

Climate Change and Energy

Throughout this document 'Devon' refers to the administrative area of Devon County Council and 'Torbay' refers to the administrative area of Torbay Council.

Economic Prosperity, Health and Wellbeing

The scientific evidence is now overwhelming: climate change is a serious global threat and it demands an urgent global response. The overall costs and risks of climate change will be equivalent to losing

between 5% and 20% of global GDP each year, now and forever, through the effects of changes to severe weather on infrastructure, resource availability, supply chains and health. The costs of reducing greenhouse gas emissions to avoid the worst impacts of climate change amount to 1% of global GDP each yearⁱ. Conversely, assuming strong adaptation occurs in vulnerable parts of the economy, Devon and Torbay are well placed to move towards a low carbon economy and seize the opportunities that a warmer climate will bring; they have good natural resources, centres of international research (including the [South West Marine Energy Park](#)), strong organic food and tourism sectors and a vibrant, local grassroots community movement.

In 2009/10 the low carbon and environmental technologies sector contributed £185m and £23m to Devon and Torbay's economy respectively and provided 10,500 and 1,300 full time equivalent jobsⁱⁱ. The low carbon economy is likely to require a diverse array of skills across many sectors, ranging from engineering and design, to waste management, to transport technology, to finance, as well as renewable energy. By 2022 the retrofitting of energy efficiency measures to domestic properties in Devon is anticipated to generate a further 800 jobs and add £500m to the economyⁱⁱⁱ.

A changing climate is anticipated to have significant negative impacts on health and wellbeing. Heat-related mortality, currently 2,000 premature deaths per year in the UK, is projected to increase by 70% to 3,400 in the 2020s and by 540% to 10,800 in the 2080s. The elderly are more vulnerable to extreme heat, so future health burdens are likely to be amplified by an ageing population. High temperatures increase levels of ozone and other air pollutants, which aggravate cardiac and respiratory problems and will increase human exposure to pollen and fungal spores, which will cause more acute symptoms for allergy sufferers and will increase exposure to UV radiation which could contribute to more incidences of skin cancer. By the 2080s mosquitos and ticks are anticipated to be spread across much of the UK providing an opportunity for increased activity of vector borne diseases and the introduction of exotic pathogens. Additionally, flooding, and the actual and perceived risk of flooding, can undermine the mental health of communities^{iv}. Changes in climate and increases in extreme weather events could disrupt stability in the supply of



Projects like South Brent Community Energy Society's wind turbine are growing in popularity as a local response to climate change and energy prices (Credit: South Brent Community Energy Society)

food^v. This will affect the price and availability of food and reduce the ability of people on lower incomes to eat a fresh, well-balanced diet.

Evidence for Climate Change in the UK^{vi}

The evidence for climate change is undeniable. The Intergovernmental Panel on Climate Change has concluded it is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century^{vii}. Average temperatures in England have risen by approximately one degree Celsius since 1980, with 2014 being the warmest year on record. The State of the UK Climate 2017 reported that the Central England Temperature series provides evidence that the 21st century so far has overall been warmer than the previous three centuries; the most recent decade (2008–2017) has 15% fewer days of air frost 14% fewer days of ground frost compared to the 1961–1990 average; and seven of the 10 wettest years since 1910 for the UK have occurred since 1998^{viii}.

Exmouth has recorded an increase of 1.05°C since 1900 and Ilfracombe 0.64°C. Annually, South West England has almost 21 fewer days of air frost than it did in 1961. Annual mean precipitation over England and Wales has not changed significantly since records began in 1766. However, based on a linear trend, South West England is experiencing almost 10% more precipitation now that it did in 1961. Seasonal rainfall is highly variable but has decreased in summer and increased in autumn and winter; based on a linear trend the South West experiences 28% more precipitation in autumn, almost 16% more in winter, and approaching 9% less in summer than it did in 1961.

All regions of the UK have experienced an increase in the contribution to winter rainfall from heavy precipitation events between 1961 and 2006. In summer, all regions except NE England and N Scotland show decreases.

Severe windstorms around the UK have become more frequent in the past few decades, although not above that seen in the 1920s. The 1990s saw 14 strong wind events, compared to 4, 5 and 8 in the 1960s, 1970s and 1980s respectively. These observations are correlated with the strength of the North Atlantic Oscillation for which no trend is identifiable.

Relative sea level (sea level considering changes in land height) in the South West has risen by approximately 250mm since 1916^{ix}.

Phenology

Phenology is the study of the timing of seasonal natural events. Figure 1^x shows the timing of spring events. This is compiled by monitoring the first flowering of hawthorn, first flowering of horse chestnut, first recorded flight of an orange-tip butterfly and first sighting of a swallow.

Since 1999 the annual mean observation dates have occurred 7.5 days in advance of the average dates in the first part of the 20th century, which is strongly linked to warmer temperatures in March and April. The

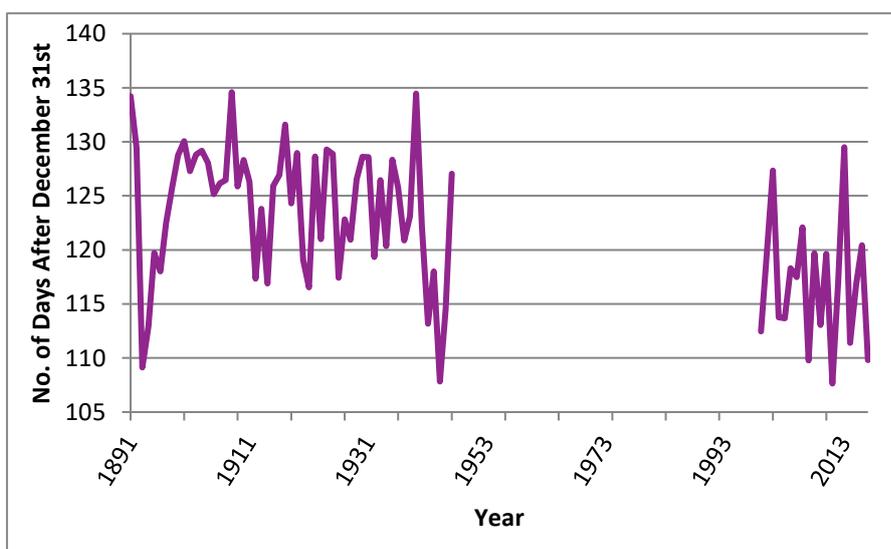


Figure 1 - Timing of Spring Events in the UK. 1891 - 1947, and 1999 to 2017

mean observation dates in 2011 were the earliest for which there are records, being 0.2 days earlier than the previously most advanced dates in 1945. The warmest April in the Central England Temperature series (1659 onwards) occurred in 2011 and was likely to be a factor.

This indicator illustrates the how one aspect of climate change (spring warming) can affect biological systems. Different responses among species may cause problems for natural cycles (e.g. pollinating insects emerging out of synchrony with flowers opening in spring) and make them more vulnerable to extreme events such as late frosts and upset the balance of competition between species.

Climate Change Projections

Climate change projections for the South West region are shown in Table 1^{xi}. The projections suggest warmer, wetter winters and drier, hotter summers. The likelihood of extreme changes in climate becomes greater towards the end of the 21st century. Devon and Torbay are already committed to the level of climate change projected for the 2020s as a result of historic and present global emissions. Any action we take today to reduce emissions will not have an impact on climate until the mid-21st century

Table 1 – Projected Changes in Climate for the South West Under the High Emissions Scenario (RCP 8.5)

Year	Likelihood	Winter mean temp.	Summer mean temp.	Summer mean max temp.	Annual mean precip.	Winter mean precip.	Summer mean precip.	Relative sea level
2020s	Very likely to be > than	0.2°C	0.4°C	0.4°C	-3%	-5%	-27%	9cm
	Very likely to be < than	1.8°C	2.2°C	2.6°C	7%	19%	9%	17cm
2050s	Very likely to be > than	0.7°C	1.4°C	1.2°C	-6%	-4%	-49%	24cm
	Very likely to be < than	3.7°C	5.1°C	5.2°C	8%	32%	1%	46cm
2080s	Very likely to be > than	1.4°C	2.4°C	2.7°C	-7%	0%	-74%	43cm
	Very likely to be < than	5.4°C	8.3°C	9.4°C	13%	57%	-5%	90cm

NB1: The changes are relative to the 1961-1990 climate average, except for Relative Sea Level which is comparable to the 1981-2000 climate baseline. NB2: Either end of the range of projected change is equally likely to occur. The mid-point of the range does not indicate an average projected change. NB3: 'Very Likely' in this context refers to 90% statistical certainty, except for Relative Sea Level where it refers to 95% certainty

Energy Consumption^{xii}

Total energy consumption in Devon, Torbay and Plymouth in 2015 was 22,934GWh. This is a 15% reduction from 26,913GWh in 2005 but it has been climbing since 2011 (Figure 2) due to increasing population and economic activity. Figure 3 shows the breakdown by fuel type and sector.

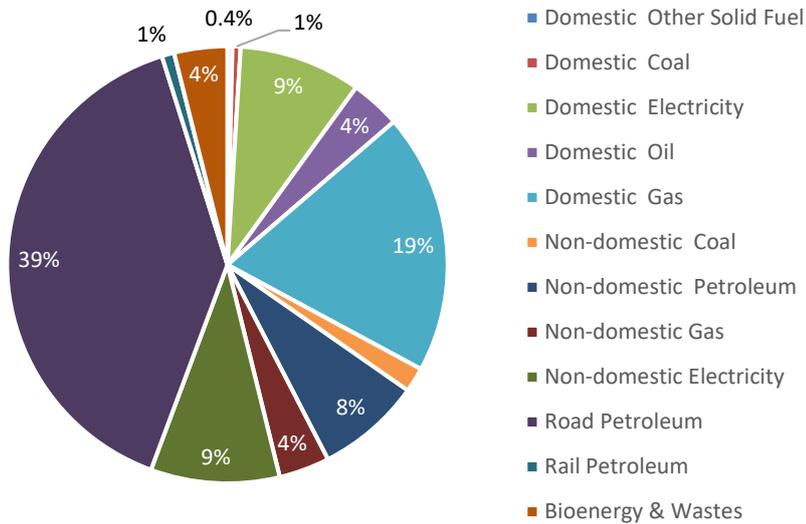


Figure 3 – 2015 Energy Consumption by Fuel Type and Sector in Devon, Torbay and Plymouth

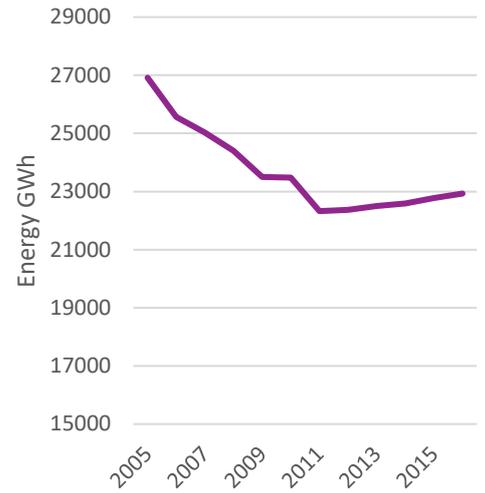


Figure 2 – Energy Consumption in Devon, Torbay and Plymouth

Renewable Energy^{xiii}

Devon, Torbay and Plymouth are rich in renewable energy resources. Table 2 shows the total installed renewable energy capacity and the amount of energy those projects generate in Devon. Installed capacity has increased substantially since 2011 following the introduction of the Feed in Tariff and Renewable Heat Incentive (Figure 4^{xiv}). Renewable energy capacity in Devon as of 2017 stands at 874 MW. As of March 2016 Torbay’s renewable energy capacity was 6.9MW and in Plymouth it was 21MW.

Table 2 –Renewable Energy Capacity in Devon (2017)			
Number of Projects	Electricity MW	Heat MW	Total MW
27,757	728.7	145.1	873.8

Annual generation from renewable sources stands at 1,205GWh in Devon. This means that 9.7% of energy consumption in Devon is provided for by renewable sources within the area.

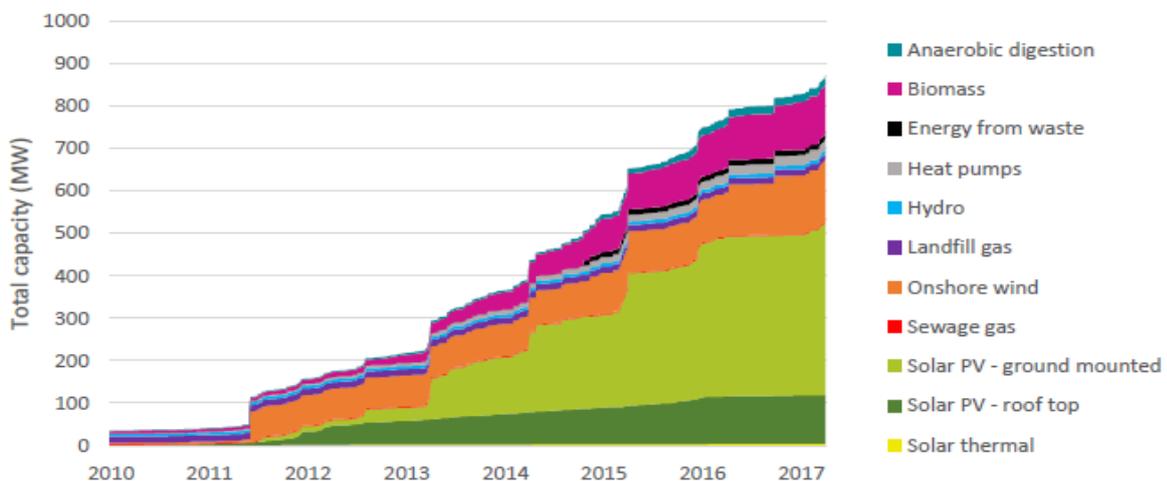


Figure 4 – Increase in renewable energy capacity in Devon since 2010

Figure 5^{xv} shows that solar photovoltaic (PV) panels are the most significant source of renewable energy in Devon, by installed capacity, followed by onshore wind turbines.

Current and future trends indicate further growth in deployment of renewable energy. With excellent natural resources and a strong local supply chain and expertise, the area is well positioned to take a prominent role in delivering the 2020 national target of 15% of energy from renewable energy sources^{xvi}.

36% of the electricity consumption in Devon was met by renewable generation in 2017, with the largest amount being met in Torridge. (Table 3)

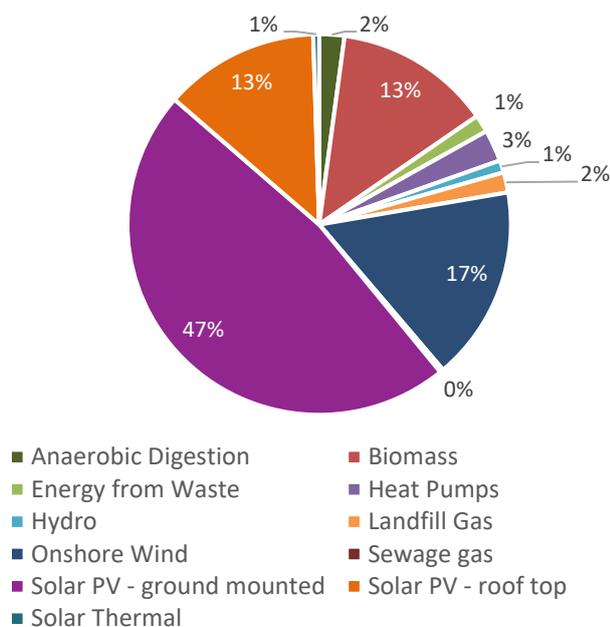


Figure 5 – Renewable Energy Capacity by Technology in Devon

Table 3 ^{xiii} - Electricity demand met by renewable electricity generation by local authority in Devon			
Local Authority	2016 electricity consumption (GWh)	Annual renewable electricity generation (GWh)	Electricity consumption met by renewable generation
East Devon	499	127	25%
Exeter	565	49	9%
Mid Devon	341	100	29%
North Devon	451	366	81%
South Hams	453	133	29%
Teignbridge	488	72	15%
Torridge	264	268	101%
West Devon	248	92	37%
Devon	3,309	1,205	36

Carbon Dioxide Emissions^{xvii}

Carbon dioxide (CO₂) emissions in Devon and Torbay have decreased since measurements began in 2005 (Figure 6); 2015 CO₂ emissions in Devon and Torbay were 27% and 31% below 2005 levels respectively. CO₂ emissions per person in Torbay and Devon have followed the same trend as in the South West and nationally in England between 2005 and 2010 (Figure 7). This is due to improving energy efficiency of buildings and vehicles, and the decarbonisation of the electricity grid nationally.

Figure 6 – CO₂ Emissions per Year

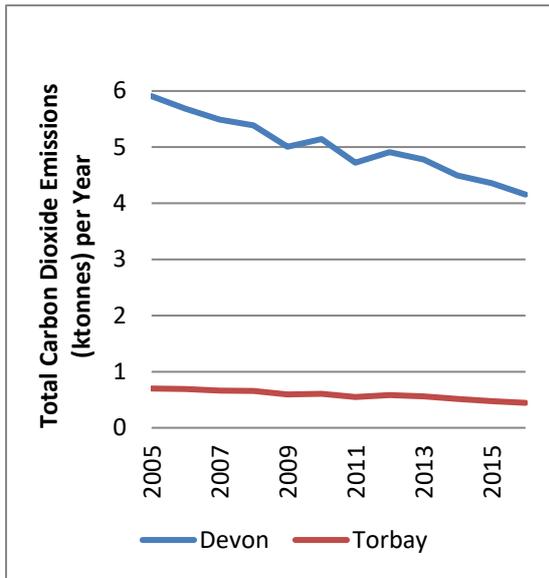
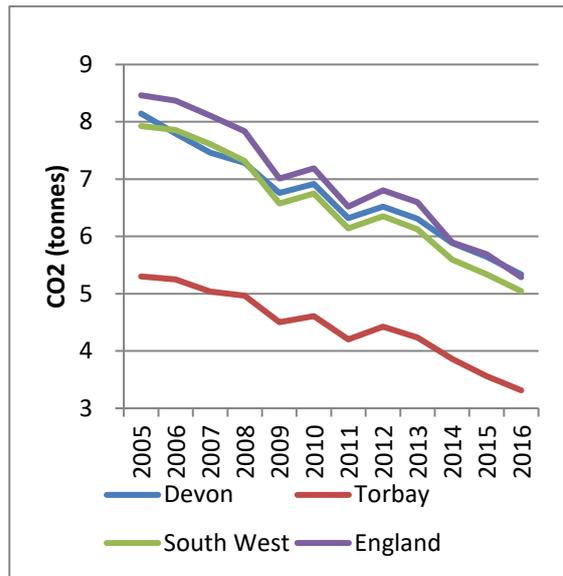


Figure 7 – CO₂ Emissions per Person, per Year



Emission levels per person are markedly lower in Torbay than in Devon and the region due to its urban nature that benefits from the heat island effect, extensive gas network coverage, a lower requirement for private transport, its mild micro-climate and its economic profile that is not reliant on energy intensive sectors such as manufacturing.

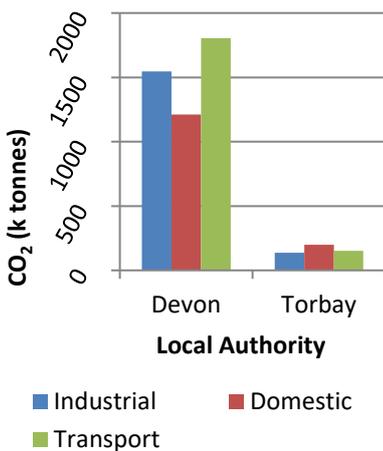


Figure 8 - Carbon Dioxide Emissions by source in 2015

CO₂ emissions in Devon are dominated by transport emissions (40%), which have become more dominant in recent years as improvements to domestic and industrial energy efficiency and decarbonisation have been more successful than decarbonising transport. In Torbay, CO₂ emissions are dominated by domestic emissions (41%) (Figure 8).

However, these emissions figures only describe those emissions arising from the UK. Carbon emitted due to the UK's consumption of resources from abroad (to provide food, construction materials, motor vehicles, chemicals and electronic equipment, for example) are not included. When these emissions are included, the UK's carbon footprint is 10% larger than it was in 1993^{xviii}; demonstrating that the performance of national measures to reduce emissions has been outstripped by the increase in overseas emissions due to population growth and a demand for more energy intensive food and consumer goods.

Other Greenhouse Gas Emissions^{xix}

It can be seen in Figure 9 that the most significant non-CO₂ greenhouse gas (GHG) emitted in Devon is methane, and that agriculture is far and away the most significant sector for non-carbon dioxide GHGs. In Devon, carbon dioxide is responsible for around two-thirds of GHG emissions (as opposed to 84% nationally) and agriculture is the single largest sector. Nationally, the approximate split of GHG emissions from agriculture are 50% enteric fermentation from cows and sheep, 30% from fertilisers for soil management, and 10% CO₂ for machinery (accounted for under 'transport'). When non CO₂ GHGs are taken into account, per capita emissions in Devon and most of its districts are significantly higher than the national average.

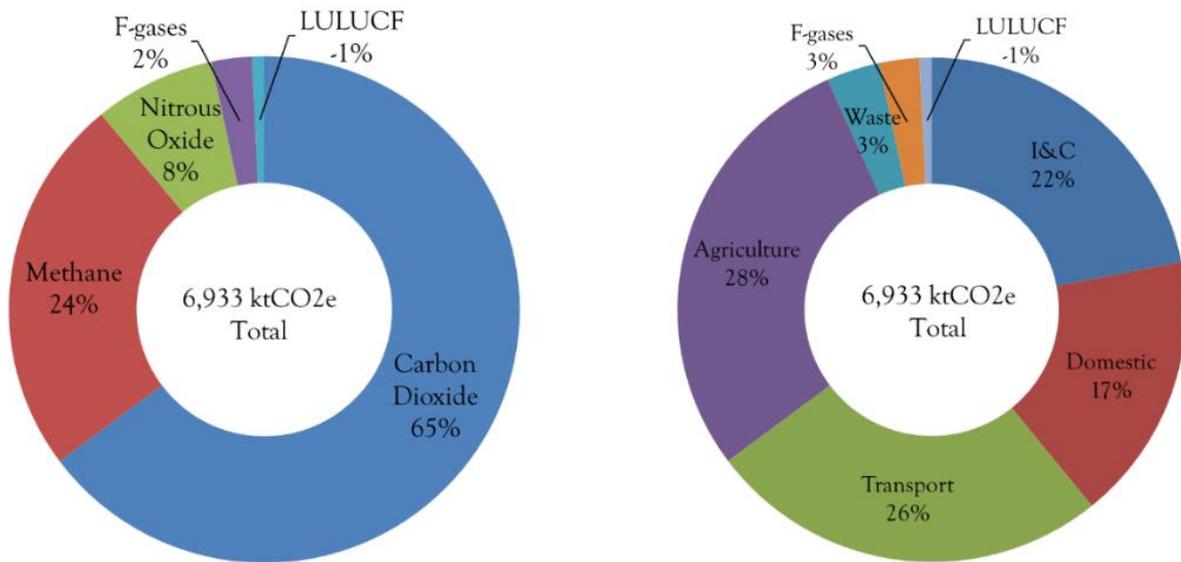


Figure 9 - Split of GHG emissions by gas and sector for Devon in 2015 (note: carbon dioxide emissions from agriculture are allocated to the I&C sector, and F-gas %s differ due to rounding)

Community Energy^{xx}

There are 23 community energy organisations in Devon, Plymouth and Torbay which is believed to be more than any other county in the UK. These organisations run 62 community owned renewable projects, which have generated 17,431 MWh of clean, green energy, saving 6,080 tonnes of CO₂ emissions and helping 2,717 homes to save on energy bills and increase their energy efficiency.

The 12.3 MW of capacity installed by community energy groups represents 1.3 per cent of the total renewable electricity installed in Devon, Plymouth and Torbay.

Community energy organisations have raised £14.1 million of investment, enabling them to create 33 FTE jobs. These are represented by the [Devon Community Energy Network](#) - a partnership bringing together communities and local authority representatives from across Devon.

- ⁱ Stern, N. (2007) *The Economics of Climate Change: The Stern Review*. Cambridge University Press, Cambridge
- ⁱⁱ Transform Research Consultancy (2012) *Devon's Green Economy: Report on a Scoping and Baseline Study*. University of Exeter, Exeter. Available at: <http://www.devonenvironment.org.uk/wp-content/uploads/2012/07/Final-Report-on-Scoping-Devons-Green-Economy.pdf>
- ⁱⁱⁱ Lash, D. *et al* (2010) *The Low Carbon Economy in the Context of the Devon Economy*. Centre for Energy and the Environment, University of Exeter, Exeter. Available at: <http://www.devonomics.info/sites/default/files/documents/Low%20Carbon%20Economy%20final%20report%20v9.pdf>
- ^{iv} Health Protection Agency (2012) *Health Effects of Climate Change in the UK 2012*. Health Protection Agency. Available at <http://www.hpa.org.uk/hecc2012>
- ^v Met Office and The World Food Programme (2012) *Food Insecurity and Climate Change* Met Office. Available at: http://www.metoffice.gov.uk/media/pdf/8/7/MO_PUP_insert_FOOD.web.pdf
- ^{vi} UK Climate Impacts Programme (2009) *The Climate of the UK and Recent Trends*. UKCIP. Up to date data available from: https://www.ukcip.org.uk/wp-content/PDFs/UKCP09_Trends.pdf
- ^{vii} Intergovernmental Panel on Climate Change (2013) *Climate Change 2013: Headline Statements from the Summary for Policymakers*. Available at: http://www.ipcc.ch/news_and_events/docs/ar5/ar5_wg1_headlines.pdf
- ^{viii} Kendon, M *et al.* (2018) *State of the UK Climate 2017*. International Journal of Climatology, 38 (S2). Available at: <https://rmets.onlinelibrary.wiley.com/doi/epdf/10.1002/joc.5798>
- ^{ix} National Tidal and Sea Level Facility (2019) *Sea Level Trends for Newlyn*. Available at <https://www.ntsfl.org/products/sea-level-trend-charts?name=Newlyn&freq=annual>
- ^x Joint Nature Conservation Committee (2012) *Pressure from Climate Change – Spring Index*. Available at: <http://jncc.defra.gov.uk/page-4247>.
- ^{xi} UK Climate Impacts Programme (2018) *UKCP18*. UKCIP. Available at: <https://www.metoffice.gov.uk/research/collaboration/ukcp>
- ^{xii} BEIS (2018) *Total Final Energy Consumption 2003 – 2016 at Regional and Local Authority Level*. Available at: <https://www.gov.uk/government/statistical-data-sets/total-final-energy-consumption-at-regional-and-local-authority-level>
- ^{xiii} RegenSW (2016) *South West Renewable Energy Progress Report 2016*. RegenSW. Available at: <https://www.regensw.co.uk/Handlers/Download.ashx?IDMF=84ec0a2f-03da-4e7a-9e22-38a30937c50a>
- ^{xiv} Regen (2018) *Renewable Energy Progress Report for Devon 2016-17*. Regen. Available at: <https://new.devon.gov.uk/energyandclimatechange/sustainable-energy>
- ^{xv} Regen (2018) *Renewable Energy Progress Report for Devon 2016-17*. Regen. Available at: <https://www.devon.gov.uk/energyandclimatechange/sustainable-energy>
- ^{xvi} University of Exeter Centre for Energy and the Environment (2011) *A review of renewable energy resource assessment and targets for Devon*. University of Exeter. Available at: <http://www.devon.gov.uk/reviewofrenewableenergyresourceassessmentandtargetsfordevon.pdf> (Accessed: 16/09/2013)
- ^{xvii} DECC (2017) *UK Local and regional CO2 emissions estimates for 2005-2017 Full dataset*. DECC. Available at: <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-2015>
- ^{xviii} Committee on Climate Change (2014) *Reducing the UK's Carbon Footprint and Managing Competitiveness Risks*. Committee on Climate Change. Available at <http://www.theccc.org.uk/publication/carbon-footprint-and-competitiveness/>

^{xix} Devon County Council (2018) *Climate Change Strategy*, Available at <https://www.devon.gov.uk/energyandclimatechange/strategy/climate-change-strategy>

^{xx} RegenSW (2018) *Devon Community Energy Impact Report*. Available at <https://www.regen.co.uk/publications/devon-community-energy-impact-report-2018/>