North Devon's Biosphere Reserve & Torridge District Energy Plan

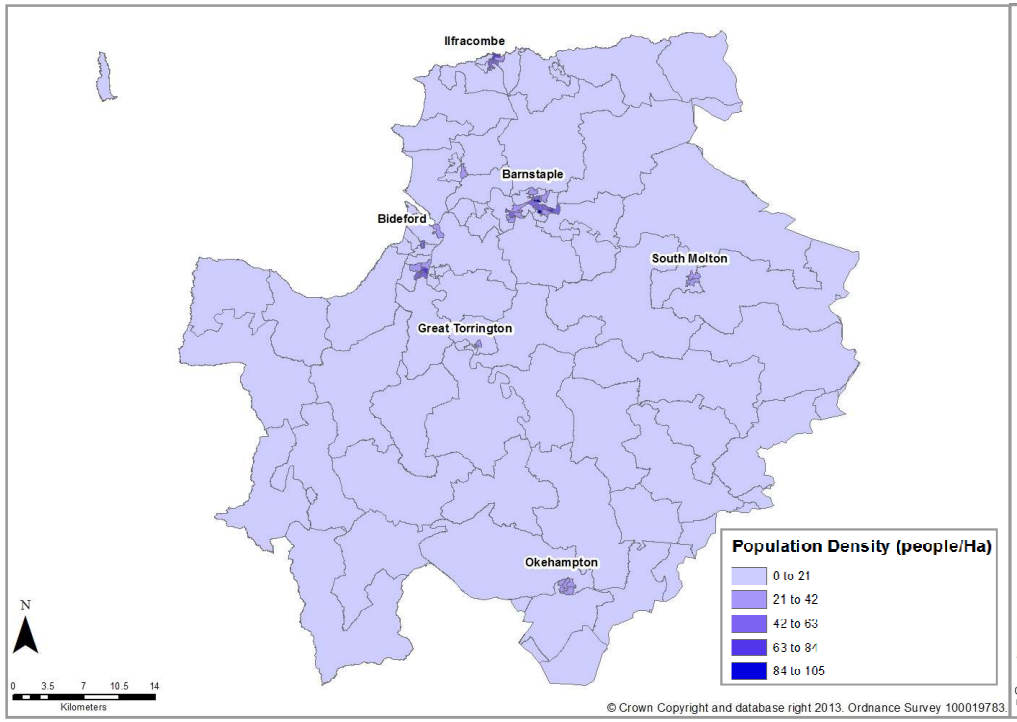
Appendix

Authors: **Andrew BELL, Emilie LE HELLOCO & Rose STAINTHORP**

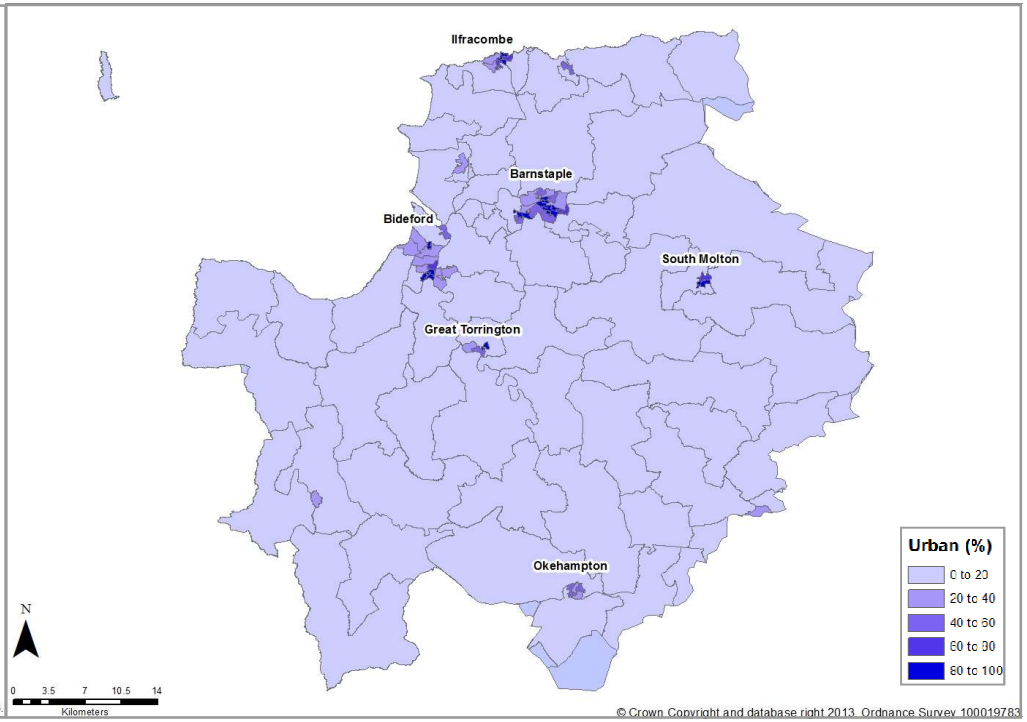
8. GIS mapping of key indicators

8.1 Population

(1) Population density



(2) Urban



What is the map showing?

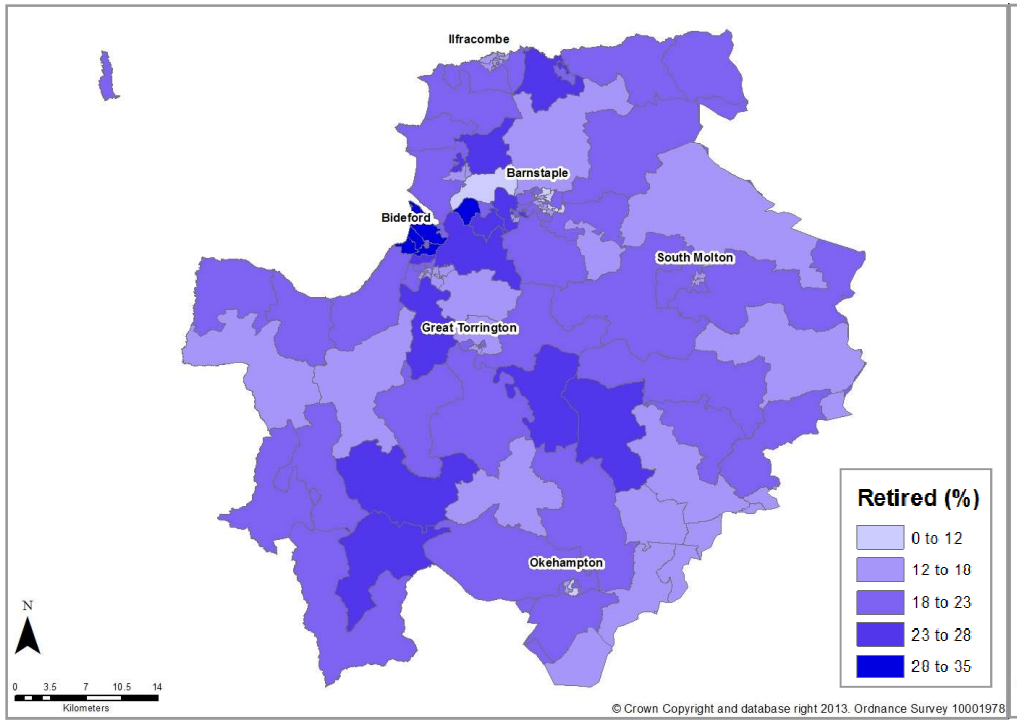
This map illustrates the rural nature of the study area. The highest population densities occur in the urban centres. As discussed in Section 4.1 of the Evidence Base, the rurality of the area may explain the high transport consumption, especially private vehicle use.

Census 2011, ONS

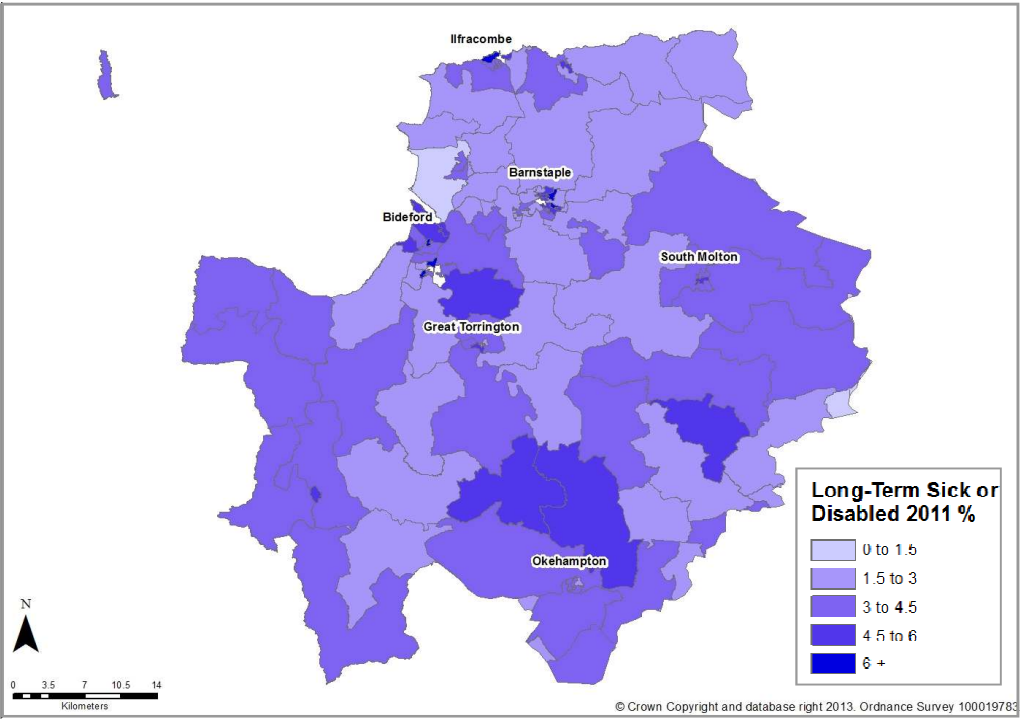
8. GIS mapping of key indicators

8.2 Social

(3) Retired



(4) Long-term sick or disabled

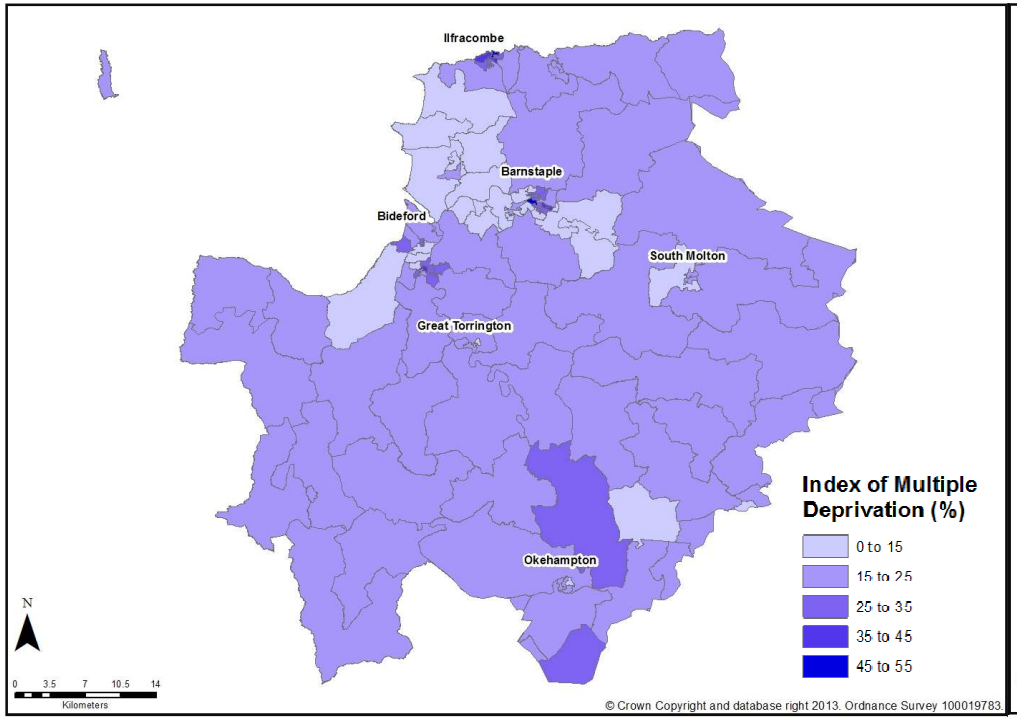


What is the map showing?

The retired population are concentrated around the urban centres of Barnstaple, Bideford and Great Torrington, as well as some rural parts of Torridge. In the town centres themselves the elderly population is very low. Overall this map shows the relatively high proportion of elderly people across the whole Energy Plan area. The long-term sick or disabled make up a much lower proportion of the total population and mainly concentrated around Great Torrington, Bideford and Barnstaple.
This demographic are likely to be more vulnerable and therefore should be targeted for insulation measures and other improvements to dwellings. As it is recognised these households also have a higher average energy consumption they could also be targeted for behaviour change and energy efficiency education.

Census 2011, ONS

(5) Index of multiple deprivation



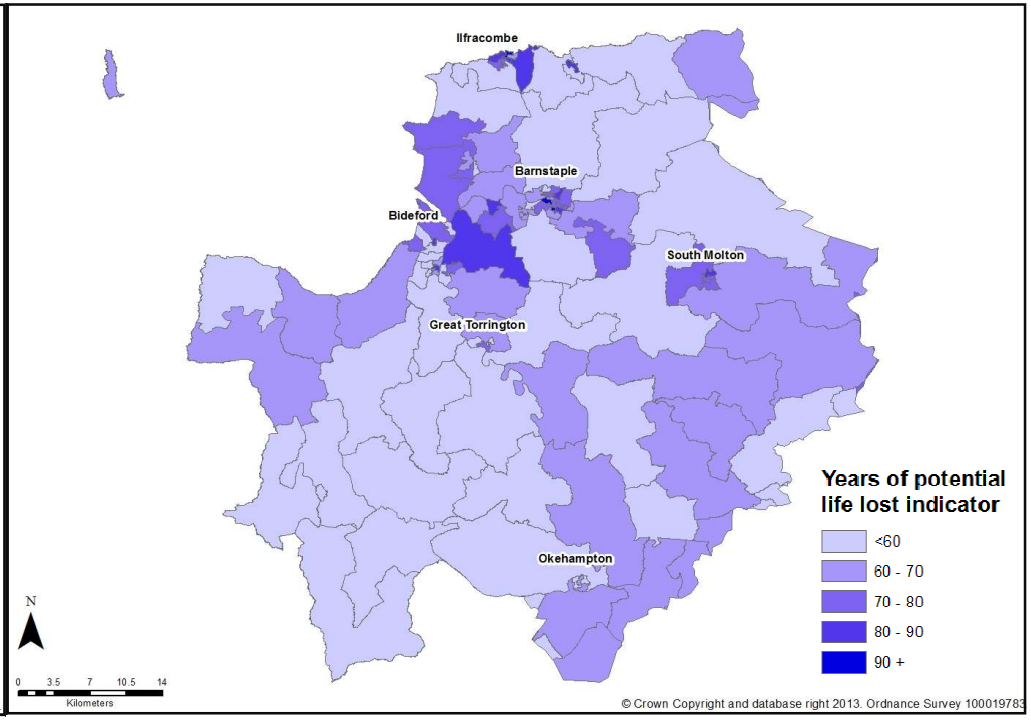
What is the map showing?

This map shows that there are fairly low levels of deprivation throughout the Energy Plan area. The highest levels are in the town centres of Bideford, Barnstaple and Ilfracombe. The coastline at the mouth of the Taw-Torridge estuary has very low levels of deprivation, the house prices in this area are very high and so this may reflect the higher wealth of the population living in these parts?

2010

http://www.communities.gov.uk/publications/corporate/statistics/indices2010technicalreport).

(6) Years of potential life lost



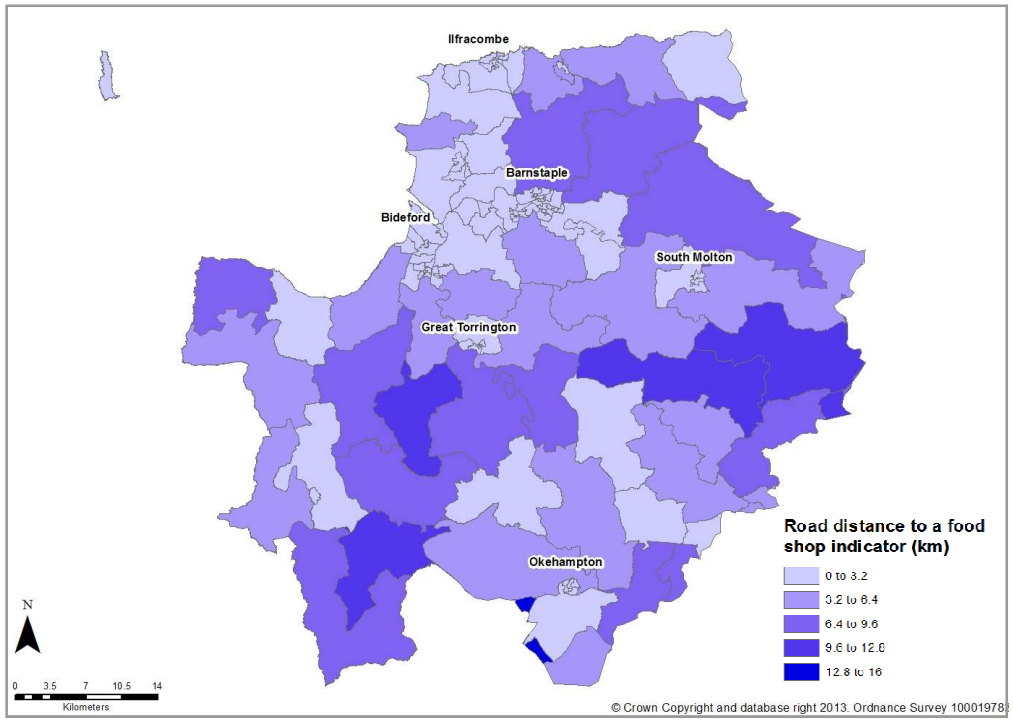
What is the map showing?

This indicator shows low levels in the most rural parts of the study area. Around the urban centres, especially Ilfracombe and Bideford there are high levels of premature mortality which may correspond to fuel poverty, particularly in Ilfracombe (see map ??).

2010

http://www.communities.gov.uk/publications/corporate/statistics/indices2010technicalreport).

(7) Road distance to a supermarket



What is the map showing?

People in rural areas have to travel relatively far to reach their nearest food center. Levels of private vehicle fuel consumption will be higher for these areas and could be targeted for car sharing programmes and improvements to public transport.

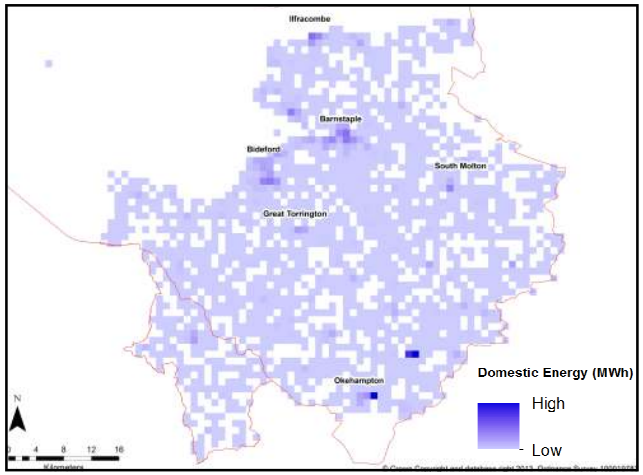
2010

http://www.communities.gov.uk/publications/corporate/statistics/indices2010technicalreport).

8. GIS mapping of key indicators

8.3 Energy Use

(8) Domestic energy



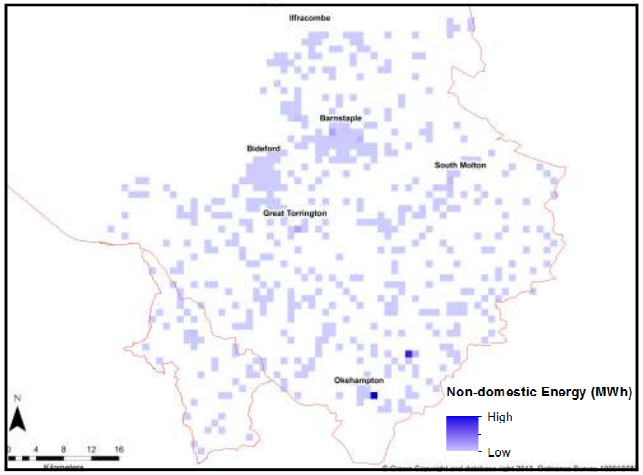
What does the map show?

There is a positive relationship between population and energy consumption which can clearly be seen on this map. The edge of Dartmoor and the border of Exmoor are clearly defined where there is none or very little data.

2010

NAEI

(9) Non-Domestic energy



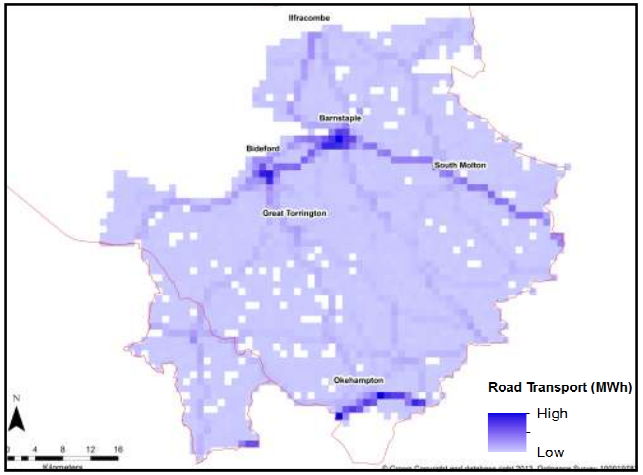
What does the map show?

Non-domestic energy use is concentrated around the urban centres, with two areas of particularly high levels near Okehampton. One of these point sources can be identified as the Taw Valley Creamery (Arla Foods UK Plc) in North Tawton.

2010

NAEI

(10) Road transport



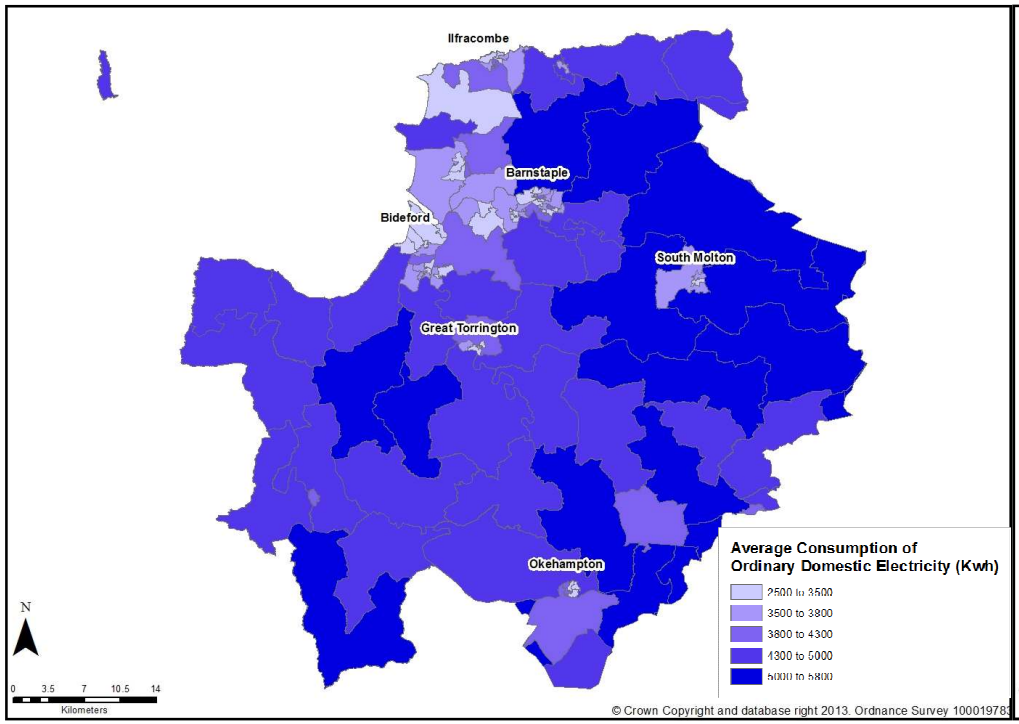
What does the map show?

The A30 and the A361 have the highest road energy intensity as major routes linking the South Wset to Exeter and the motorways. Other A roads are also visible.

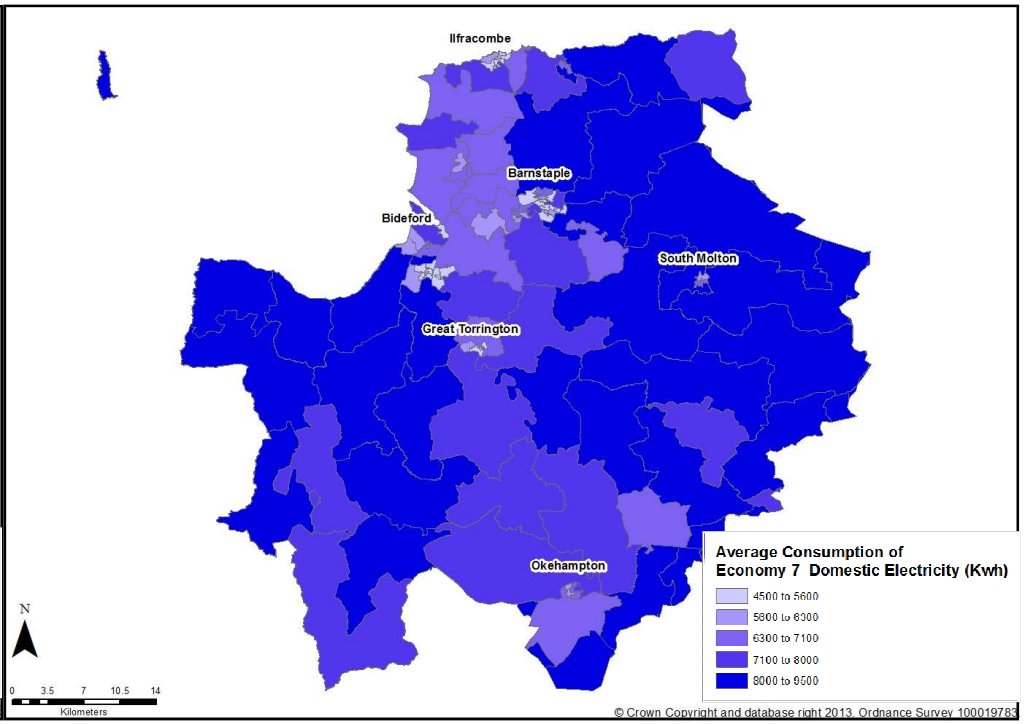
2010

NAEI

(11) Domestic: Normal electricity meters



(12) Domestic: E7 electricity meters



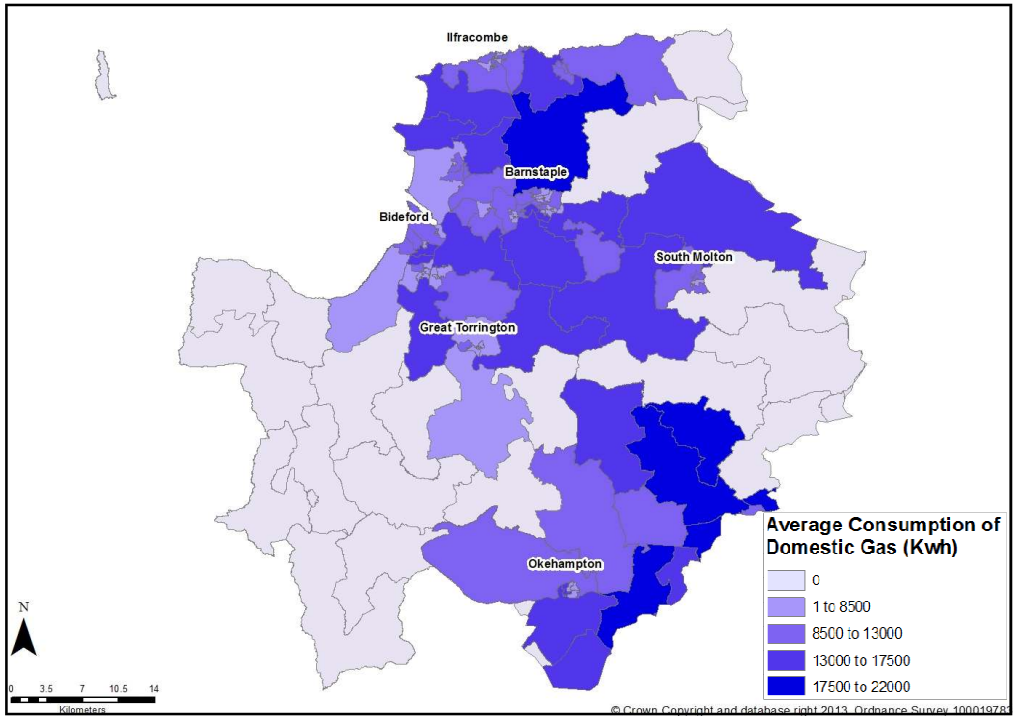
What is the map showing?

Energy use per metre is high throughout the area except town centres and particularly in the more rural parts. This is probably due to larger property sizes and less efficient traditional buildings with E7 meters (which typically use more electricity).

Census 2011

ONS

(13) Domestic: Gas meters



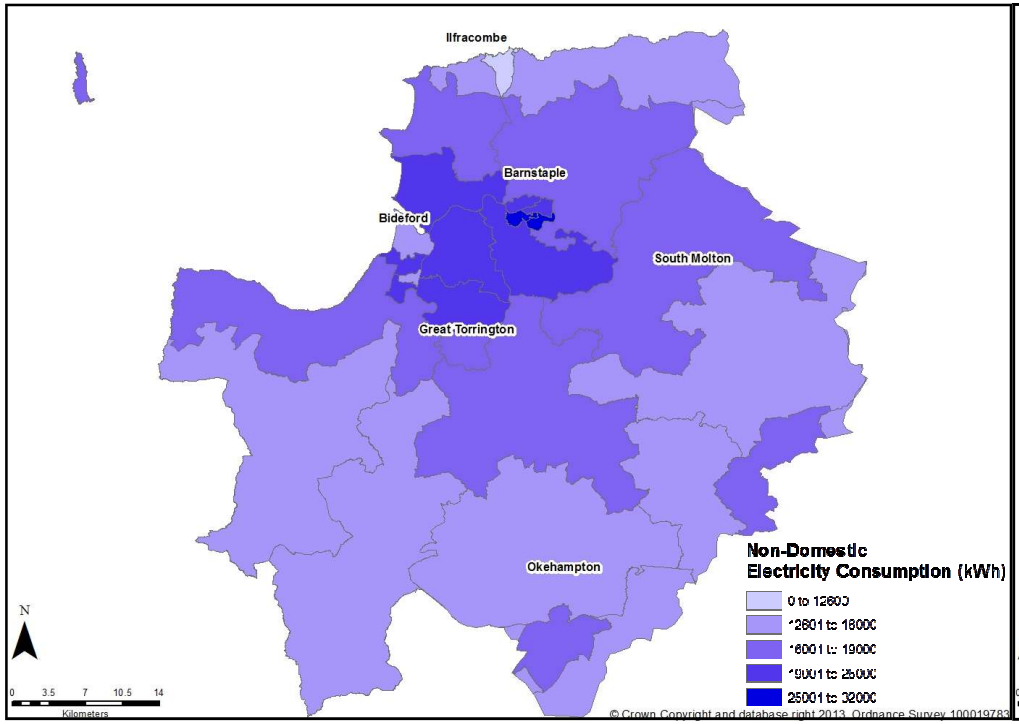
What is the map showing?

Torridge and Mid Devon have almost no data for gas meters and most of the properties in these districts will be off-gas. More energy per meter is used on gas than on electric, energy efficiency improvements to the dwelling and targeting behaviour could improve this.

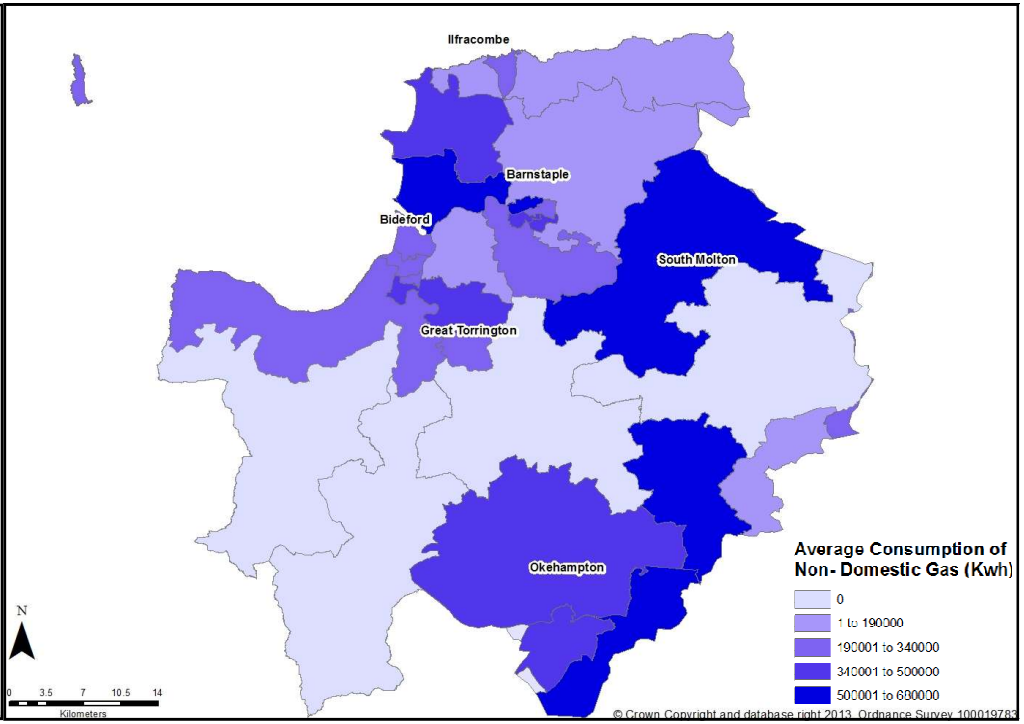
Census 2011

ONS

(14) Non-domestic electricity consumption



(15) Non-domestic gas consumption



What is the map showing?

The peak non-domestic electricity consumption is centred around Barnstaple and Bideford which are the main urban centres for the area. Non-domestic gas consumption is high in North Devon, particularly near South Molton and in West Devon which is probably influenced by the Taw Valley Creamery (Arla Foods UK Plc) site in North Tawton. The data is only available at the MSOA level so the maps are of limited value in terms of providing a detailed outlook.

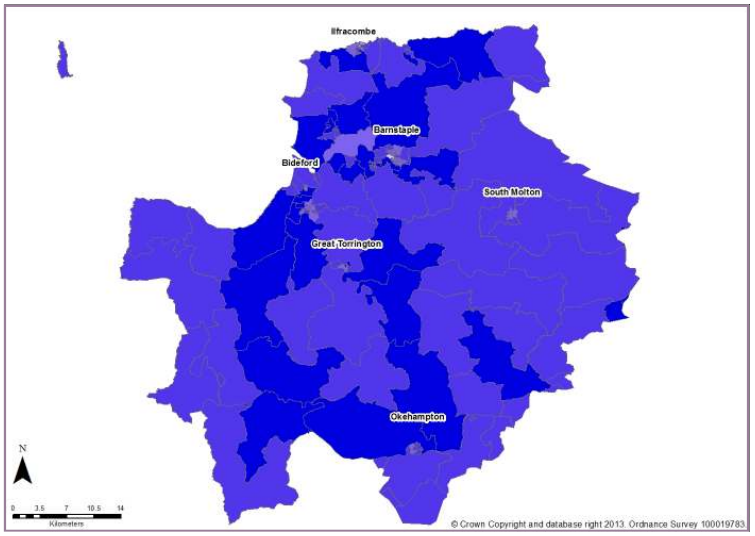
Census 2011

ONS

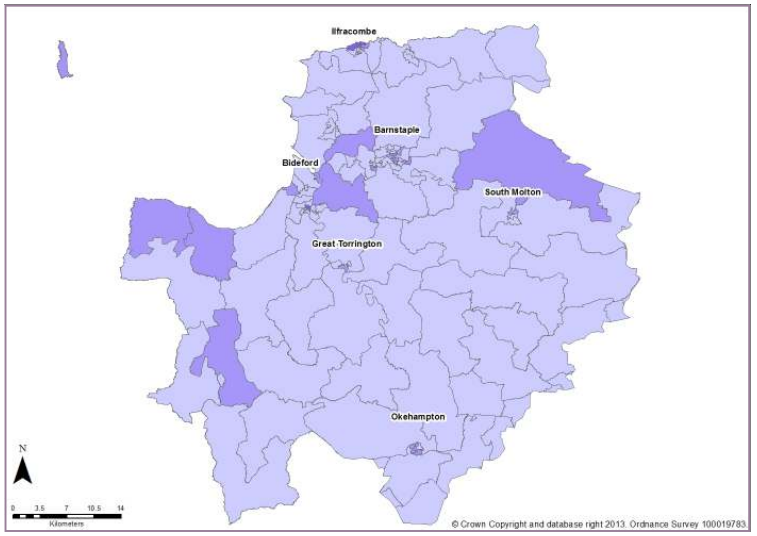
8. GIS mapping of key indicators

8.4 Housing

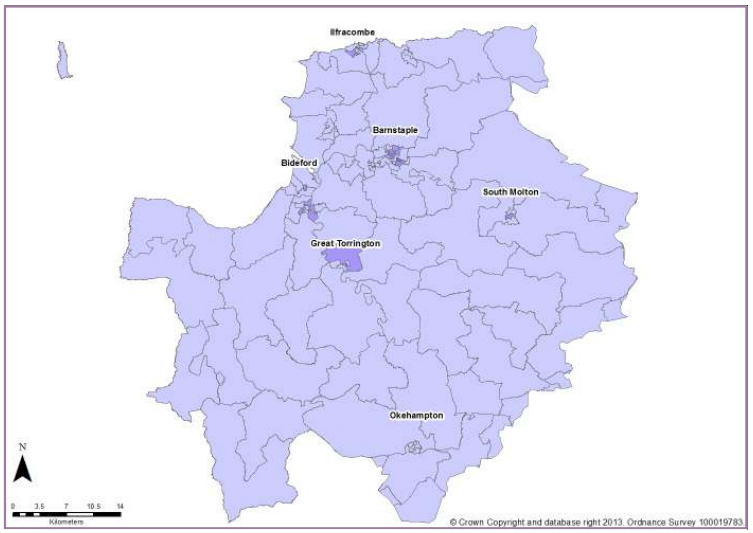
(16) Owned (0 - 100 scale)



(17) Private Rented (0 - 100 scale)



(18) Social Rented (0 - 100 scale)



Tenure % (Owned, Private rented, Social rented)

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 -100

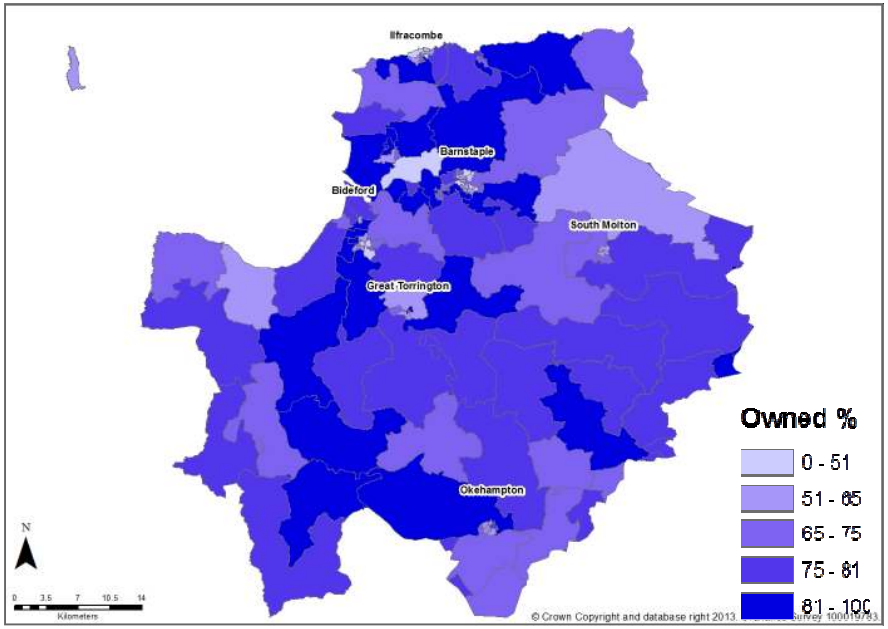
What is the map showing?

The vast majority of housing in the area is privately owned, with social renting concentrated in the main urban centres. Tenure is an important consideration in identifying the opportunities for improvements to dwellings.

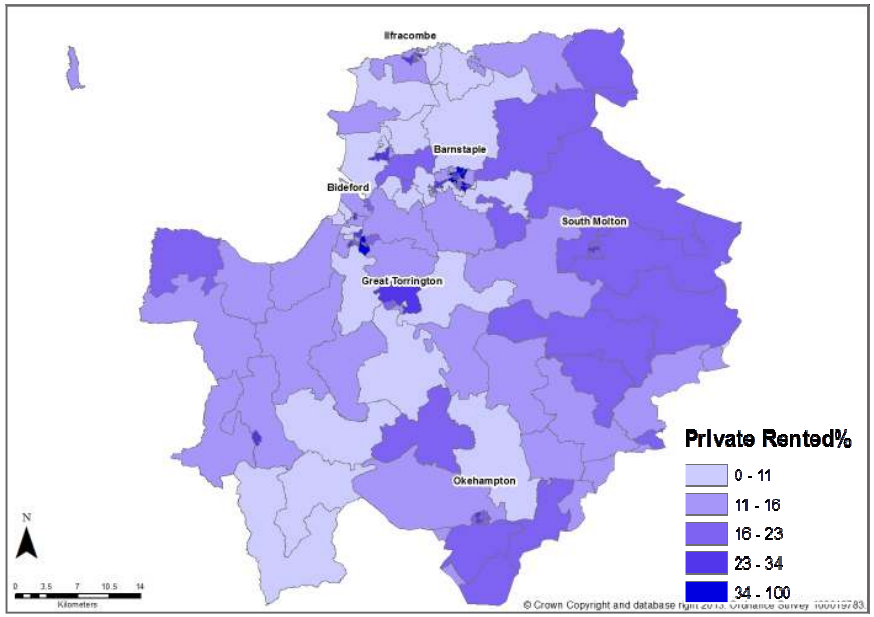
Census 2011

ONS

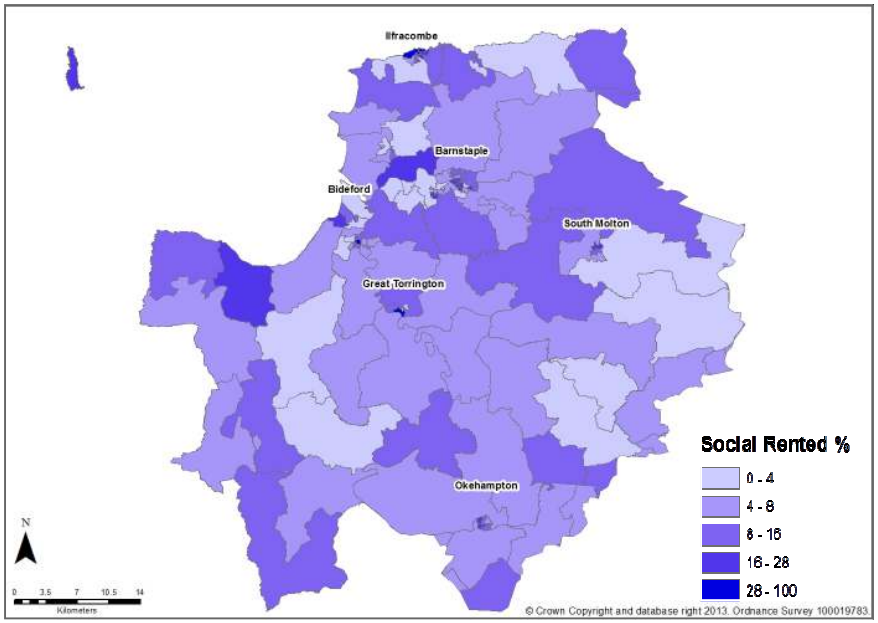
(19) Owned (Variable scale)



(20) Private Rented (Variable scale)



(21) Social Rented (Variable scale)



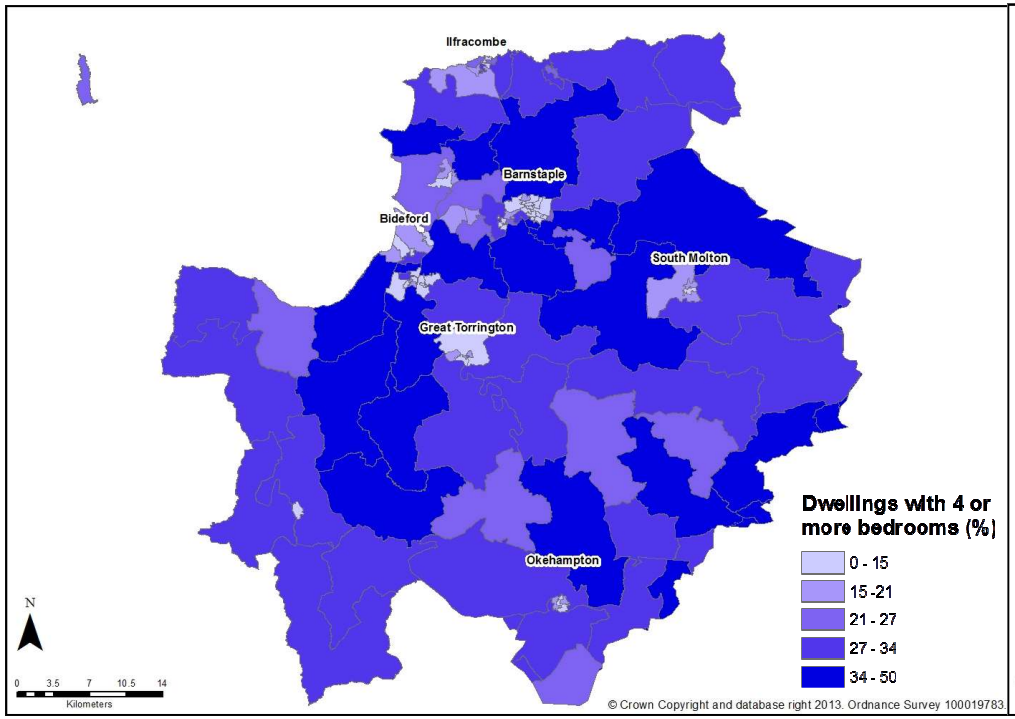
What is the map showing?

With variable scales more detail can be seen for each indicator. For example, the highest proportion of privately-rented properties are in the main urban centres.

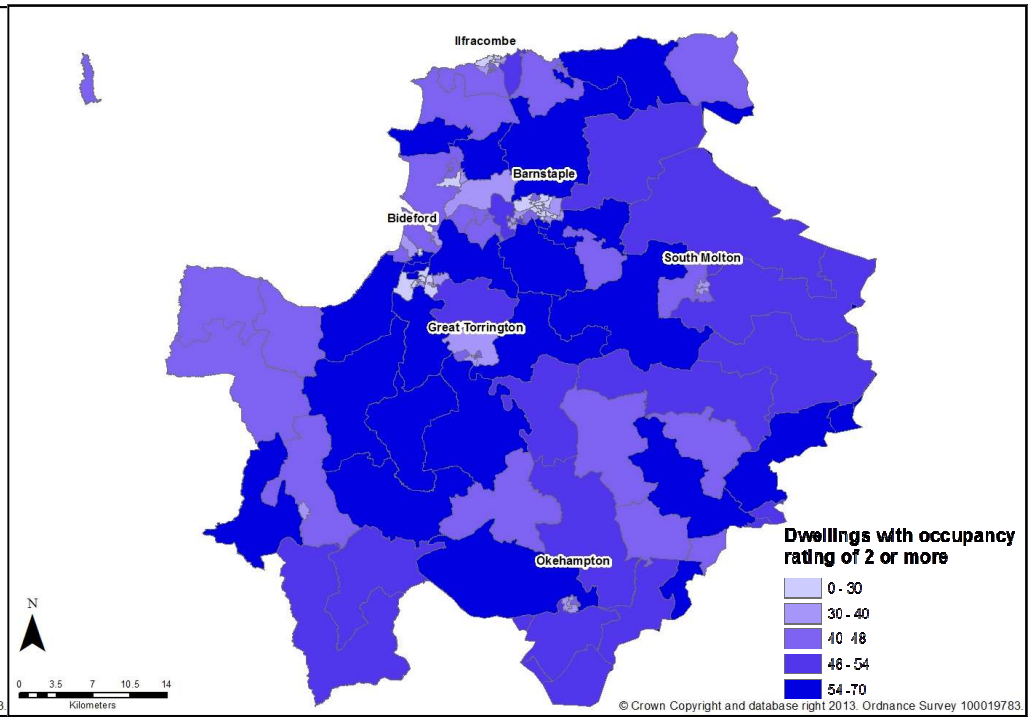
Census 2011

ONS

(22) Percentage of dwellings with 4 or more bedrooms



(23) Percentage of dwellings with occupancy rating of 2 or more



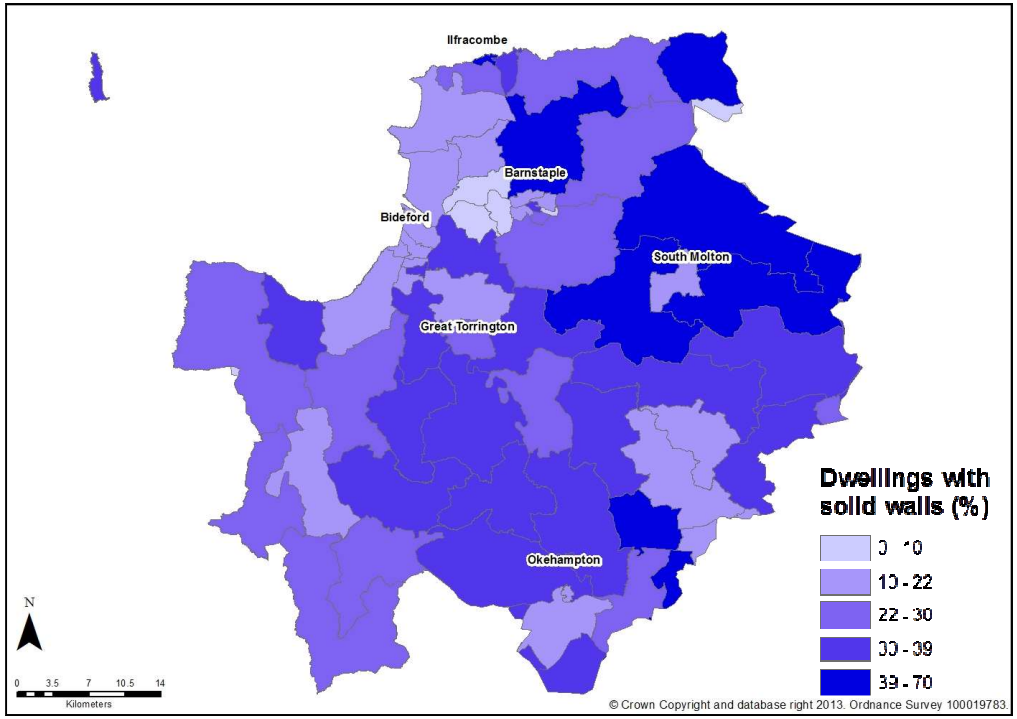
What is the map showing?

Overall a large proportion of the homes in the Energy Plan area are large; especially in North Devon outside of Barnstaple and towards South Molton, and in Torridge around Bideford and Great Torrington. The urban centres themselves do not have large dwellings as expected. The homes with “spare rooms”, as defined by a positive occupancy rating, corresponds closely with Map 22. Areas with large homes should be targeted as these dwellings are more likely to use more energy and therefore will have a greater impact. Dwellings with spare rooms can also be advised on controlling heating in infrequently used spaces.

Census 2011

ONS

(24) Percentage of dwellings with solid walls

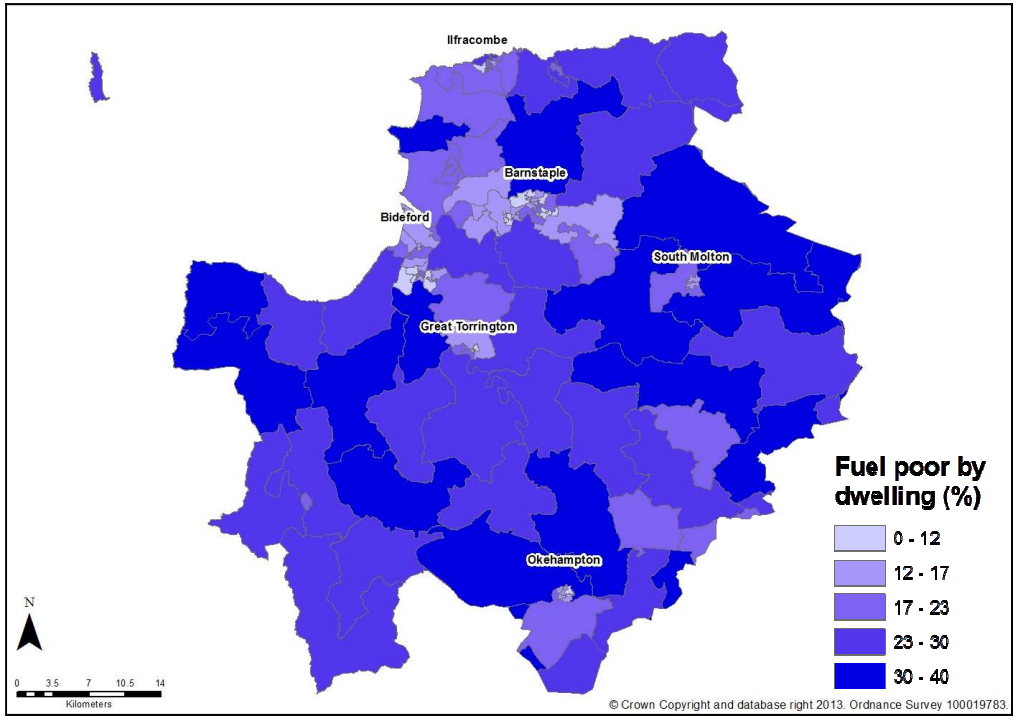


What is the map showing?

There are a high proportion of properties with solid walls in the most rural parts of the area, especially on the edge of Exmoor. From this areas with easier to treat measures can be identified and prioritised, for example those dwellings with cavity walls. Solid wall properties typically use more energy and insulation could be funded through ECO.

2011, EST

(25) Proportion of fuel poor dwellings

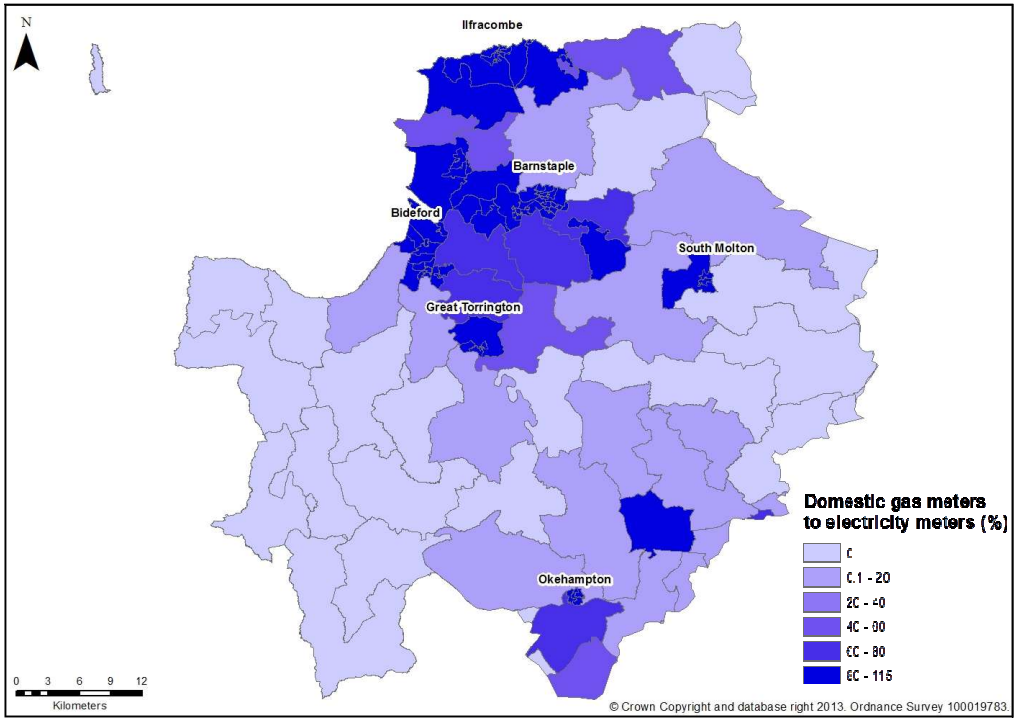


What is the map showing?

The highest proportion of fuel poor homes are in the off-gas areas of Torridge and Mid Devon, as well as the area on the edge of Exmoor with a high proportion of solid wall properties. The urban centres are generally not fuel poor, with the exception of Ilfracombe. These areas should be targeted through promotion of ECO funding.

Census 2011, ONS

(26) Percentage of domestic gas meters to electricity meters



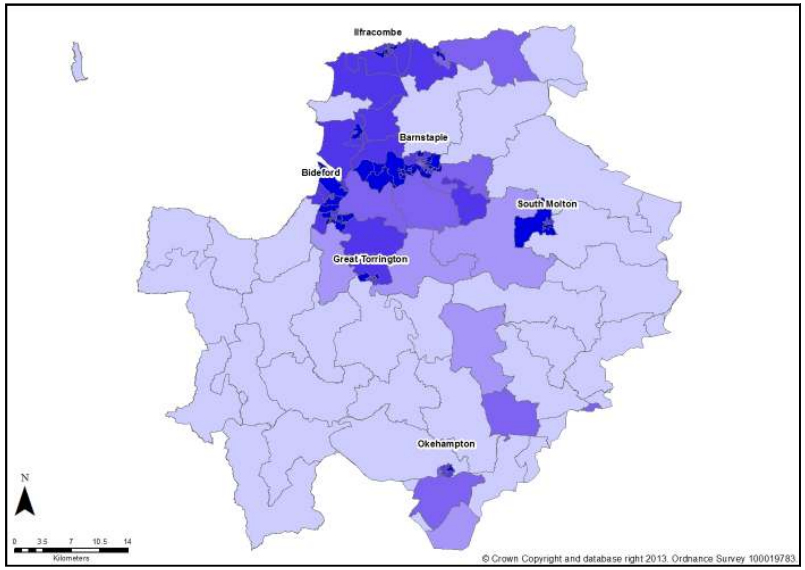
What is the map showing?

The main areas of off-gas are Torridge and Mid Devon. Gas is cheaper and has a lower carbon intensity than other fossil fuels so promotion of switching to renewable fuels sources and improving the efficiency of dwellings in the off-gas areas should be prioritised.

Census 2011

ONS

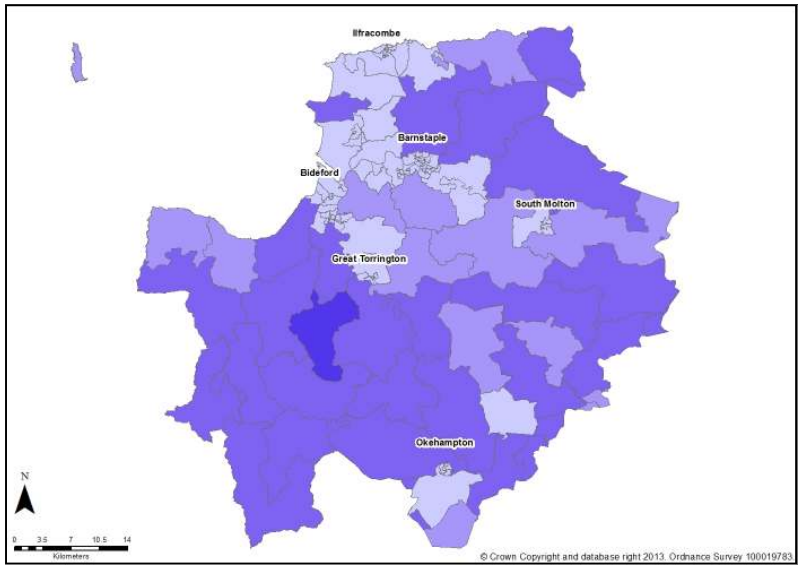
(27) Percentage of gas central heating (0-100 scale)



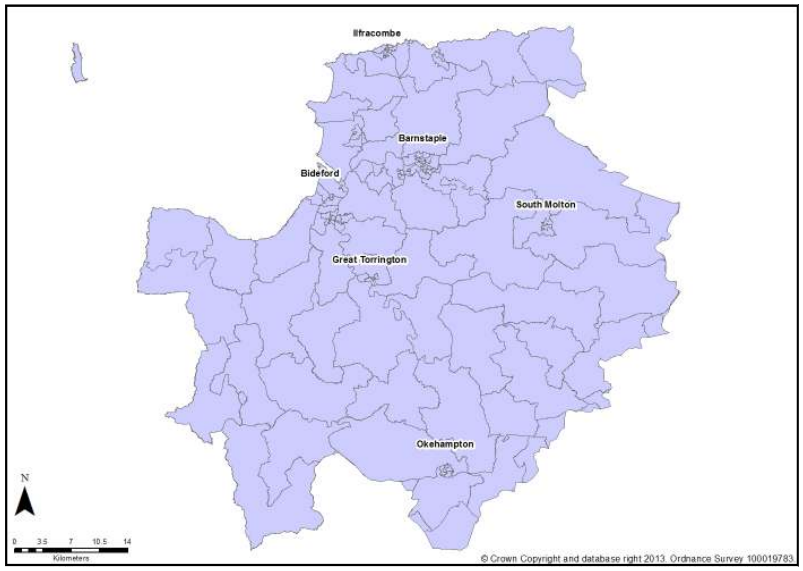
Heating type (%)
(Gas central heating, Oil, solid fuel, Electric heating)

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100

(28) Percentage of oil central heating (0-100 scale)



(29) Percentage of solid fuel (0-100 scale)



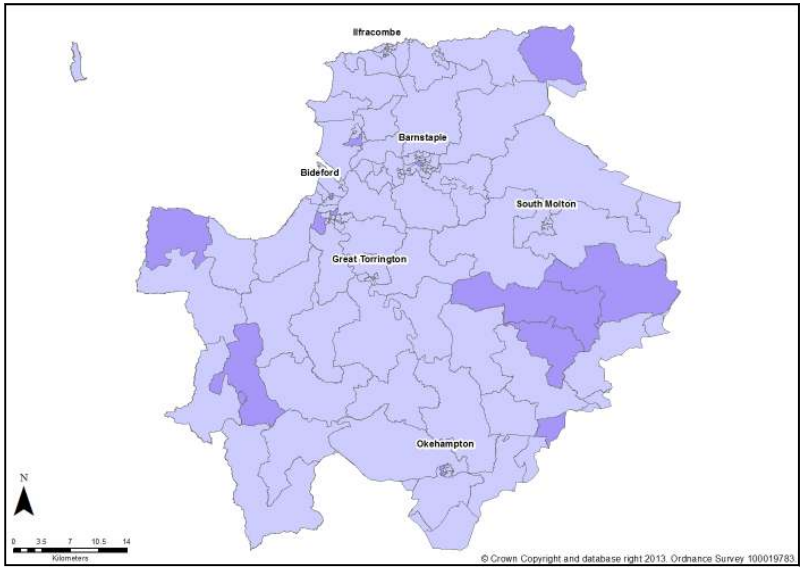
What is the map showing?

At this scale these maps show that the off-gas areas are mainly heated using oil, with some small parts of Torridge and Mid Devon also using electricity.

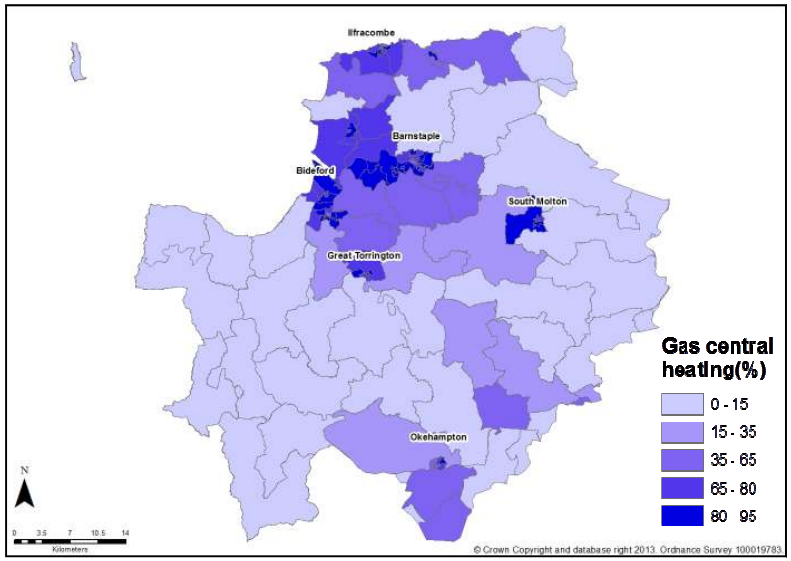
Census 2011

ONS

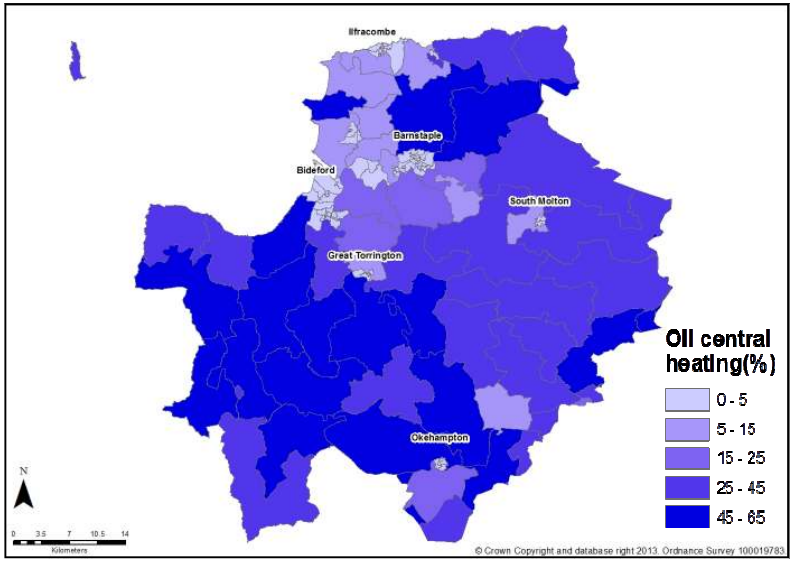
(30) Percentage of electricity heating (0-100 scale)



(31) Percentage of gas central heating (Variable scale)



(32) Percentage of oil central heating (Variable scale)

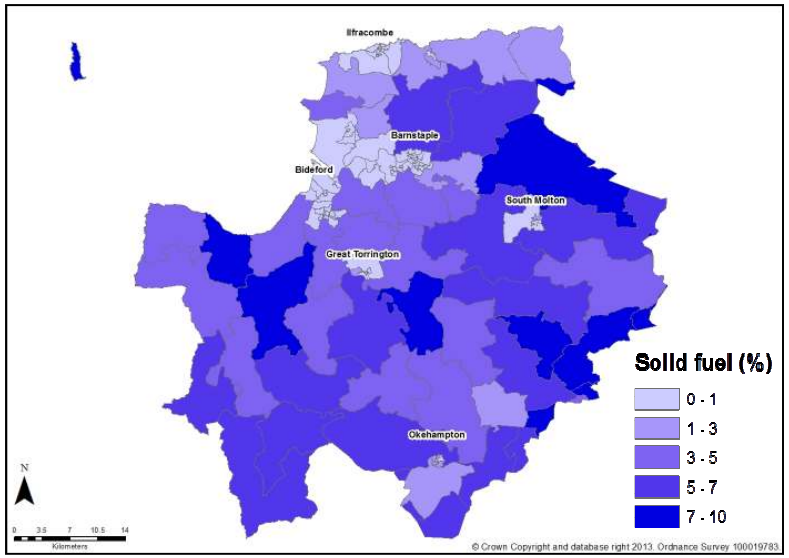


What is the map showing?

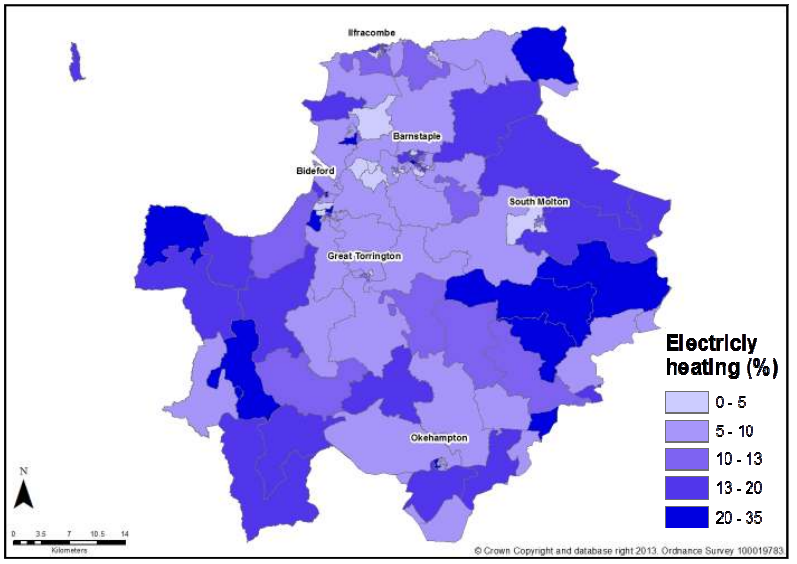
With a variable scale, more detail is seen for each indicator. The rural areas use a mix of fuel types while the town centres and much of North Devon use gas. The rural areas need energy efficiency improvements as the dwellings are often larger or with solid walls, whilst the areas on gas can be targeted for switching to renewable energy sources.

Census 2011, ONS

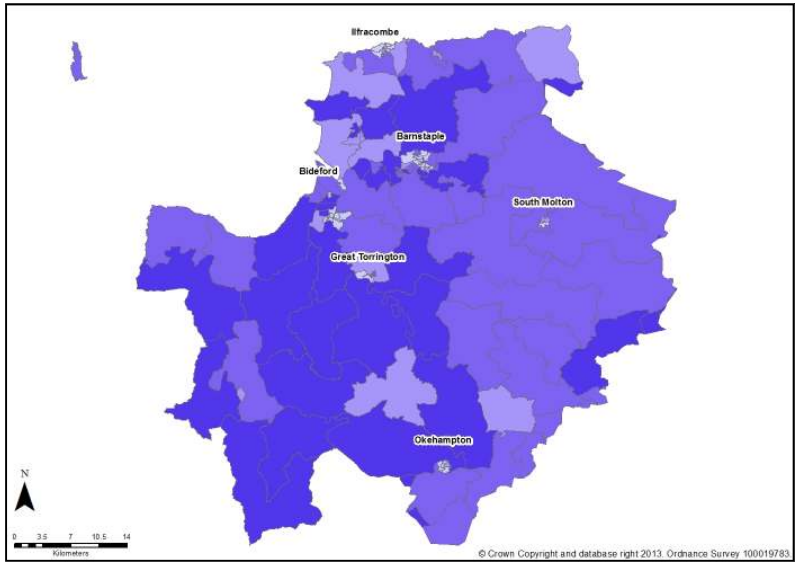
(33) Percentage of solid fuel (Variable scale)



(34) Percentage of electricity heating (Variable scale)



(35) Percentage of detached house (0 - 100 scale)



Housing type (%) (Detached, Semi-detached, Terraced,Flat)

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100

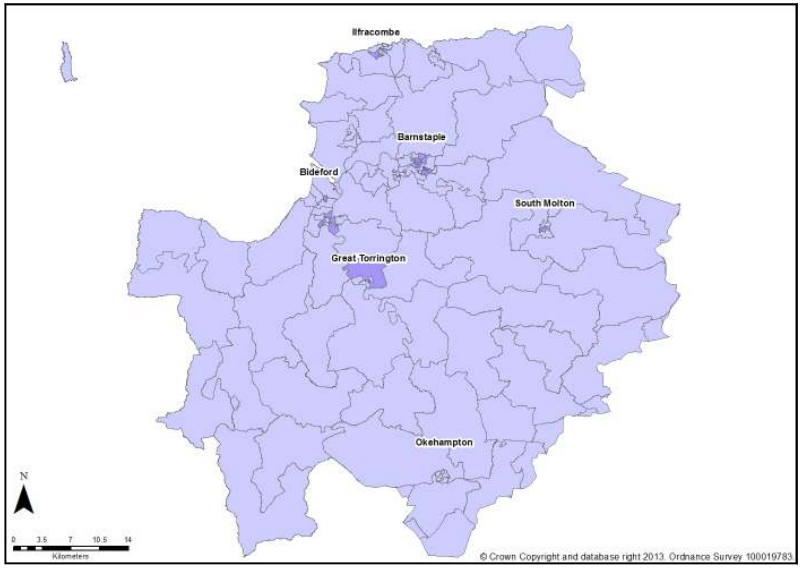
What is the map showing?

At this scale detached homes are the dominant type through-out the area, terraced are the next most common property type and are mainly in town centres or around more urban areas. Flats and semi-detached properties are only seen in the towns.

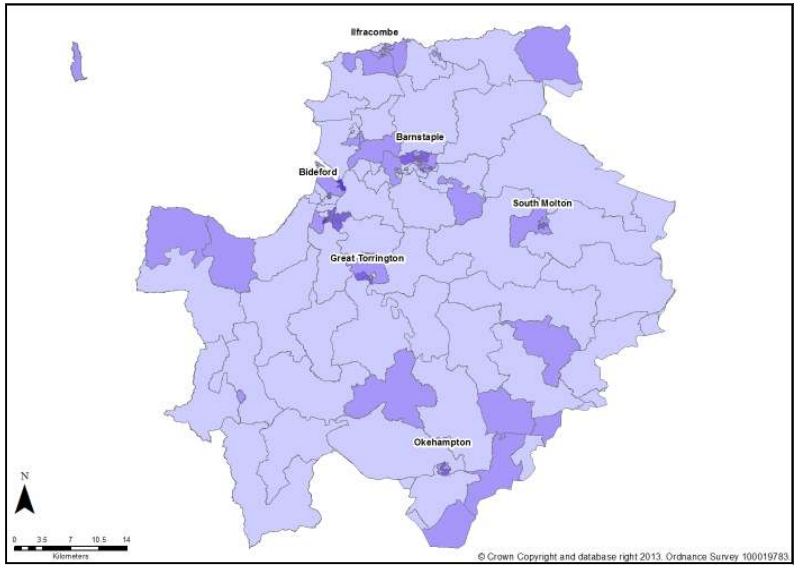
Census 2011

ONS

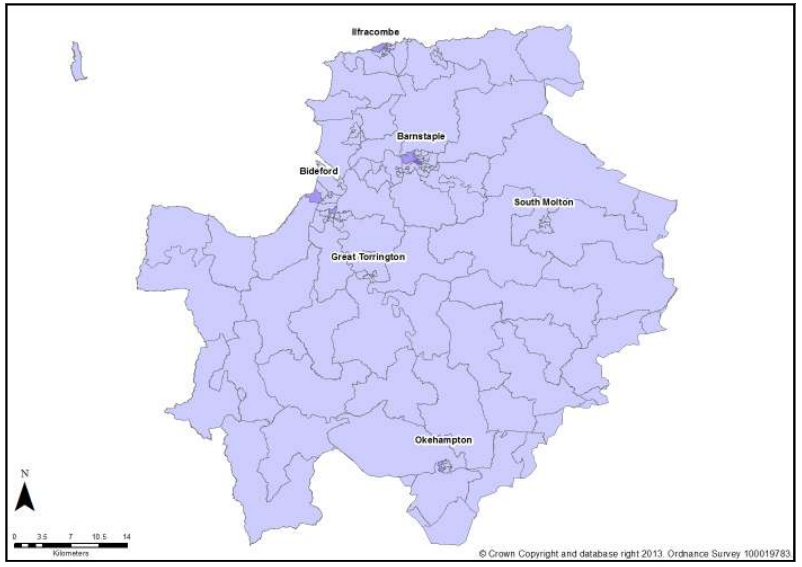
(36) Percentage of semi-detached house (0 - 100 scale)



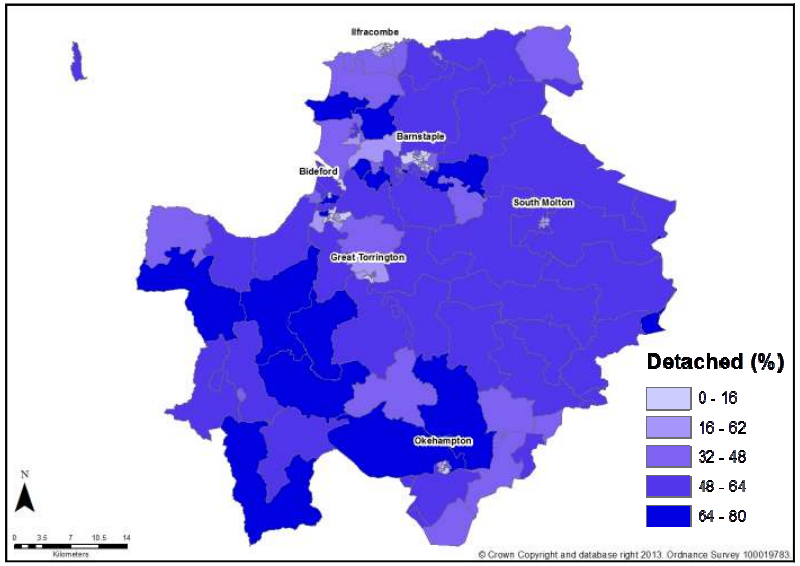
(37) Percentage of terraced house (0 - 100 scale)



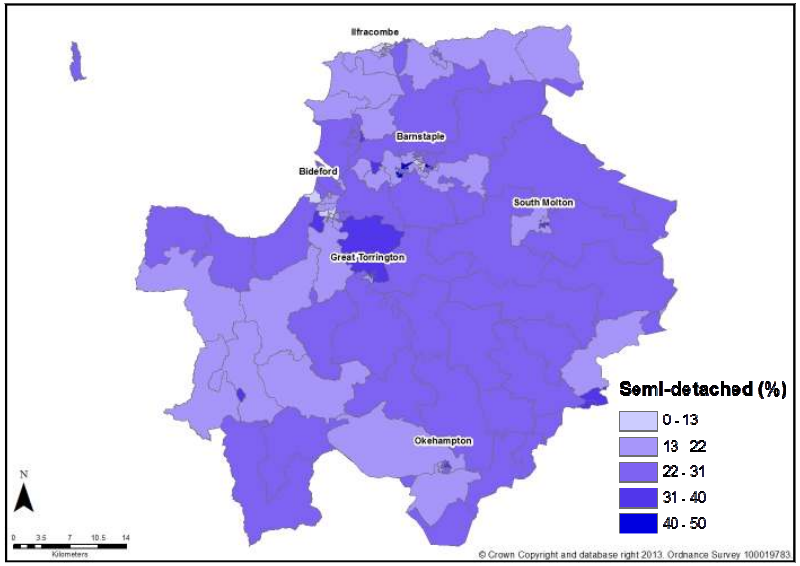
(38) Percentage of flats (0 - 100 scale)



(39) Percentage of detached house (Variable scale)



(40) Percentage of semi-detached house (Variable scale)



What is the map showing?

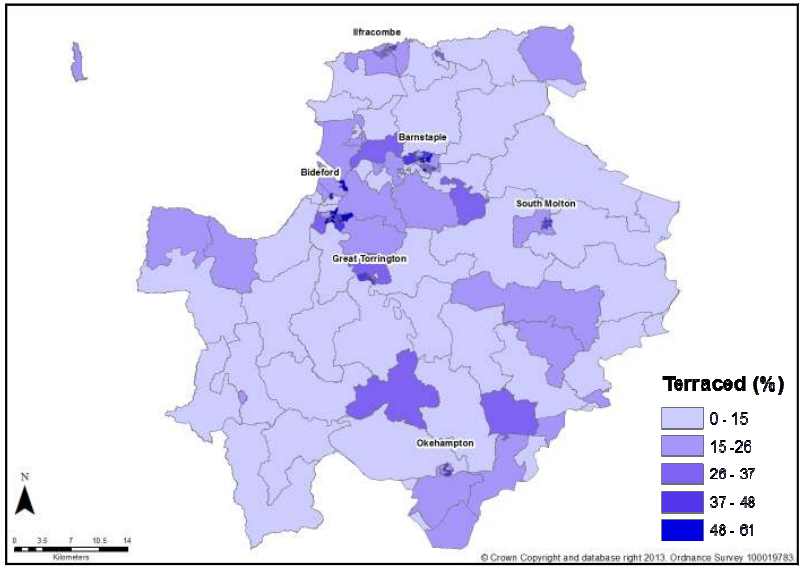
With a variable scale more detail can be seen for each indicator; for example semi-detached houses can be found throughout the area in both rural and urban centres.

Different approaches should be used to target different house types. Detached dwellings lose the most energy through heat loss so improvements to energy efficiency should be prioritised in these areas for example.

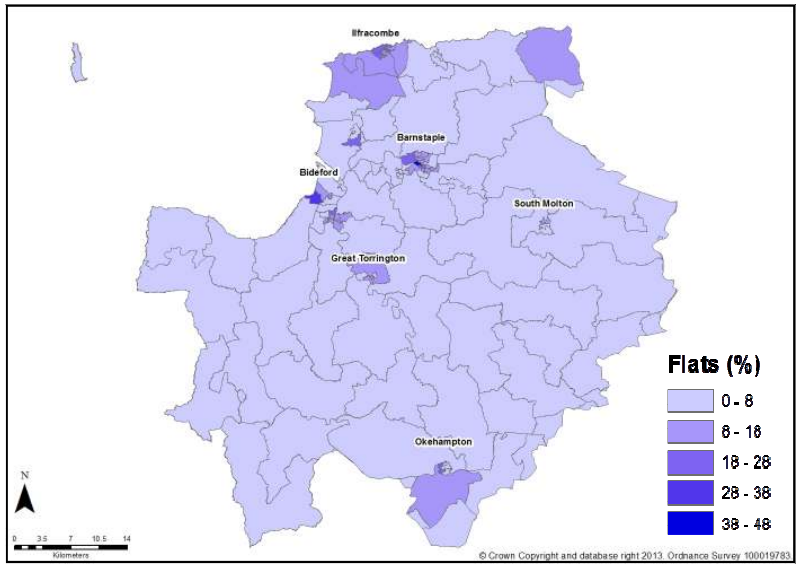
Census 2011

ONS

(41) Percentage of terraced house (Variable scale)



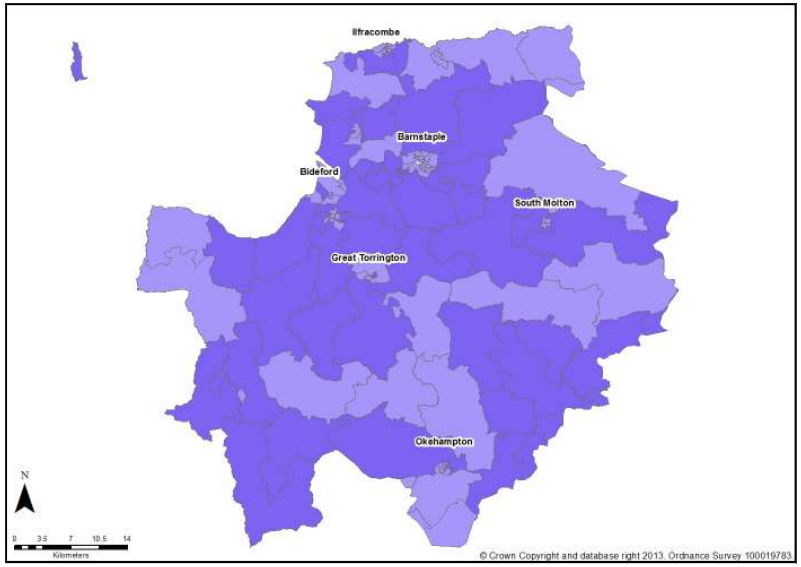
(42) Percentage of flats (Variable scale)



8. GIS mapping of key indicators

8.5 Transport

(43) Method of travel to work , single driver in a car (0 - 100 scale)



Method of travel to work (%)
(Single driver in a car, Mainly work at home, Bus, Bike, Walk)

- 0 - 20
- 20 - 40
- 40 - 60
- 60 - 80
- 80 - 100

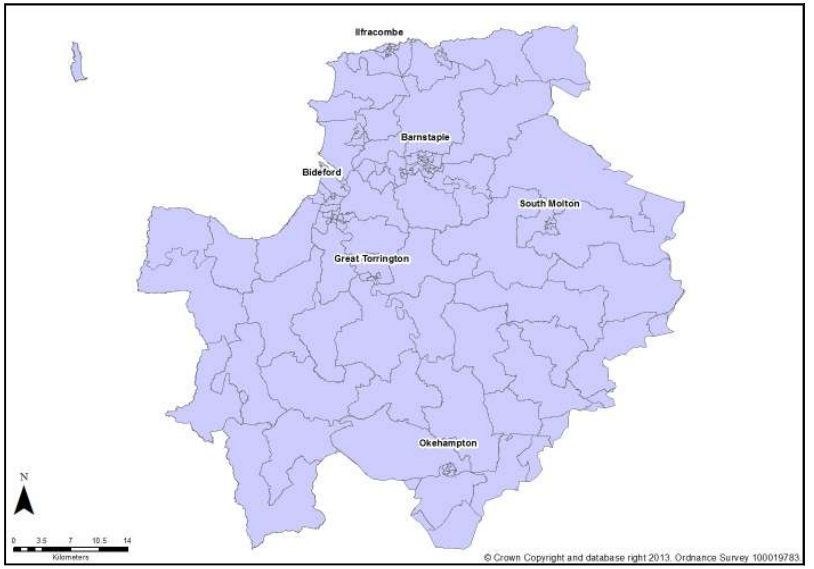
What is the map showing?

Individuals driving to work is the dominant trend throughout the area. The LLSOAs through which the major A roads run show the highest proportion of single drivers in cars.

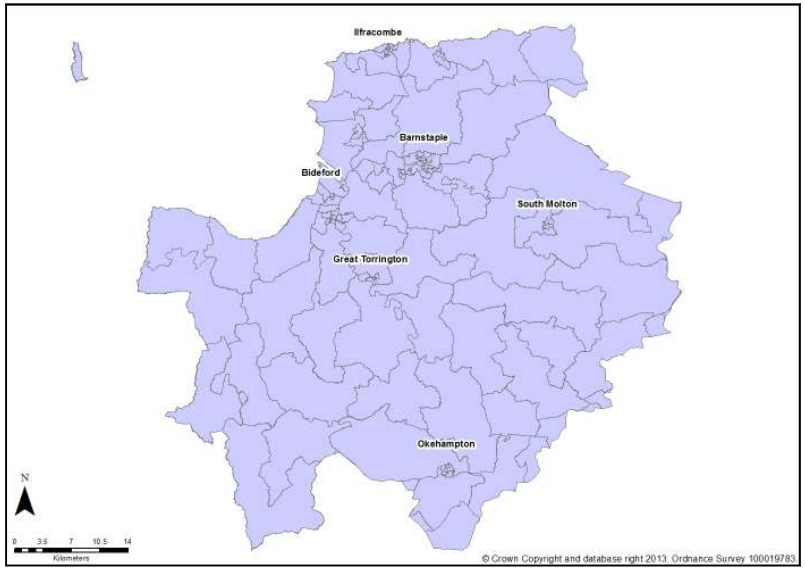
Census 2011

ONS

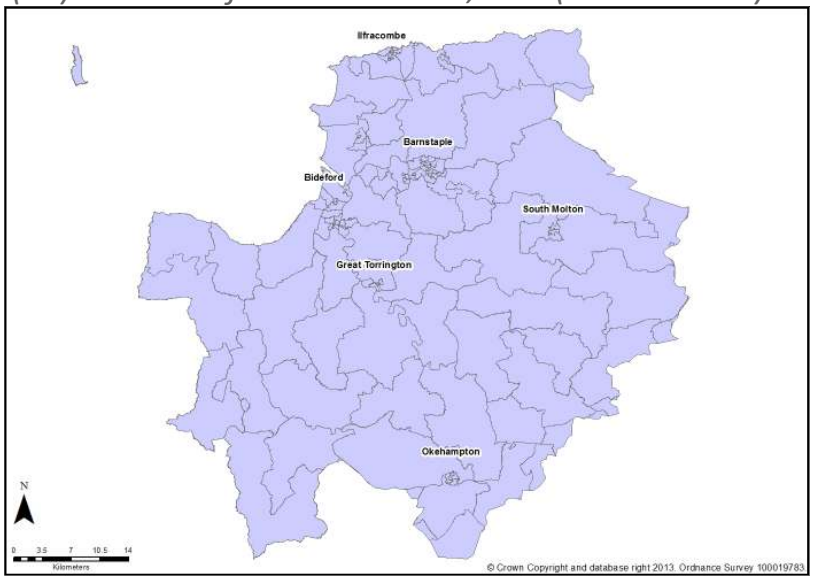
(44) Method of travel to work , mainly work at home (0 - 100 scale)



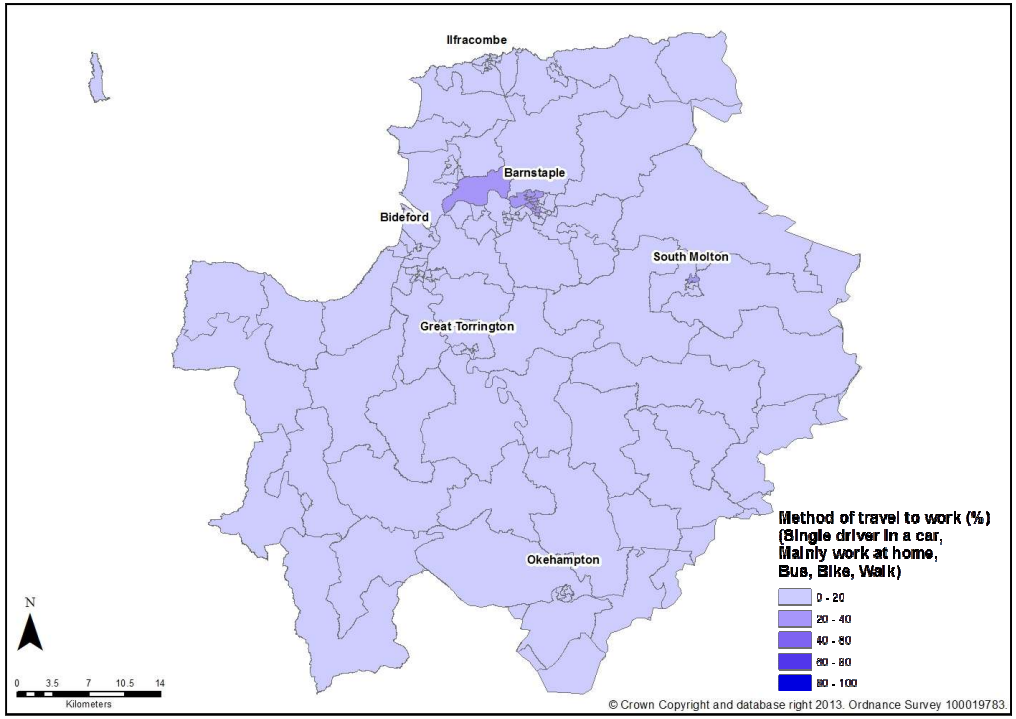
(45) Method of travel to work , bus (0 - 100 scale)



(46) Method of travel to work , bike (0 - 100 scale)



(47) Method of travel to work , walk (0 - 100 scale)



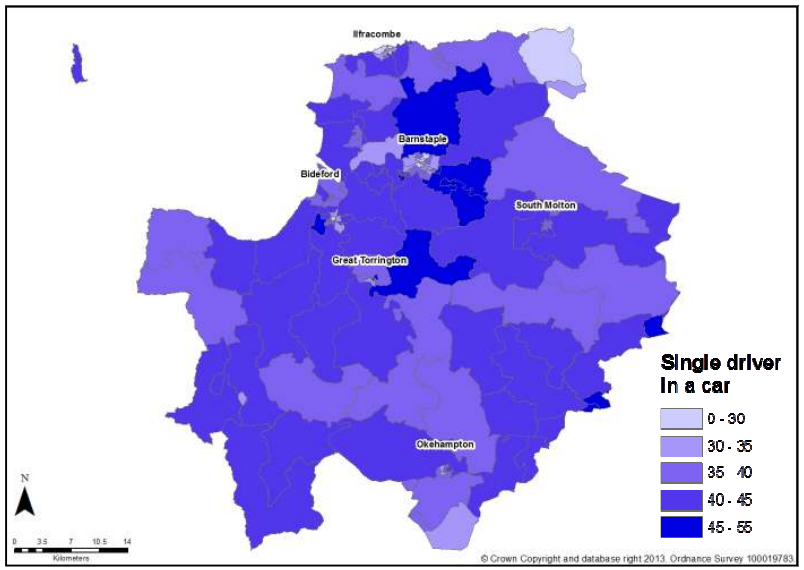
What is the map showing?

At this scale people walking to work can only be seen in Barnstaple and South Molton.

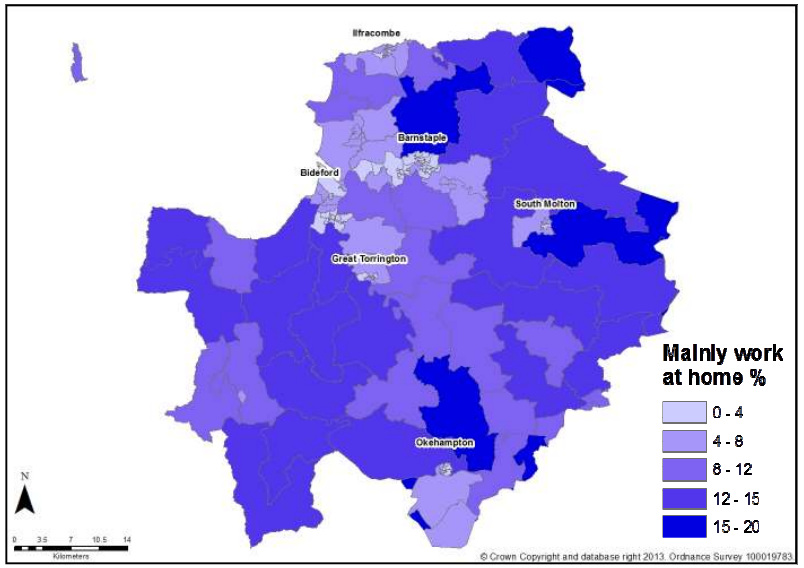
Census 2011

ONS

(48) Method of travel to work , single driver in a car (Variable scale)



(49) Method of travel to work , mainly work at home (Variable scale)



What is the map showing?

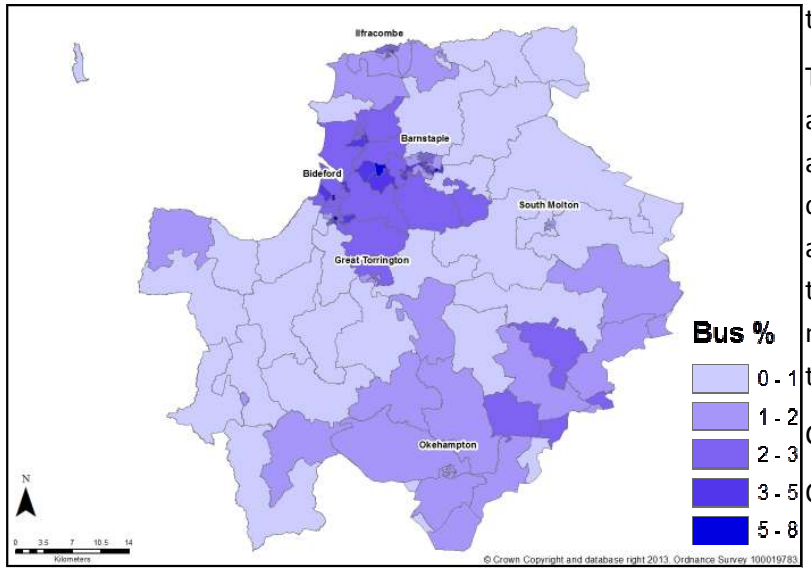
The rural areas have the highest proportion of people working from home, which includes those people working in an agricultural setting (i.e. family-run farming business) or those for which the remote transport routes promote this type of work.

The main bicycle users are in and around Barnstaple, whilst buses are used between the major urban centres of Barnstaple, Bideford and Great Torrington, but not in the rural areas—highlighting the need for more connected public transport routes.

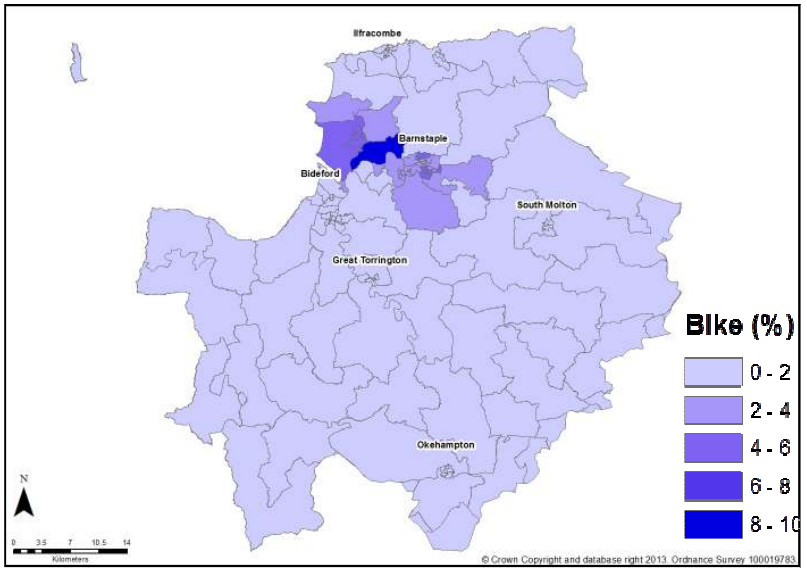
Census 2011

ONS

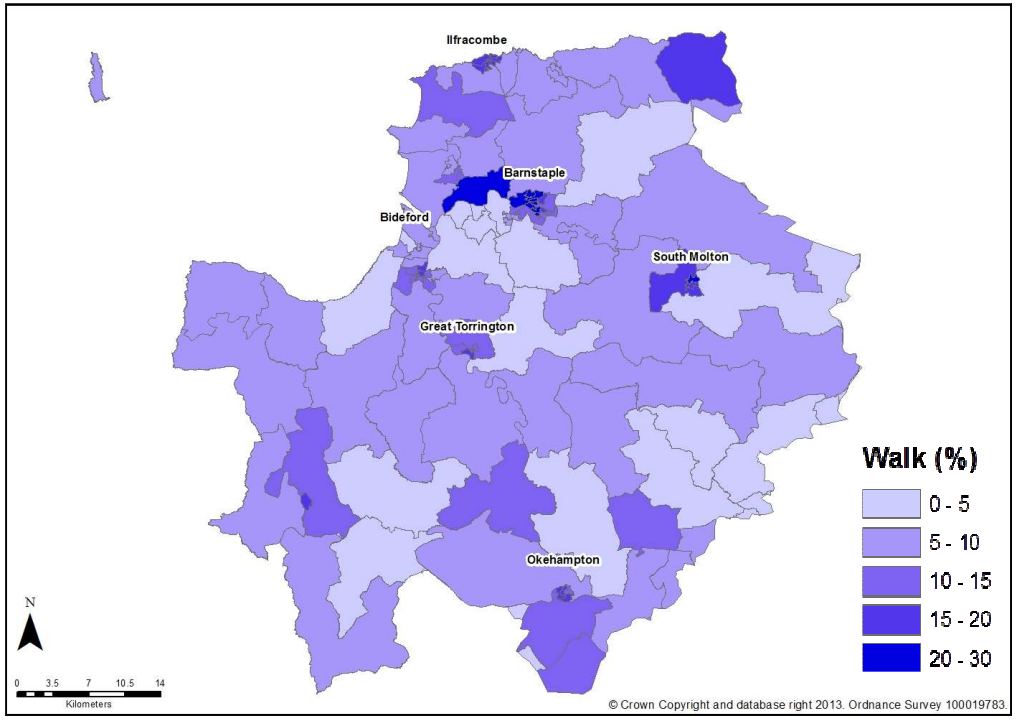
(50) Method of travel to work , bus (Variable scale)



(51) Method of travel to work , bike (Variable scale)



(52) Method of travel to work , walk (Variable scale)



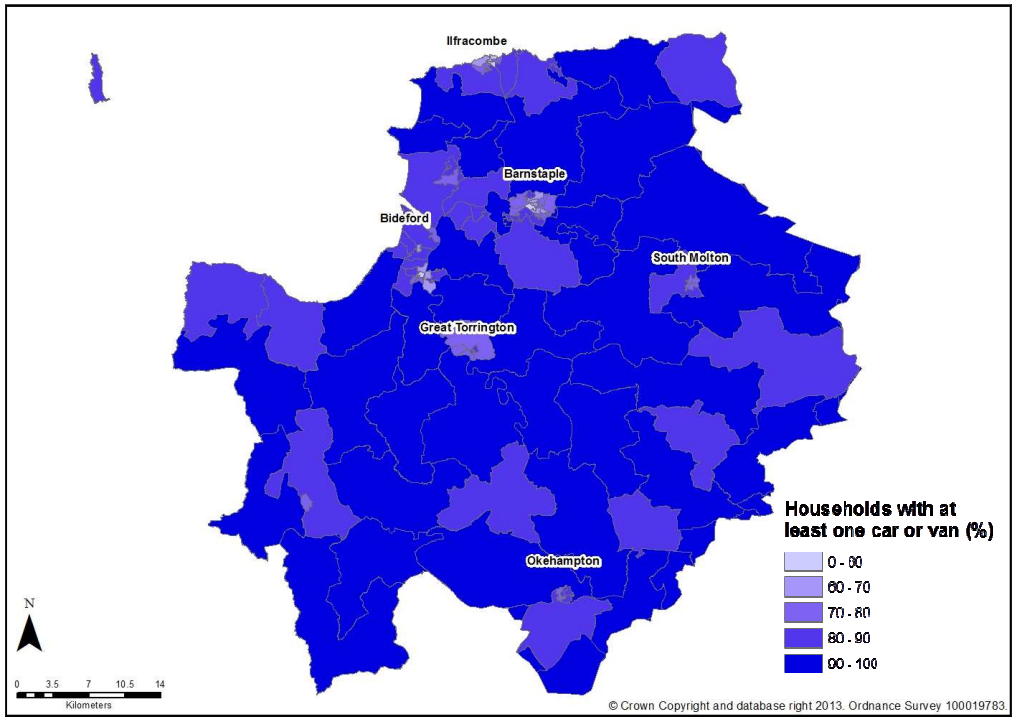
What is the map showing?

Around town centres, the highest proportion of walkers can be seen where people live close to work. People walking to work in the rural areas corresponds with those working from home, probably in agriculture or local village businesses.

Census 2011

ONS

(53) Car available: percentage of households with at least one car or van



What is the map showing?

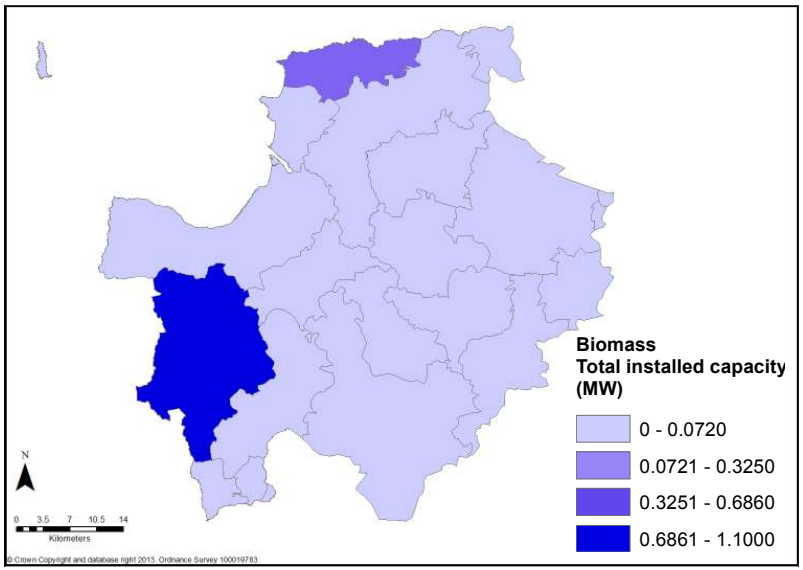
There is a very high proportion of households with at least one car throughout the Energy Plan area. In the town centres the proportion is often less but still between 60-70%. Targeting peoples behaviour will provide the biggest opportunities for reducing energy consumption; promoting car-sharing and journey planning and where possible use of local public transport.

Census 2011, ONS

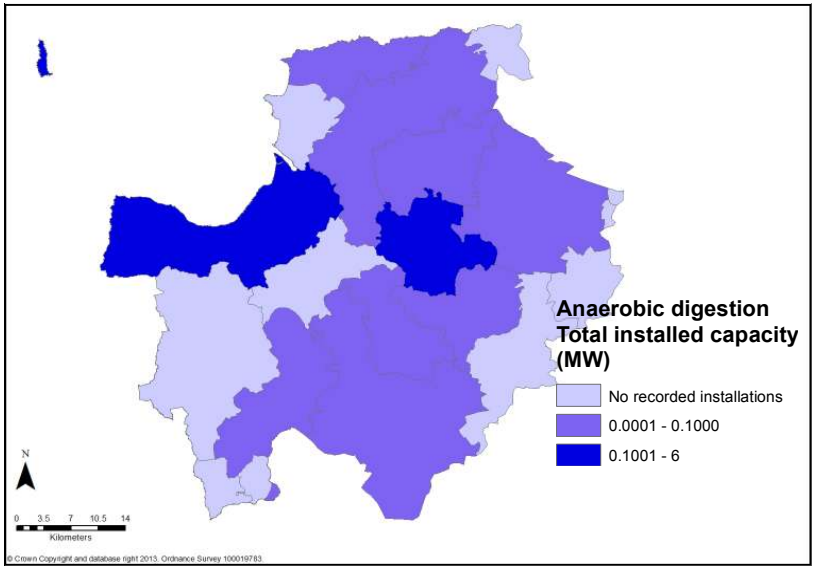
8. GIS mapping of key indicators

8.6 Technology distribution

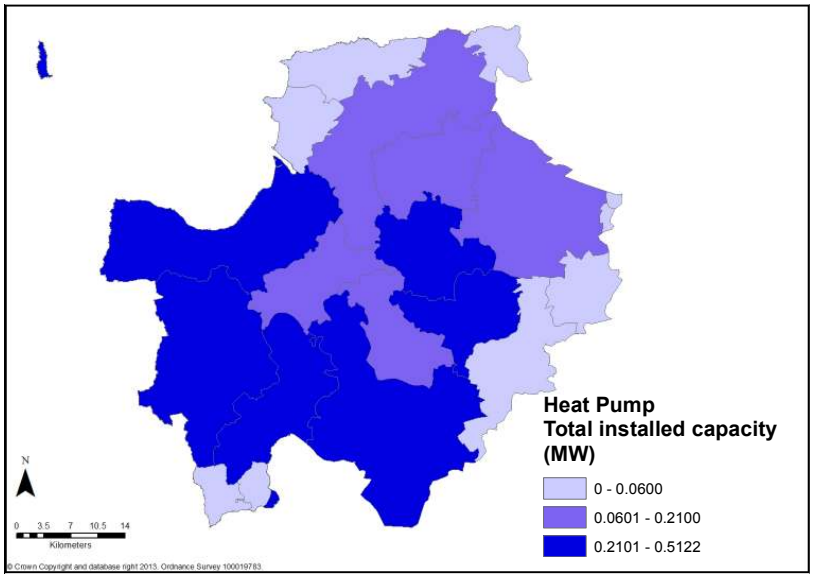
(54) Anaerobic digestion



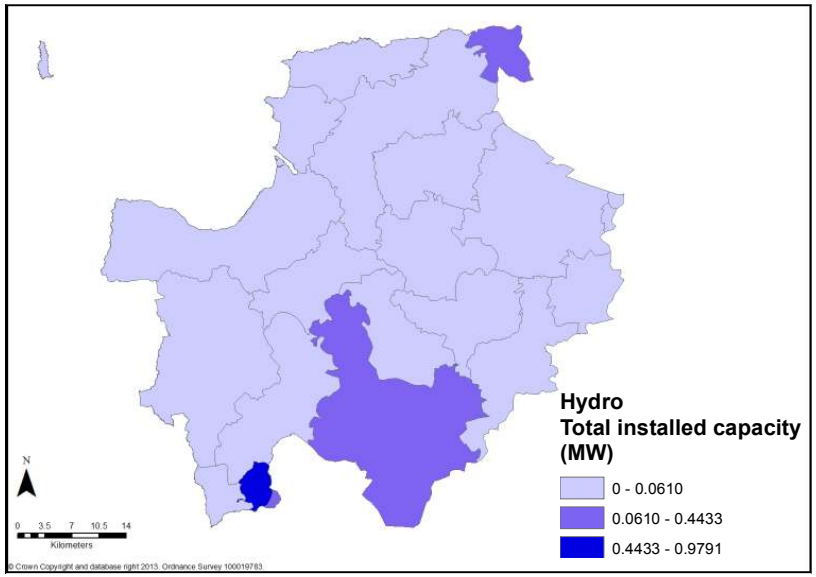
(55) Biomass



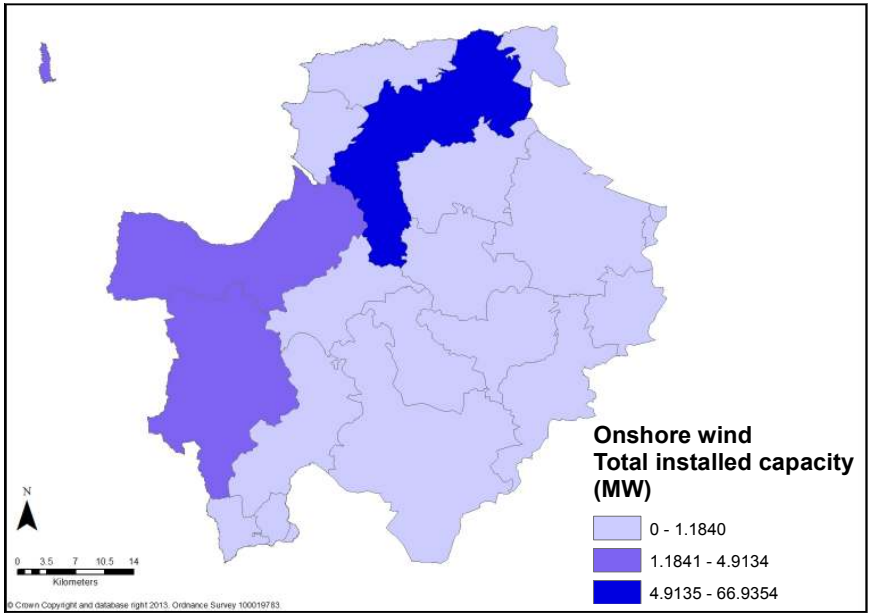
(56) Heat pump



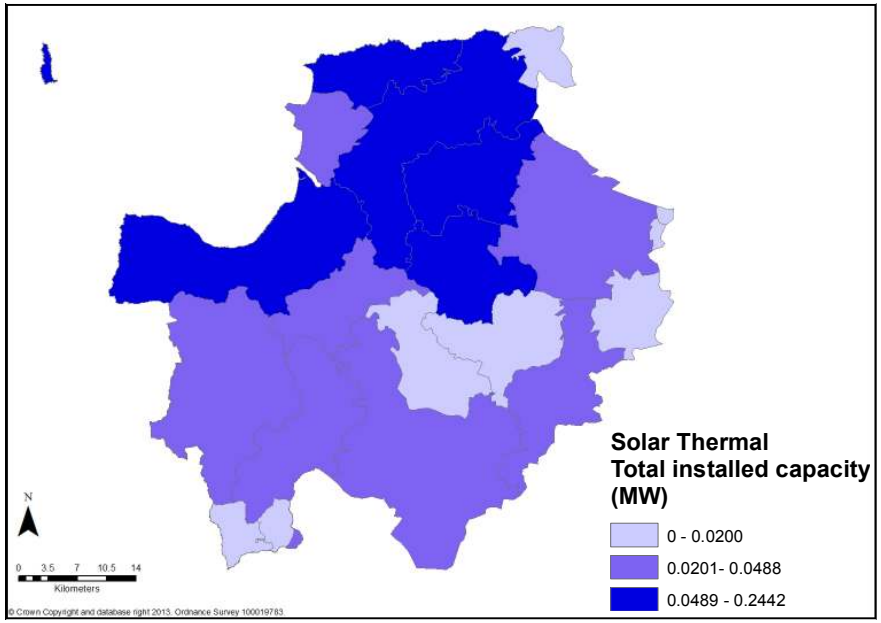
(57) Hydro



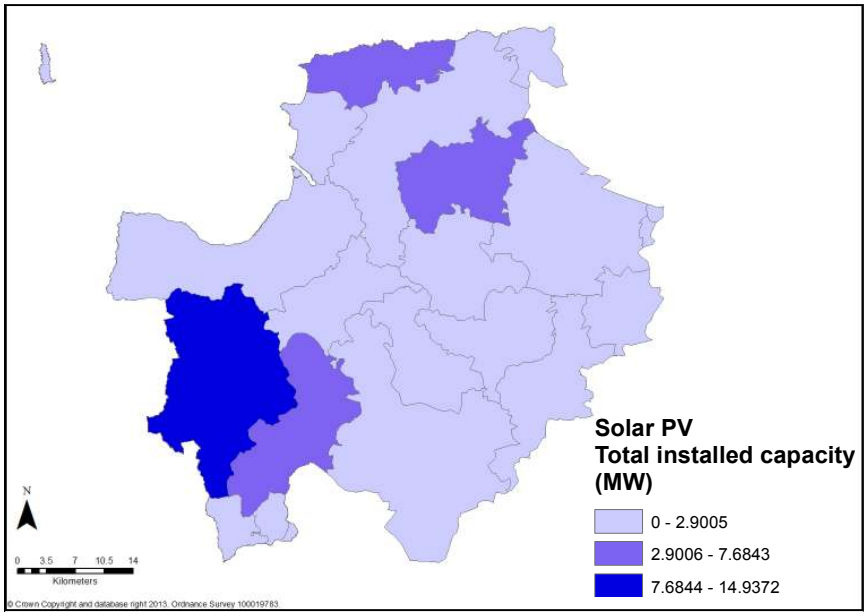
(58) Onshore wind



(59) Solar Thermal



(60) Solar PV



9. Relevant tables

9.1 Current cost of fuel

Table 1. Current estimates for the cost of different fuel types within the three broad energy sectors and the various sources for these estimates.

Domestic	£ per...	Unit	Source
Natural gas	0.045	kWh	DECC based on Plymouth average unit rate (inc. standing charge) for average property
Electricity peak	0.15	kWh	DECC based on Plymouth average unit rate (inc. standing charge) for average property
Electricity E7	0.062	kWh	Solid Fuel Technology Institute
Electricity area averag	0.135	kWh	Based on calculated consumption in area (by LSOA) of regular and E7 consumption and area weighting of both tariffs and analysis of fraction of E7 energy used on-peak.
Heating oil	0.054	kWh	Solid Fuel Technology Institute
LPG bulk	0.082	kWh	Solid Fuel Technology Institute
LPG bottle	0.121	kWh	Solid Fuel Technology Institute
Average LPG	0.102	kWh	unable to determine local split e.g. Bottle likely to be used in park homes, tanks elsewhere
Wood logs	0.047	kWh	Solid Fuel Technology Institute
Wood pellets	0.039	kWh	Solid Fuel Technology Institute
Bituminous coal	0.04	kWh	Solid Fuel Technology Institute
Anthracite	0.044	kWh	Solid Fuel Technology Institute
Non-Domestic	£ per...	Unit	Source
Electricity	0.108	kWh	DECC weighted average of "very small" and "small/medium" electricity based on average metered non-domestic electricity normal and half hourly consumption in study area
Gas	0.029	kWh	DECC small gas user based on average metered non-domestic gas consumption in study area
Coal	2.86	GJ	DECC mean industrial user based on all available 2012 quarterly data
Heavy Fuel Oil	631.63	tonne	DECC median industrial user based on all available 2012 quarterly data
Gas oil	808.87	tonne	DECC median industrial user based on all available 2012 quarterly data
Coal	0.01	kWh	converted from above based on Defra conversion factors
Heavy Fuel Oil	0.053	kWh	converted from above based on Defra conversion factors
Gas oil	0.064	kWh	converted from above based on Defra conversion factors
Transport	£ per...	Unit	Source
Petrol	1.354	litre	DECC based on average price all months in 2012
Diesel	1.418	litre	DECC based on average price all months in 2012
Burning oil	0.059	litre	DECC based on average price all months in 2012
Gas oil	0.071	litre	DECC based on average price all months in 2012
Therefore...			
Petrol	0.141	kWh	Based on Defra conversion factors
Diesel	0.134	kWh	Based on Defra conversion factors
Burning oil	0.006	kWh	Based on Defra conversion factors
Gas oil	0.006	kWh	Based on Defra conversion factors

9. Relevant tables

9.2 Comparison capital costs, CO_2 and costs savings

Table 2. Comparison of the energy saving measures included in models and the capital costs, and CO_2 and cost savings that can be made by implementing them. Source: EST

	Energy saving measure	$kgCO_2$/house/year	Cost saving per year (£)	Min. installation cost (£)	Max. installation cost (£)
Insulation	Loft insulation (0 to 270mm)	730	180	300	300
	Loft insulation (100 to 270mm)	110	25	300	300
	Cavity wall insulation	560	140	450	500
	Hard to fill	560	140	1500	3000
	Solid wall insulation (internal)	1800	460	5500	8500
	Solid wall insulation (external)	1900	490	9400	13000
Heating	Boiler rating G (<70%)	1200	310	2300	2300
	Boiler rating F (70 - 74%)	810	205	2300	2300
	Boiler rating E (74 - 78%)	610	155	2300	2300
	Boiler rating D (78 - 82%)	430	105	2300	2300
Main fuel	Electricity to wood	7500	630	7000	13000
	Oil to wood	3900	270	7000	13000
	LPG to wood	3600	790	7000	13000
	Coal to wood	7700	270	7000	13000
	Gas to wood	3100	90	7000	13000

9. Relevant tables

9.3 Models

Table 3. Associated cost , CO2 saving and cost installation for each model houses.

	Un-insulated cavi-	Loft insulation	Oil to wood	"D" rate boiler to	Double glaz-	Total	Payback period
Cost saving (£)	140	180	270	310	170	1070	
CO2 saving (Kg)	560	730	3900	1200	680	7070	12
Cost installation (£)	450	300	7000	2300	2400	12450	

	Un-insulated cavity wall	Loft insulation <150mm	Electric to wood	"D" rate boiler to condensing boiler	Double glazing	Total	Payback period
Cost saving (£)	140	180	630	310	170	1430	
CO2 saving (Kg)	560	730	7500	1200	680	10670	9

	Un-insulated cavity wall	Loft insulation <150mm	LPG to wood	"D" rate boiler to condensing boiler	Double glazing	Total	Payback period
Cost saving (£)	140	180	790	310	170	1590	
CO2 saving (Kg)	560	730	3600	1200	680	6770	8
Cost installation (£)	450	300	7000	2300	2400	12450	

	Solid wall (external)	Loft insulation <150mm	Oil to wood	"D" rate boiler to condensing boiler	Double glazing	Total	Payback period
Cost saving (£)	490	180	270	310	170	1420	
CO2 saving (Kg)	1900	730	3900	1200	680	8410	15

	Solid wall (external)	Loft insulation <150mm	Electric to wood	"D" rate boiler to condensing boiler	Double glazing	Total	Payback period
Cost saving (£)	490	180	630	310	170	1780	
CO2 saving (Kg)	1900	730	7500	1200	680	12010	12

	Solid wall (external)	Loft insulation <150mm	LPG to wood	"D" rate boiler to condensing boiler	Double glazing	Total	Payback period
Cost saving (£)	490	180	790	310	170	1940	
CO2 saving (Kg)	1900	730	3600	1200	680	8110	11
Cost installation (£)	9400	300	7000	2300	2400	21400	

Table 3. Cont.

	Solid wall (internal)	Loft insulation <150mm	Oil to wood	"D" rate boiler to condensing boiler	Double glazing	Total	Payback period
Cost saving (£)	460	180	270	310	170	1390	
CO2 saving (Kg)	1800	730	3900	1200	680	8310	13
Cost installation (£)	5500	300	7000	2300	2400	17500	

	Solid wall	Loft insulation	Electric to	"D" rate boiler to con-	Double	Total	Payback period
Cost saving (£)	460	180	630	310	170	1750	
CO2 saving (Kg)	1800	730	7500	1200	680	11910	10
Cost installation (£)	5500	300	7000	2300	2400	17500	

	Solid wall (internal)	Loft insulation <150mm	LPG to wood	"D" rate boiler to condensing boiler	Double glazing	Total	Payback period
Cost saving (£)	460	180	790	310	170	1910	
CO2 saving (Kg)	1800	730	3600	1200	680	8010	9
Cost installation (£)	5500	300	7000	2300	2400	17500	

9. Relevant tables

9.4 Total installed capacity per year and per technology

Table 4. The total installed capacity (MW) for each renewable technology per year in the Energy Plan area. Source: RegenSW

Year	Anaerobic digestion	Biomass	Heat pump	Hydro	Onshore Wind	Solar PV	Solar Thermal
1983							0.0020
1986				0.9750			
1987				0.3000			
1991				0.0040			
1993						0.0002	
1998		0.2200					
1999		0.0150					
2000		0.1500			0.0040	0.0010	
2001		0.0350				0.0056	0.0120
2002	6.0000	0.1490	0.0060			0.0014	
2003			0.3100	0.4300	0.0060	0.0056	0.0088
2004			0.0200			0.0052	0.0289
2005			0.0172		3.0000	0.0869	0.0415
2006		0.2155	0.0280		0.0110	0.0339	0.0639
2007		0.4980	0.1090		0.0450	0.0341	0.1924
2008		0.5920	0.0780		0.0392	0.1232	0.2234
2009		1.1815	0.0728		0.1025	0.0794	0.0822
2010		0.5368	0.2893	0.0008	66.2100	4.8483	0.0956
2011		0.2670	0.6257	0.0550	3.9147	9.9626	0.0443
2012	0.1000	3.3050	1.0316		0.7032	17.4849	0.1688
2013		0.8526	0.4359		0.0240	14.5180	0.0164

Table 13. Summarise of the installed capacity and number of projects by technology and by sectors

Sector	Technology	Installed capacity (MW)	Number of installations
Domestic	Biomass	3.3644	85
	Heat pump	0.3478	36
	Hydro	0.0040	1
	Onshore Wind	0.4424	47
	Solar PV	12.5767	3183
	Solar Thermal	0.4691	158
Community	Biomass	0.1660	4
	Heat pump	0.0520	3
	Onshore Wind	0.0300	1
	Solar PV	0.1838	25
	Solar Thermal	0.0933	5
Public	Biomass	0.8530	7
	Heat pump	0.3300	3
	Onshore wind	0.0060	1
	Solar PV	0.1448	12
	Solar Thermal	0.0744	7
Commercial	Anaerobic digestion	6.1000	2
	Biomass	0.9120	12
	Heat pump	0.0970	6
	Hydro	1.7608	5
	Onshore Wind	73.4112	36
	Solar PV	31.0038	112
	Solar Thermal	0.1531	21
Non-domestic	Biomass	2.7220	23
	Heat pump	2.1888	234
	Onshore Wind	0.1700	4
	Solar PV	0.2307	7
	Solar Thermal	0.1472	58
Unknown	Heat pump	0.0080	1
	Solar PV	3.0504	94
	Solar Thermal	0.0390	2

10. Data sources

References:

Future energy prices: http://www.nationalgrid.com/NR/rdonlyres/86C815F5-0EAD-46B5-A580-A0A516562B3E/50819/10312_1_NG_Futureenergyscenarios_WEB1.pdf

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