TEIGNBRIDGE MAPPED DATA-
CALCULATING DOMESTIC EMISSIONS

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Contents:

Section 1. Calculation of Domestic Emissions

This paper describes how domestic emissions have been calculated for output areas, parishes, wards and lower super output areas for Teignbridge.

There are 3 principle sources of information:

- Overall emissions for Teignbridge from government 2017 GHG emissions estimates at district level
- Meter readings for gas and electricity
    - Gas and electricity meter readings for 2017 are published as aggregates at Census 2011 Lower Super Output Area (LSOA) level.
    - Gas meter readings for 2017 are published as aggregates at postcode level, some postcodes are not published where they might identify individuals.
- CO2 Estimates on Energy Performance Certificates

Section 2. Overall emissions for Teignbridge

Derived from from 2017 GHG emissions estimates.

These are shown in the following table:

Fuel Source	Emissions $ktCO_2e$	Energy GWh
Electricity	63.15	248.23
Gas	99.47	536.04
Other Fuels	20.48	93.56
Total	**183.1**	**877.83**

Other fuels includes Coal, Manufactured Fuels and Petroleum products.

The apportionment to parishes needs to be reconciled with these figures.

2.1 Meter readings at LSOA level

Summing these across Teignbridge we get:

Fuel Source	Energy GWh	Meters
Electricity	248.23	62347
Gas	536.05	47096

Readings from this source add up to the published district totals above, so we have confidence in these figures at this level.

2.2 Gas meter readings at Postcode level

Summing these across Teignbridge we get:

Fuel Source	Energy GWh	Meters
Gas	499.60	44069

The shortfall over the LSOA level figures is mainly accounted for by postcodes where readings have been excluded as these might identify individuals.

The shortfall is as follows:

Fuel Source	Energy GWh	Meters
Gas shortfall	36.45	3027

We need to produce a shortfall figure for each LSOA and apportion this to lower level geographies, so the energy consumption for each lower level area is:

Sum of meter readings for postcodes within area + Adjustment.

2.3 Electricity meters at lower levels

Since we only have electricity meter readings at LSOA level, the LSOA is apportioned to each lower level area in proportion to the number of dwellings.

2.4 Emissions from electricity and gas

Emissions factors are published for all fuels for use by companies that report their GHG emissions. These factors could be used, but as we want to reconcile to the district figure, we derive a factor from district emissions divided by district energy:

Fuel Source	Emissions $ktCO_2e$	Energy GWh	Factor
Electricity	63.15	248.23	0.2544
Gas	99.47	536.04	0.1855

The figure for gas from https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019 is 0.18385 (Gross CV), and for electricity 0.2556 , these are slightly different from the above, but not significantly, and if used will give an answer that doesn't balance.

These factors are then applied to energy for each fuel for each area.

The gas factor is applied to gas meters by postcode:

	Energy GWh	Emissions $ktCO_2e$
Meter readings	499.60	92.70
Discrepancy	36.45	6.76

Section 3. Energy Performance Certificates

We need a way to:

- Estimate emissions from meters in postcodes which we excluded from the postcode level dataset.
- Estimate emissions from other fuels.

EPCs can be used to provide this estimate.

As described in my post about EPCs these contain a wealth of information and are available at individual EPC level. The previous version of the domestic emissions figures was derived using these.

Each EPC since October 2008 contains an estimate of CO2 emissions at the time the inspection was done.

It was shown that when scaled to represent all dwellings in Teignbridge the sum of these significantly overestimates district emissions:

Heat Fuel Source	Official Emissions $ktCO_2e$	Sum of all EPCs	Number of EPCs	Scaled emissions based on all EPCs
Electricity	63.15	30.37	6312	47.19
Gas	99.47	95.04	26759	147.71
Other	20.48	32.30	4176	50.20
Total	**183.1**	**157.70**	**37247**	**245.11**

Scaling is based on the total number of dwellings, which we estimate for Teignbridge at 57,890. This is between ONS estimates for the district in 2017 and 2019 of 57,287 and 58,414. We use our estimates because ONS estimates are only available at district level. The scaling factor used in the above table is 1.554219 (Number of dwellings / Number of EPCs = 57890/37247).

Details of the procedure for estimating the number of dwellings is given in the CalculatingDwellings document on our web site.

3.1 Typical EPCs

There will be an EPC for every new build and various other categories, these EPCs are not typical of those buildings that do not have an EPC, we define typical EPCs as those where the TRANSACTION_TYPE field of the EPC is one of:

- marketed sale
- none of the above
- assessment for green deal
- ECO assessment
- non marketed sale
- unknown
- Stock Condition Survey
- not recorded

Heat Fuel Source	Official Emissions $ktCO_2e$	Sum of Typical EPCs	Number of Typical EPCs	Sum of non-typical EPCs	Number of non-typical EPCs	Scaled Typical EPCs	All EPCs
Electricity	63.15	19.15	3489	11.22	2823	36.50	47.72
Gas	99.47	70.20	16409	24.84	10350	133.84	158.68
Other	20.48	25.73	2874	6.56	1302	49.06	55.63
Total	**183.1**	**115.09**	**22772**	**42.62**	**14475**	**219.40**	**262.03**

There are 43,415 buildings that are represented by the typical EPCs, so the typical EPCs need to be factored by 1.906508. This gives a higher overall estimate.

In order to reconcile these figures to the government totals, a factor of 183.1/262.03 needs to be applied. Once this is done it is clear that some areas have emissions based on meter readings that are higher than the estimates produced using this method.

Section 4. Gas meters in postcodes with no reported gas meters.

EPCs have 2 fields that are of interest when trying to estimate where the non-recorded gas meters are:

- mains_gas_flag a Y/N value that is sometimes filled in.
- mainheat_description which is a text field, which can be searched to determine fuel type.

A field HEATFUEL is derived from mainheat_description by searching for the following strings until a match is found to give value given in the following table:

Search string in mainheat_description	HEATFUEL value	HEATFUEL_GROUP value
electricity	electricity	Electricity
gas	gas	Gas
Community	community	Other
wood	wood	
anthracite	manufactured	
smokeless		
coal	Coal	
Oil	Petroleum	
LPG		

The following summarises analysis of EPCs where the postcode doesn't have a record in the gas meters by postcode data.

	mains_gas_flag=Y		HEATFUEL=gas		Notes
	Count	CO2	Count	CO2	
total EPCs	1467	6.80	1875	7.02	Value retrieved from database query
simply scaled	3027	14.03	3027	11.34	Scaled by deficit count/epc count
typical	1016	5.16	969	4.78	And typical=1
atypical	451	1.64	906	2.24	And typical=0
deficit	3027	6.76	3027	6.76	From above
typical reqd	2576	5.12	2121	4.52	Deficit – atypical
scaling factor	2.535433071		2.188854		Typical reqd/total EPC count
typical scaled	2576	13.08	2121	10.47	Scaling factor X total EPC emissions
complex scaled	3027	14.72	3027	12.71	Typical scaled + atypical

The actual figures are remarkably close to the emissions discrepancy, but correspond with far fewer meters.

HEATFUEL=gas gives a better value for the number of meters and slightly better figure for emission.

We will use HEATFUEL=gas figures from now on.

A scaling factor of 6.76/12.71 (0.531865) needs to be applied to emissions figures derived by the above method for each LSOA.

The method used above needs to be repeated for each LSOA to get to determine factors to apply to gas meter derived values for each area.

Section 5. Other fuel emissions

Other fuel emissions also need to be filled in.

Our starting point is to compare other fuel emissions from EPCs with government figures.

Other fuel data source	Count	Emissions
Government		20.48
Typical EPCs	2594	24.32
Non-typical EPCs	1157	6.04
Total EPCs	3751	30.36

Wood has been split out of the figures as emissions from wood burning are not counted. These dwellings will have other emissions, but these will be from electricity or gas that have already been accounted for.

Here we do not know how many properties are heated from other fuels, so this needs to be derived, this is done by scaling the number of typical EPCs by the overall ratio of typical EPCs to typical dwellings(1.906508) to give 4945 typical properties and emissions of 52.41.

	Counts	Emissions	Notes
EPCs	3751	30.358	Totals for other fuels less wood from EPCs
Typical EPCs	2594	24.321	Totals for other fuels less wood that are typical
Atypical EPCs	1157	6.04	Totals for other fuels less wood that are typical
Scaling factor	1.906508		Scaling factor from dwellings/typical EPCs (57,890/22772)
Scaled typical	4945.482	46.36818	Typical EPC values scaled by scaling factor
Total	6102	52.40818	Atypical EPC values + Scaled Typical
Govt total		20.48	Emissions total we are aiming at
Global scaling		0.390779	Factor to apply to other fuel emissions