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BRE Client Report

BRE Dwelling Level Housing Stock Modelling and Database for Chichester District Council

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Executive summary

- Chichester District Council commissioned BRE to undertake a series of modelling exercises on their housing stock. This report describes the modelling work and provides details of the results obtained from the dwelling level model and database. The database is also provided to the council to enable them to obtain specific information whenever required.
- The detailed housing stock information provided in this report will facilitate the delivery of Chichester's housing strategy and enable a targeted intervention approach to improving housing. In addition to this there are also several relevant government policies – the Housing Act 2004, Housing Strategy Policy, Local Authority Housing Statistics (LAHS) and the Green Deal/ECO.
- The main aims of this work were to provide estimates of:
    - The percentage of dwellings meeting each of the key indicators[1] for Chichester overall and broken down by tenure and then mapped by COA (private sector stock only)
    - Information relating to LAHS reporting for the private sector stock - category 1 hazards as well as information on EPC ratings
- BRE Housing Stock Models were used to provide such estimates at dwelling level with a focus on private sector housing. The key indicators provide Chichester with detailed information on the likely condition of the stock and the geographical distribution of properties of interest.
- A stock modelling approach has been developed and used by BRE for many years and the most recent 2014 models have been updated to make use of the results of the 2011 English Housing Survey (EHS)[2] and additionally now incorporate a technique known as geomodelling[3] which makes use of Ordnance Survey (OS) data. These dwelling level models are used to estimate the likelihood of a particular dwelling meeting the criteria for each of the key indicators. These outputs can then be mapped to provide the authority with a geographical distribution of each of the key indicators which can then be used to target resources for improving the housing stock.

[1] Presence of a HHSRS category 1 hazard, presence of a category 1 hazard for excess cold, presence of a category 1 hazard for falls, dwellings in disrepair, fuel poverty (10% and Low Income High Cost definitions), dwelling occupied by a low income household and SimpleSAP rating.

[2] 2011 is the latest available data. Prior to the 2014 models EHS 2009 data was used.

[3] The OS data has been used to update a number of the model inputs – the main value of the OS data is the ability to determine the dwelling type with much greater confidence – see Appendix B for more information.

- The headline results are as follows:

Headline results for Chichester

1,844 dwellings in the private rented sector have category 1 Housing Health and Safety Rating System (HHSRS) hazards. This equates to 22% of properties in the private rented sector. *See full results*

The highest concentrations of fuel poverty in the private sector stock are fairly evenly distributed across central and northern parts of the district. Higher levels of excess cold are also concentrated in these areas; furthermore the levels of excess cold in Chichester are high compared to the national average. *See full results*

The highest concentrations of all HHSRS hazards in the private sector are found in the wards of Bury, Rogate and Wisborough Green and generally in the central and northern parts of the district. The more urban areas of Chichester and Selsey have relatively lower levels of hazards. *See full results*

The average SimpleSAP ratings for all private sector dwellings in Chichester is 51, which is worse than England (55). For the owner occupied stock in Chichester the figure is 52 and for the private rented sector it is 49. *See full results*

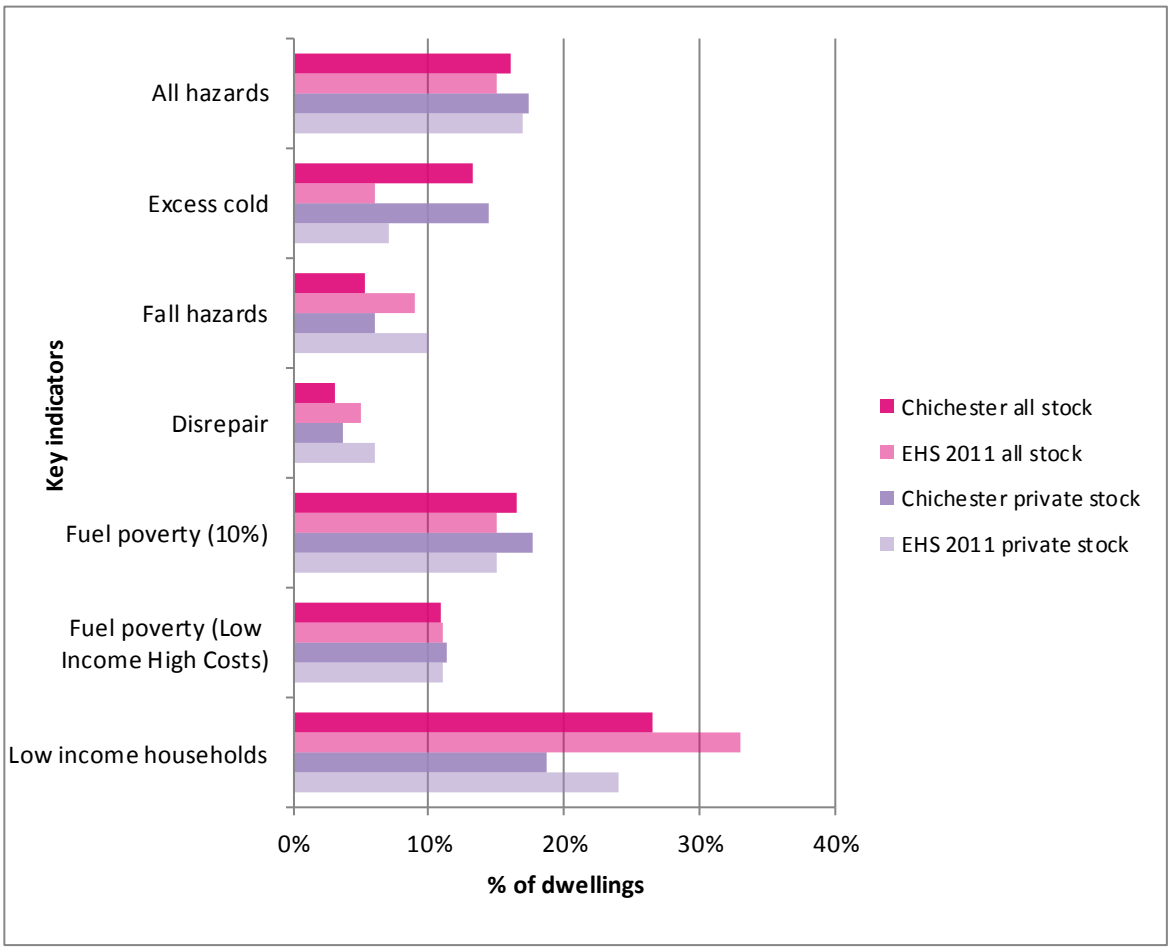
Maps by COA have been provided for the above key indicators. *See maps*

The total cost of mitigating category 1 hazards in Chichester's private sector stock is estimated to be £27.1 million. *See full results*

Key illustrations of headline results

- The table below shows the results for 7 of the key indicators in Chichester compared to England (EHS 2011) and split into all stock and private sector stock. The data shows that private stock in Chichester is better than the stock for the whole of England for Low income households, but worse for Excess cold.

Estimates of the percentage of dwellings meeting the key indicator criteria assessed by the housing stock models and database for all stock and private sector stock – Chichester compared to England (EHS 2011)



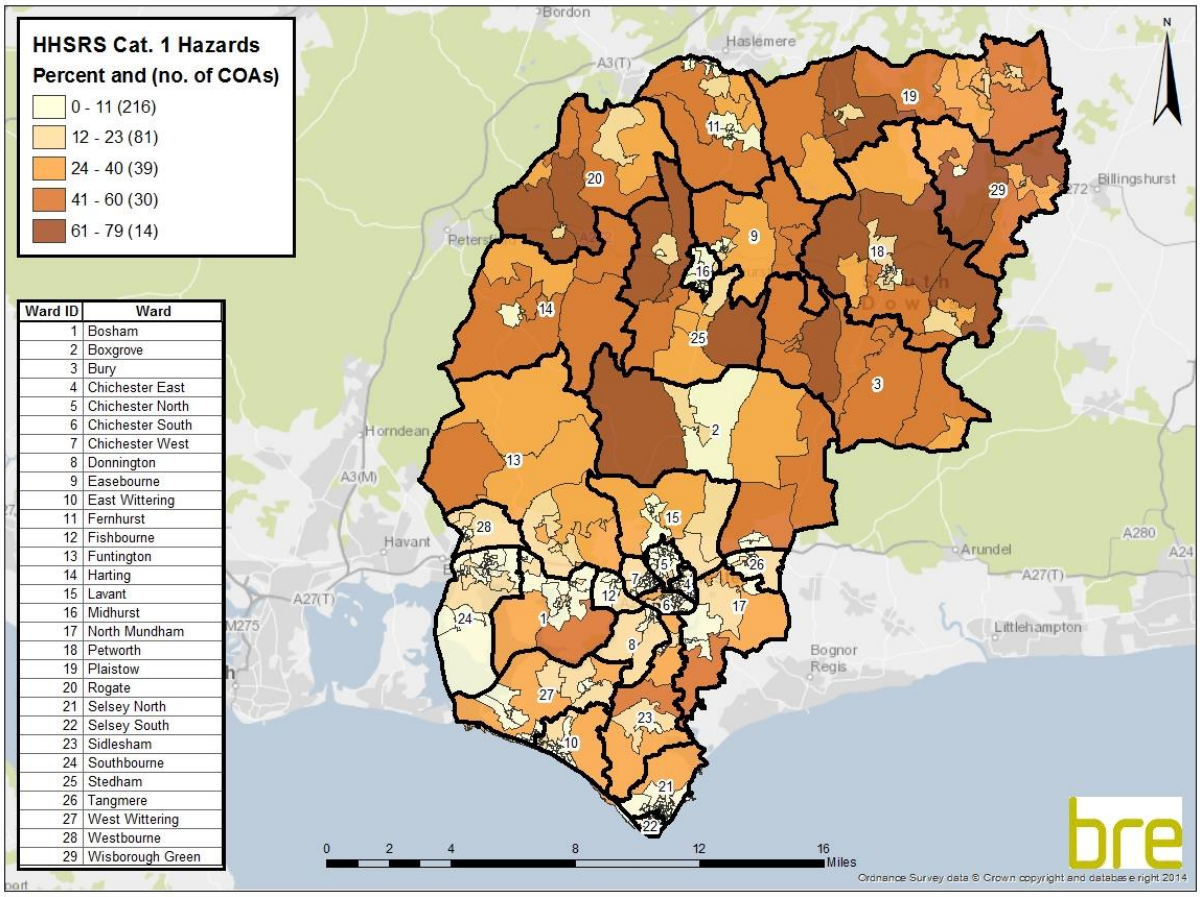
- The table overleaf shows the number and percentage of Chichester's private rented stock falling into each of the EPC ratings bands (based on SimpleSAP). This shows that the majority of properties in the private rented sector fall in the bands C to F, with over half in bands D and E.

Number and percentage of Chichester's private rented stock falling into each of the EPC ratings bands (based on SimpleSAP)

	Count	Percent
(92-100) A	0	0.0%
(81-91) B	44	0.5%
(69-80) C	1,292	15.6%
(55-68) D	2,538	30.6%
(39-54) E	2,233	26.9%
(21-38) F	1,384	16.7%
(1-20) G	808	9.7%

- The map below shows the distribution of category 1 hazards, as defined by the Housing Health and Safety Rating System (HHSRS), across the local authority area. The map shows that there appear to be higher concentrations of hazards in the northern parts of Chichester, in particular Bury, Rogate and Wisborough Green wards.

Percentage of private sector dwellings in Chichester with the presence of a HHSRS category 1 hazard



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1 Introduction

Chichester District Council commissioned BRE to undertake a series of modelling exercises on their housing stock. This report describes the modelling work and provides details of the results obtained from the dwelling level model and database. The database is also provided to the council to enable them to obtain specific information whenever required.

The stock models and database provide the council with dwelling level information on various key housing indicators, focussing on private sector housing. The key indicators provide Chichester with detailed information on the likely condition of the stock and the geographical distribution of properties of interest. These properties are likely to be suitable targets for energy efficiency improvements or other forms of intervention, such as mitigating Housing Health and Safety Rating System (HHSRS) hazards. The key indicators are split into indicators related to house condition, energy efficiency and household vulnerability as shown in **Table 1** (see Appendix A for full definitions):

Table 1: Key indicators split into categories

Indicator	House condition indicators	Energy efficiency indicators	Household vulnerability indicators
Presence of HHSRS cat 1 hazard	✓		
Presence of cat 1 hazard for excess cold	✓	✓	
Presence of cat 1 hazard for falls	✓		
Dwellings in disrepair	✓		
Fuel Poverty (10% and Low income, High cost definitions)			✓
Dwellings occupied by low income households			✓
SimpleSAP rating		✓	

N.B. Presence of category 1 hazard for falls does NOT include the hazard of falling between levels

The single indicators shown in **Table 1** can also be combined within the database to provide powerful information on the housing stock, for example dwellings suffering from excess cold and also occupied by households on a low income. The true potential of the database lies in its ability to produce combined indicators such as this, as it allows council officers to explore the stock and to assess the likely scope of any programmes they might wish to implement.

It is also possible to extract other information from the database which is of use to local authorities. This information includes estimates relating to the Department for Communities and Local Government's (DCLG) Local Authority Housing Statistics (LAHS) reporting of Energy Performance Certificate (EPC) ratings and costs of mitigating hazards.

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The key indicators and other information are derived from the Housing Stock Database which is made up of a series of Dwelling Level Stock Models. The BRE Dwelling Level Stock Models have been used for many years to provide key housing indicators to local authorities The most recent 2014 models have been updated to make use of the results of the 2011 English Housing Survey (EHS)[4] and additionally now incorporate a technique known as geomodelling[5] which makes use of Ordnance Survey (OS) data. The models also make significant use of the Experian UK Consumer Dynamics Database of dwelling and household indicators as inputs to the models.

The information in the database can be used to ensure the council meets various policy and reporting requirements. For example, local housing authorities are required to review housing conditions in their districts in accordance with the Housing Act 2004[6].

Furthermore, having this information available will also help to facilitate the delivery of Chichester's housing strategy. It will enable a targeted intervention approach to improving housing; therefore allowing the council to concentrate their resources on housing in the poorest condition or with the greatest health impact.

1.1 Project aims

The main aim of this project was to provide data on key private sector housing indicators for Chichester. The main aims of this work were therefore to provide estimates of:

- The percentage of dwellings meeting each of the key indicators for Chichester overall and broken down by tenure and then mapped by COA (private sector stock only)
- Information relating to LAHS reporting for the private sector stock - category 1 hazards, plus information on EPC ratings

This report looks firstly at the policy background and why such information is important for local authorities. Secondly, it provides a brief description of the overall stock modelling approach. Finally, this report provides the modelling results for Chichester covering each of the main aims above.

[4] 2011 is the latest available data. Prior to the 2014 models EHS 2009 data was used.

[5] The OS data has been used to update a number of the model inputs – the main value of the OS data is the ability to determine the dwelling type with much greater confidence – see Appendix B for more information.

[6] http://www.legislation.gov.uk/ukpga/2004/34/contents

2 Policy background

The detailed housing stock information provided in this report will facilitate the delivery of Chichester's housing strategy and enable a targeted intervention approach to improving housing. This strategy needs to be set in the context of relevant government policy and legislative requirements. These polices either require reporting of housing-related data by local authorities, or the use of such data to assist in meeting policy requirements. The main policies and legislative requirements are summarised in the following sub-sections.

2.1 Housing Act 2004

The Housing Act 2004[6] requires local housing authorities to review housing statistics in their district. The requirements of the Act are wide-ranging and also refer to other legislation which between them covers the following:

- Dwellings that fail to meet the minimum standard for housings (i.e. dwellings with HHSRS category 1 hazards)
- Houses in Multiple Occupation (HMOs)
- Selective licensing of other houses
- Demolition and slum clearance
- The need for provision of assistance with housing renewal
- The need to provide assistance with adaptation of dwellings for disabled persons

2.2 Key housing strategy policy areas and legislation

2.2.1 Private rented sector

In the report "Laying the Foundations: A Housing Strategy for England" Chapters 4 and 5 focus on the private rented sector and empty homes.

There has been significant growth in the private rented sector in recent years and new measures are being developed to deal with rogue landlords and to encourage local authorities to make full use of enforcement powers for tackling dangerous and poorly maintained dwellings. The report encourages approaches which work closely with landlords whilst still operating a robust enforcement regime (e.g. Landlord Forums and Panels across the country).

2.2.2 Health inequalities

The government's white paper "Choosing Health"[7] states that the key to success in health inequalities will be effective local partnerships led by local government and the NHS working to a common purpose and reflecting local needs. Housing is a key determinant of health, and poor housing conditions continue to cause preventable deaths and contribute to health inequalities[8]. An example in this area is the work carried out by Liverpool City Council in partnership with Liverpool Primary Care Trust – the "Healthy Homes Programme". This has identified over 3,800 hazards and led to an estimated £4.8 million

[7] Choosing Health: Making healthy choices easier, Department of Health, 2004

[8] The health impacts of poor private sector housing, LACORS, 2010

investment by landlords, delivering sustainable health improvements and enhancing community wellbeing.

2.2.3 Integrated care

It has been recognised by central government that to fully address the health needs of the population, services need to become more integrated and there needs to be better communication between different providers. Housing is a key aspect of this:

"Many people with mental and physical disabilities, complex needs, long-term conditions and terminal illness also need to access different health care, social care, housing and other services, such as education, and often simultaneously"[9].

It is therefore essential that departments providing or regulating housing work with other council departments and health organisations to provide services that are integrated and take full account of the needs of the individual.

2.2.4 Public Health Outcomes Framework

The Public Health Outcomes Framework "Healthy lives, healthy people: Improving outcomes and supporting transparency"[10] sets out desired outcomes for public health and how they will be measured. Many of the measurements have links to housing, some of the more relevant being:

- Falls and injuries in over 65's
- Fuel poverty
- Excess winter deaths

2.2.5 Joint Strategic Needs Assessment (JSNA) and Joint Health and Wellbeing Strategies

The JSNA and joint health and wellbeing strategy allow health and wellbeing boards to analyse the health needs of their local population and to decide how to make best use of collective resources to achieve the priorities that are formed from these. The Department of Health document "Joint Strategic Needs Assessment and joint health and wellbeing strategies explained - Commissioning for populations" says "This will ensure better integration between public health and services such as housing and education that have considerable impact on the wider determinants of health"[11].

2.2.6 Energy Act 2011

The Energy Act 2011 requires that from 2016 reasonable requests by tenants for energy efficiency improvements will not be able to be refused. Furthermore, from 2018 it will be unlawful for landlords to rent out properties that do not reach a minimum standard of energy efficiency (likely to be set at Energy Performance Certificate rating E[12]). While there will be various caveats to these powers, they will provide

[9] Integrated Care: Our Shared Commitment, Department of Health, 2013

[10] Healthy lives, healthy people: Improving outcomes and supporting transparency, Department of Health, 2013

[11] Joint Strategic Needs Assessment and joint health and wellbeing strategies explained: Commissioning for populations, Department of Health, 2011

[12] https://www.gov.uk/getting-a-green-deal-information-for-householders-and-landlords

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a new minimum standard for rented accommodation. Part of this current project for Chichester includes provision of a private rented sector variable that should assist in identifying such dwellings.

2.2.7 Empty homes

Empty homes brought back into use will qualify for the New Homes Bonus where, for the following 6 years, the government will match fund the Council Tax on long term empty properties brought back into use. In addition, from 2012-15, £100million of capital funding from within the Affordable Homes Programme will be available to tackle problematic[13] empty homes. Whilst the data provided by this project cannot necessarily assist with the actual identification of empty homes, the database provided would be the logical place for such information to be stored should it be gathered from other sources.

2.3 Other policy areas

The following policy areas, whilst not directly relating to environmental health services, will have an effect on demand and local authorities will need to be aware of the possible impact in their area.

2.3.1 Welfare Reform Act 2012

The key parts of this act for environmental health services are the sections relating to the under occupation of social housing, and the benefit cap. Whilst this will mainly affect tenants in the social rented sector it will undoubtedly have an impact on private sector services. Social tenants may find themselves being displaced into the private sector, increasing demand in this area, and the tenants of Registered Providers (RP's) and some private landlords may have greater trouble affording rent payments. If tenants are in arrears on their rental payments then authorities may be met with reluctance from landlords when requiring improvements to properties.

2.3.2 Localism Act 2011

The Localism Act allows social housing providers to offer fixed term, rather than secure lifetime, tenancies. As with the Welfare Reform Act, this has a greater direct impact on the social rented sector, however, there is some concern this may lead to greater turnover of tenancies meaning such that some traditional social tenants may find themselves in the private rented sector.

Both of these policy changes above may increase the number of vulnerable persons in private sector properties. If this occurs any properties in this sector in poor condition are likely to have a far greater negative impact on the health of those occupiers.

2.3.3 Potential increase in private rented sector properties

Policies such as the Build to Rent and the New Homes Bonus are aimed at increasing the supply of properties. As the private rented sector is already growing, it is reasonable to assume that many of the new properties being built will be rented to private tenants. Local authorities will need to be aware of the potential impact on the demand for their services and how their perception of their local area may have to change if large numbers of properties are built.

[13] Properties that are likely to remain empty without direct financial support from government.

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2.4 Local Authority Housing Statistics (LAHS)[14] and EPC ratings

The purpose of these statistics is twofold – firstly to provide central government with data with which to inform and monitor government strategies, policies and objectives as well as contributing to national statistics on housing, secondly, to the local authorities themselves to help manage their housing stock. Local authorities are required to complete an annual return which covers a wide range of housing-related issues. Of particular relevance to this current project is "Section F: Condition of dwelling stock" which, amongst other things, requests the following information:

- Total number of dwellings and number of private sector dwellings with category 1 HHSRS hazards and the estimated costs of mitigating these
- Estimates of the number of HMOs and the number of mandatory licensable HMOs

Whilst the LAHS no longer requires reporting of average EPC ratings of the private sector stock and the proportion below a certain rating, this information remains pertinent due to the Energy Act 2011. Under this act new rules mean that from 2018 landlords must ensure that their properties meet a minimum energy efficiency standard. Subject to Parliamentary approval, this minimum standard has been set at band E by 1 April 2018[15, 16]. Furthermore, from 1 April 2016, tenants in F and G rated dwellings may legally request an upgrade to the dwelling to a minimum of a band E.

Results relating to LAHS statistics and EPC ratings can be found in Section 4.2.

[14] https://www.gov.uk/government/publications/completing-local-authority-housing-statistics-2012-to-2013-guidance-notes

[15] https://www.gov.uk/government/consultations/private-rented-sector-energy-efficiency-regulations-domestic

[16] Although landlords will still be able to rent out F and G rated properties after this date they will not be able to renew or sign a new contract.

3 Overview of the BRE Dwelling Level Housing Stock Modelling approach

3.1 Overview

This section provides a simplified overview of the BRE dwelling level housing stock modelling approach. More detail on the methodology is provided in Appendix B.

A stock modelling approach has been developed and used by BRE for many years and dwelling level models are used to estimate the likelihood of a particular dwelling meeting the criteria for each of the key indicators (and other outputs of interest). These outputs can then be mapped to provide the council with a geographical distribution of each of the key indicators which can then be used to target resources for improving the housing stock. The process itself is actually made up of a variety of data sources, calculations and models.

The models are principally informed by the Department for Communities and Local Government's (DCLG) English Housing Survey (EHS)[17]. The survey is not used to supply data for the database, but rather it allows the identification of patterns in the housing stock, so that this knowledge can be applied, in the form of mathematical algorithms, to impute key indicators and energy characteristics from other data available at the national level. The particular approach for Chichester, however, makes significant use of the Experian UK Consumer Dynamics Database of dwelling and household indicators as inputs to the models. One example is the BRE SimpleCO_2 Model which is based on dwelling level inputs from Experian and expands on these using imputation techniques to provide sufficient information to calculate the likely energy efficiency of each dwelling in the stock. Some of the key housing indicators, such as HHSRS excess cold category 1 hazards and BRE's SimpleSAP[18], can be directly inferred from this data.

Figure 1 shows a simplified flow diagram of the overall BRE housing stock modelling approach. The process is made up of a series of data sources and models which, combined with various imputation and regression techniques and the application of other formulae, make up the final database. The database is essentially the main output of the modelling and provides information on the key indicators and other data requirements (e.g. energy efficiency variables). More detailed information on the data sources and models is provided in Appendix B, but to summarise:

The data sources are:
EHS, Experian, Ordnance Survey (OS) MasterMap.

The Models are:
SimpleSAP, Fuel Poverty, HHSRS (all hazards, falls hazards and excess cold), Disrepair and Low Income Households.

The data sources and models are linked as shown in the flow diagram and the modelling process itself can be divided into "energy inputs" and "other inputs", which are summarised as follows:

[17] The most recent survey used in the housing stock models is 2011.

[18] A Simplified version of the SAP model that produces an output broadly comparable to SAP. The SimpleSAP model is distinct from both full SAP and RD SAP in that uses a smaller, simplified set of inputs.

Energy inputs - are developed from Experian. The EHS data is used to impute (using cold deck imputation[19]) and interpolate where there are gaps in the data. The “energy inputs” are then fed into the SimpleCO_2 Model to produce the “energy outputs” for the database plus information on excess cold for the HHSRS Model and information on energy costs for the Fuel Poverty Model.

Other inputs – are developed from Experian, OS MasterMap and other local data sources. The EHS data is used to impute (using cold deck imputation[19]) and interpolate where there are gaps in the data. The “other inputs” are then fed into the HHSRS, Disrepair, and Low Income Models (note that tenure data is fed directly into the database). Information from the EHS also feeds into the Fuel Poverty, HHSRS, Disrepair and Low Income Models.

[19] Cold deck imputation is a process of assigning values in accordance with their known proportions in the stock.

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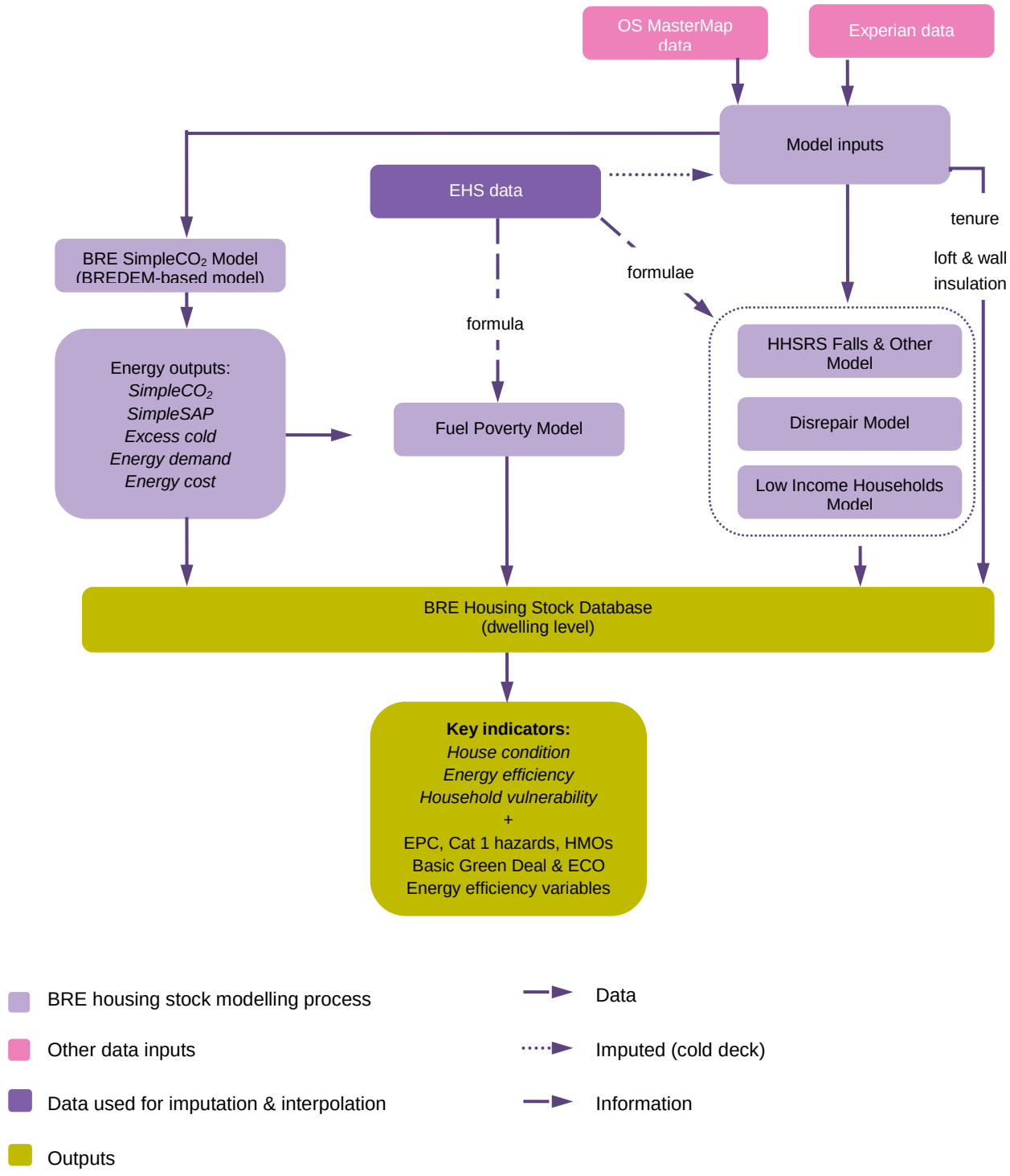
Figure 1: Simplified flow diagram of overall BRE housing stock modelling approach (N.B. the EHS data is only used to inform the mathematical algorithms of the model – it does not provide data)



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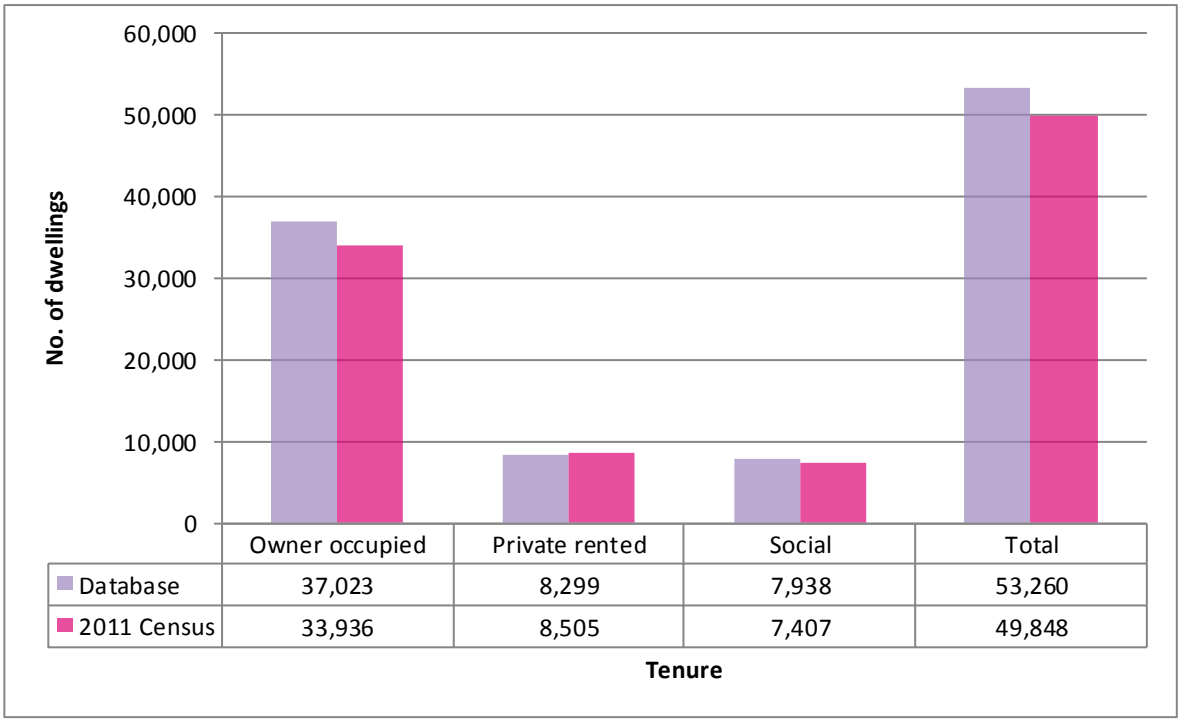
3.2 Breakdown of the housing stock by tenure - validation

Providing the results split by tenure is useful since it can have an effect on how resources and improvement policies are targeted. This report is particularly focussed on private sector stock which is made up of owner occupied and private rented dwellings. The remainder of the housing stock consists of social housing.

The total number of dwellings in Chichester from the BRE database uses the tenure split derived from the purchased Experian tenure variable.

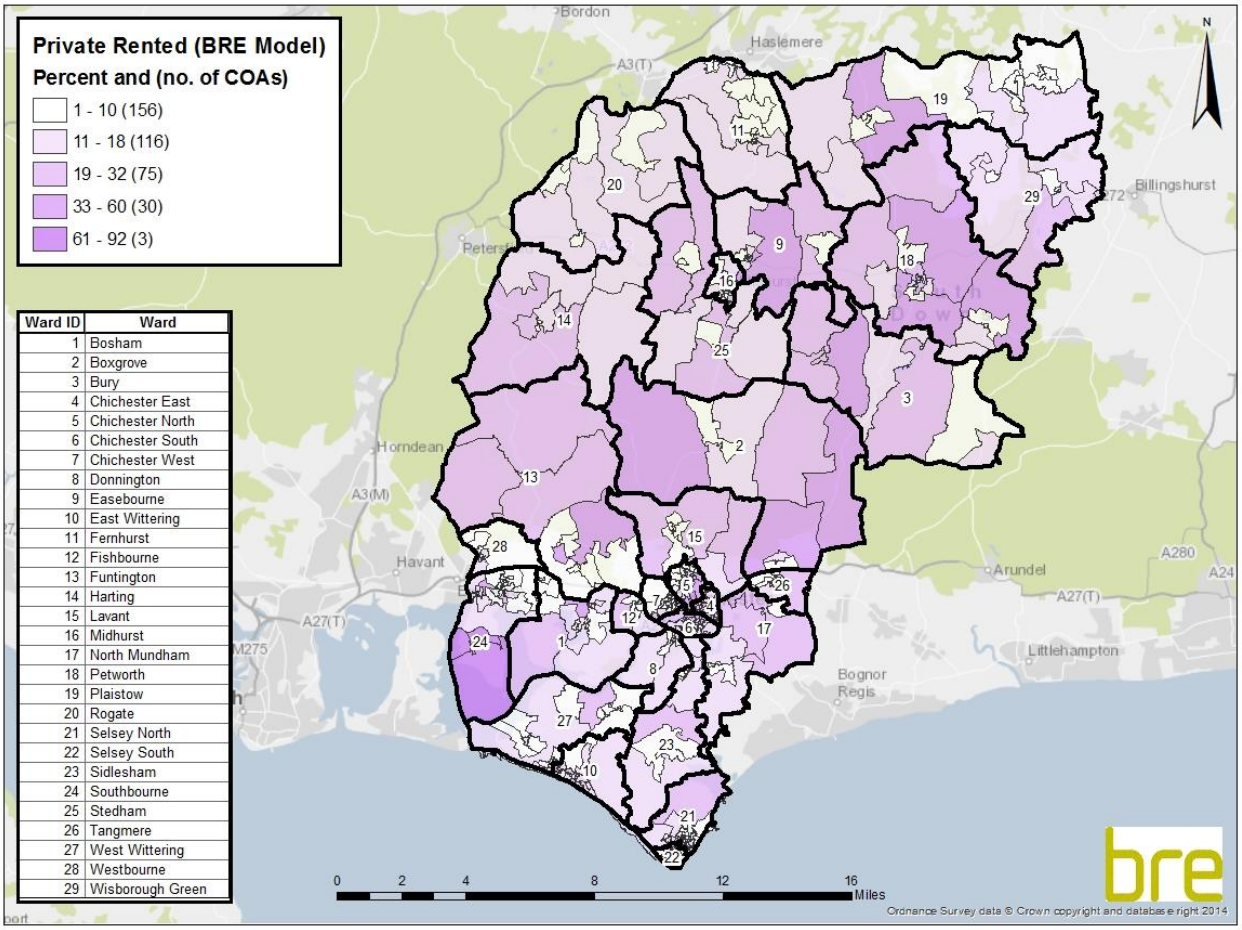
Since it is possible for private rented dwellings to become owner occupied and vice versa relatively easily, it is difficult to accurately predict the actual tenure split at any given point in time. A validation process was undertaken to compare the tenure split from the database to the 2011 Census figures[20]. The results of the validation exercise show that the differences between the tenure split from the database compared to the Census figures are relatively small (see **Figure 2**), suggesting that the database should provide a good overview of the housing stock in Chichester. Furthermore, **Map 1** and **Map 2** show that the geographical distributions look very similar, again giving confidence that the database provides a good overview of Chichester's housing stock.

Figure 2: Tenure split – comparison of BRE Housing Stock Database outputs with 2011 Census figures for Chichester

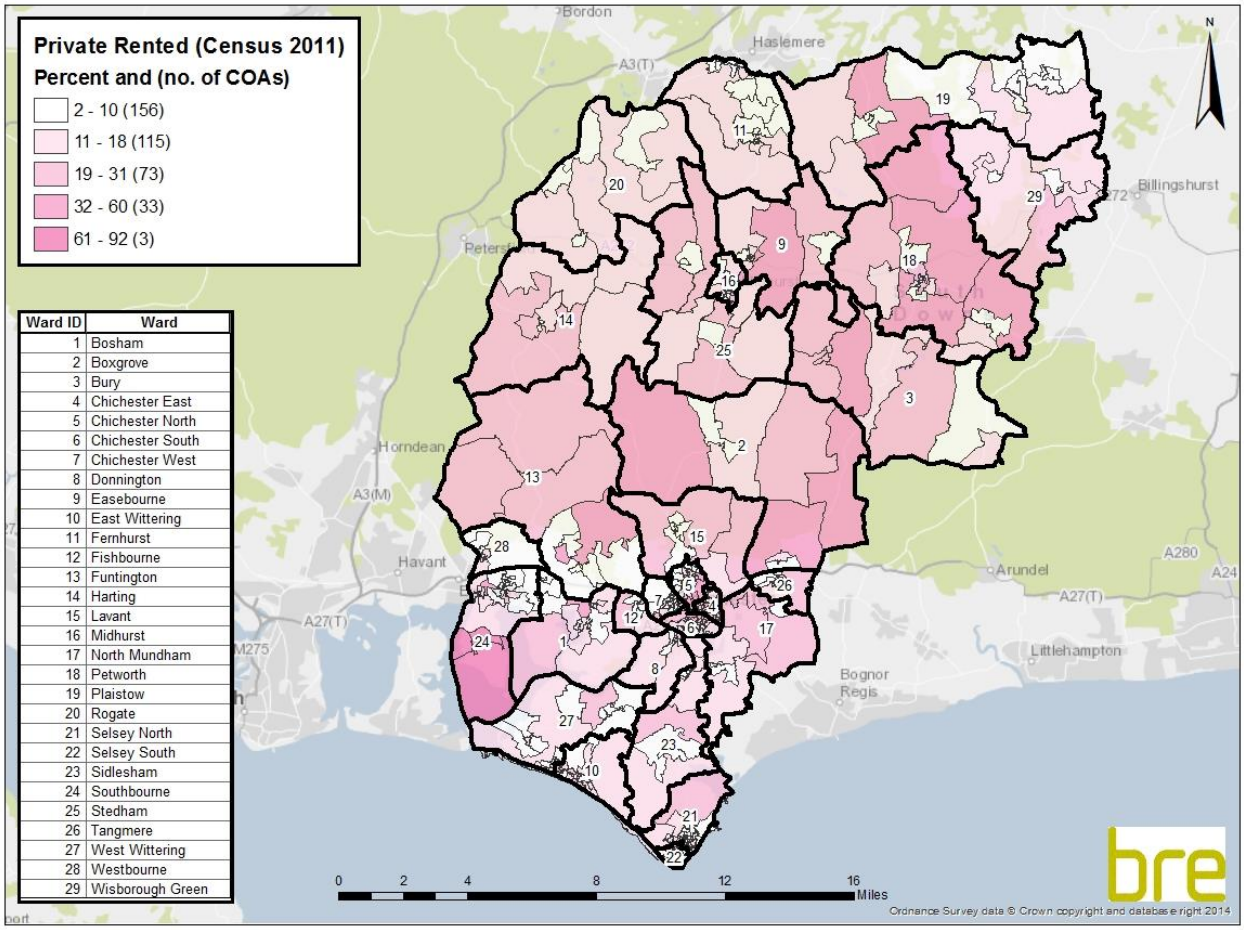


[20] http://www.ons.gov.uk/ons/datasets-and-tables/index.html

Map 1: Distribution of estimated percentage of private rented dwellings in Chichester District Council – based on database



Map 2: Distribution of estimated percentage of private rented dwellings in Chichester District Council – based on 2011 Census Data (Neighbourhood Statistics)



4 Results from the BRE Dwelling Level Housing Stock Models and Database

As described in the previous section, the housing stock modelling process consists of a series of different stock models with the main output being the database. The results in this section have been obtained from interrogating the database at the level of the local authority as a whole to give a useful overview for Chichester. Information at ward level, however, is provided in the maps, in Section 4.2.4 and can also be obtained from the database which has been supplied as part of this project (see Appendix C for instructions).

The first sub-section below provides a map of the wards in Chichester. The results are then displayed in the following sub-sections:

- Key indicators:
    - Chichester compared to England
    - Key indicators by tenure for Chichester
    - Key indicators mapped by COA for Chichester private sector stock
    - Ward level results for the key indicators

- Information relating to LAHS reporting and EPC ratings:
    - Category 1 hazards
    - EPC ratings

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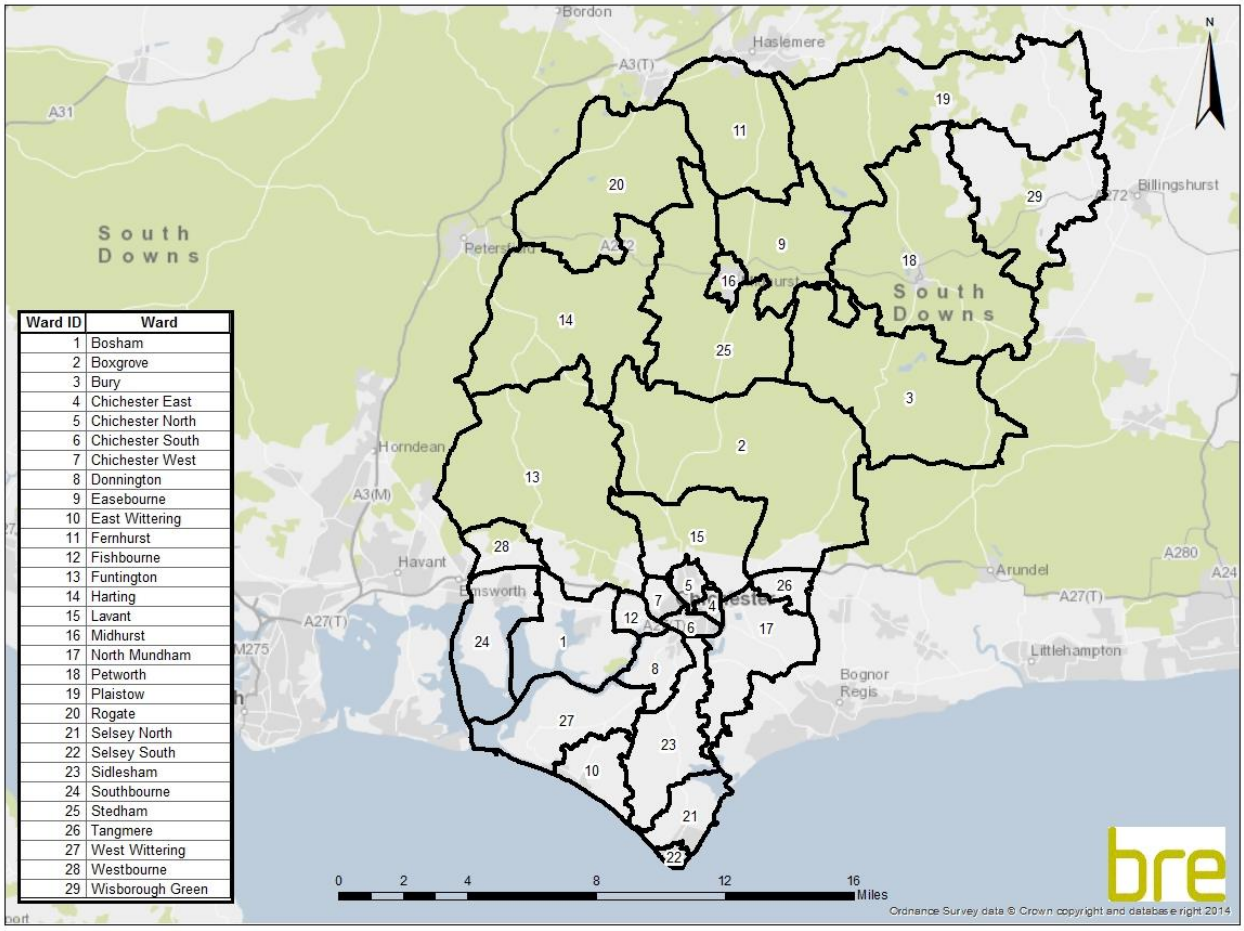
4.1 Overview of Chichester

Map 3 below shows the 29 wards in Chichester District Council. The data in the report is separated into wards and then further divided into Census Output Areas (COA's). These typically comprise around 125 households and usually include whole postcodes, which have populations that are largely similar.

Map 3: The wards in Chichester District Council



Ward ID	Ward
1	Bosham
2	Boxgrove
3	Bury
4	Chichester East
5	Chichester North
6	Chichester South
7	Chichester West
8	Donnington
9	Easebourne
10	East Wittering
11	Fernhurst
12	Fishbourne
13	Funtington
14	Harting
15	Lavant
16	Midhurst
17	North Mundham
18	Petworth
19	Plaistow
20	Rogate
21	Selsey North
22	Selsey South
23	Sidlesham
24	Southbourne
25	Stedham
26	Tangmere
27	West Wittering
28	Westbourne
29	Wisborough Green

4.2 Key indicators

4.2.1 Chichester compared to England

Table 2 and **Figure 3** show the results for each of the key indicators in Chichester compared to England (EHS 2011) and split into all stock and private sector stock. **Figure 4** shows the results of the SimpleSAP ratings.

For all stock, Chichester performs better than the EHS average for the following indicators: falls (5% compared to 9%), disrepair (3% compared to 5%) and low income households (27% compared to 33%) and the same for fuel poverty (Low Income High Costs) at 11%. Chichester performs slightly worse for all hazards, and fuel poverty (10% definition) and significantly worse for the hazard of excess cold.

The picture is similar for the private sector stock, with the hazard of excess cold in Chichester being particularly high compared to the national average.

The average SimpleSAP ratings in Chichester (**Figure 4**) are lower than those for the England average for all stock and for private sector stock. Much of the central and northern parts of the district are in the South Downs National Park and it is not unusual for rural areas to perform worse than urban areas as a whole, since there are generally less flats (which are more energy efficient due to reduced heat loss areas) and due to the lower likelihood of being on gas, a more efficient heating fuel. This may also explain the higher levels of excess cold overall in the district compared to the national average.

Table 2: Estimates of the numbers and percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database for all stock and private sector stock – Chichester compared to England (EHS 2011)

Indicator		All stock			Private sector stock		
		Chichester (no.)	Chichester (%)	2011 EHS (%)	Chichester (no.)	Chichester (%)	2011 EHS (%)
No. of dwellings		53,260	-	-	45,322	-	-
HHSRS category 1 hazards	All hazards	8,526	16%	15%	7,873	17%	17%
	Excess cold	7,068	13%	6%	6,540	14%	7%
	Fall hazards	2,823	5%	9%	2,701	6%	10%
Disrepair		1,639	3%	5%	1,636	4%	6%
Fuel poverty (10%)		8,798	17%	15%	8,013	18%	15%
Fuel poverty (Low Income High Costs)		5,780	11%	11%	5,142	11%	11%
Low income households		14,173	27%	33%	8,500	19%	24%

N.B. the information on HHSRS category 1 hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.

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Figure 3: Estimates of the percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database for all stock and private sector stock – Chichester compared to England (EHS 2011)

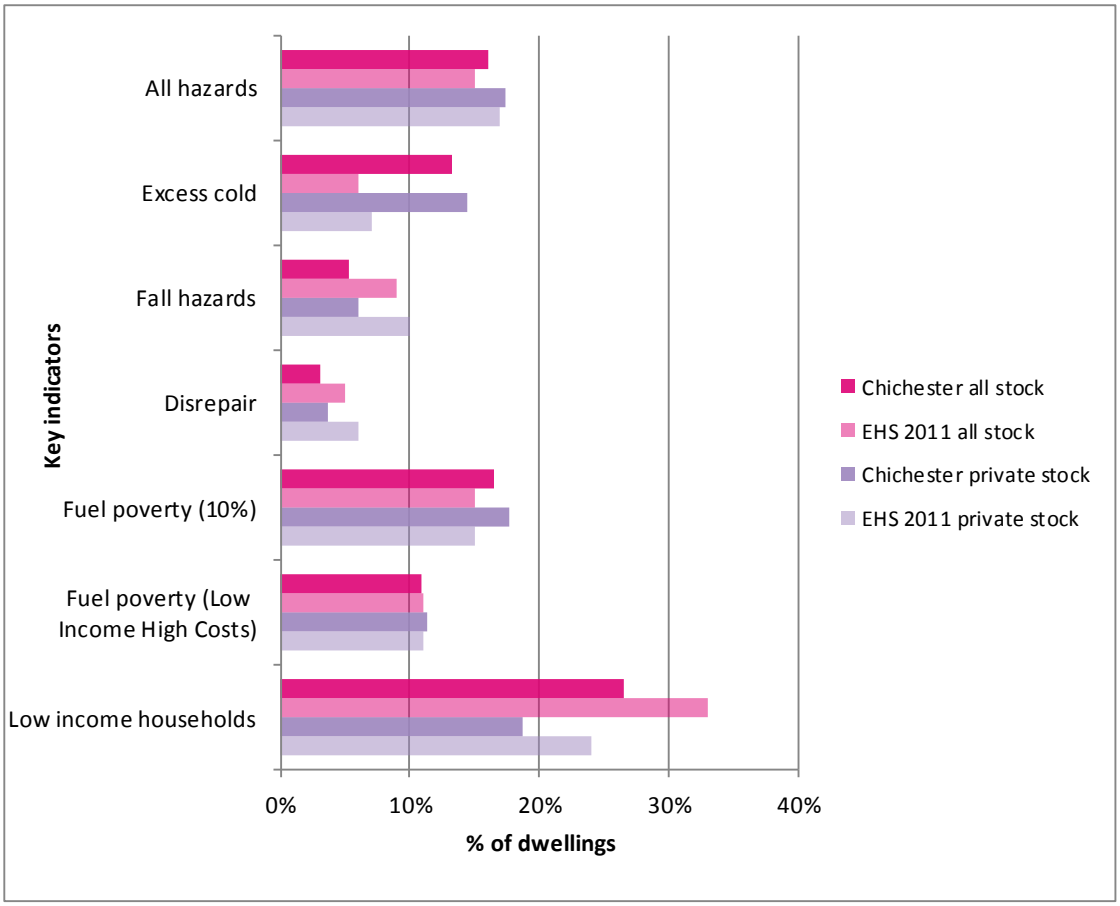


Figure 4: Average SimpleSAP ratings for all stock and private sector stock – Chichester compared to England (EHS 2011)

4.2.2 Key indicators by tenure – Chichester

The private sector stock can be further split by tenure – owner occupied and private rented - with the difference between total private sector stock and total housing stock being the social housing stock. **Table 3** and **Figure 5** below show the results for each of the key indicators split by tenure and **Figure 6** shows the SimpleSAP ratings by tenure.

The social stock is generally better than the private sector stock for the indicators relating to hazards, disrepair and energy efficiency (SimpleSAP). Social stock tends be more thermally efficient than the private stock partly due to the prevalence of flats, and partly due to being better insulated owing to the requirements placed on social housing providers, for example through the Decent Homes Programme. As would be expected, the social stock is generally worse than the private sector stock for the low income households indicator. For fuel poverty; however, the social stock is slightly better than the owner occupied and significantly better than private rented stock. In the social stock this would imply that the lower levels of income are being balanced out by the superior energy performance of the stock, as can be seen by the average SimpleSAP ratings in **Figure 6**.

The social data should be treated with some caution as the social rented stock, particularly when largely comprising stock owned by a single landlord, is more difficult to model than the private sector. This is because the decisions of an individual property owner usually only affect a single dwelling out of the thousands of private sector stock whereas the policies and decisions of a single landlord can have a very great effect on a large proportion of the social stock. The social rented results are therefore best considered as a benchmark which takes account of the age, type, size and tenure against which the landlord's own data could be compared.

Focussing on the tenures within the private sector stock, the private rented stock is generally worse than the owner occupied stock for all the indicators.

Table 3: Estimates of the numbers and percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database by tenure for Chichester

Indicator		Private sector stock				Social stock	
		Owner occupied		Private rented			
		No.	%	No.	%	No.	%
No. of dwellings		37,023	-	8,299	-	7,938	-
HHSRS category 1 hazards	All hazards	6,029	16%	1,844	22%	653	8%
	Excess cold	4,972	13%	1,568	19%	528	7%
	Fall hazards	2,059	6%	642	8%	122	2%
Disrepair		1,165	3%	471	6%	3	0%
Fuel poverty (10%)		6,225	17%	1,788	22%	785	10%
Fuel poverty (Low Income High Costs)		3,323	9%	1,819	22%	638	8%
Low income households		5,757	16%	2,743	33%	5,673	71%

N.B. the information on HHSRS category 1 hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.

Figure 5: Estimates of the percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database by tenure for Chichester

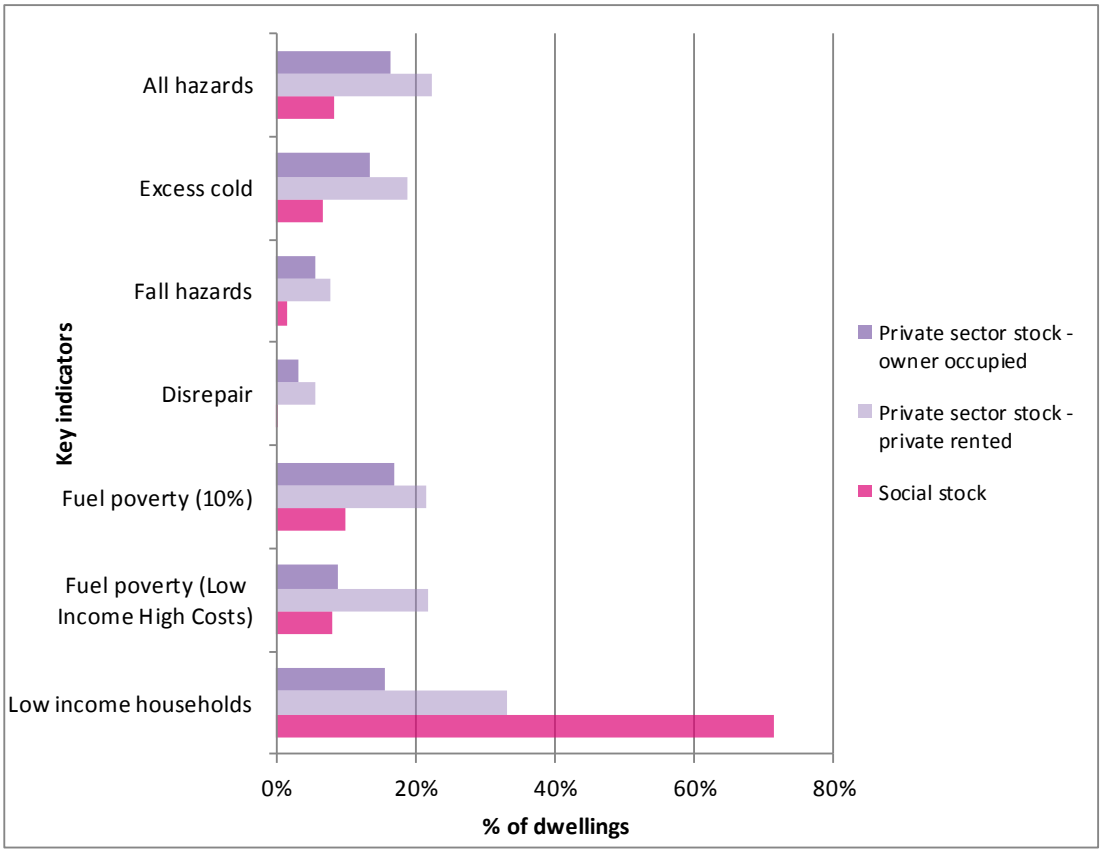
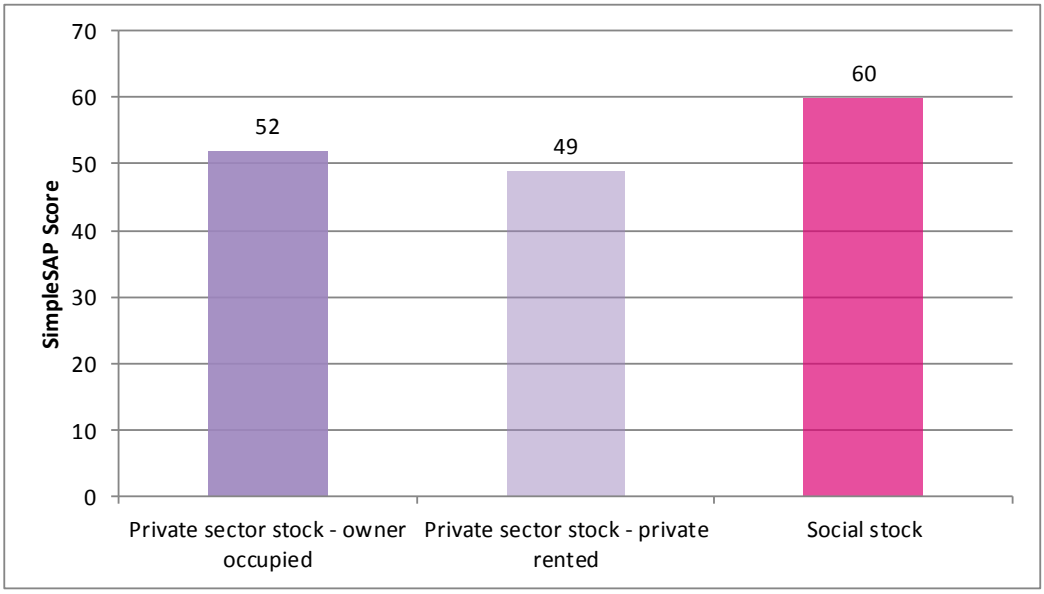


Figure 6: Average SimpleSAP ratings by tenure for Chichester



4.2.3 Key indicators mapped by Census Output Area (COA) – Chichester private sector stock

Some of the key indicators are also provided in map form below along with a brief description of each indicator[21], thus enabling quick observation of the geographical distribution of properties of interest. The maps show the percentages of private sector dwellings in each Census Output Area (COA) that are estimated to have each of the key indicators.

The ranges shown in the map keys are defined based on the Jenks' Natural Breaks algorithm of the COA statistics[22]. The outputs in the lightest and darkest colours on the maps show the extreme ends of the range, highlighting the best and the worst areas.

Maps at COA level are provided for the following key indicators for the entire district, and zooming in on Chichester and Selsey, in **Map 4** to **Map 17** below:

- The presence of a category 1 HHSRS hazard
- The presence of a category 1 hazard for excess cold
- Levels of fuel poverty
- Dwellings occupied by low income households
- Dwellings with a category 1 excess cold hazard that are occupied by a low income household
- The average SimpleSAP[23] rating

[21] See Appendix A for full definitions.

[22] Natural breaks classes are based on natural groupings inherent in the data.

[23] Important note: Whilst it is possible to provide "SimpleSAP" ratings from the "SimpleCO_2" software, under no circumstances must these be referred to as "SAP" as the input data is insufficient to produce an estimate of SAP or even RdSAP for an individual dwelling that meets the standards required by these methodologies.

These maps are extremely useful in showing the geographical distribution for single key indicators. Maps can also be produced for a combination of indicators, such as dwellings with an excess cold hazard which are also occupied by low income households, as shown in **Map 14**.

The maps are produced at COA level, which is typically made up of 125 households, usually including whole postcodes and having similar sized populations. Using the first map below (**Map 4**) as an example, it can be seen that each ward is split into several COAs and, in this instance, there are 14 COAs that have 61 - 79% of private sector dwellings estimated to have the presence of a category 1 hazard.

The maps also highlight the differences between areas, showing that the results for some areas are much worse than for others and these are the specific areas which might warrant attention. The maps also show that even within wards there can be large differences between the results at COA level.

4.2.3.1 HHSRS

The Housing Health and Safety Rating System (HHSRS) is a risk-based evaluation tool to help local authorities identify and protect against potential risks and hazards to health and safety from any deficiencies identified in dwellings. It was introduced under the Housing Act 2004[6] and applies to residential properties in England and Wales.

The HHSRS assesses 29 categories of housing hazard. Each hazard has a weighting which will help determine whether the property is rated as being category 1 (serious) or category 2 (other)[24].

The HHSRS map (**Map 4**) shows that there are concentrations of high levels of hazards in the central and northern parts of the district, particularly the Bury, Rogate and Wisborough Green wards. **Map 5** shows that the more urban areas of Chichester and Selsey have relatively low levels of hazards. It is reasonable to expect that areas with greater numbers of older properties will record higher levels of excess cold and falls hazards.

There are particularly high levels of excess cold hazards in the district compared to the national average. There are again high concentrations in the central and northern parts of the district, particularly in Bury, Rogate and Wisborough Green – see **Map 6**. **Map 7** shows that the areas of Chichester and Selsey again have lower levels of excess cold hazards. As previously discussed, much of the central and northern parts of the district are in the South Downs National Park and it is not unusual for rural areas to perform worse that urban areas as a whole, due to less flats (which are more energy efficient due to reduced heat loss areas) and due to the lower likelihood of being on gas, a more efficient heating fuel. This may also explain the higher levels of excess cold overall in the district compared to the national average.

[24] Housing Health and Safety Rating System Operating Guidance, ODPM, 2006

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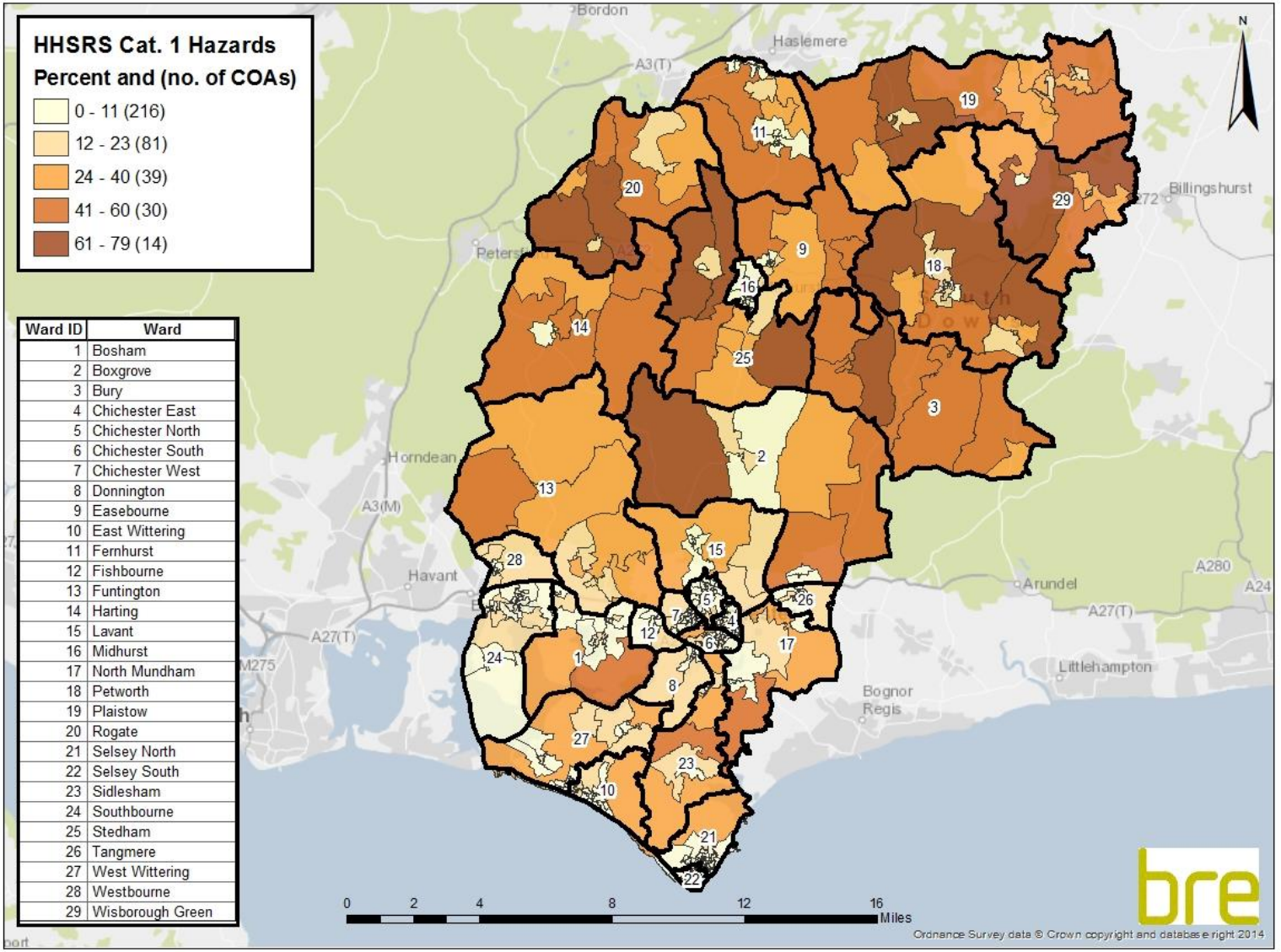
Map 4: Percentage of private sector dwellings in Chichester District Council with the presence of a HHSRS category 1 hazard



Ward ID	Ward
1	Bosham
2	Boxgrove
3	Bury
4	Chichester East
5	Chichester North
6	Chichester South
7	Chichester West
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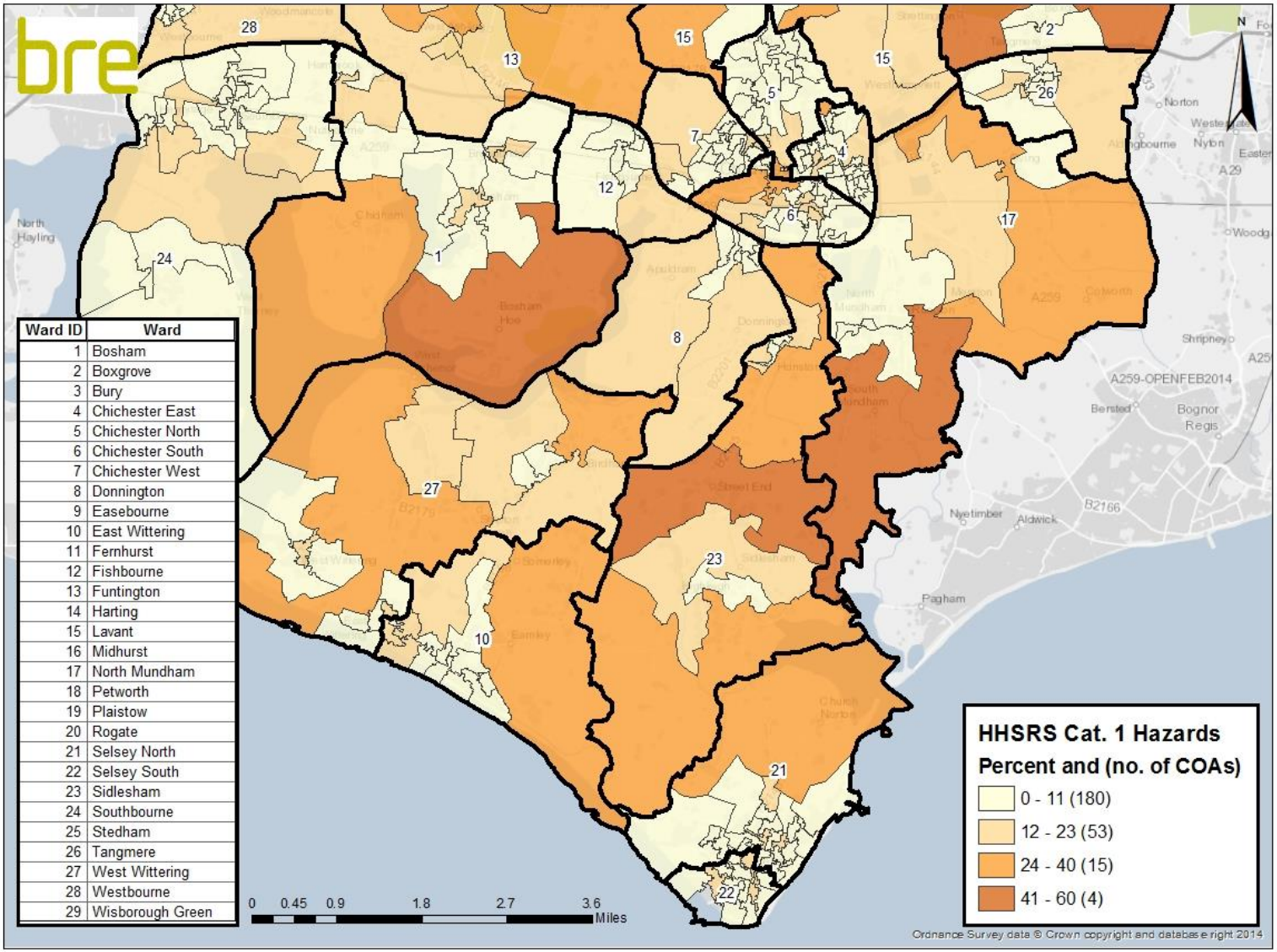
24	Southbourne
25	Stedham
26	Tangmere
27	West Wittering
28	Westbourne
29	Wisborough Green

Map 5: Percentage of private sector dwellings in the areas of Chichester and Selsey with the presence of a HHSRS category 1 hazard



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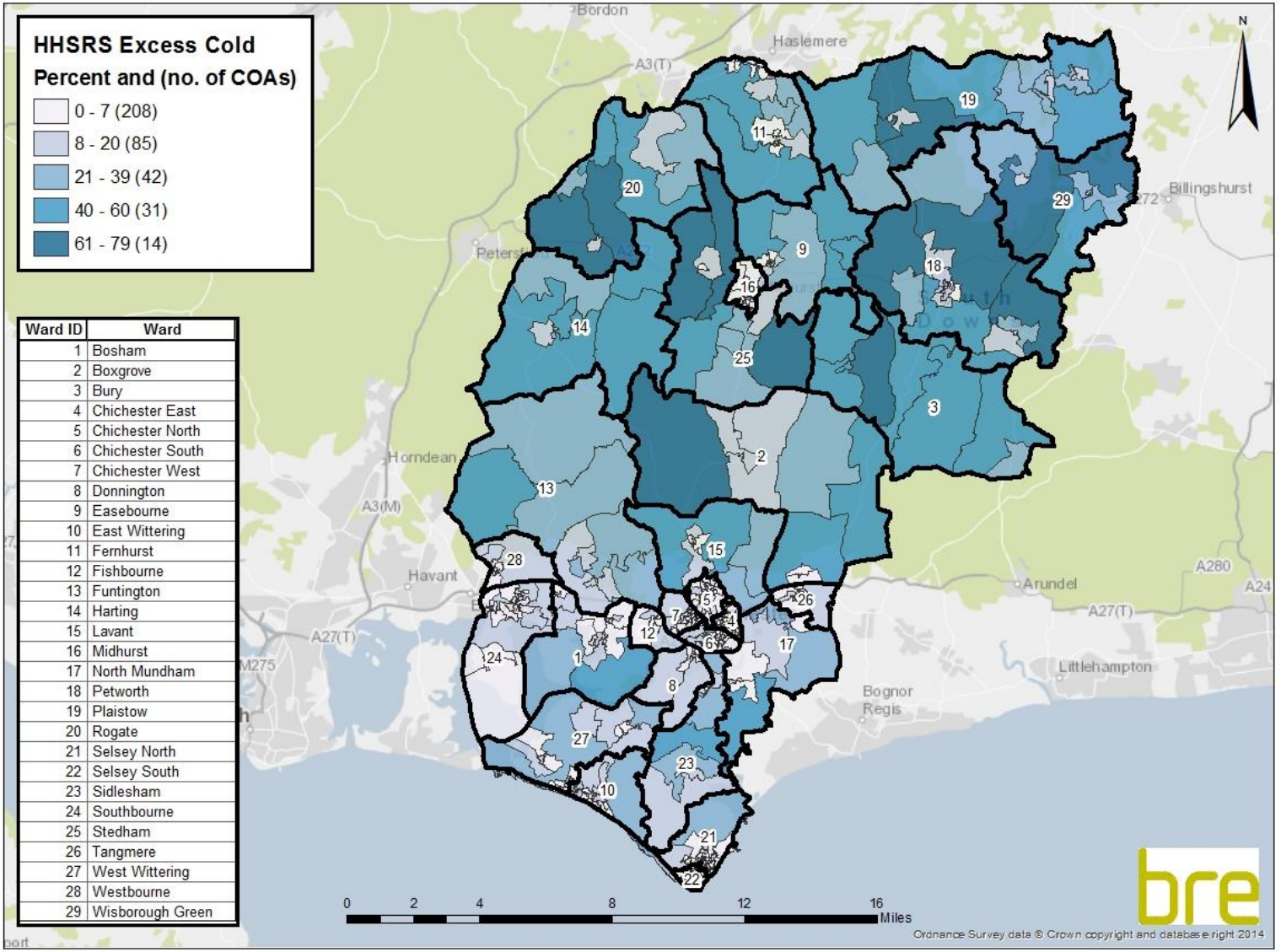
Map 6: Percentage of private sector dwellings in Chichester District Council with the presence of a HHSRS category 1 hazard for excess cold



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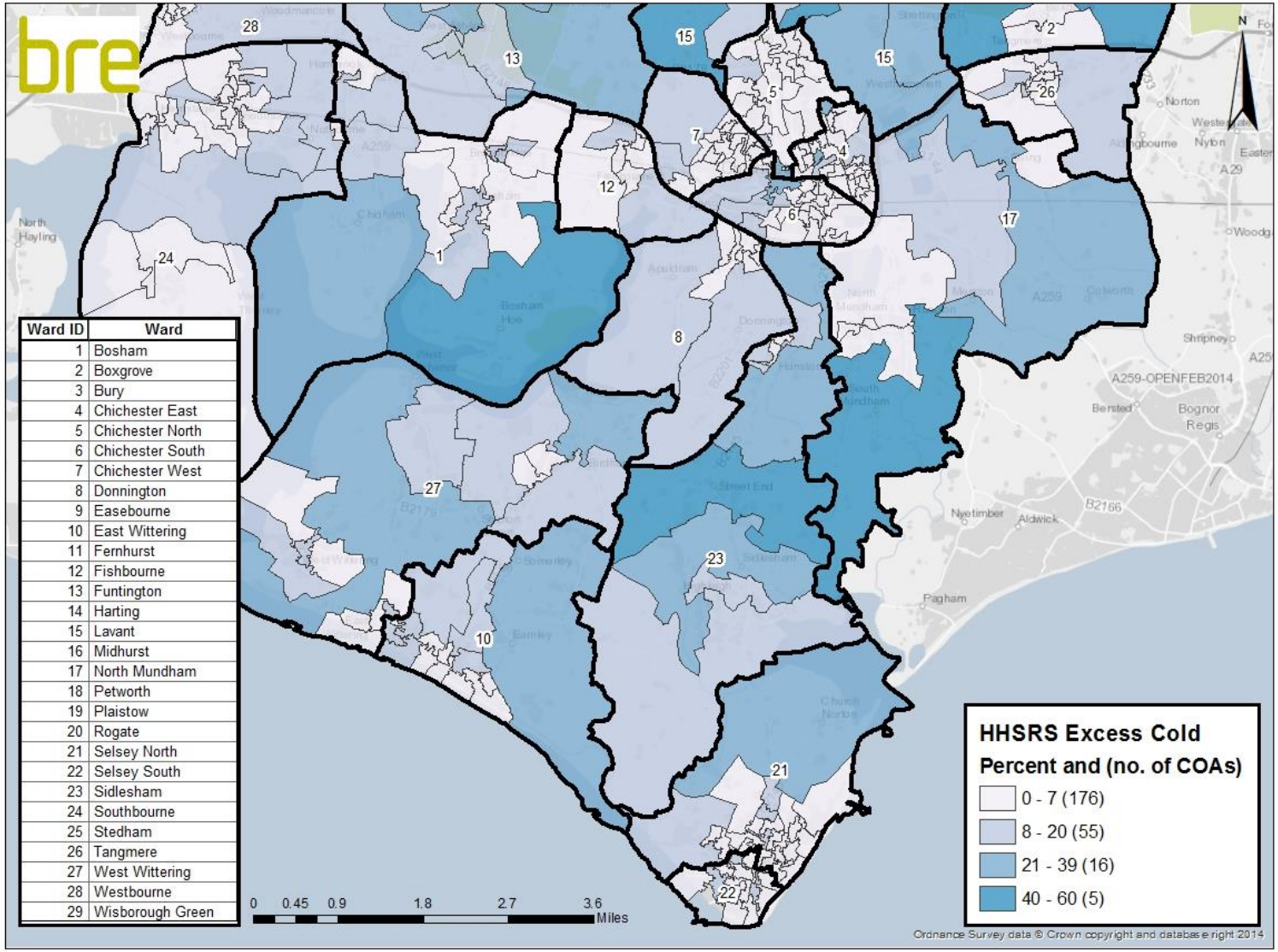
Map 7: Percentage of private sector dwellings in the areas of Chichester and Selsey with the presence of a HHSRS category 1 hazard for excess cold



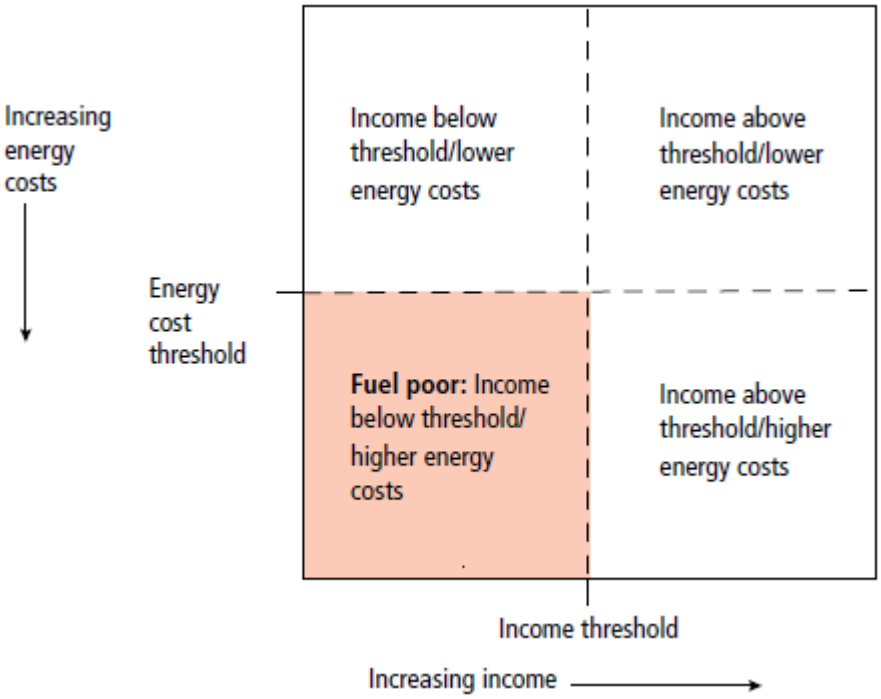
4.2.3.2 Fuel poverty

This report covers both the original definition and the new definition of fuel poverty which is currently being rolled out by government.

The original definition states that a household is said to be in fuel poverty if it spends more than 10% of its income on fuel to maintain an adequate level of warmth (defined as 21°C for the main living area, and 18°C for other occupied rooms in the 2012 Hills Fuel Poverty Review)[25]. For the purposes of this report this is termed "fuel poverty (10%)".

Under the new definition, a household is said to be in fuel poverty if they have required fuel costs that are above average (the national median level) and were they to spend that amount they would be left with a residual income below the official poverty line (see the shaded area in **Figure 7** below). For the purposes of this report this is termed "fuel poverty (Low Income High Costs)".

Figure 7: A representation of the Low Income High Costs definition of fuel poverty**Error! Bookmark not defined.**



A report produced by DECC[26] states that under the 10% fuel poverty indicator, increasing household income potentially removes households from fuel poverty as they will be spending a smaller proportion of their income on fuel. Reducing income has the opposite effect potentially pushing households into fuel poverty. Decreasing fuel prices and/or improvements made to the energy efficiency of the home can remove households from fuel poverty, while rising prices will have the opposite effect.

[25] Hills, J. Getting the measure of fuel poverty - Final Report of the Fuel Poverty Review, London: LSE, 2012

[26] Fuel Poverty Report – Updated August 2013, Department of Energy and Climate Change, 2013

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As the low income high cost indicator is a relative measure, it provides a much steadier trend in the number of fuel poor households over time than the 10% indicator. Whereas an increase in income is likely to reduce the extent of fuel poverty under the 10% definition, under the low income high cost indicator, a change in income will only have an impact on fuel poverty if households with low incomes and high costs see relatively larger income changes (increases or decreases) than the overall average change in income.

The 10% indicator tends to be very responsive to changes in prices, such that these usually dominate the indicator, outweighing other factors such as income and energy efficiency.

Map 8 shows that, based on the fuel poverty 10% definition, the highest concentrations are in the Bury, Plaistow and Rogate wards, though it is fairly evenly distributed across the central and northern parts of the district. The more urban areas of Chichester and Selsey have lower levels of fuel poverty – see **Map 9**

For comparison, **Map 10** and **Map 11** show the results based on the fuel poverty Low Income High Costs definition for the whole of the district and zooming in on Chichester and Selsey. The highest concentrations are again in the central and northern parts of the district – in particular Bury, Boxgrove and Rogate.

4.2.3.2.1 What type of property is in fuel poverty under the Low Income High Costs Definition?

The Hills Fuel Poverty Review[27] provides useful figures that show the likely composition of a fuel poor household under this definition:

- 76% of fuel poor households have an EPC rating of E to G
- 20% of fuel poor households are rural
- 82% of fuel poor households live in houses as opposed to flats or bungalows
- A third of fuel poor households are found in a fifth of the most deprived households
- Fuel poverty is spread fairly evenly between regions, including London
- 34% of fuel poor households contain a person with a long term illness or disability
- 10% of fuel poor households contain a person over the age of 75
- 20% of fuel poor households contain a person under the age of 5

These figures should be considered when analysing the map showing the percentage of private sector dwellings in Chichester occupied by households in fuel poverty under the Low Income High Costs definition.

[27] Hills, J. Getting the measure of fuel poverty - Final Report of the Fuel Poverty Review, London: LSE., 2012

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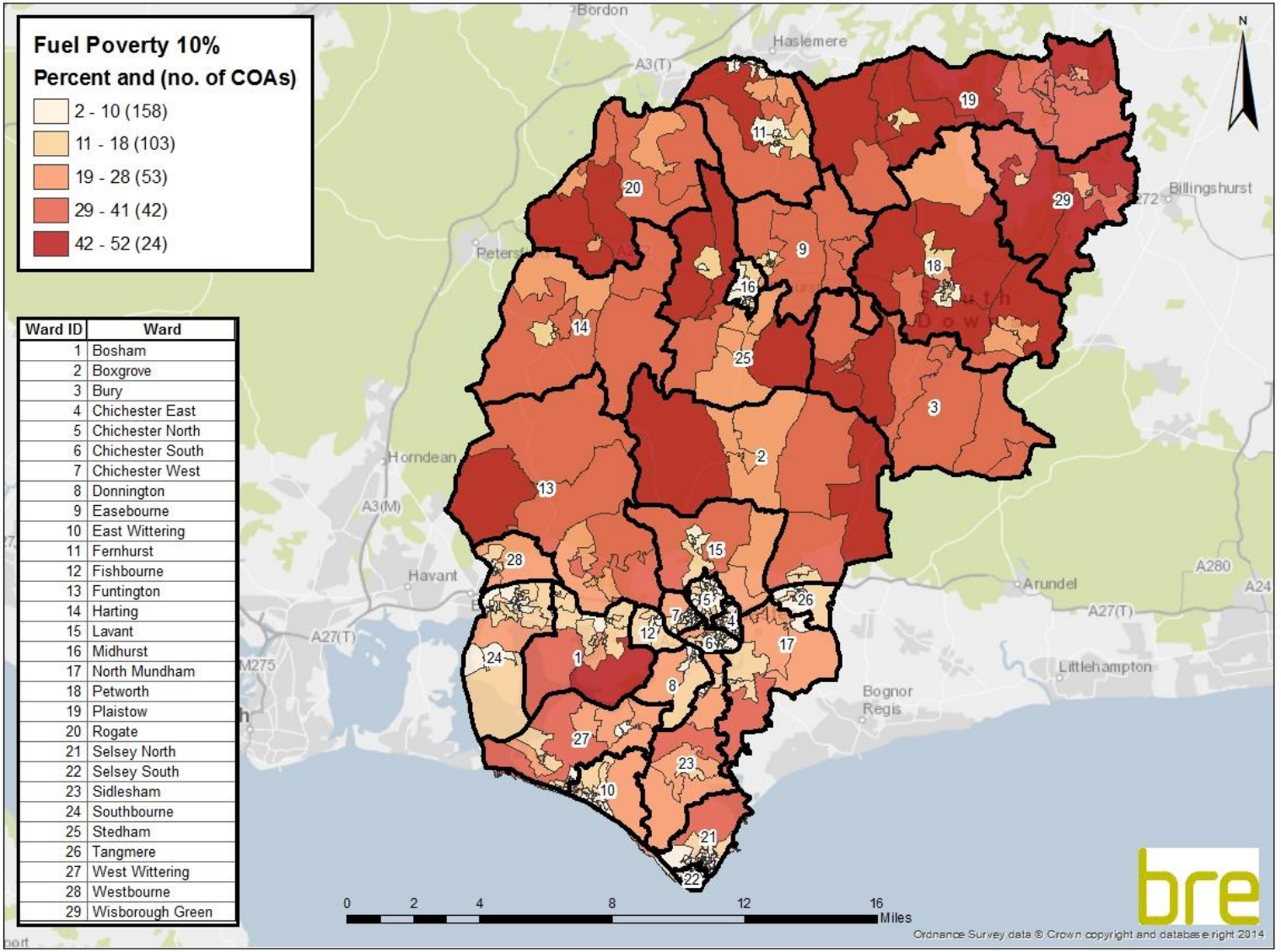
Map 8: Percentage of private sector dwellings in Chichester District Council occupied by households in fuel poverty - 10% definition



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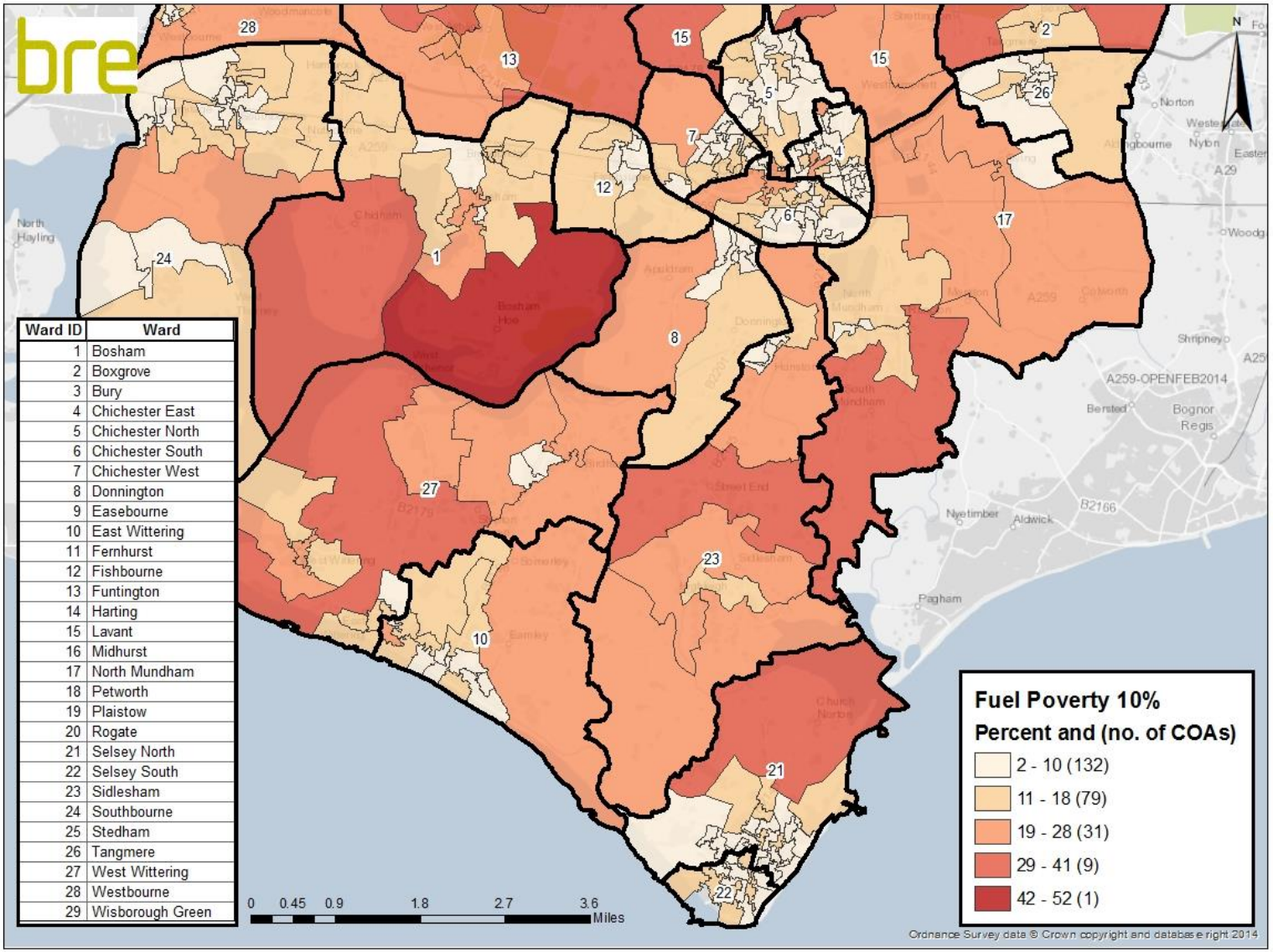
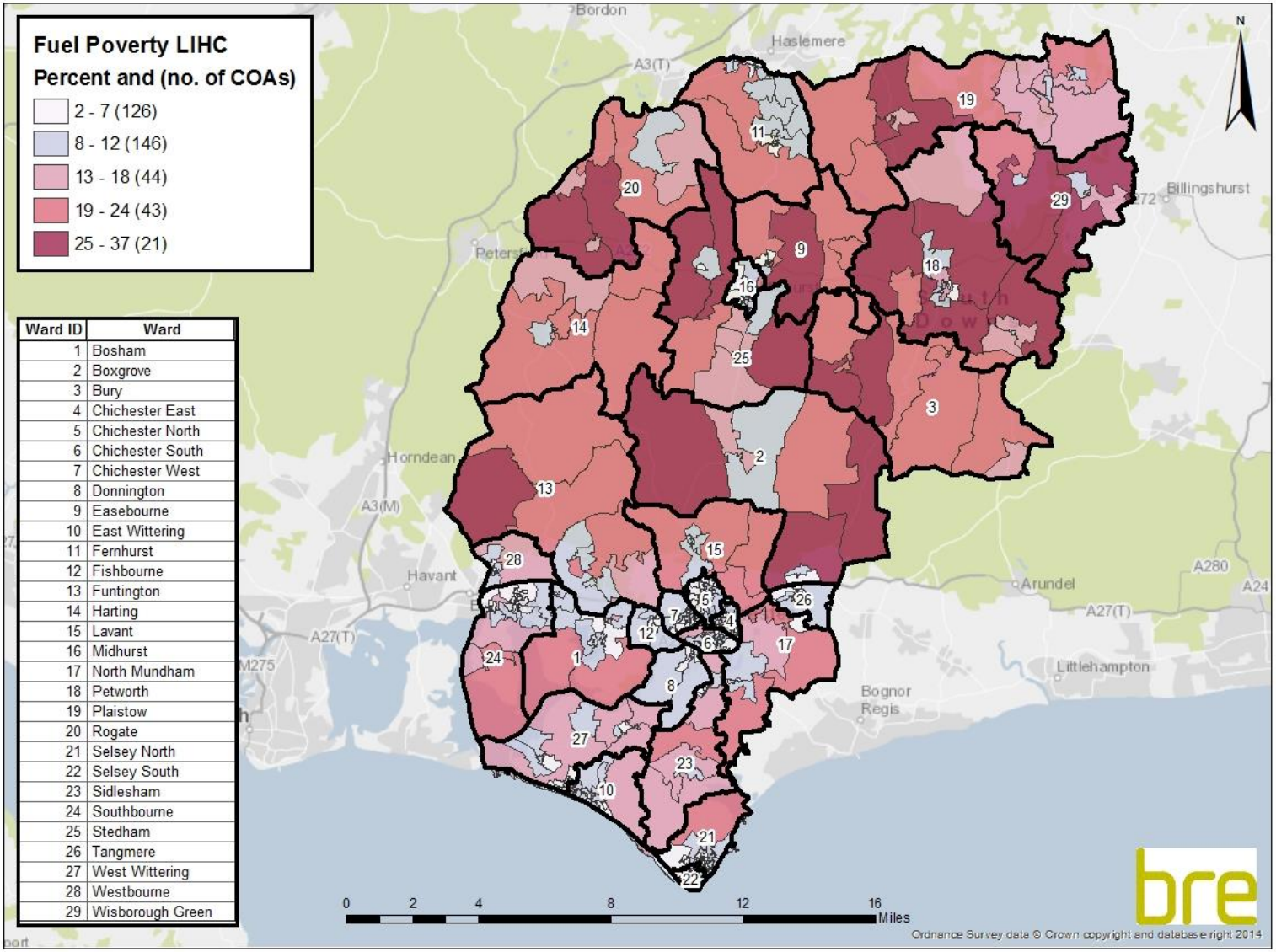
Map 9: Percentage of private sector dwellings in the areas of Chichester and Selsey occupied by households in fuel poverty - 10% definition



Map 10: Percentage of private sector dwellings in Chichester District Council occupied by households in fuel poverty – Low Income High Costs definition



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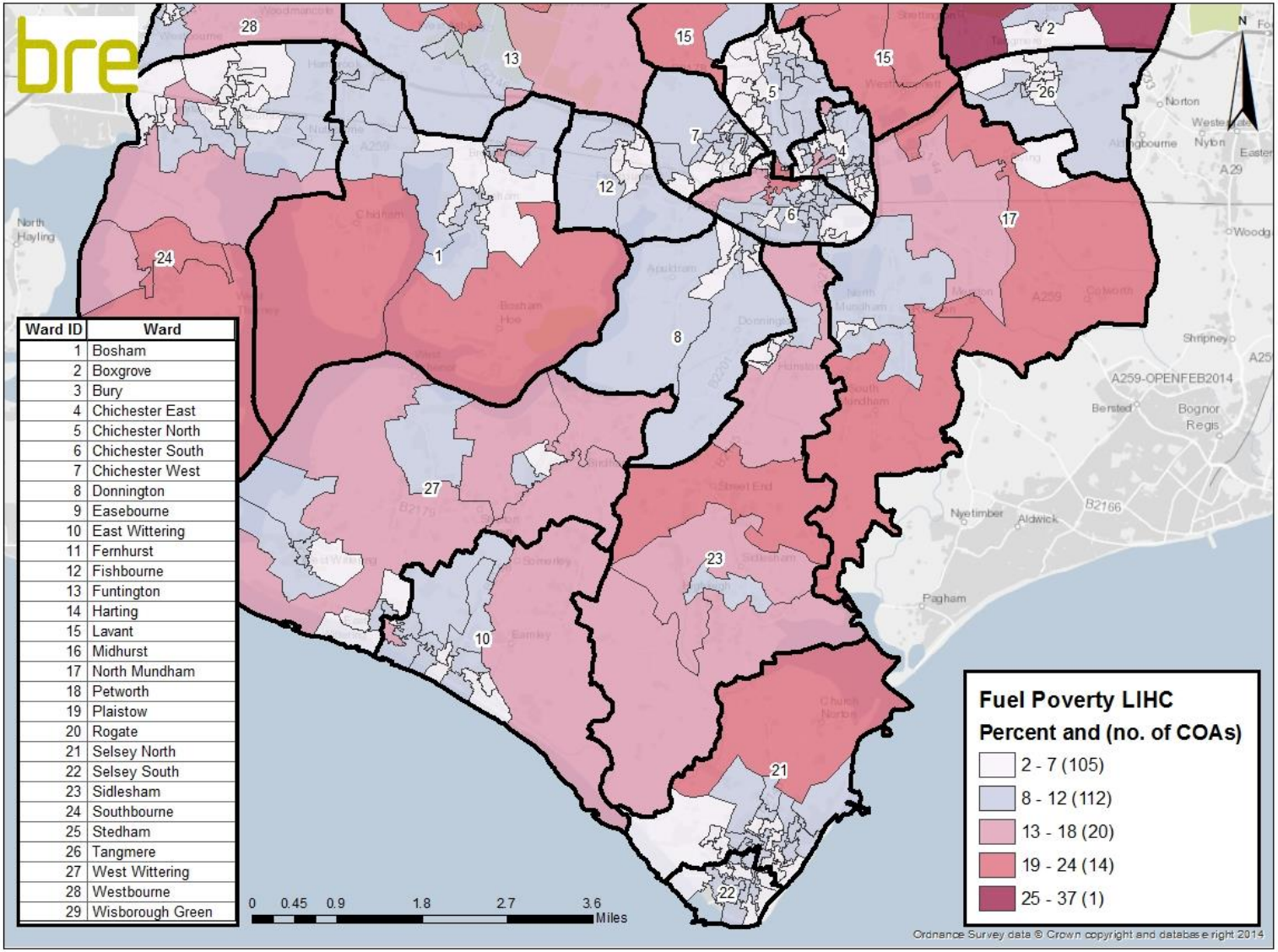
Map 11: Percentage of private sector dwellings in the areas of Chichester and Selsey occupied by households in fuel poverty - Low Income High Costs definition



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4.2.3.3 Low income households

A low income household is defined as a household in receipt of:

- Income support
- Housing benefit
- Attendance allowance
- Disability living allowance
- Industrial injuries disablement benefit
- War disablement pension
- Pension credit
- Child tax credit
- Working credit

For child tax credit and working tax credit, the household is only considered a low income household if it has a relevant income of less than £15,050.

The definition also includes households in receipt of Council Tax benefit and income based Job Seekers Allowance.

The proportion of low income households in the district is lower than the national average. **Map 12** shows the distribution of low income households across the entire district and **Map 13** zooms in on Chichester and Selsey. The maps indicate that the highest concentrations of low income households tend to be in Chichester and Selsey; however, there are pockets of high concentrations distributed throughout the district - for example in Southbourne.

Map 14 and **Map 15** provide an additional layer of information, with the data for low income households being combined with HHSRS excess cold data. This provides a vital picture of where vulnerable people are likely to be living in poor housing. The map indicates that the distribution shows higher levels being seen in the more rural areas of Boxgrove, Bury and Petworth.

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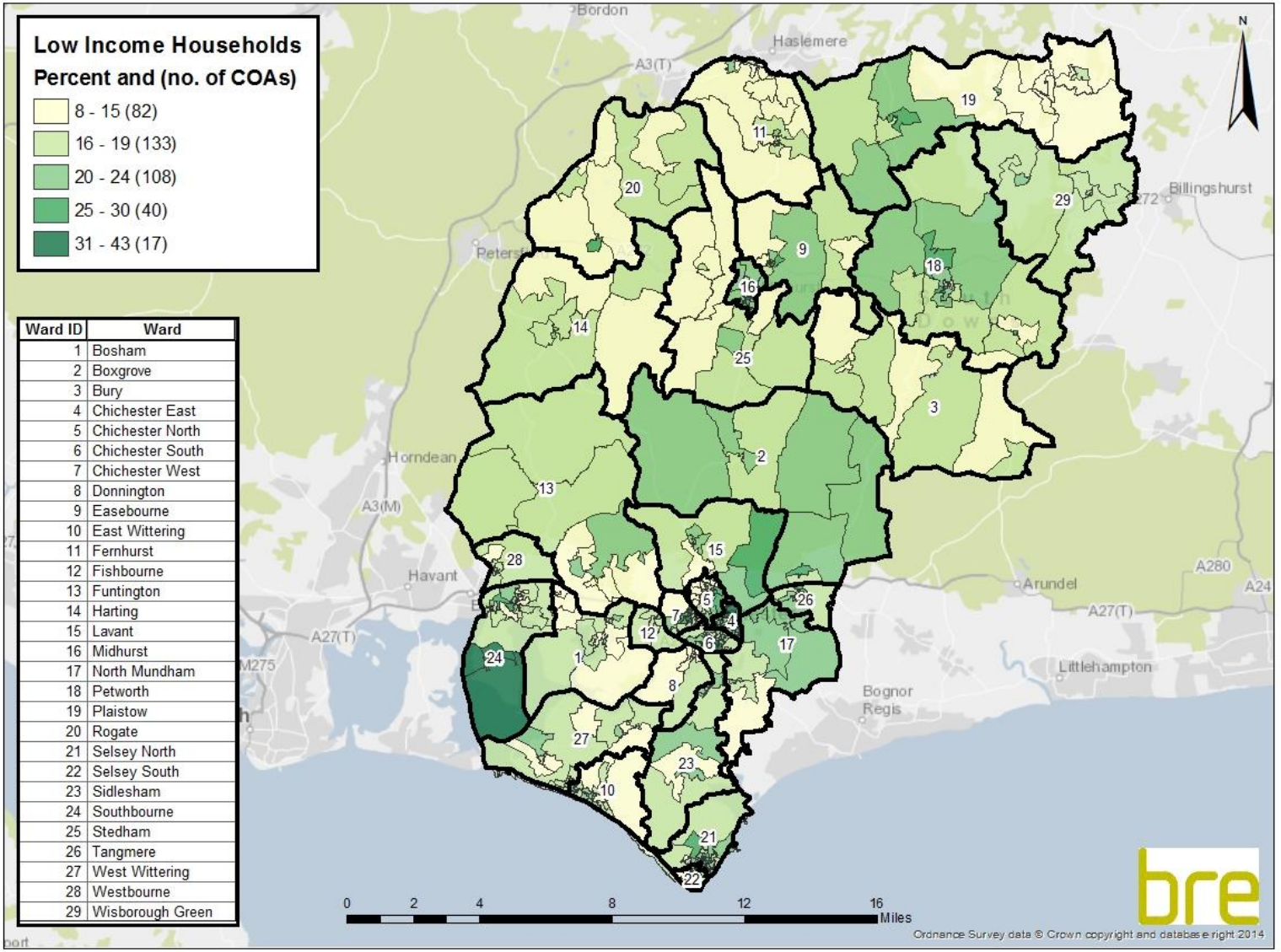
Map 12: Percentage of private sector dwellings in Chichester District Council occupied by low income households



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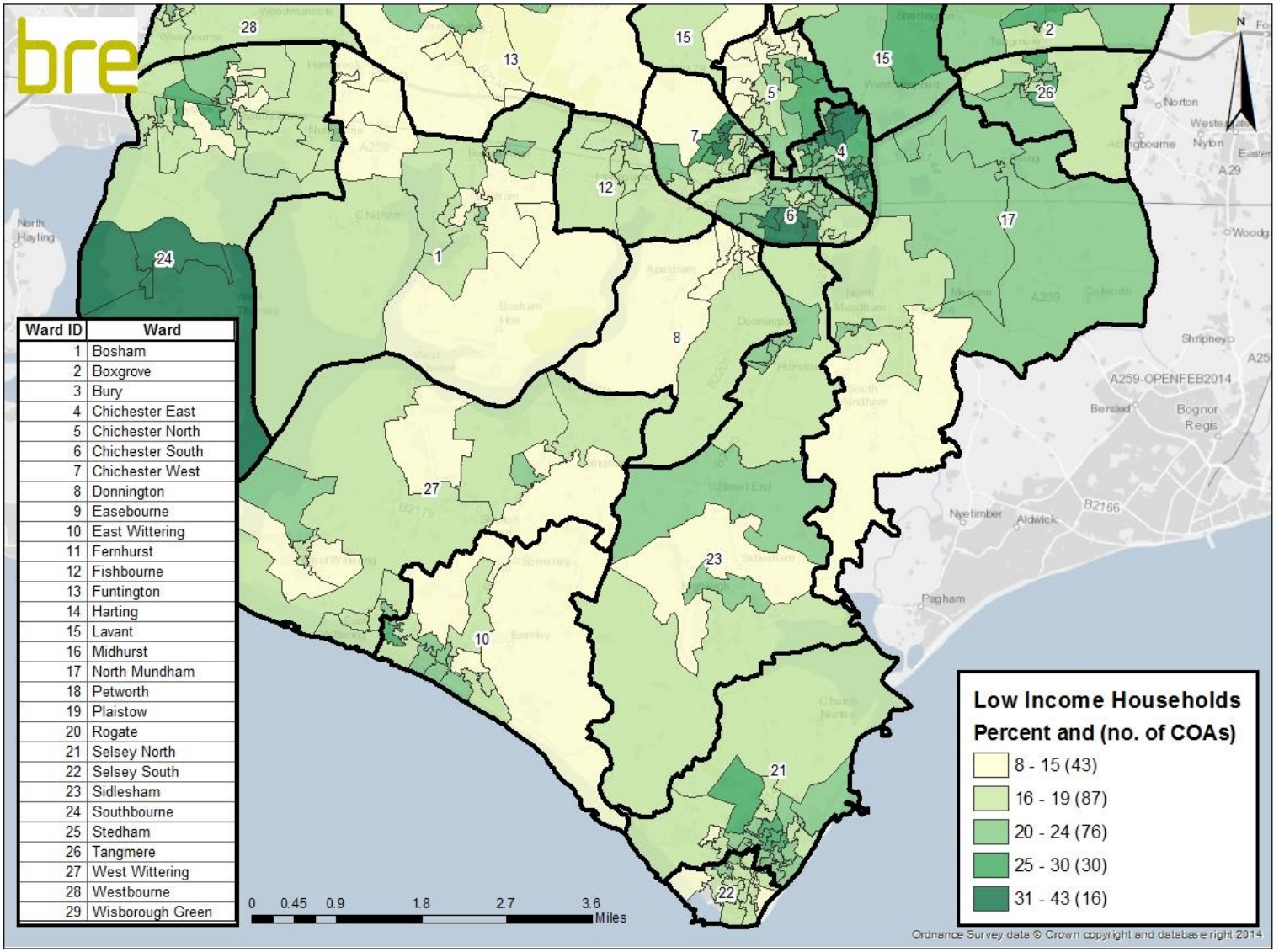
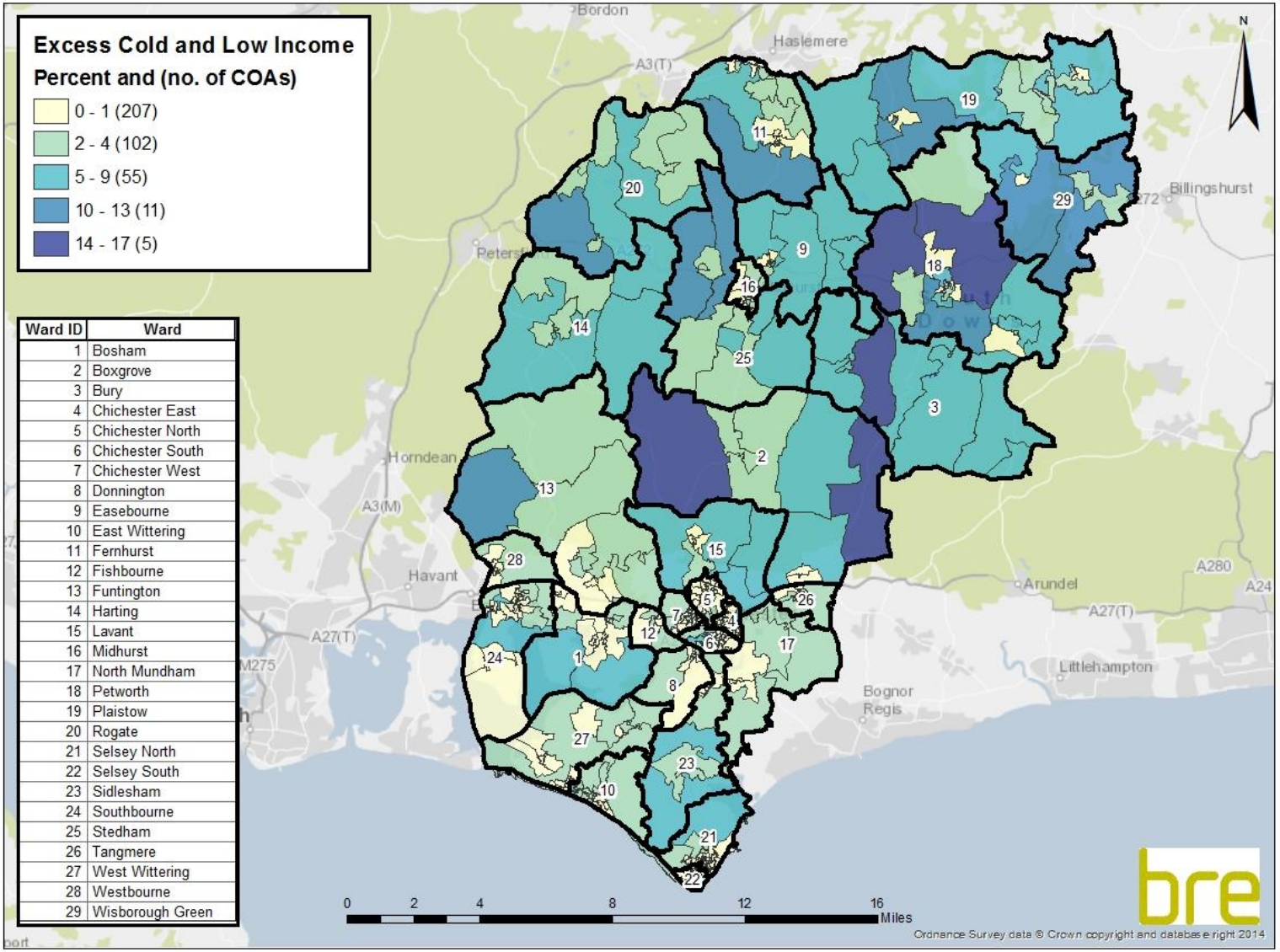
29	Wisborough Green

Map 13: Percentage of private sector dwellings in the areas of Chichester and Selsey occupied by low income households

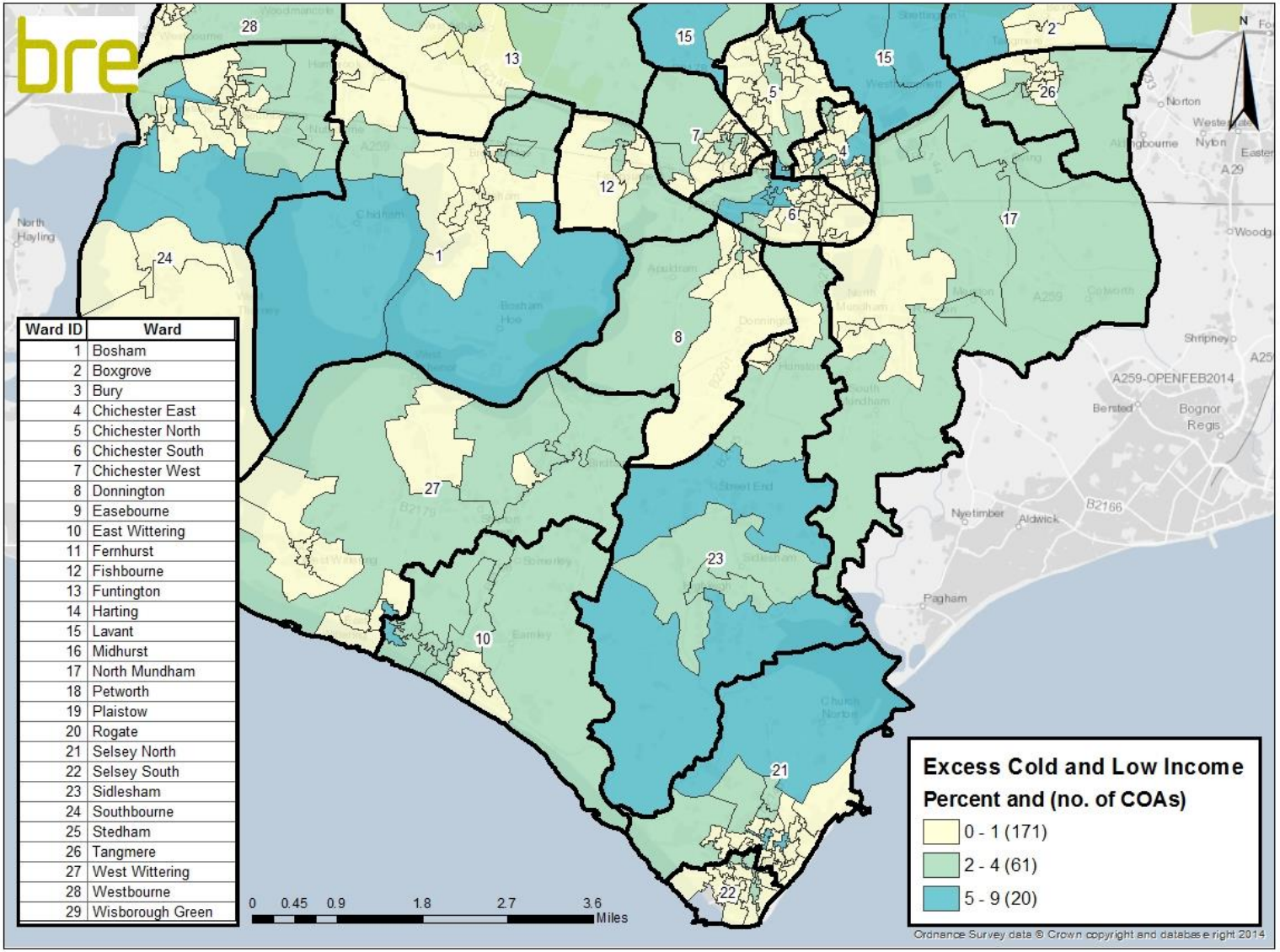


Map 14: Percentage of private sector dwellings in Chichester District Council with both the presence of a HHSRS category 1 hazard for excess cold and occupied by low income households



Ward ID	Ward
1	Bosham
2	Boxgrove
3	Bury
4	Chichester East
5	Chichester North
6	Chichester South
7	Chichester West
8	Donnington
9	Easebourne
10	East Wittering
11	Fernhurst
12	Fishbourne
13	Funtington
14	Harting
15	Lavant
16	Midhurst
17	North Mundham
18	Petworth
19	Plaistow
20	Rogate
21	Selsey North
22	Selsey South
23	Sidlesham
24	Southbourne
25	Stedham
26	Tangmere
27	West Wittering
28	Westbourne
29	Wisborough Green

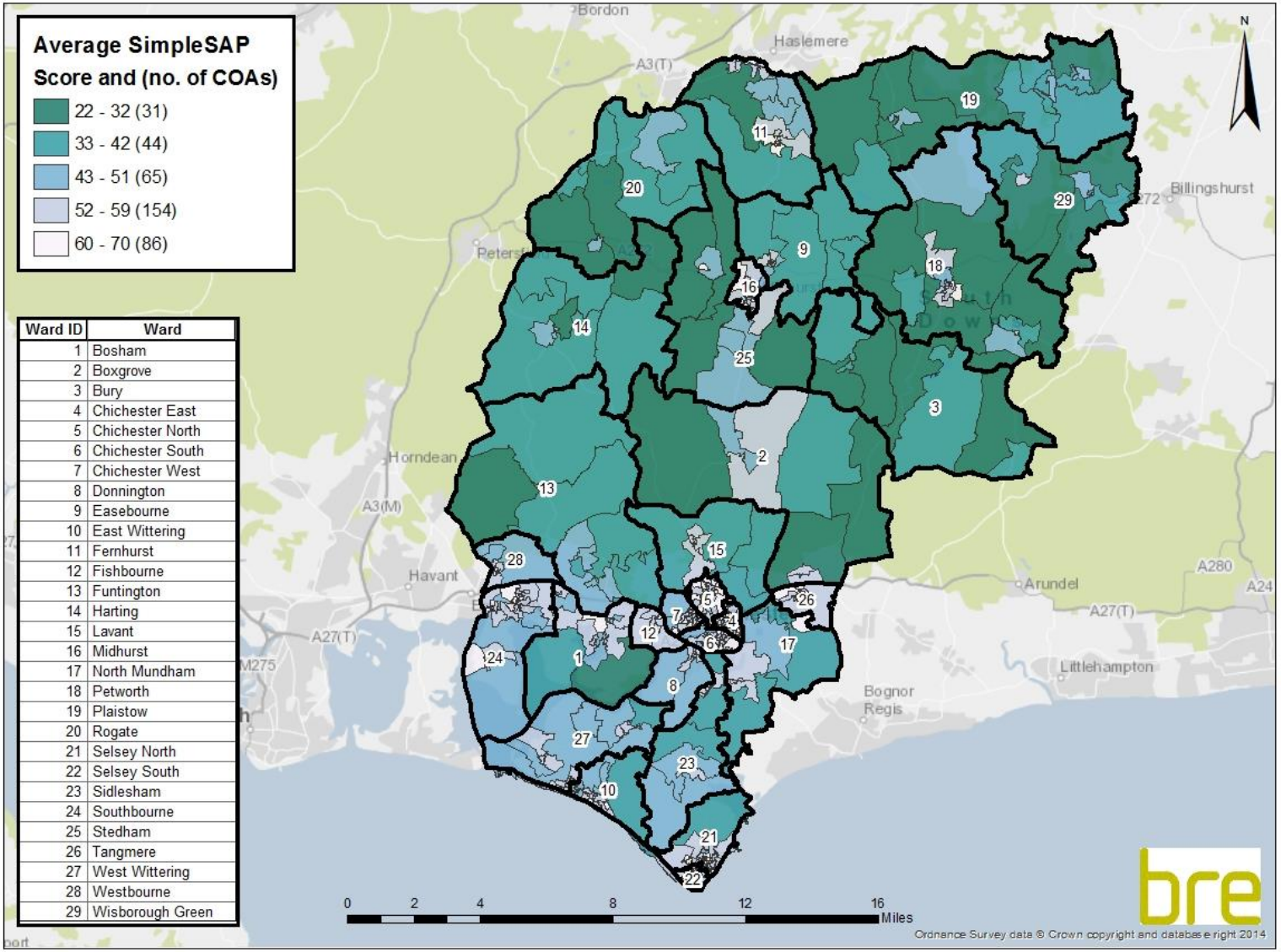
Map 15: Percentage of private sector dwellings in the areas of Chichester and Selsey with both the presence of a HHSRS category 1 hazard for excess cold and occupied by low income households



4.2.3.4 SimpleSAP

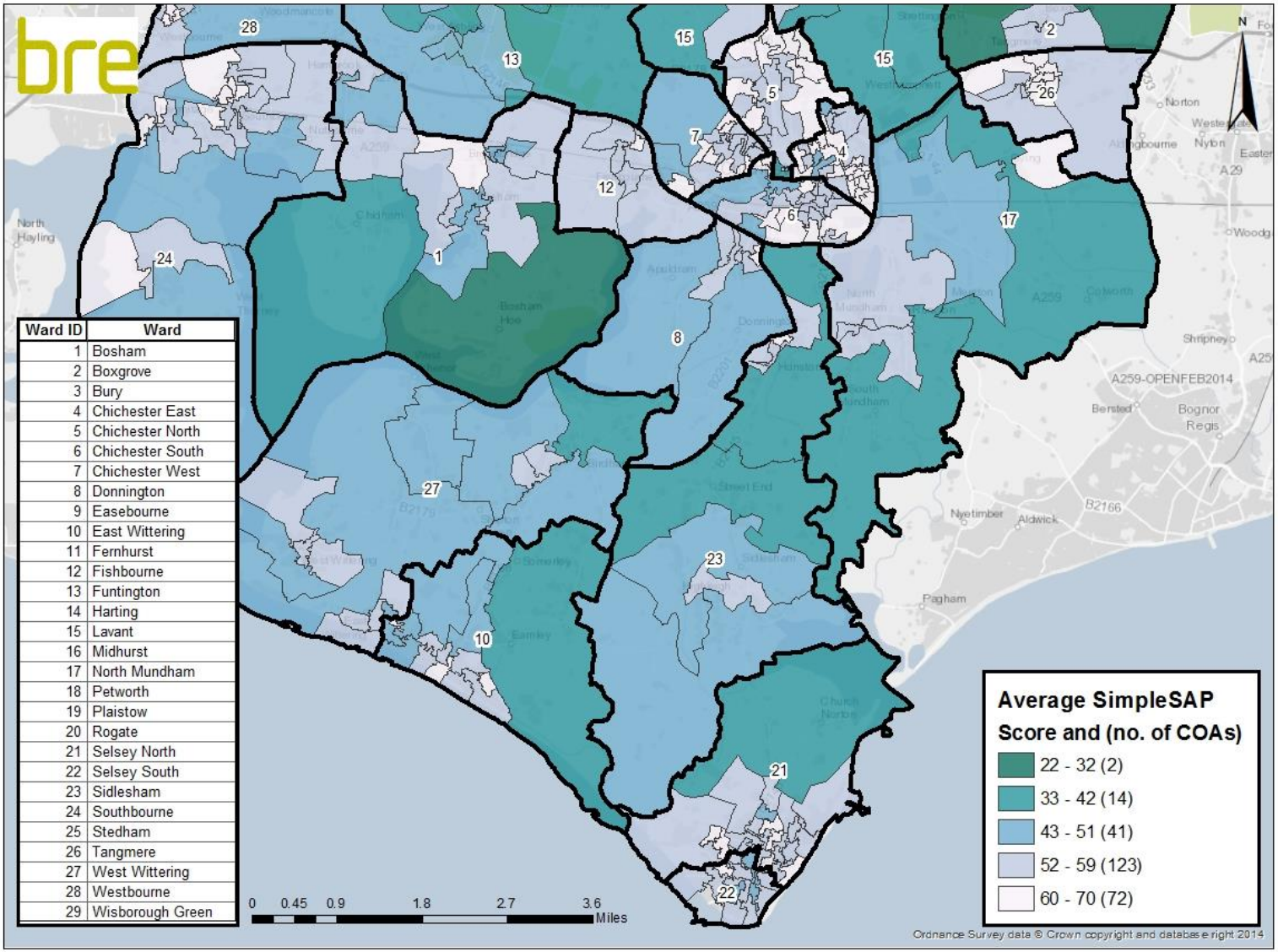
The average SimpleSAP maps (**Map 16** and **Map 17**) show that certain areas have lower average SimpleSAP ratings, again these areas tend to be in the central and northern parts of the district with poor ratings particularly in the wards of Bury, Rogate and Plaistow. This can be the case if an area includes larger, older homes where little work has been done by the occupiers to improve energy performance. The size of the home itself is not a factor in SimpleSAP, but these homes are more likely to be semi-detached or detached, and therefore have larger heat loss areas.

Map 16: Average SimpleSAP ratings per dwelling in Chichester District Council private sector stock



Ward ID	Ward
1	Bosham
2	Boxgrove
3	Bury
4	Chichester East
5	Chichester North
6	Chichester South
7	Chichester West
8	Donnington
9	Easebourne
10	East Wittering
11	Fernhurst
12	Fishbourne
13	Funtington
14	Harting
15	Lavant
16	Midhurst
17	North Mundham
18	Petworth
19	Plaistow
20	Rogate
21	Selsey North
22	Selsey South
23	Sidlesham
24	Southbourne
25	Stedham
26	Tangmere
27	West Wittering
28	Westbourne
29	Wisborough Green

Map 17: Average SimpleSAP ratings per dwelling in the areas of Chichester and Selsey



4.2.4 Ward level results for the key indicators – total stock and private sector stock

The previous maps have provided a visual representation of the key indicators at Census Output Area (COA) level. The following tables provide the complete set of figures at ward level for the key indicators; firstly, for the total stock (**Table 4**) and secondly, for the private sector stock (**Table 5**). This allows a direct comparison between the wards in Chichester.

Table 4: *Total stock* – number and percentage of dwellings failing each of the key indicators, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Bosham	2,051	275 (13%)	229 (11%)	111 (5%)	74 (4%)	377 (18%)	201 (10%)	404 (20%)	53
Boxgrove	1,076	337 (31%)	318 (30%)	65 (6%)	43 (4%)	297 (28%)	210 (20%)	322 (30%)	42
Bury	1,015	518 (51%)	516 (51%)	68 (7%)	61 (6%)	389 (38%)	225 (22%)	196 (19%)	32
Chichester East	4,009	279 (7%)	138 (3%)	161 (4%)	88 (2%)	326 (8%)	293 (7%)	1,699 (42%)	61
Chichester North	3,104	275 (9%)	162 (5%)	161 (5%)	108 (3%)	343 (11%)	225 (7%)	657 (21%)	58
Chichester South	3,365	369 (11%)	192 (6%)	226 (7%)	141 (4%)	384 (11%)	311 (9%)	1,081 (32%)	57
Chichester West	2,367	170 (7%)	59 (2%)	132 (6%)	71 (3%)	228 (10%)	175 (7%)	804 (34%)	59
Donnington	959	86 (9%)	51 (5%)	50 (5%)	27 (3%)	92 (10%)	58 (6%)	160 (17%)	57
Easebourne	1,156	323 (28%)	303 (26%)	83 (7%)	63 (5%)	310 (27%)	191 (17%)	282 (24%)	44
East Wittering	2,565	282 (11%)	247 (10%)	102 (4%)	62 (2%)	312 (12%)	224 (9%)	621 (24%)	55
Fernhurst	2,166	311 (14%)	257 (12%)	104 (5%)	52 (2%)	356 (16%)	202 (9%)	498 (23%)	53
Fishbourne	1,000	75 (8%)	50 (5%)	44 (4%)	14 (1%)	107 (11%)	75 (8%)	202 (20%)	57
Funtington	1,192	368 (31%)	365 (31%)	77 (6%)	48 (4%)	367 (31%)	214 (18%)	238 (20%)	40
Harting	911	314 (34%)	312 (34%)	44 (5%)	32 (4%)	258 (28%)	163 (18%)	211 (23%)	39
Lavant	1,012	175 (17%)	155 (15%)	58 (6%)	27 (3%)	178 (18%)	142 (14%)	339 (33%)	50
Midhurst	2,591	222 (9%)	138 (5%)	135 (5%)	79 (3%)	311 (12%)	219 (8%)	832 (32%)	58
North Mundham	983	152 (15%)	143 (15%)	49 (5%)	31 (3%)	185 (19%)	124 (13%)	282 (29%)	51
Petworth	2,303	629 (27%)	574 (25%)	156 (7%)	103 (4%)	539 (23%)	376 (16%)	698 (30%)	46

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Table 4 cont.: *Total stock* – number and percentage of dwellings failing each of the key indicators, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Plaistow	1,966	720 (37%)	709 (36%)	102 (5%)	70 (4%)	671 (34%)	341 (17%)	416 (21%)	38
Rogate	1,080	457 (42%)	456 (42%)	66 (6%)	45 (4%)	366 (34%)	215 (20%)	239 (22%)	36
Selsey North	3,206	236 (7%)	121 (4%)	152 (5%)	59 (2%)	285 (9%)	249 (8%)	834 (26%)	57
Selsey South	2,053	170 (8%)	95 (5%)	96 (5%)	52 (3%)	218 (11%)	162 (8%)	405 (20%)	55
Sidlesham	1,058	186 (18%)	156 (15%)	60 (6%)	34 (3%)	189 (18%)	125 (12%)	299 (28%)	50
Southbourne	3,171	278 (9%)	140 (4%)	173 (5%)	81 (3%)	341 (11%)	270 (9%)	797 (25%)	56
Stedham	1,031	379 (37%)	370 (36%)	62 (6%)	45 (4%)	311 (30%)	174 (17%)	234 (23%)	41
Tangmere	1,125	63 (6%)	41 (4%)	31 (3%)	8 (1%)	74 (7%)	63 (6%)	377 (34%)	63
West Wittering	2,638	336 (13%)	279 (11%)	128 (5%)	56 (2%)	492 (19%)	261 (10%)	514 (19%)	52
Westbourne	1,028	101 (10%)	55 (5%)	62 (6%)	23 (2%)	128 (12%)	81 (8%)	263 (26%)	56
Wisborough Green	1,079	440 (41%)	437 (41%)	65 (6%)	42 (4%)	364 (34%)	211 (20%)	269 (25%)	37

N.B. the information on HHSRS category 1 hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.

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Table 5: *Private sector stock* – number and percentage of dwellings for each of the key indicators, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Bosham	1,900	269 (14%)	225 (12%)	109 (6%)	74 (4%)	362 (19%)	192 (10%)	305 (16%)	52
Boxgrove	872	281 (32%)	267 (31%)	60 (7%)	42 (5%)	257 (29%)	178 (20%)	182 (21%)	41
Bury	936	486 (52%)	485 (52%)	67 (7%)	61 (7%)	368 (39%)	210 (22%)	145 (15%)	32
Chichester East	2,647	234 (9%)	115 (4%)	139 (5%)	87 (3%)	231 (9%)	218 (8%)	683 (26%)	60
Chichester North	2,797	256 (9%)	147 (5%)	157 (6%)	107 (4%)	313 (11%)	205 (7%)	460 (16%)	58
Chichester South	2,696	339 (13%)	175 (6%)	215 (8%)	141 (5%)	332 (12%)	267 (10%)	596 (22%)	55
Chichester West	1,771	146 (8%)	47 (3%)	121 (7%)	71 (4%)	181 (10%)	134 (8%)	356 (20%)	57
Donnington	919	82 (9%)	47 (5%)	50 (5%)	27 (3%)	87 (9%)	56 (6%)	137 (15%)	57
Easebourne	992	298 (30%)	281 (28%)	80 (8%)	63 (6%)	285 (29%)	174 (18%)	177 (18%)	42
East Wittering	2,305	274 (12%)	240 (10%)	101 (4%)	62 (3%)	296 (13%)	211 (9%)	439 (19%)	54
Fernhurst	1,868	291 (16%)	241 (13%)	100 (5%)	52 (3%)	323 (17%)	177 (9%)	288 (15%)	52
Fishbourne	943	71 (8%)	46 (5%)	44 (5%)	14 (1%)	102 (11%)	71 (8%)	164 (17%)	57
Funtington	1,113	346 (31%)	344 (31%)	76 (7%)	48 (4%)	349 (31%)	202 (18%)	187 (17%)	40
Harting	787	282 (36%)	281 (36%)	43 (5%)	32 (4%)	237 (30%)	144 (18%)	129 (16%)	38
Lavant	765	147 (19%)	132 (17%)	53 (7%)	27 (4%)	151 (20%)	114 (15%)	158 (21%)	48
Midhurst	2,047	184 (9%)	108 (5%)	127 (6%)	79 (4%)	264 (13%)	181 (9%)	432 (21%)	57
North Mundham	813	139 (17%)	133 (16%)	46 (6%)	31 (4%)	166 (20%)	109 (13%)	160 (20%)	49
Petworth	1,865	595 (32%)	550 (29%)	146 (8%)	103 (6%)	498 (27%)	339 (18%)	372 (20%)	43

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Table 5 cont.: *Private sector stock* – number and percentage of dwellings for each of the key indicators, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Plaistow	1,753	681 (39%)	673 (38%)	99 (6%)	70 (4%)	639 (36%)	312 (18%)	274 (16%)	36
Rogate	943	413 (44%)	413 (44%)	65 (7%)	45 (5%)	337 (36%)	192 (20%)	147 (16%)	34
Selsey North	2,893	216 (7%)	106 (4%)	147 (5%)	59 (2%)	254 (9%)	223 (8%)	601 (21%)	57
Selsey South	1,943	164 (8%)	91 (5%)	94 (5%)	52 (3%)	211 (11%)	154 (8%)	331 (17%)	55
Sidlesham	876	177 (20%)	150 (17%)	57 (7%)	34 (4%)	174 (20%)	111 (13%)	167 (19%)	48
Southbourne	2,839	268 (9%)	135 (5%)	168 (6%)	81 (3%)	318 (11%)	250 (9%)	561 (20%)	56
Stedham	892	341 (38%)	334 (37%)	60 (7%)	45 (5%)	283 (32%)	156 (17%)	142 (16%)	40
Tangmere	859	59 (7%)	39 (5%)	29 (3%)	8 (1%)	64 (7%)	50 (6%)	182 (21%)	62
West Wittering	2,496	327 (13%)	273 (11%)	125 (5%)	56 (2%)	480 (19%)	251 (10%)	417 (17%)	51
Westbourne	860	95 (11%)	51 (6%)	60 (7%)	23 (3%)	113 (13%)	72 (8%)	145 (17%)	55
Wisborough Green	932	412 (44%)	411 (44%)	63 (7%)	42 (5%)	338 (36%)	189 (20%)	163 (17%)	36

N.B. the information on HHSRS category 1 hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.

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4.3 Information relating to LAHS reporting and EPC ratings

4.3.1 Cost of mitigating category 1 hazards in the Chichester private sector stock

Table 6 shows the total number of dwellings with HHSRS category 1 hazards in Chichester's private sector stock, the average cost of mitigating hazards per dwelling and the total cost for mitigating all dwellings. The costs are based on the average cost of mitigating category 1 hazards for the South East using EHS 2011 data[28].

Table 6: Total number of dwellings with category 1 hazards in private sector stock and cost of mitigation

HHSRS cat 1 hazards	Total no. in the authority	Average cost per dwelling (£)	Total cost (£)
	7,873	3,446	27,131,374

[28] Note that these costs are estimated based on standardised cost assumptions intended for comparison purposes. If available, local data on costs – such as grant or loan aided works – could be used; however, this type of data is usually biased. The estimates here are therefore considered as a useful starting point.

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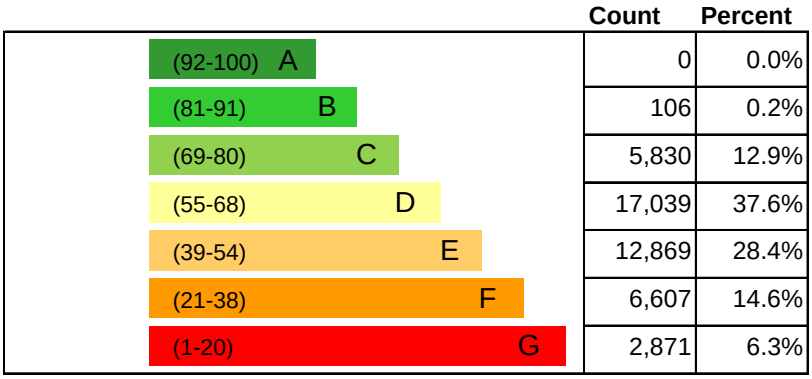
4.3.2 EPC ratings in the Chichester private sector stock

Figure 8 below shows the bands A – G and corresponding SAP ratings in brackets. The columns show the number and percentage of Chichester's private sector stock falling into each of the EPC ratings bands.

The estimated average SimpleSAP for the private sector stock in Chichester is 51 which corresponds to an EPC rating of E. The number of private sector dwellings with an EPC rating below band E is estimated to be 9,478 (20.9%).

Figure 8: Number and percentage of Chichester's *private sector stock* falling into each of the EPC ratings bands (based on SimpleSAP)



	Count	Percent
(92-100) A	0	0.0%
(81-91) B	106	0.2%
(69-80) C	5,830	12.9%
(55-68) D	17,039	37.6%
(39-54) E	12,869	28.4%
(21-38) F	6,607	14.6%
(1-20) G	2,871	6.3%

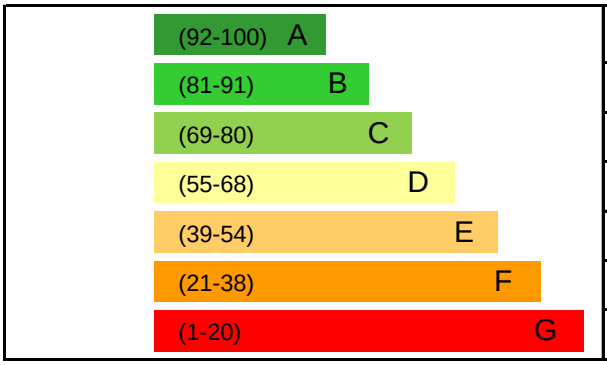
Under the Energy Act 2011, new rules mean that from 2018 landlords must ensure that their properties meet a minimum energy efficiency standard. Subject to Parliamentary approval, this minimum standard has been set at band E by 1 April 2018[29, 30].

[29] https://www.gov.uk/government/consultations/private-rented-sector-energy-efficiency-regulations-domestic

[30] Although landlords will still be able to rent out F and G rated properties after this date they will not be able to renew or sign a new contract.

Figure 9 below shows the breakdown of SimpleSAP results into the A – G bands for the private rented stock only. The number of private rented dwellings in Chichester with a rating below band E (i.e. bands F and G), is estimated to be 2,192 (26.4%).

Figure 9: Number and percentage of Chichester's *private rented stock* falling into each of the EPC ratings bands (based on SimpleSAP)



	Count	Percent
(92-100) A	0	0.0%
(81-91) B	44	0.5%
(69-80) C	1,292	15.6%
(55-68) D	2,538	30.6%
(39-54) E	2,233	26.9%
(21-38) F	1,384	16.7%
(1-20) G	808	9.7%

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5 Conclusion and recommendations

5.1 Conclusion

Chichester District Council commissioned BRE to undertake a series of modelling exercises on their housing stock. This report describes the modelling work and provides details of the results obtained from the dwelling level model and database. The database is also provided to the council to enable them to obtain specific information whenever required.

The stock models and database provide the council with dwelling level information, focussing on private sector housing, for the following:

- The percentage of dwellings meeting each of the key indicators for Chichester overall and broken down by tenure and then mapped by COA (private sector stock only)
- Information relating to LAHS reporting for the private sector stock - category 1 hazards, as well as information on EPC ratings

Such information will facilitate the decision making process for targeting resources to improve the condition of housing and to prevent ill health resulting from poor housing conditions. Furthermore, the results of this project provide Chichester with information which will assist in housing policy and strategy development whether these are inspired locally, arise from obligations under the Housing Act 2004 or as responses to government initiatives such as DCLG's Housing Strategy Policy, Green Deal and ECO.

5.2 Recommendations

The current database could be enhanced to include the addition of various other sources of data (if they are available to the council). If such data were available BRE are able[31] to integrate these local data sources into the current database.

Examples of such data are:

- **Energy Performance Certificate (EPC) data**

EPCs contain data on key dwelling energy characteristics (e.g. energy demand, excess cold, SimpleSAP) and where these are available they can be used in preference to the modelled data (it should be noted that to comply with bulk EPC data licencing requirements the EPC data is only used to inform the energy efficiency aspects of the model).

- **Local Land and Property Gazetteer (LLPG) data**

The Unique Property Reference Number (UPRN) from the LLPG can be used to uniquely identify all properties, while the address details from the LLPG can be used to merge the BRE models and EPC data using address matching.

[31] Dependent on a successful feasibility assessment of the data.

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- **Households on benefits**

Data regarding any households in receipt of either Council Tax Support or Housing Allowance could be used to enhance the low income model, making the targeting of individual low income households more accurate.

- **Local repair schemes**

Data from any local repair schemes, including the use of repair grants, could be used to enhance the Disrepair Model.

- **Local energy improvement schemes**

Any local schemes to improve the energy efficiency of dwellings, including national schemes for which local data has been made available to Chichester, could be used to further enhance the energy models (SimpleSAP, excess cold, fuel poverty).

Furthermore, it would be possible to provide Chichester with an analysis of the condition of the housing stock and its health impact, through a Health Impact Assessment. This report would also provide a cost benefit analysis of mitigating Housing Health and Safety hazards within the stock. Further assistance can be provided in the form of a Healthy Homes Advisory Service. This involves assisting the local authority in using the data from stock modelling and the health impact assessment to proactively assist vulnerable residents living in the poorest quality housing in the local authority area. The toolkit will allow Chichester to target the poorest quality housing and maximise the joint working opportunities with health and community groups in the area.

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Appendix A Definitions of the key indicators

1. **House condition indicators**
   a. **The presence of a category 1 hazard under the Housing Health and Safety Rating System (HHSRS) – reflecting both condition and thermal efficiency**
   Homes posing a category 1 hazard under the HHSRS – the system includes 29 hazards in the home categorised into category 1 (serious) or category 2 (other) based on a weighted evaluation tool. Note that this includes the hazard of excess cold which is also included as one of the energy efficiency indicators.

   The 29 hazards are:

1 Damp and mould growth	16 Food safety
2 Excess cold	17 Personal hygiene, Sanitation and Drainage
3 Excess heat	18 Water supply
4 Asbestos	19 Falls associated with baths etc.
5 Biocides	20 Falling on level surfaces etc.
6 Carbon Monoxide and fuel combustion products	21 Falling on stairs etc.
7 Lead	22 Falling between levels
8 Radiation	23 Electrical hazards
9 Uncombusted fuel gas	24 Fire
10 Volatile Organic Compounds	25 Flames, hot surfaces etc.
11 Crowding and space	26 Collision and entrapment
12 Entry by intruders	27 Explosions
13 Lighting	28 Position and operability of amenities etc.
14 Noise	29 Structural collapse and falling elements
15 Domestic hygiene, Pests and Refuse	

   b. **The presence of a category 1 hazard for falls (includes "falls associated with baths", "falling on the level" and "falling on stairs")**
   The HHSRS Falls Model includes the 3 different falls hazards where the vulnerable person is over 60 as listed above.

   c. **Dwellings in disrepair (based on the former Decent Homes Standard criteria for Disrepair)**
   The previous Decent Homes Standard states that a dwelling fails this criterion if it is not found to be in a reasonable state of repair. This is assessed by looking at the age of the dwelling and the condition of a range of building components including walls, roofs, windows, doors, electrics and heating systems).

2. **Energy efficiency indicators:**
   a. **The presence of a category 1 hazard for excess cold (using SAP ratings as a proxy measure in the same manner as the English House Condition Survey)**
   This hazard looks at households where there is a threat to health arising from sub-optimal indoor temperatures. The HHSRS assessment is based on the most low income group for this hazard – persons aged 65 years or over (note that the assessment requires the hazard to

be present and potentially affect a person in the low income age group should they occupy that dwelling. The assessment does not take account of the age of the person actually occupying that dwelling at that particular point in time).

The English Housing Survey (EHS) does not measure the actual temperatures achieved in each dwelling and therefore the presence of this hazard is measured by using the SAP rating as a proxy. Dwellings with a SAP rating of less than 31.5 (SAP 2005 methodology) are considered to be suffering from a category 1 excess cold hazard.

b. An estimate of the SAP rating which, to emphasise its origin from a reduced set of input variables, is referred to as "SimpleSAP"

The Standard Assessment Procedure (SAP) is the UK Government's standard methodology for home energy cost ratings. SAP ratings allow comparisons of energy efficiency to be made, and can show the likely improvements to a dwelling in terms of energy use. The Building Regulations require a SAP assessment to be carried out for all new dwellings and conversions. Local authorities, housing associations, and other landlords also use SAP ratings to estimate the energy efficiency of existing housing. The version on which the Average SAP rating model is based is SAP 2005.

The SAP ratings give a measure of the annual unit energy cost of space and water heating for the dwelling under a standard regime, assuming specific heating patterns and room temperatures. The fuel prices used are averaged over the previous 3 years across all regions in the UK. The SAP takes into account a range of factors that contribute to energy efficiency, which include:

Thermal insulation of the building fabric
The shape and exposed surfaces of the dwelling
Efficiency and control of the heating system
The fuel used for space and water heating
Ventilation and solar gain characteristics of the dwelling

3. Household vulnerability indicators:

a. Fuel poverty - 10% definition

This definition states that a household is said to be in fuel poverty if it spends more than 10% of its income on fuel to maintain an adequate level of warmth (usually defined as 21^{o}C for the main living area, and 18^{o}C for other occupied rooms). This broad definition of fuel costs also includes modelled spending on water heating, lights, appliances and cooking.

The fuel poverty ratio is defined as:

$$\textit{Fuel poverty ratio} = \frac{\textit{Fuel costs (usage * price)}}{\textit{Full income}}$$

If this ratio is greater than 0.1 then the household is in fuel poverty.

The definition of full income is the official headline figure and in addition to the basic income measure, it includes income related directly to housing (i.e. Housing Benefit, Income Support for Mortgage Interest (ISMI), Mortgage Payment Protection Insurance (MPPI), Council Tax Benefit (CTB)).

Fuel costs are modelled, rather than based on actual spending. They are calculated by combining the fuel requirements of the household with the corresponding fuel prices. The key goal in the modelling is to ensure that the household achieves the adequate level of warmth set out in the definition of fuel poverty whilst also meeting their other domestic fuel requirements.

b. Fuel poverty - Low Income High Costs definition

The government has recently set out a new definition of fuel poverty which it intends to adopt under the Low Income High Costs (LIHC) framework[32]. Under the new definition, a household is said to be in fuel poverty if:

- They have required fuel costs that are above average (the national median level)
- Were they to spend that amount they would be left with a residual income below the official poverty line

c. Dwellings occupied by a low income household

A household in receipt of:

- Income support
- Housing benefit
- Attendance allowance
- Disability living allowance
- Industrial injuries disablement benefit
- War disablement pension
- Pension credit
- Child tax credit
- Working credit

For child tax credit and working tax credit, the household is only considered a low income household if it has a relevant income of less than £15,050.

The definition also includes households in receipt of Council Tax benefit and income based Job Seekers Allowance.

[32] https://www.gov.uk/government/collections/fuel-poverty-statistics

Appendix B Methodology for the BRE Dwelling Level Housing Stock Modelling approach

This Appendix provides a more detailed description of the models which make up the overall housing stock modelling approach and feed into the database. The process is made up of a series of data sources and models which, combined with various imputation and regression techniques and the application of other formulae, make up the final database. The database is essentially the main output of the modelling and provides information on the key indicators and other data requirements (e.g. energy efficiency variables). An overview of the approach and a simplified flow diagram are provided in Section 3 of this report.

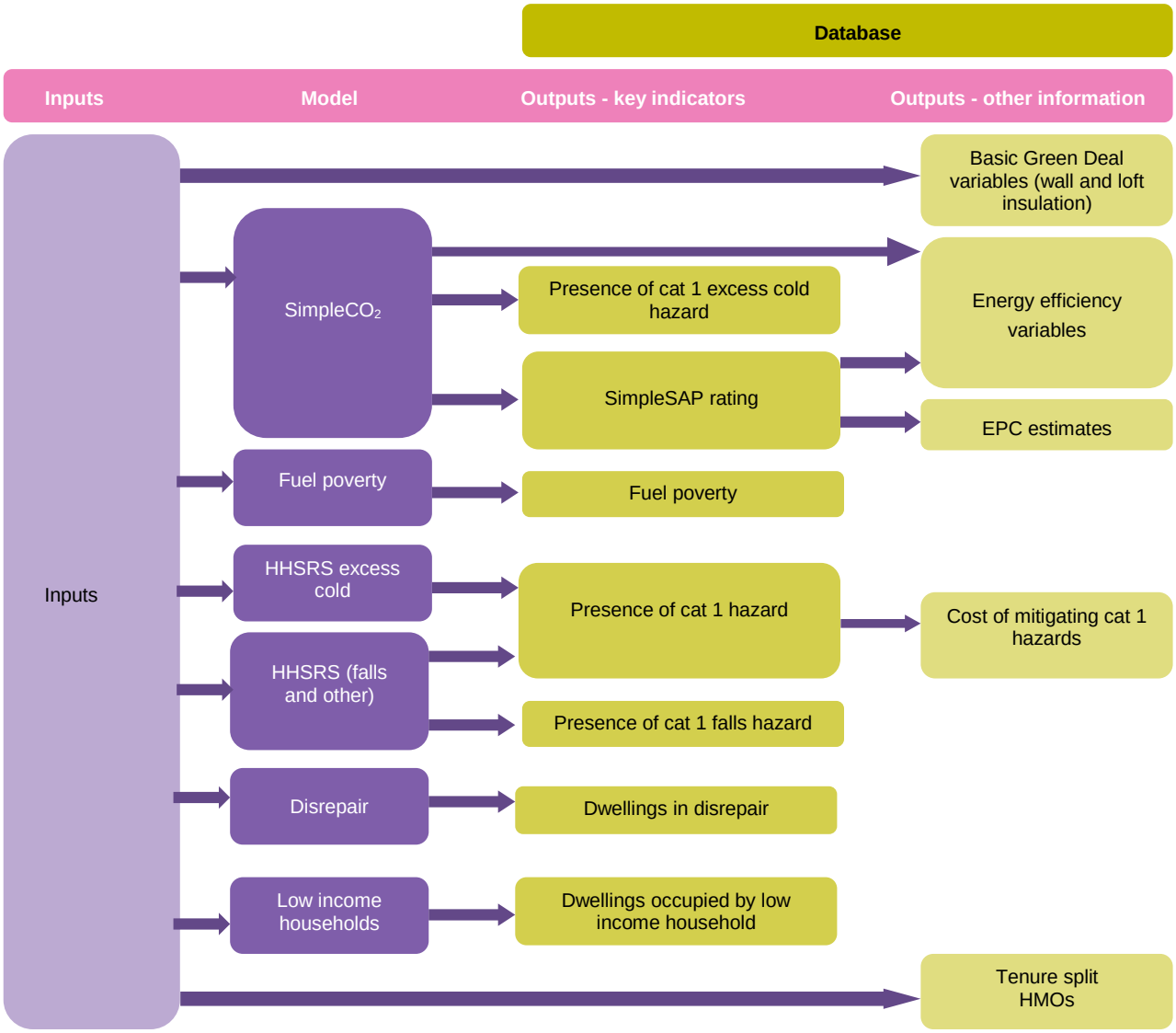
The models making up the overall housing stock modelling approach are:

- SimpleCO_2 Model
- Fuel Poverty Model
- HHSRS (all hazards, falls hazards and excess cold) Models
- Disrepair Model
- Low Income Households Model

Figure B. 1 shows the data flows for the stock modelling approach, showing which models each of the outputs in the database (split into the key indicators and other information) come from. The exception is the Green Deal variables (if used) which come directly from the energy inputs, and the tenure and HMO data (if used) which come directly from the other inputs.

Section B.1 describes the SimpleCO_2 Model in more detail, Section B.2 provides more information on the other four models and Section B.3 gives details of the OS MasterMap/geomodelling approach.

Figure B. 1: Simplified data flow for the housing stock modelling approach



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B.1 BRE SimpleCO_2 Model

BRE have developed a variant of the BREDEM[33] software, named "SimpleCO_2", that can calculate outputs from a reduced set of input variables. These outputs are indicative of the full BREDEM outputs and the minimum set of variables the software accepts is information on:

- Dwelling type
- Dwelling age
- Number of bedrooms
- Heating fuel
- Heating system
- Tenure

The Experian UK Consumer Dynamics Database is used as a source of these variables and they are converted into a suitable format for the SimpleCO_2 software. However, these variables alone are insufficient for the software to calculate the "SimpleSAP" rating or carbon emissions estimate (one of the outputs of the SimpleCO_2 Model). Additional variables are required and as these values cannot be precisely inferred then a technique known as cold deck imputation is undertaken. This is a process of assigning values in accordance with their known proportions in the stock. For example, this technique is used for predicting heating fuels as the Experian data only confirms whether a dwelling is on the gas network or not. Fuel used by dwellings not on the gas network is unknown, so in most cases this information will be assigned using probabilistic methods. The process is actually far more complex e.g. dwellings with particular characteristics such as larger dwellings are more likely to be assigned with oil as a fuel than smaller dwellings.

The reason for taking this approach is to ensure that the national proportions in the data source are the same as those found in the stock nationally (as predicted by the EHS or other national survey). Whilst there is the possibility that some values assigned will be incorrect for a particular dwelling (as part of the assignment process has to be random) they ensure that examples of some of the more unusual types of dwelling that will be present in the stock are included.

Whilst this approach is an entirely sensible and commonly adopted approach to dealing with missing data in databases intended for strategic use, it raises issues where one of the intended uses is planning implementation measures. It must therefore be kept in mind at all times that the data provided represents the most likely status of the dwelling, but that the actual status may be quite different. That said, where EPC data has been used, the energy models (which use EPC data) are likely to be more accurate.

It is important to note that some variables have been entirely assigned using cold decking imputation techniques. These include presence of cavity wall insulation and thickness of loft insulation as there is no reliable database with national coverage for these variables.

[33] Building Research Establishment Domestic Energy Model, BRE are the original developers of this model which calculates the energy costs of a dwelling based on measures of building characteristics (assuming a standard heating and living regime). The model has a number of outputs including an estimate of the SAP rating and carbon emissions.

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The "SimpleCO_2" software takes the combination of Experian and imputed data and calculates the "SimpleSAP" rating for each dwelling in the national database. The calculated "SimpleSAP" ratings are the basis of the estimates of SAP and excess cold. How the other key variables are derived is discussed later in this Appendix.

Because the estimates of "SimpleSAP" etc. are calculated from modelled data it is not possible to guarantee the figures. They do, however, provide the best estimates that we are aware can be achieved from a data source with national coverage and ready availability. The input data could, however, be improved in its:

- accuracy for example through correcting erroneous values,
- depth of coverage, for example by providing more detailed information on age of dwellings,
- breadth by providing additional input variables such as insulation.

Improving any of these would enhance the accuracy of the output variables and for this reason it is always worth considering utilising additional information sources where they are available. Using EPC data will go some way towards meeting these improvements by providing more accurate data.

B.2 Housing Condition and Low Income Household Models

This section provides further information on the remaining four models – fuel poverty, HHSRS, disrepair and low income households. These models are discussed together since the approach used for each one is broadly the same.

These models are not based solely on the thermal characteristics of the dwelling, and in some cases are not based on these characteristics at all. A top down methodology has been employed for these models, using data from the EHS and statistical techniques, such as logistic regression, to determine the combination of variables which are most strongly associated with failure of each standard. Formulae have been developed by BRE to predict the likelihood of failure based on certain inputs. The formulae are then applied to the variables in the national Experian dataset to provide a likelihood of failure for each dwelling. Each individual case is then assigned a failure/compliance indicator based on its likelihood of failure and on the expected number of dwellings that will fail the standard within a given geographic area. Thus if the aggregate values for a census output area are that 60% of the dwellings in the area fail a particular standard then 60% of the dwellings with the highest failure probabilities will be assigned as failures and the remaining 40% as passes.

The presence of a category 1 hazard failure is the only exception to this as it is found by combining excess cold, fall hazards and other hazards such that failure of any one of these hazards leads to failure of the standard.

B.3 OS MasterMap information

The OS data has been used to update a number of the SimpleCO_2 model inputs. The most valuable use of the OS data is the ability to determine the dwelling type with much greater confidence.

The existing dwelling type is replaced with a new dwelling type derived from OS data. By looking at the number of residential address points it can be inferred whether the building is a house or block of flats (houses have one residential address point and blocks of flats have two or more).

Houses - where the dwelling is a house the number of other buildings it is attached to can be observed and the following assumptions made:

- If there are no other dwellings attached, the house is detached.

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- If two dwellings are joined to one another, but not to any other dwellings, they are semi-detached.
- If they are attached to two or more other dwellings, they are mid terraced.
- If they are attached to only one dwelling, but that dwelling is a mid-terrace, they are an end-terrace.

Flats - if the building is a block of flats, its exact nature is determined by its age and the number of flats in the block and the following assumptions made:

- If there are between two and four flats in the block (inclusive) and the dwelling was built before 1980 then it is a conversion.
- Otherwise it is purpose built.

This information can also be used to reconcile discrepancies within blocks of flats, terraced and semi-detached houses. These discrepancies occur in variables such as dwelling age, location of flat in block, number of storeys, loft insulation, wall insulation, wall type and floor area.

Looking at dwelling age, although the OS data does not itself provide any information on age, it does allow reconciliation of age data within semi-detached, terraces and blocks of flats.

Where a group of buildings are all attached in some way, such as a terrace, it is logical to assume that they were built at the same time. Therefore the age of each building is replaced with the most common age among those present. Where the most common age occurs in equal numbers, this is resolved by looking at the average age of houses in the same postcode.

If one dwelling has an age that is notably newer than its neighbours, then the age is not changed, as it is assumed that the original dwelling was destroyed and rebuilt.

Figure B. 2 and **Figure B. 3** below show how the initial base data is adjusted using the OS data to produce more consistent and reliable results.

Considering the number of storeys and the location of a flat in its block, if the OS data reveals that the dwelling type is significantly different from the original value – specifically if a house becomes a flat, or vice versa then the variables are adjusted. If this is the case a new location for the flat within the block or the number of storeys will be imputed using the same method as before, but taking into account the revised dwelling type.

Similarly with floor area, loft insulation and wall type - if the dwelling type or location of a flat within a block changes as a result of OS data then the variables are calculated using the same method of imputation as the original models, but taking into account the new data.

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Figure B. 2: Dwelling level map showing the base data, prior to using the OS data

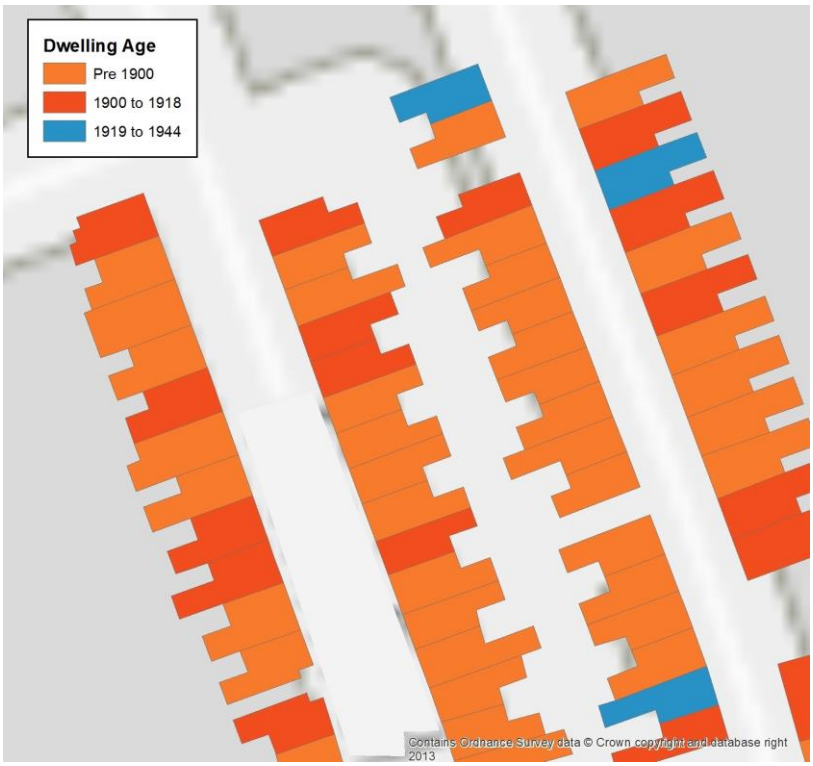
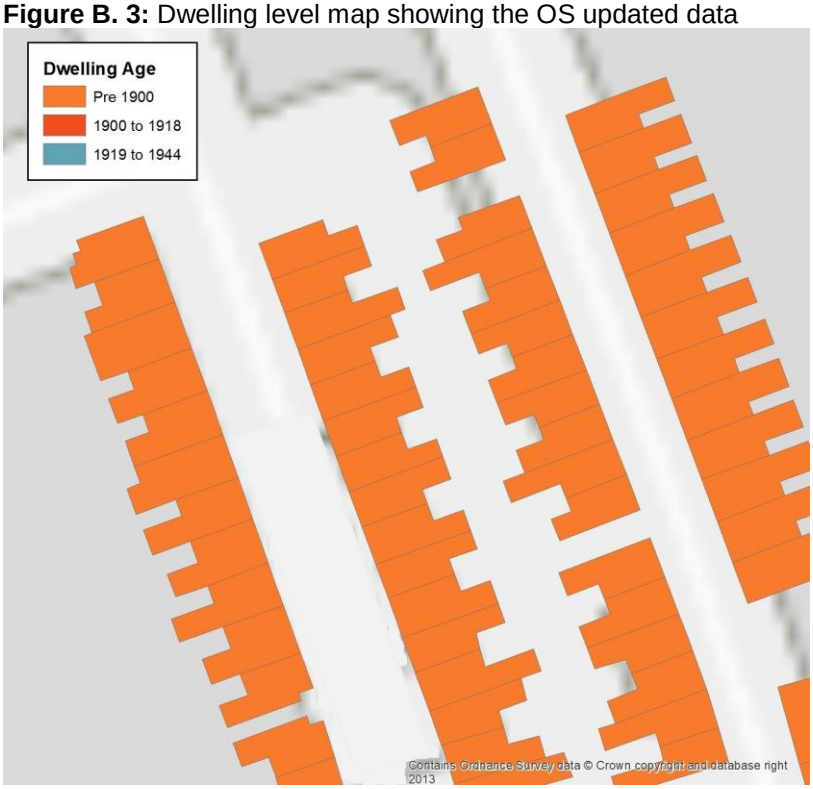


Figure B. 3: Dwelling level map showing the OS updated data



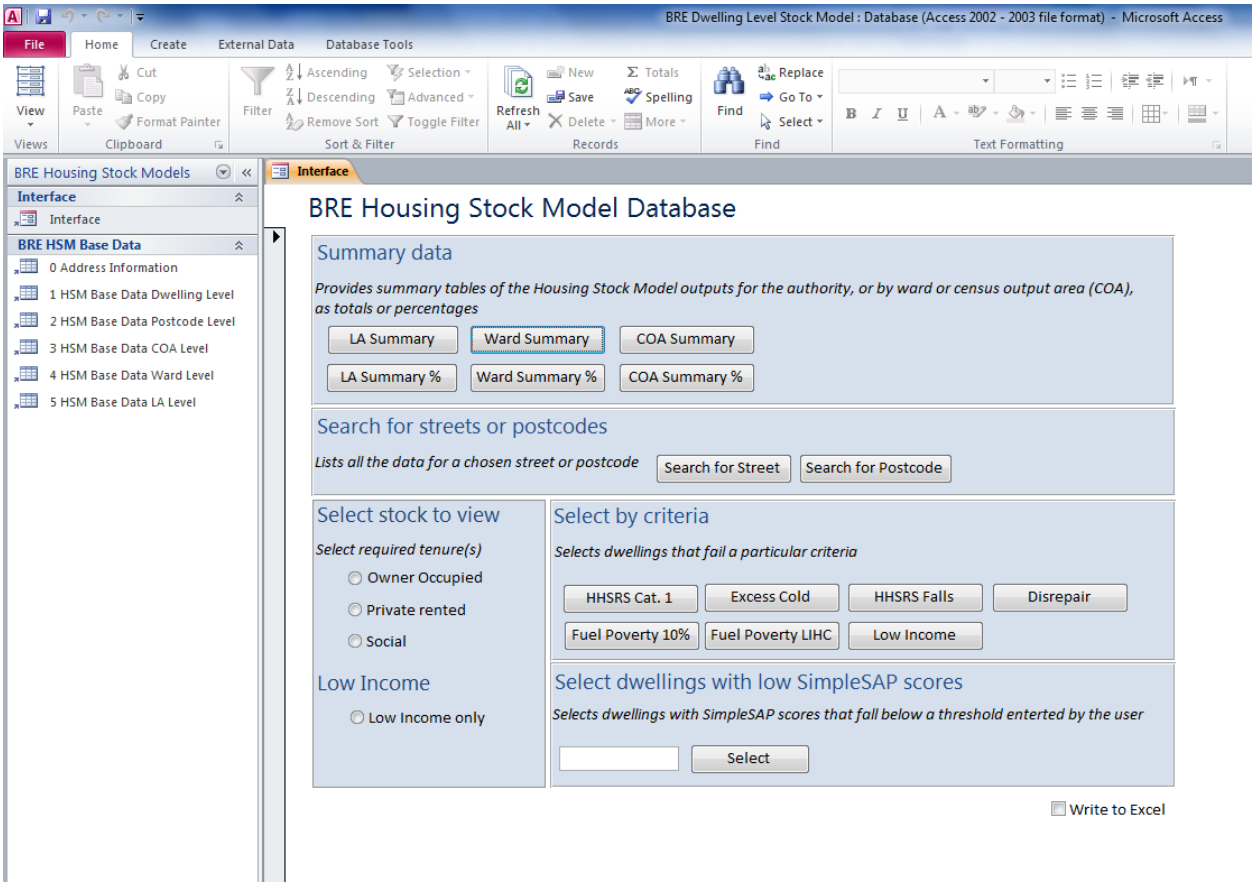
Appendix C Using the BRE Dwelling Level Housing Stock Database

The BRE Dwelling Level Housing Stock Database is the final output of the overall stock modelling approach described in Section 3 and Appendix B. The database has been designed to provide local authorities with a number of different options for summarising or investigating their data and generating lists of properties of interest. This Appendix provides details of how to use the database.

C.1 Overview

The database will automatically open on the interface screen as shown in **Figure C. 1** below.

Figure C. 1: BRE dwelling level housing sock database – opening interface screen



On the left hand side of the database is a vertical column known as the “navigational pane”. Under the heading “BRE HSM Base Data” there are 6 tables which hold the BRE housing stock model data. The tables are as follows:

Table C. 1: Summary of information provided in each table in the database

Table Name	Description
0 Address Information	Address details (building names, house numbers, postcodes), COA and Ward for each address
1 HSM Base Data Dwelling Level	Dwelling level housing stock model data and Experian tenure variable[34]. SimpleSAP results: score out of 100 All other indicators: 0 = pass the standard, 1 = fail
2 HSM Base Data Postcode Level	Summary information and statistics for each of the aggregated levels specified. 5 “stock levels” are provided – all, private, owner occupied, private rented, social
3 HSM Base Data COA Level	
4 HSM Base Data Ward Level	
5 HSM Base Data LA Level	

C.2 Using the database

The rest of the screen is the main interface which has been developed with a number of standard queries that will present the user with information likely to be of use when reviewing data in order to design a housing stock strategy. There are 3 main sections to the interface: “Summary data”, “Search for street or postcode” and “Filter by criteria”. These sections are described in more detail below.

C2.1 “Summary data”

These options allow the user to generate summaries of their data at different levels of aggregation. The three different levels of aggregation are;

- Local authority
- Ward
- COA

There are two types of summaries available at each level - totals and percentages:

- Totals give the user the total number of dwellings that fail a particular standard, for example, the total number of dwellings that have a HHSRS category 1 hazard in the authority.
- Percentages tell the user the percentage of dwellings that fail a criterion, for example, the percentage of dwellings suffering from HHSRS category 1 excess cold hazards.

[34] If the Experian tenure variable has been purchased.

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C2.2 “Search for streets or postcodes”

These options allow the user to search for particular areas, either by street name or postcode. By clicking on a search button the user will be asked to type in either a street or postcode. A table will then be shown which provides a list of all dwellings in the street or postcode requested.

If the full name of the street is not known, wildcard characters can be used to search for close matches. A wildcard character is one that can stand in for any other letter or group of letters. Access uses an asterisk (*) as the wildcard character. For example entering “Abbey*” will return any street name starting with “Abbey”, for example, “Abbey Road”, “Abbey Close”, “Abbeyfield” etc. Wildcard characters can be used at both the beginning and the end of the search text. For example, by entering “*Abbey*” would find “Abbey Road”, “Old Abbey Road” etc.

The street names used are those provided in the Local Land and Property Gazetteer. It can sometimes be the case that a street name can be written differently across databases (e.g. “Rose Wood Close” or “Rosewood Close”). If a road name does not appear to be present, try using wildcard characters to check for alternatives.

The postcode search facility works in a similar manner. Entering “BN15 0AD” will find all dwellings in that exact post code, but entering “BN15*” will find all dwellings whose postcode begins with BN15.

Note: always close the results of an existing search before starting a new one. Clicking the button when the results of an existing search are still open will simply return to the results of that search. A search, or any other table, can be closed by clicking the “x” in the top right corner of the table window.

C2.3 “Filter by criteria”

This section allows the user to select dwellings based on one or more criteria / key indicators of interest.

First, the user needs to select which tenure(s)[35] they are interested in by using the “Select stock to view” on the right hand side of the box.

The default setting is that no tenures are selected, so the user will need to select at least one in order to get any results. Multiple tenures can be selected, so for the results for all the private stock select both owner occupied and private rented.

Once one or more of the tenures has been selected, choose one or more of the indicators of interest either by selecting an indicator e.g. HHSRS Cat.1 hazards will return dwelling with fail HHSRS, or for SimpleSAP enter a rating to select dwellings on and below the rating.

Once a tenure(s) and indicator(s) have been selected clicking the ‘Filter by criteria’ button will return the addresses matching the chosen criteria.

As with the searches, close the results of an existing selection before starting a new one.

C.3 Creating Excel files

Whilst it is possible to copy the data from any of the queries accessed from the interface screen, an option has been added to make this process easier. To output results to Excel click the “Write to Excel” check box at the bottom right of the screen. As long as this box is checked, clicking any of the summary data, search or criteria selection buttons will cause the resulting data to be written to Excel instead of being displayed.

If this option is selected when any button is clicked the database requests a format for the output data. Once the appropriate file format is selected, click “OK” and choose a file name and location and click “OK” to save the file.

This function means it is possible to rapidly export summary tables for inclusion in reports, or lists of dwellings which can be used to target improvement programmes.

[35] If the Experian tenure variable has not been purchased this section is locked and only private sector stock is shown.