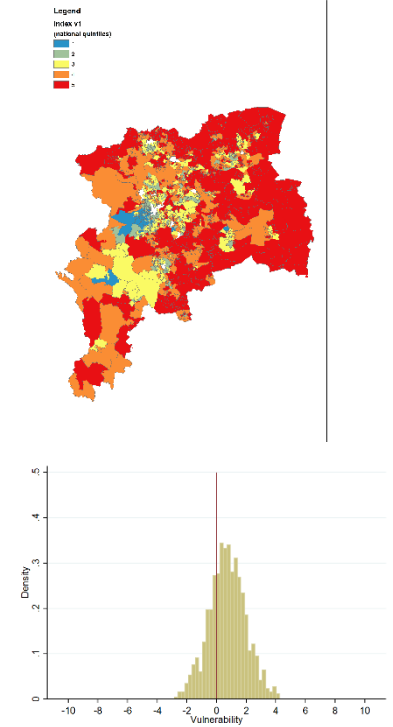
West Midlands



West Yorkshire



Sheffield CR

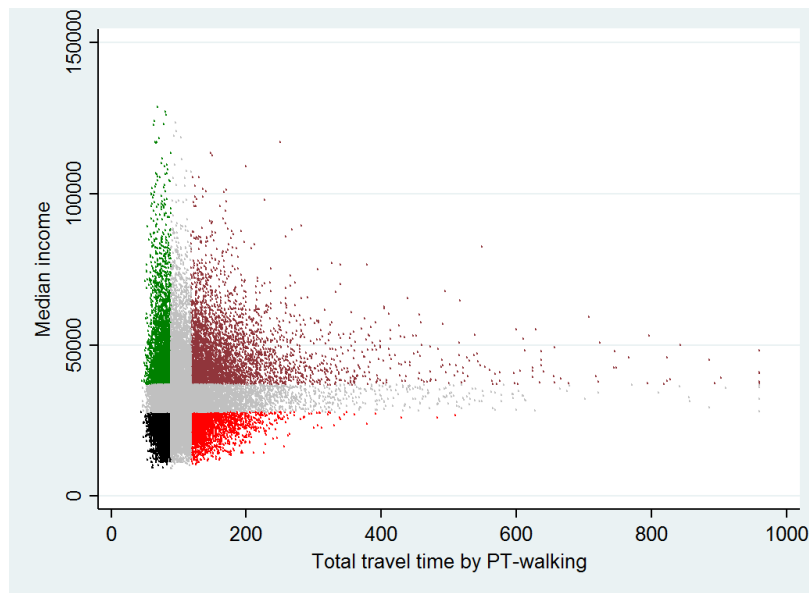


Car dependence & income: a regressive spatial distribution?

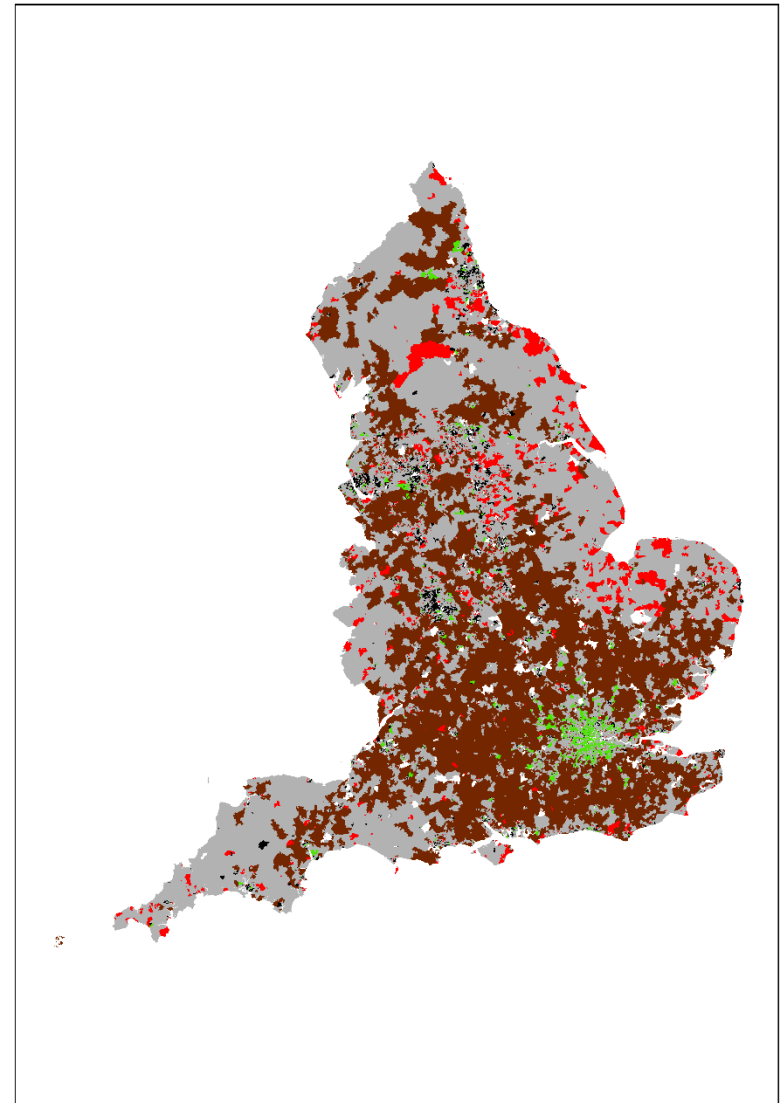


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		Car dependence		
		Low	Medium	High
Income	Low	4,112	4,029	2,417
	Medium	3,158	3,578	3,821
	High	3,118	3,119	4,320



$r = +0.10$

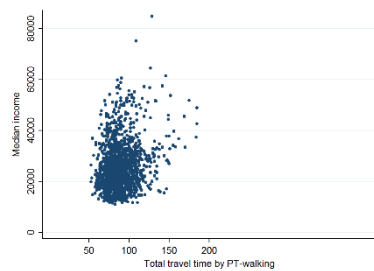
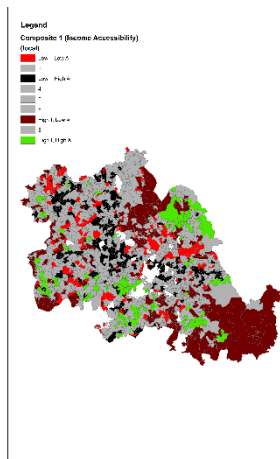


Car dependence & income: a regressive spatial distribution?



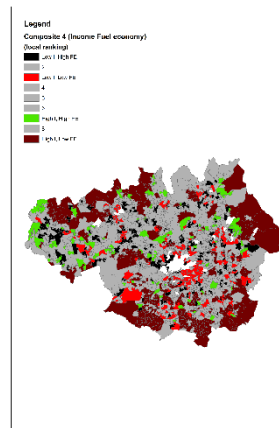
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West Midlands



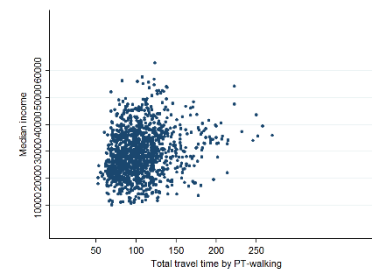
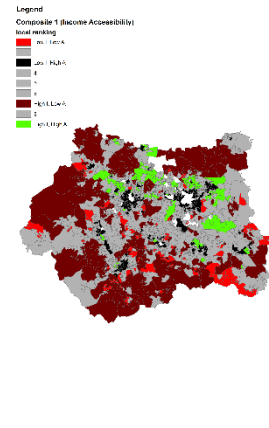
$r = +0.23$

Greater Manchester



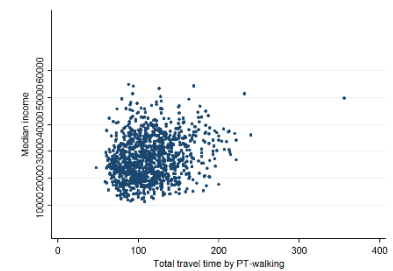
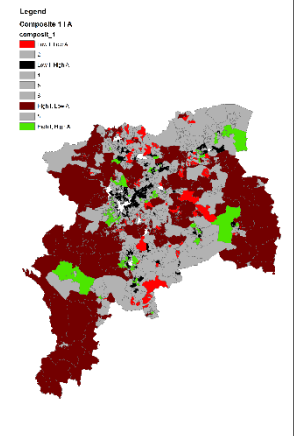
$r = +0.22$

West Yorkshire



$r = +0.23$

Sheffield CR

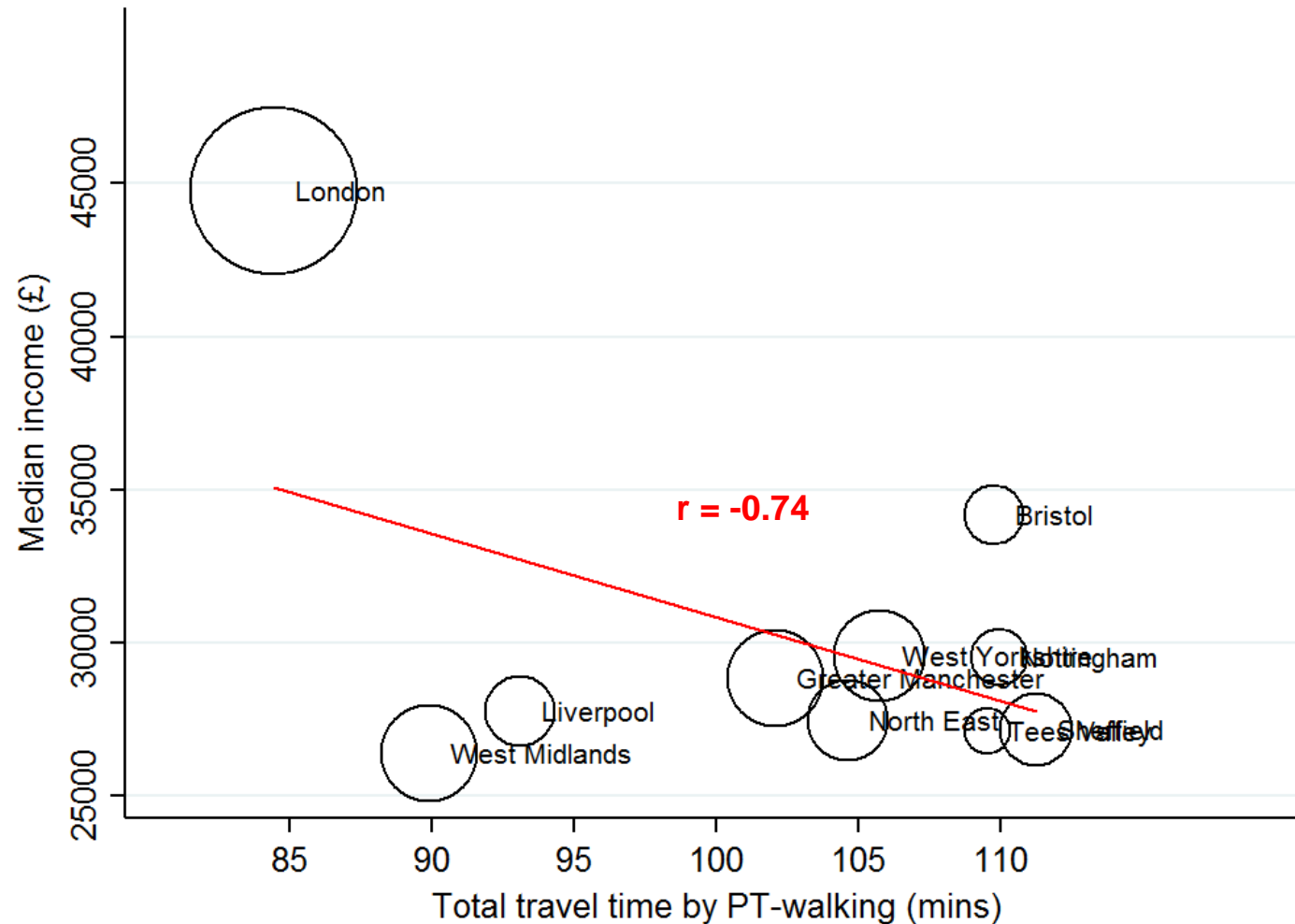


$r = +0.22$

Regressive city or regressive *country*?



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Regressive *transport investment*?



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London gets 24 times as much spent on infrastructure per resident than north-east England



IPPR
NORTH

Of course London gets more transport funding than the north. It's addicted to it

By [Ionn Elledge](#)



Greater Leeds is thought to be the largest city in Europe without some form of metro network. Image: Reptonix/Wikimedia Commons.

New transport figures reveal London gets £1,500 per head more than the North – but North West powerhouse 'catching-up'

Here's why London gets so much of Britain's transport funding

By [Ionn Elledge](#)



It's all the fault of these fellas. Image: HBO.

Regressive cuts?

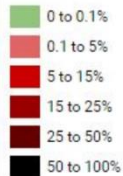


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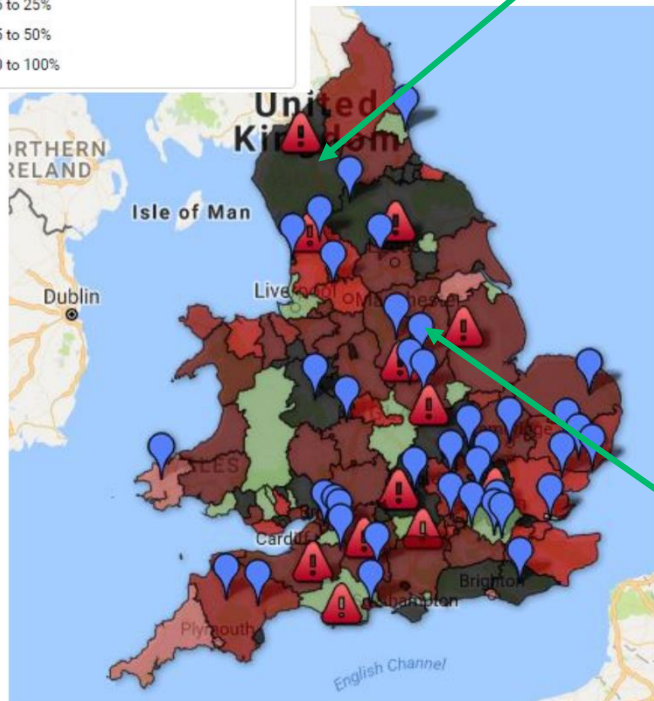


Bus cuts 2010 - 2016: the map

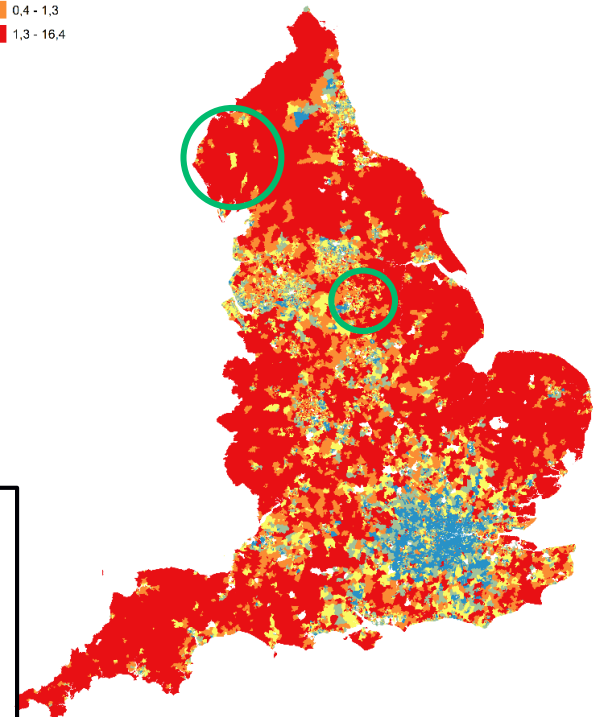
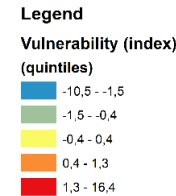
Percentage of Local Authority bus funding cuts since 2010:



Cumbria County Council
100 per cent cut since 2010
- stopped supporting bus services in 2014/15 .



South Yorkshire - SYPTE Integrated Transport Authority
33 per cent cut in bus funding since 2010.



- VFP \neq known patterns of deprivation
- spatial patterns at city-region level \neq Australia (no regressive *city*)
- ...but: capital/global city vs. other city regions
- from a VFP perspective:
 - regressive public transport funding –improves adaptive capacity of least vulnerable areas
 - regressive bus cuts?

Thank you for your attention!

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<https://teresproject.wordpress.com/>
@TransPoverty



www.demand.ac.uk
@DEMAND_CENTRE



www.MOTproject.net

A spatial index of vulnerability to fuel price increases - England, 2011



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Standardise each component variable (z-scores)

Vulnerability to fuel price increases (VFP)

VFP = f(Exposure , Sensitivity , Adaptive Capacity)



VFP = cost burden – income + travel time

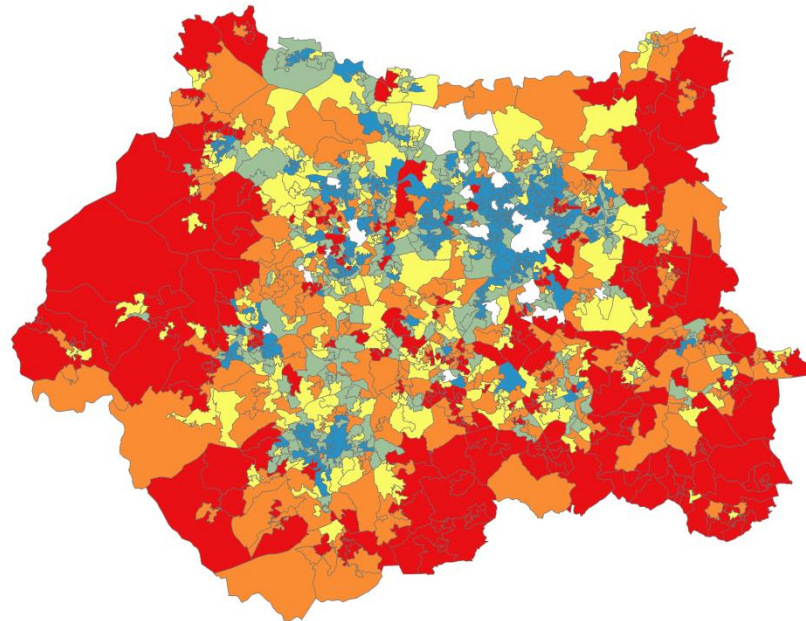
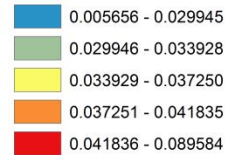
West Yorkshire: Exposure



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Legend

Cost burden ratio
(WY quintiles)



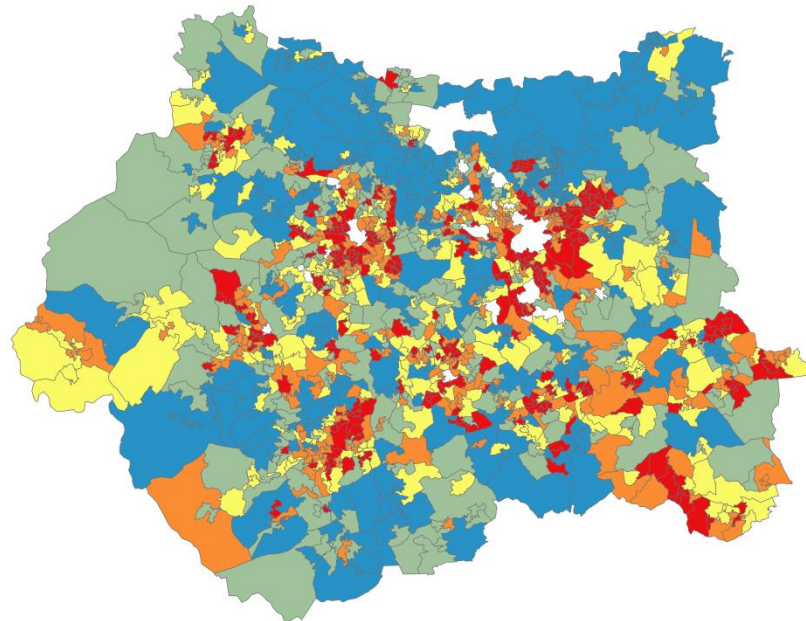
West Yorkshire: Sensitivity



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Legend

Income (WY quintiles)
(quintiles)

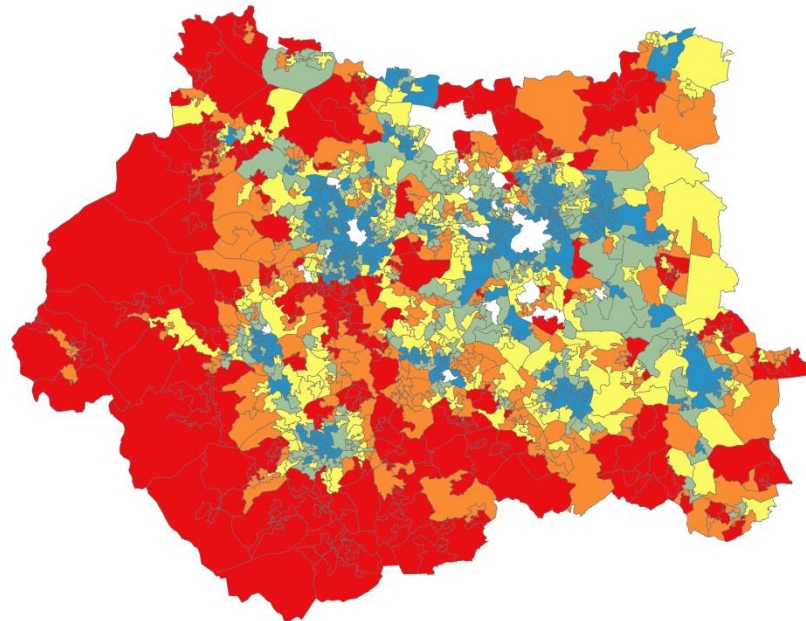
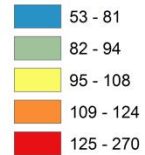


West Yorkshire: Adaptive Capacity



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Legend
SAC (WY quintiles)
(quintiles)



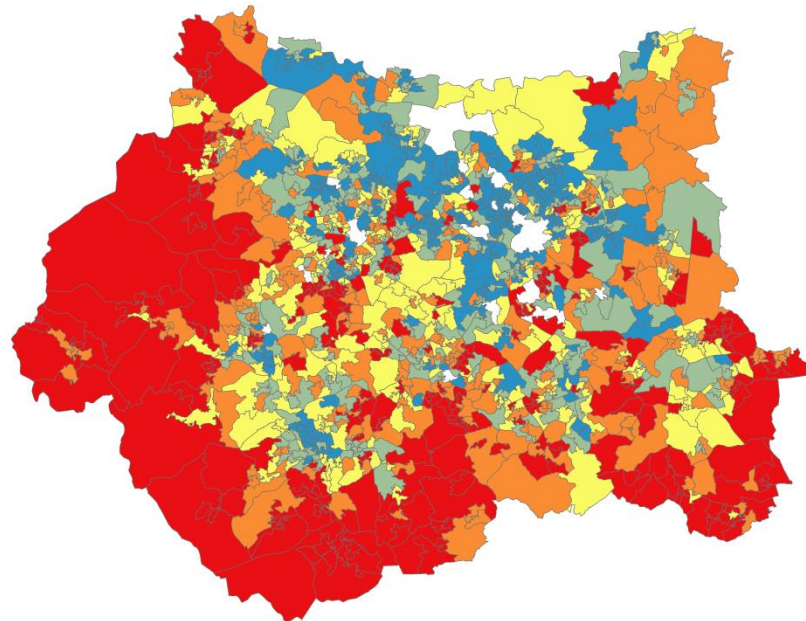
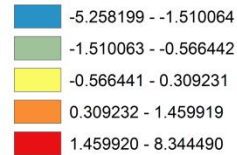
West Yorkshire: Vulnerability



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Legend

Index (3 - local ranking)
(quintiles)





Exposure: Fuel cost / income

(Also called the cost burden ratio)

MOT test certificate

DVLA stock table

Annual mileage of a vehicle, LSOA of registered keeper, fuel type engine size

Fuel economy (litres/100km)

2011 average prices £1.33litre petrol, £1.39 diesel £0.73 for LPG (DECC, 2012).

MOT
project
safe
data
haven

LSOA aggregate data

per household expenditure on fuel (amongst car owning households) / median income by LSOA

Experian LSOA
income estimate

Accessibility by public transport



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Journey time to
nearest service by
PT & or walk

employment

Primary school

Secondary school

Further education

Doctor (GP)

Hospital

Food shop

Sum of journey
time to reach all
8 services

Adaptive
capacity: Total
travel time to 8
destinations by
Public transport
& or walking