7. Environment

6.2 tonnes of Carbon Dioxide (CO₂) emitted per person in West Sussex in 2012

- 30% Transport
- 37% Domestic
- 33% Commercial & Industrial

CO₂ emissions up 5% from 2011 to 2012 due to a colder winter

804mm annual rainfall
1,665 sunshine hours

2.6°C predicted rise in max daily temperatures by the 2050s

76,600 homes and 20,100 businesses at risk of surface water flooding, with the likelihood of floods increasing due to climate change

53% of the county lies within National Park or AONBs

6.2 tonnes of Carbon Dioxide (CO₂) emitted per person in 2012

1,665 sunshine hours

2.6°C predicted rise in max daily temperatures by the 2050s

Click here for a video summary

413,553 tonnes of waste in 2012/13

- 44% Recycled
- 38% Landfill
- 18% Incinerated

Click here for a video summary

Insight.team@westsussex.gov.uk
Weather and Climate

Description

‘Weather’ generally refers to day-to-day temperature and precipitation, whereas ‘climate’ is the term for the average conditions over longer periods. The UK has a temperate climate, predominantly influenced by the Atlantic Ocean. The prevailing wind is from the south-west and bears frequent spells of mild, wet weather from the Atlantic, with rainfall common throughout the year. Eastern regions are drier, as the prevailing south-westerly wind means that most rain falls over western regions. However, the proximity of the UK to mainland Europe means that continental air masses also have an effect, with the convergence of continental and maritime air masses a major factor in the changeable weather that the UK experiences.

The south east of England is most exposed to the continental air masses, which typically bring warm dry air resulting in the warmest summer temperatures. Coastal regions tend to see the most hours of sunshine anywhere on the UK mainland, with West Sussex often quoted as the sunniest county in the UK. However, coastal regions are also slightly cooler, and experience more wind and rain than other parts of the south east, particularly along the South Downs.

The Met Office compiles and publishes weather records for the UK dating back to 1910 at a regional level, with West Sussex in the ‘South East and Central South’ region, which stretches from Wiltshire to Kent and includes London. As well as Met Office regional records, West Sussex is covered by a network of smaller weather stations that compile local records of temperature, rainfall and wind speed. Most of these stations are run independently, with many appearing in the last few years across the county.

Performance

The South East and Central South region of England saw a summer mean daily maximum temperature of 22.1°C in 2013, the warmest summer since 2006 for the region. The mean daily maximum temperature is the average of the highest temperature recorded each day during a period, with summer defined as the months of June, July and August. Similarly, the mean daily minimum temperature is the average of the lowest temperature recorded each day (typically at night) during a period, with winter defined as the months of December, January and February (with the year referring to the months of Jan/Feb, e.g. winter 2013 is the period December 2012 to February 2013).

The highest summer temperatures on record occurred in 1976, with a mean daily maximum of 24.1°C. The lowest occurred in 1954 with a mean daily maximum of 18.4°C. Averaging summer daily maximum temperatures over 10 years shows a pattern of slight cooling from 1950 to 1970, followed by a period of warming from 1980 to 2010, peaking in the 10 years from 1997-2006 with a summer mean daily maximum of 21.6°C over the period. The moving average has decreased slightly in the last few years, with cooler summers recorded between 2007 and 2012.

The winter mean daily minimum temperature for the South East and Central South region was 1.4°C in 2013. The lowest winter temperatures were recorded in 1963, with a mean daily minimum of -3.4°C, and the highest occurred in 1990, with a mean daily minimum of 3.9°C. Similar to summer temperatures, the 10 year average showed a period of warming from 1987 to 2007, peaking in the 10 years from 1998-2007 with a winter mean daily minimum of 2.4°C. Colder winters followed in 2009, 2010 and 2011, bringing the average down in the last five years.

Source: Met Office regional climate summary
Of the independent weather stations in West Sussex with at least three years’ records available via Weather Underground, Copthorne recorded the highest average annual maximum temperature of 32.3°C from 2010 to 2013. The annual maximum differs from the mean daily maximum in that it is the highest temperature recorded at any single point during the year, typically on a summer day. Average annual maximum temperatures varied between 29.3°C and 32.3°C across the county, with the highest temperatures typically recorded in the north of the county, furthest inland.

Copthorne also recorded the lowest average annual minimum temperature of -9.3°C from 2010 to 2013. The annual minimum is the lowest temperature recorded at any point in the year, usually in winter and at night. Average annual minimum temperatures ranged from -3.7°C to -9.3°C across the county. Inland areas of West Sussex have the most extreme temperatures, both high and low, with coastal areas showing less variation between the seasons due to greater influence from the sea.

Figure 7.2: Average annual maximum and minimum temperatures recorded at West Sussex weather stations, 2010-2013

Source: Weather Underground

Temperatures recorded at independent West Sussex weather stations in the last five years:

Highest: 36.1°C Angmering, 2009
Lowest: -12.7°C Copthorne, 2012
Weather and Climate

On average there were 1,665 hours of sunshine in the South East and Central South region over the last 10 years (July 2004 – June 2014). July typically sees the most sunshine, with an average of 218 hours, closely followed by June with 215 hours of sunshine. December typically has the least hours of sunshine with 57, followed by January with 59 hours. An average of 804mm of rainfall occurs in the South East and Central South region each year, with the wettest months being October and December with 90mm of rainfall each. April is the driest month on average, with 48mm of rainfall.

Coastal areas of West Sussex follow the regional pattern for a south-westerly prevailing wind, however inland areas typically see a more southerly prevailing wind. Average annual wind speeds varied between 1.7mph in Broadfield, Crawley and 8.1mph in Hurstpierpoint, Mid Sussex. There is no clear pattern to average wind speeds recorded at independent weather stations across West Sussex, however the highest gust speeds (the highest speed recorded at any single point during the year, averaged across three years) were recorded along the coast, with West Worthing recording gusts over 100mph on average in the last three years. 
Climate change refers to man-made changes in our climate. Global warming is one of the most well-known effects of climate change where there is a steady increase in the earth's temperature. Other effects include rising sea levels, ice caps melting at the poles and extreme weather events such as hurricanes, floods and droughts becoming more commonplace. The Climate Change Act 2008 sets out the Government’s commitment to tackling climate change, including targets to reduce greenhouse gas emissions by at least 26% from 1990 levels by the year 2020, and 80% by 2050.

Local authorities need to be able to assess likely future weather patterns and any impact this may have with regards to risks or opportunities that arise from a changing climate. UK Climate Projections (UKCP09) provides climate information designed to help those needing to plan how they will adapt to a changing climate, including targets to reduce greenhouse gas emissions by at least 26% from 1990 levels by the year 2020, and 80% by 2050. The Department of Energy & Climate Change (DECC) carries out a quarterly representative sample survey to monitor public attitudes to climate change and other related topics, with the first wave carried out in March 2012 and the most recent 10th wave carried out in June 2014. Each wave consists of over 2,000 face-to-face interviews, with the aim of the survey being to understand how attitudes to climate change issues change over time.

### Performance

UK Climate Projections 2009 (UKCP09) forecast a 2.6°C rise in annual daily maximum temperatures by the 2050s, 1.4% less annual rainfall, an increase in flash flooding at any time of year and a sea level rise of 21cm. Hotter, drier summers are predicted; an increase of 3.2°C in daily maximum temperatures for June-August is forecast by the 2050s along with a 24% decrease in rainfall for the months from April-September. Milder, wetter winters are also predicted, with an increase of 1.8°C in daily maximum temperatures for December-February and an increase of 13% in rainfall for the months from October-March.

### Table 7.1: Forecasted climate change, medium scenario for West Sussex

<table>
<thead>
<tr>
<th>Climate Variable</th>
<th>Baseline Observation (1961-1990)</th>
<th>2020s (2010-2039)</th>
<th>2050s (2040-2069)</th>
<th>2080s (2070-2099)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual average daily max temperature</td>
<td>13.7°C</td>
<td>+1.5°C +0.7 to +2.4°C</td>
<td>+2.6°C +1.5 to +4.2°C</td>
<td>+3.5°C 1.9 to 5.9°C</td>
</tr>
<tr>
<td>Summer average daily max temp. (Jun-Aug)</td>
<td>17.5°C</td>
<td>+1.8°C +0.6 to +3.5°C</td>
<td>+3.2°C +1.3 to +6.3°C</td>
<td>+4.5°C +2.2 to +8.7°C</td>
</tr>
<tr>
<td>Winter average daily max temp. (Dec-Feb)</td>
<td>9.9°C</td>
<td>+1.2°C +0.5 to +2.3°C</td>
<td>+1.8°C +0.8 to +3.7°C</td>
<td>+2.4°C +0.9 to +5.0°C</td>
</tr>
<tr>
<td>Annual rainfall</td>
<td>718mm</td>
<td>-0.9% +6.2% to -6.9%</td>
<td>-1.4% +5.7% to -7.8%</td>
<td>-2.0% +5.8% to -9.7%</td>
</tr>
<tr>
<td>Summer rainfall (Apr-Sep)</td>
<td>292mm</td>
<td>-13% +12% to -29%</td>
<td>-24% +8% to -47%</td>
<td>-35% +1% to -58%</td>
</tr>
<tr>
<td>Winter rainfall (Oct-Mar)</td>
<td>426mm</td>
<td>+5% +19% to -5%</td>
<td>+13% +1% to +41%</td>
<td>+17% +4% to +50%</td>
</tr>
</tbody>
</table>

Source: UK Climate Projections (UKCP09)
Comparing to baseline observations from the period 1961 to 1990, this means that annual average daily maximum temperatures would reach 15°C by the 2020s, 16°C by the 2050s and 17°C by the 2080s. Annual rainfall is forecast to decline steadily to 704mm by the 2080s, although upper estimates show that an increase in annual rainfall is also possible.

These figures are based on the central estimate of the medium emissions scenario, which incorporates economic and population growth offset by the introduction of new and more efficient technologies and a balance between fossil fuels and cleaner non-fossil fuel energy sources. Upper (90th percentile) and lower (10th percentile) estimates are also provided for this scenario.

Additionally, the UKCP09 provides high and low emissions scenarios which show much greater variation in temperatures and rainfall, with the high emissions scenario largely dependent on fossil fuels to provide for growing populations and economies, while the low emissions scenario is based on a shift in economic structures towards services and information, reductions in material intensity and introduction of clean and resource efficient technologies.
The DECC public attitudes tracker survey included a question on what the biggest challenges facing Britain today are, in waves 1 (March 2012), 5 (March 2013) and 9 (March 2014). The proportion choosing climate change among the top three challenges rose from 10% in 2012 to 22% in 2014. However, the proportion choosing climate change as the single biggest challenge was much lower, at 8% in 2014, compared to 30% choosing unemployment as the top challenge facing Britain.

In contrast, when asked specifically about climate change, two-thirds of people (68%) said they were either very or fairly concerned about it. The proportion who said they were very concerned has increased by 2% from the 2nd wave (June 2012) to the 9th wave (March 2014) of the survey, as did the proportion who said they were fairly concerned. In 2014, 35% of respondents thought climate change was mainly or entirely caused by human activity while 13% thought it was caused by natural processes and 47% thought it was a combination of human activity and natural processes.

### Table 7.2: Answers to ‘Which areas do you feel represent the three biggest challenges that Britain is facing today?’

<table>
<thead>
<tr>
<th>Area of Concern</th>
<th>Mentioned in top three challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wave 1</td>
</tr>
<tr>
<td>Unemployment</td>
<td>76%</td>
</tr>
<tr>
<td>National Health Service</td>
<td>44%</td>
</tr>
<tr>
<td>Inflation/rising prices</td>
<td>45%</td>
</tr>
<tr>
<td>Energy supply</td>
<td>16%</td>
</tr>
<tr>
<td>Crime/law and order</td>
<td>36%</td>
</tr>
<tr>
<td>Education</td>
<td>25%</td>
</tr>
<tr>
<td>Climate change</td>
<td>10%</td>
</tr>
<tr>
<td>Level of taxation</td>
<td>27%</td>
</tr>
<tr>
<td>National security/defence</td>
<td>10%</td>
</tr>
<tr>
<td>Don't know</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Base</strong></td>
<td>2,121</td>
</tr>
</tbody>
</table>

Source: Department of Energy & Climate Change (DECC) public attitudes tracker survey

### Table 7.3: Answers to ‘How concerned, if at all, are you about current climate change?’

<table>
<thead>
<tr>
<th>Level of concern</th>
<th>Wave 2</th>
<th>Wave 5</th>
<th>Wave 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very concerned</td>
<td>20%</td>
<td>20%</td>
<td>22%</td>
</tr>
<tr>
<td>Fairly concerned</td>
<td>45%</td>
<td>46%</td>
<td>47%</td>
</tr>
<tr>
<td>Not very concerned</td>
<td>23%</td>
<td>23%</td>
<td>22%</td>
</tr>
<tr>
<td>Not at all concerned</td>
<td>11%</td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td>Don't know</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Base</strong></td>
<td>2,100</td>
<td>2,051</td>
<td>2,040</td>
</tr>
</tbody>
</table>

Source: Department of Energy & Climate Change (DECC) tracker survey
**Description**

The Department of Energy & Climate Change (DECC) compiles an annual inventory of UK greenhouse gas (GHG) emissions in order to monitor progress against domestic and international targets. Carbon dioxide (CO₂) is the main greenhouse gas, accounting for about 82 per cent of UK greenhouse gas emissions in 2012. Increasing emphasis is being placed on the role of regional bodies and local government in contributing to reductions in carbon dioxide emissions.

DECC statistics treat emissions from the energy industry differently from all other emissions. For the energy industry, emissions are distributed according to the point of energy consumption. Emissions that are not related to the energy industry are distributed according to the point of emission, for instance emissions from manufacturing are allocated to where the activity takes place rather than where the end product is consumed.

**Performance**

An estimated 5.01 million tonnes of CO₂ were emitted in West Sussex in 2012, equivalent to 6.2 tonnes per person. By comparison, there were 6.7 tonnes of CO₂ emissions per person in the South East, and 7.0 tonnes per person for the whole of England. CO₂ emissions increased by 5.0% from 2011 to 2012 in West Sussex, in line with regional and national increases. The main drivers of this were an increase in domestic gas use due to 2012 being colder than 2011 and increased use of coal for electricity generation. However, West Sussex CO₂ emissions in 2012 represented a decrease of over 650,000 tonnes (-12.0%) since 2005 when the first local authority estimates were produced.

Just over a third of all CO₂ emissions in West Sussex (36.7%) were generated by the domestic sector, with a relatively even split between electricity and gas, as well as a much smaller amount from other fuels (mostly in rural areas). Just under a third of all emissions (32.6%) were generated by the industry & commercial sector, and the remaining 30.6% were generated by transport within the county.

There are significant variations in the amount of CO₂ emissions per person by district in West Sussex, with Chichester having the highest level of CO₂ emissions at 8.1 tonnes per person in 2012, and Worthing having the lowest level of emissions at 4.6 tonnes per person. Chichester has the highest domestic and transport sector emissions per person, while Crawley has the highest industry and commercial sector emissions. Rural districts tend to have higher levels of transport emissions per person, the exception to this rule among the urban districts being Crawley where the figures include emissions from Gatwick Airport.
In addition to emissions statistics, the DECC also publish energy consumption figures at a local authority level, for four main fuel categories:

- Gas
- Electricity
- Road transport fuels (petroleum products)
- Other fuels (includes coal, manufactured fuels, bioenergy & waste)

These four datasets are aggregated to comprise a dataset for total final energy consumption. Sub-national consumption does not include fuels consumed in the generation of electricity as well as fuel consumed by very large industrial users.

### Performance

An estimated total of 16,327 gigawatt hours (GWh) of energy was consumed in 2012 in West Sussex, a decrease of 16.1% from 2005. Of this, 41% of energy came from petroleum products, including petrol and diesel used in transport, 36% came from gas and 21% was electricity. Fuels used in the generation of electricity are not included.

Chichester district consumed the most energy at 2,999 GWh in 2012, followed by Horsham and Mid Sussex.

Source: Department of Energy & Climate Change, Sub-national energy consumption statistics
By consuming sector, 37.5% of energy consumed in West Sussex during 2011 was consumed by the domestic sector, 32.9% by the transport sector (public, private and commercial) and 29.6% by the industry & commercial sector.

Consumption of domestic electricity per meter (typically one meter per household) is highest in rural areas, particularly in the north of Chichester and Horsham districts, and lowest in urban areas such as Worthing and Crawley.

Similarly, domestic gas consumption per meter is also highest in rural areas, particularly in Horsham and Mid Sussex.

Some areas of the county have no mains gas availability, including rural parts of Chichester, Horsham and Mid Sussex districts. These are generally the least densely populated parts of the county, with residents relying on alternatives such as oil, electricity, Liquid Petroleum Gas (LPG) or heating from renewable sources.

An estimated 46,630 households in West Sussex are not connected to the mains gas network.
Waste

Description

There are many different types of waste, but in general, waste comes from the following ‘streams’:

- Municipal Solid Waste (MSW): waste disposed of by residents, such as household waste and waste from public bins. It accounts for about 22% of all waste generated in West Sussex.
- Commercial and Industrial (C&I): waste from shops, industrial and business premises, accounting for about 30% of waste in West Sussex.
- Construction, Demolition and Excavation Waste (CDEW): 75% of which is inert material such as soils, concrete, and rubble. It accounts for about 48% of waste in West Sussex.
- Special/Hazardous: waste which has hazardous properties or requires specialist disposal. Accounts for only a small proportion of total waste, and is included within the C&I and CDEW streams. Most hazardous waste generated in West Sussex is exported.
- Agricultural Waste: mostly manure, slurry, or straw. No data is published for agricultural waste in West Sussex.
- Wastewater: the majority of sewage is reused through spreading on farm land, with much of the remainder incinerated. No data is published for waste water in West Sussex.

Within West Sussex there are a number of organisations that are involved in waste collection, disposal and planning. Collection of municipal waste is the responsibility of the seven district & borough councils, disposal is the responsibility of West Sussex County Council, and waste planning is a joint responsibility between the County Council and the South Downs National Park (SDNP) Authority. The majority of Commercial and Industrial waste and Construction, Demolition and Excavation Waste is collected and disposed of by the private sector, although some is also collected by district & borough councils and disposed of by the County Council.

The West Sussex Waste Local Plan, adopted in April 2014, sets out a vision for ‘zero waste to landfill by 2031’ and describes how this will be achieved through more sustainable waste disposal methods. Key to achieving this vision is the provision of new facilities to maximise opportunities to reuse, compost, recycle, and treat waste, as well as reducing the amount of waste generated in all streams.

Performance

A total of 413,553 tonnes of municipal waste was disposed of by West Sussex County Council in 2012/13, a decrease of 2.8% from the previous year. Total municipal waste has decreased for the last six years consecutively, down from 465,897 tonnes in 2006/07.

44.1% of municipal waste was recycled, reused or composted in 2012/13, 37.9% was sent to landfill and 17.7% was incinerated. Incinerating waste provides an opportunity to derive Energy from Waste (EfW) in the form of electricity or heat; in West Sussex, all incinerated waste is processed in this way.

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The proportion of waste sent to landfill has decreased steadily from 67.2% in 2005/06 to 37.9% in 2012/13, with corresponding increases in the proportion of waste recycled, reused or composted as well as the proportion incinerated.

The proportion of municipal waste recycled, reused or composted also varies significantly by district, from 26.1% of waste in Crawley to 52.5% of waste in neighbouring Horsham district.

This covers only the waste that is collected by district & borough councils in their capacity as waste collection authorities. Most districts are below the 44.1% of total municipal waste recycled across West Sussex, as the overall county figure is raised by a higher rate of recycling for waste collected through household waste recycling sites (which are operated by the County Council and hence do not appear in district figures).
Description

The risk of flooding is an important issue across West Sussex. Large parts of the county are low-lying and many of our towns and villages are located near rivers. As a result the county is vulnerable to flooding from the sea, rivers, groundwater and surface water following heavy rainfall.

West Sussex County Council is the Lead Local Flood Authority, and is responsible for producing the Local Flood Risk Management Strategy, which sets out how the County Council will operate its flood risk responsibilities.

Performance

Analysis of flood risk data has identified ‘wet spots’ prone to surface water flooding across the county. The wet spots represent areas where over 500 properties are at risk of flooding. Parts of Worthing, Shoreham and Crawley have been identified as having over 5,000 properties at risk.

In total, 76,600 residential properties and 20,100 businesses are within surface water flood risk areas. According to the Environment Agency, 15,000 residential properties and 3,000 businesses are within areas at risk from rivers or sea flooding also.
Natural Environment

Description

West Sussex has a rich and diverse natural environment. Despite the presence of some large urban centres the Department for Environment, Food and Rural Affairs (Defra) classify the county as ‘significantly rural’.

A large part of the county lies within the South Downs National Park. There are two large ‘areas of outstanding natural beauty’ (AONBs) - the High Weald in the northeast of the county and Chichester Harbour in the southwest.

In addition to these large areas many more small areas are designated as Sites of Nature Conservation Importance (SNCIs) and Regionally Important Geological or Geomorphological Sites (RIGGS). Collectively these are known as ‘Local Sites’ and many of them are under active ‘positive conservation management’. The County Council also monitors agricultural land quality, and the quality of bodies of fresh water.

Performance

The portion of the South Downs National Park that lies within West Sussex covers 811 square kilometres. The two AONBs cover 260 square kilometres. This means over half (53%) of the total land area of the county is designated as being of outstanding natural character.

In total 363 areas are designated as Sites of Nature Conservation Importance and 60 areas are designated as Regionally Important Geological or Geomorphological Sites.

Together, as ‘Local Sites’ 69.7% are under ‘Positive Conservation Management’ (PCM) meaning that active steps are taken by the county council and other bodies to maintain their diversity and natural character. 17.4% are not under PCM and the status of a further 12.9% is not known.

Natural water sources including lakes and rivers in West Sussex are monitored for their ecological qualities. 12% of all rivers and lakes in the county have been designated as being of good ecological quality, while the majority, 69% are designated as moderate quality, and 19% poor or bad quality.
The geology of West Sussex is predominantly clay in the north and a mixture of chalk and clay in the south of the county. The chalk ridge of the South Downs runs east/west across the southern half of the county, and north of this the Weald is predominantly made up of a mixture of clays, silts and sandstone.

Historically, the majority of sedimentary deposits within the county have been worked for specific minerals including ironstone, brick and tile clays, cement raw materials, agricultural lime, building stone and aggregate. Major extractive industries which still exist in the county include:

- Aggregates taken from the gravel deposits of the Sussex Coastal Plain around Chichester. This industry constitutes a locally important source of aggregates.
- Sand from deposits across the centre of the county, which supplies Sussex and parts of Hampshire with building and concreting sand.
- Clay deposits in the north east of the county, used to manufacture bricks and tiles used in large volumes across south east England.
- Chalk and sandstone, both worked on a smaller scale following declines in these industries locally.

**Performance**

Over 70% of the minerals extracted in West Sussex are sand and gravel. This is used in the construction industry, mostly within the county, but also contributing 6% to the total regional supply. Clay for brick and tile making makes up about a quarter of all extractions, which is far more significant regionally. Brick clay produced in West Sussex accounts for 46% of the regional supply and 4.3% of the total English supply.

Sandstone accounts for only 2% of mineral extraction, but due to a lack of alternative aggregates, it contributes 97% of the regional production. Chalk is now only used locally in the production of agricultural lime, with much of the regional supply coming from Kent.

63% of aggregates dredged from the English Channel off West Sussex are delivered to local ports. 18% are destined for the Thames Estuary and 16% go to the Continent.
Environment

Further Information

To access other chapters and data from West Sussex Life
www.westsussex.gov.uk/westsussexlife2014

Met Office Regional Climate Data
http://www.metoffice.gov.uk/climate/uk/summaries/datasets

UK Climate Projections (UKCP09)
http://ukclimateprojections.metoffice.gov.uk/

Sustainability and Climate Change in West Sussex
http://www.westsussex.gov.uk/living/environment_and_planning/sustainability_and_climate.aspx#

Department of Energy and Climate Change (DECC) statistics

Department for Environment, Food & Rural Affairs (Defra) statistics

Recycling in West Sussex
http://www.recycleforwestsussex.org/

West Sussex Local Flood Risk Management Strategy

UK-AIR: Air Information Resource
http://uk-air.defra.gov.uk/