



## **The Low Carbon Economy in the context of the Devon Economy**

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## 1 Management Summary

- 1.1.1 This report forms part of the evidence base for Devon County Council's (DCC) Local Economic Assessment (LEA). It analyses current emissions of greenhouse gases (GHG) within Devon's economy and projects the changes in emissions as a result of Government policy. It discusses the threats and weaknesses associated with a move towards a Low Carbon Economy (LCE).
- 1.1.2 The non-domestic sector is responsible for the majority of emissions in Devon (44%). Within the non-domestic sector agriculture is the largest emitter, mainly due to the high environmental impact of methane, for example from livestock, and nitrous oxide, for example from fertilisers. The manufacturing and the services sectors each have nearly as high an impact as agriculture. Transport is responsible for almost a third of Devon's emissions, and of these, around three quarters can be allocated to the industry and services sectors.
- 1.1.3 Transport emissions are over 25% greater proportionally within Devon when compared to the UK average, and agricultural emissions are proportionally double the UK average. This can be attributed to the Devon's rural nature. Addressing emissions from transport and agriculture is therefore an especially important challenge that the county must respond to if it is to move to a low carbon economy.
- 1.1.4 When breaking down emissions further, either by looking at a sector in greater detail, or by end use, or spatially, similar patterns emerge. We see that emissions tend to be concentrated amongst a few high emitters, following a "Pareto distribution" – sometimes also known as the "80-20" rule, where 80% of the effect comes from 20% of the cause. It is likely that the quickest wins will come from addressing the areas of highest concentration. The challenge of reducing emissions from the remainder will be harder. In the long term, reductions across the board will be required.

- 1.1.5 Within the manufacturing sector the top 20 out of 68 sub-sectors are responsible for 80% of emissions. Within the services sector, retail and hotels and catering are responsible for over half of emissions, and the public sector a further quarter. Within Devon 80% of emissions occur in 20% of mid level super output areas (MLSOA). Of these, almost a half are in Exeter, with the city centre area alone being responsible for 5% of Devon's non-domestic carbon dioxide emissions. There is a high proportion of old non-domestic building stock, especially in retail and offices. There is a high concentration of offices and warehouses in Exeter, with factories and warehouses being better spread across the county, though Torridge and West Devon show low amounts of non-domestic activity. In general though, the spatial pattern of emissions in Devon is determined by co-location of many smaller emitters in denser built-up areas.
- 1.1.6 Within the manufacturing sector, the source of emissions is strongly influenced by the specific sub-sector. For example in the food and drink sector, low temperature processes are the most significant factor, whilst in the metals sector it is high temperature processes. In the plastics sector it is motors, in the paper and paperboard sector it is drying and separation. The trends in the services sector follow a more common thread, with space heating and then lighting being most significant, and in total accounting for almost two thirds of emissions, though there is a dominance of lighting emissions in the retail sector, and catering emissions from the hotels and catering sector. Reducing emissions from each of these activities requires different solutions and interventions. Building up a detailed picture of where these emissions arise from will help to tackle them in the most effective way.
- 1.1.7 The services sector is by some way the most significant sector economically within Devon, and is projected to become even more so over time. In terms of economic output, the services sector has low emissions compared to other sectors.
- 1.1.8 The ratio of economic output to carbon emissions of a sector has been termed the carbon productivity, and against this indicator, Devon generally outperforms the UK across all sectors, mainly due to having less concentration of carbon intensive industry. The growth of the services sector and the decline in manufacturing sector over time, together with the impact of national emissions reduction policy, should mean that within Devon at least, the carbon intensity of the economy should reduce.

- 1.1.9 This report has looked at the economy in terms of supply. A different approach would involve analysing the demand for goods and services of the Devon population. In that sense, global emissions will not reduce along with a fall in emissions from Devon's economy, unless accompanied by a drop in demand for goods and services, or through energy efficiency measures in the economies of other territories. If anything, there could be a risk that emissions would increase due to increased imports from less efficient points of origin, as well as the associated transport emissions. Therefore, it is important for Devon to try to improve the carbon productivity across the whole economy, rather than try to reduce overall emissions by "outsourcing" more polluting sectors.
- 1.1.10 Transport emissions in Devon are expected to fall by a quarter by 2022, though this rate of decrease is slower than for other sectors meaning that proportionally transport will become more significant. Under a central oil price scenario the overall cost of motoring fuel should fall. However, under the highest oil price scenario (oil reaching \$200 a barrel), the increased cost of fuel would be significant. As a rural county covering a large geographical area, measures to reduce the need to travel, or to improve the efficiency of those journeys that are necessary, will be of greater help than elsewhere.
- 1.1.11 The UK has a raft of national policy measures in force designed to reduce carbon emissions and a set of planned measures that have been included in the Low Carbon Transition Plan. Emissions in Devon are projected to fall by 2022 due to this of national policy measures. Of the LCTP policies, the most significant is associated with reducing emission from existing dwellings, which could support over 800 jobs and generate £500 million for Devon's economy. It is likely strong local leadership will be required to mobilise this activity on the scale needed. Large scale renewables will also play an important role, and Devon may benefit from the regional growth in the nascent marine sector, as well as through the deployment of more established technologies. Small scale renewables are expected to become more widespread, with Devon already having made a good start, however the sector is strongly reliant on energy cashback schemes, and is at risk should the conditions of these change. Devon is also well placed to take a strong leadership role in reducing emissions from the agriculture sector. Existing carbon reduction policies will reduce carbon emissions by about as much as the LCTP measures (examples include the Renewables Obligation and improvements to building regulations, which will result in increased district energy solutions). Devon is already making good progress here, for example with a landmark scheme at Cranbrook and Skypark to the east of Exeter.

- 1.1.12 There are also a series of national measures that will result in emissions reductions within Devon, but where there are limited opportunities for Devon businesses to take advantage, for example the development of carbon capture and storage, and improvements to the efficiencies of cars and appliances.
- 1.1.13 Through the RE4D initiative, Devon County Council has shown that it can successfully build skills in a developing sector of the low carbon economy. However, the evidence suggests that whilst there is a latent demand for low carbon skills, this is not being translated to jobs and training, and that the skills gap in Devon is greater than the gap which occurs nationally. In addition, the low carbon economy is likely to require a hugely diverse array of skills across many sectors, ranging from design to waste to transport to finance, as well as in renewable energy which is more commonly associated with a low carbon economy. The local authority will have an important role in raising awareness and launching new skills building initiatives.
- 1.1.14 Devon is well placed to move towards a low carbon economy. It has good natural resources, a proven track record in renewable energy, a clear understanding of the importance of energy in spatial planning (as demonstrated by the landmark decentralised energy schemes underway at Cranbrook and the waste to energy plant at Marsh Barton), centres of international research, strong organic food and tourism sectors, and a strong local grassroots community movement. It will have to overcome barriers associated with the rurality of the county, which make businesses more susceptible to fuel costs and will make superfast broadband to all parts of the county more challenging. The larger than average number of small businesses, and the ageing demographic and non-domestic building stock represent further challenges that will need to be overcome. There will also need to be a step change in the rate of installation of renewable energy. The lack of certain industries in Devon due to historic and geographical factors will mean that some LCTP policy will result in emissions in Devon falling due to actions taken elsewhere in the country, for example in the case of carbon capture and storage, or improvements to vehicle efficiency.

1.1.15 The move to a low carbon economy brings with it many opportunities.

This study has identified where and how emissions arise from the various parts of Devon's economy – through engaging with those businesses to target the main sources of emissions, there is a great opportunity for Devon to both reduce its emissions and increase the long term competitiveness of its businesses. The upgrading of existing dwellings in particular will require rapid action locally, and there will need to be an increased number of both small and large scale renewable energy installations across the county. Devon is also well placed to take a lead on district heating implementation, and on reducing emissions from the agricultural sector.

1.1.16 A low carbon economy will require strong leadership from DCC as well as willing from the business community. National policy is projected to deliver large emissions reductions, but a significant proportion will arise through actions taken locally. The public sector will need to lead by example by reducing emissions across its own estate, sharing best practice and procurement frameworks, and ensuring new development in the county occurs sustainably. It must engage with the business community and help to develop the skills and infrastructure that will be required in a low carbon economy. The business community must be responsive to this if Devon is to successfully transition to a low carbon economy. This in turn will require the public in general to engage with the issue and require local business to grasp the opportunity. Again, the local authority will have an important role to play in this.

1.1.17 In order to apply the evidence base presented in this report for Devon's move to a Low Carbon Economy, the following recommendations are made for future work:

1. A further analysis of growth sectors and to what extent this will depend on public sector leadership. The analysis should cover workforce skills, training, infrastructure and business support.
2. An analysis of sectors in decline and possible interventions that will be required by DCC.
3. An analysis of where DCC should focus its efforts, for example, should DCC adopt policy to encourage low emission enterprise development or mitigate carbon emissions from carbon intensive sectors?
4. Establish how performance can be monitored over time, and what datasets will be available from which to undertake monitoring and targeting.

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## 2 Introduction

- 2.1.1 Different places face different economic challenges and opportunities. Economic development activity needs to be tailored locally. As of April 2010 a new duty was placed on county councils to prepare an assessment of the economic conditions in their area<sup>1</sup>. Well designed local economic development policy, taken forward by local authorities and partners, can contribute significantly to sustainable economic objectives.
- 2.1.2 Local economic assessments (LEAs) should equip local authorities and partners with a common understanding of local economic conditions and economic geography and the economic, social and environmental factors that impact on economic growth. This understanding should lead to improved economic interventions, including better spatial prioritisation of investment, and contribute to the Government's overall aim of delivering sustainable development. The LEA should provide a mechanism for bringing this information together within a common economic evidence base that tells the story of a place, ensuring that policy making at all levels is based around a shared understanding of local economic challenges.
- 2.1.3 As part of a two-tier area, Devon County Council (DCC) is responsible for producing the LEA, though has a duty to consult and seek the participation of district councils within its area. The eight district councils within Devon have a corresponding requirement to co-operate with DCC.
- 2.1.4 The core objectives of LEAs are to:
- Provide a sound understanding of the economic conditions in the area and how they affect residents and businesses.
  - Identify the comparative strengths and weaknesses of the local economy and the nature and form of local economic challenges and opportunities.
  - Identify the local economic geography, including the economic linkages between the area being assessed and the wider economy.
  - Identify the local constraints to economic growth and employment and the risks to delivering sustainable economic growth.

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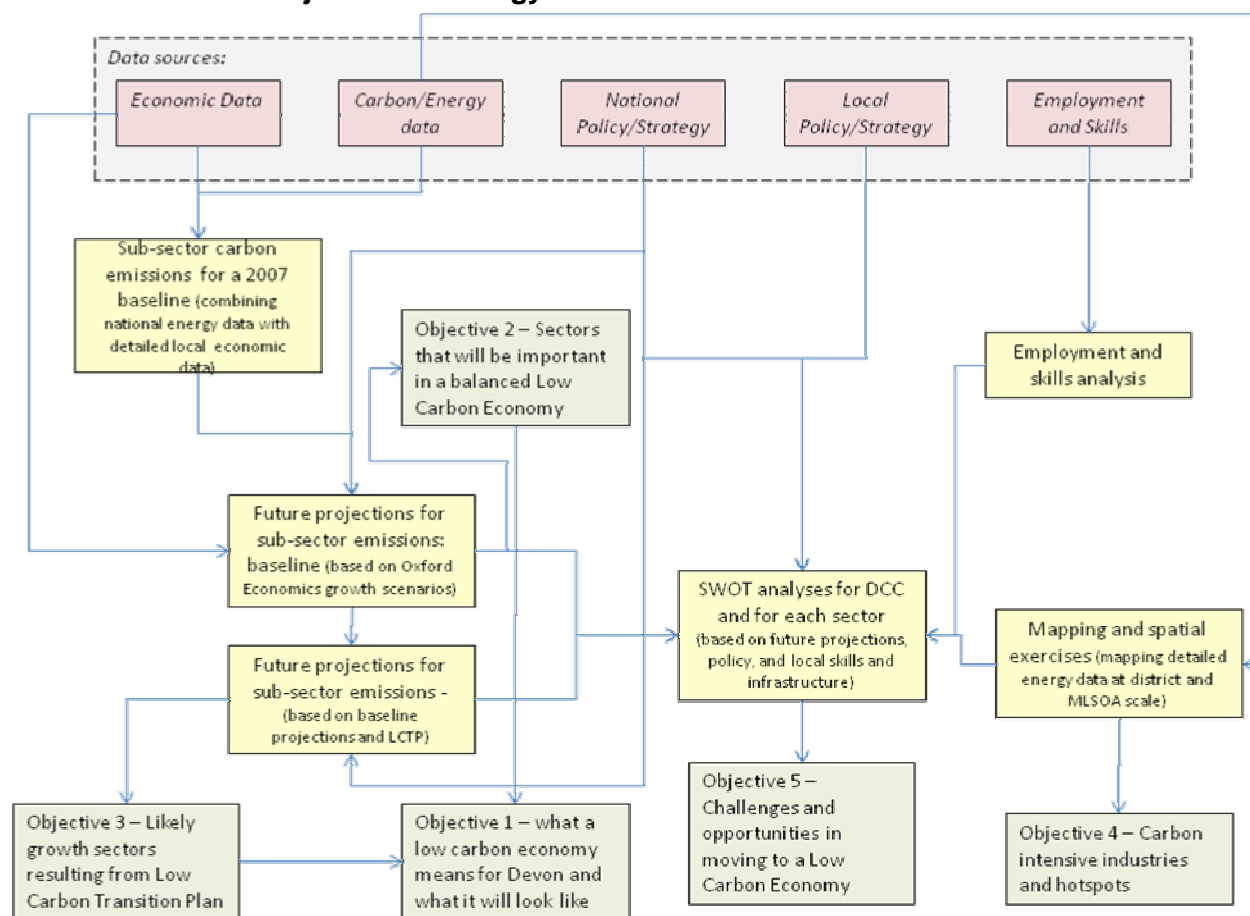
<sup>1</sup>CLG 2009, Local economic assessments: Draft statutory guidance  
<http://www.communities.gov.uk/documents/localgovernment/pdf/1314939.pdf> (accessed 5/7/10).

- 2.1.5 The move towards a Low Carbon Economy forms an important strand within the LEA. Planning for a Low Carbon Economy, including an assessment of the challenges and opportunities that such a move presents is crucial if such a move is to be successful.
- 2.1.6 The aims of this study were:
- Objective 1: To explain what a low carbon economy means for Devon, and what it might look like in reality.
  - Objective 2: To identify the sectors that will be important in a balanced low carbon economy.
  - Objective 3: To appraise the likely growth sectors that will arise as the UK Low Carbon Transition Plan is implemented and where this has implications for the Devon economy, including future employment and economic output.
  - Objective 4: To identify carbon intensive industries and spatial hotspots around the county to provide an understanding of the spatial implications arising from the analysis.
  - Objective 5: To provide a thorough assessment of the challenges, threats (vulnerabilities) and opportunities provided by a move to low carbon economy, for the Devon economy as a whole and for each industry sector.
- 2.1.7 The following principles for this study into a Low Carbon Economy for Devon will be adopted:
- 2.1.8 It will be place based, taking into account the particular history, demography and social and environmental challenges faced across and within Devon.
- 2.1.9 It will look forward, by taking a view of the future direction of the local economy including consideration of social and environmental trends (e.g. ageing population and climate change) and how different economic scenarios might impact on the local area. Detailed economic forecasting is outside the scope of this report.
- 2.1.10 It will be based on appropriate data, by supplementing national datasets with local, regional and sub-regional data, knowledge and expertise.
- 2.1.11 It will be transparent in method with any assumptions and limitations arising clearly stated.

### 3 Methodology

- 3.1.1 The aim of the study was to examine the carbon composition of the Devon economy now and provide estimates going forward, and to establish opportunities and threats this brings in order to inform local policy.
- 3.1.2 This study has modelled projections for carbon emissions arising from the Devon economy with a particular focus on the industrial and services sectors. National policy impacts on other sectors, such as in domestic and transport were considered concerning their delivery and therefore impacts and potential opportunities for the industrial and services sectors. In addition, transport emissions resulting from non-domestic use was also considered.
- 3.1.3 The approach taken was to combine national and local policy with existing available datasets and apply them to the Devon economy. Economic projections together with predictions of carbon reduction from the Low Carbon Transition Plan were used to predict the change in carbon emissions in the Devon economy. From this the balance of emissions across the economy and growth sectors has been established. This was then combined with a spatial and skills analysis taken from a wide range of data sources, in order to establish the threats and opportunities in moving to a Low Carbon Economy in Devon. A schematic of the approach is shown in the diagram below.

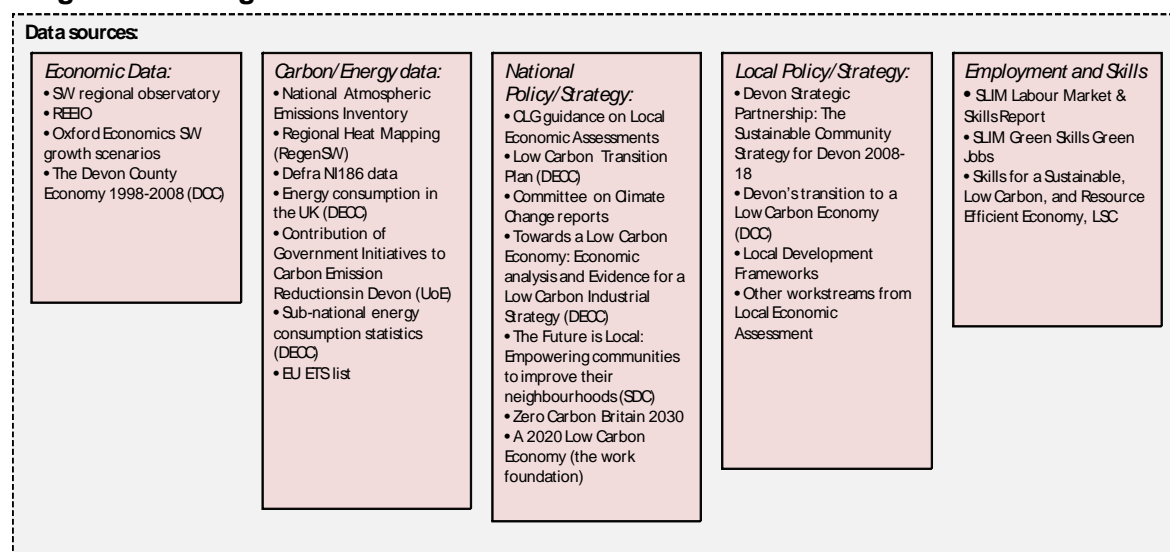
## Schematic of the Project Methodology



Source: University of Exeter

- 3.1.4 The rationale for use of datasets within the project was that they should be robust and comprehensive and come from trusted sources. The main economic projection data used was detailed and applicable to the local area. Detailed carbon (or energy) data was not available locally and therefore national data has been used and apportioned as accurately as possible. A schematic of data sources considered is shown in the diagram below. Specific details are expanded upon later within this document.

## Diagram showing main data sources considered



Source: University of Exeter

**3.1.5** The key policy document considered in this report was the UK Low Carbon Transition Plan<sup>2</sup> which is the first Government white paper which sets out to determine how the UK will meet its binding carbon budgets across all sectors, based on the Climate Change Act 2008. The Government aims to cut emissions by 34% by 2020 relative to 1990 levels. The aim is to meet this target over three budget periods: 2008-2012, 2013-2017, and 2018-2022. In order to meet these targets the Government has stipulated several key areas where efforts will be made to reduce carbon emissions in order to deliver a low carbon economy.

**3.1.6** Through providing a price for carbon the Government plans to drive decarbonisation, so as to support new technologies and infrastructure that are needed to help overcome the constraints facing low carbon choices. Creating an investment climate to support the substantial new investment that is needed to open up opportunities for low carbon infrastructure, is another key focus so as to secure energy supplies, in addition to maximising the production of oil and gas to secure the continued demand for fossil fuel needed during the transition. The Government also aims to support low carbon business; help businesses manage adaptation costs; and protect the environment through the maximisation of measures which bring environmental benefits and minimisation of measures which bring degradation where they are unavoidable.

<sup>2</sup> DECC 2009, The UK Low Carbon Transition Plan: National Strategy for Climate and Energy

- 3.1.7 The plan itself is divided into several chapters exploring the challenges and opportunities that the transition to a low carbon economy will bring about and detailed examinations into the transformation of different areas in the economy such as the power sector; households; industry; transport; waste management and agriculture. The policies included in the LCTP have been considered in this report, though it is possible that the impacts or indeed inclusion of some of the policies may be open to doubt depending on outcomes from the coalition government's spending review in October 2010.
- 3.1.8 The Industrial Strategy<sup>3</sup> was published alongside the LCTP and provides a number of active interventions supporting industry in tackling climate change. It focuses on the role of workers and businesses in the UK targeting key industries and regions where the UK has a competitive or commercial advantage in the opportunities in a low carbon economy. The strategy not only addresses the specific needs of businesses within the market for low carbon services but also the actions that Government takes in easing the UK's transition to a low carbon economy.
- 3.1.9 The following sections of this report present a picture of current greenhouse gas emissions within the Devon economy. Projections are then made for emissions together with other indicators for Devon's economy based on forecast growth and the impact of the LCTP policies.

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<sup>3</sup> BIS & DECC 2009. The UK Low Carbon Industrial Strategy

## 4 The Present Picture: Current Emissions within Devon's Economy

- 4.1.1 This chapter sets out a baseline for greenhouse gas emissions emitted by Devon's economy. Through the application of existing local and national datasets, a broad picture of where emissions occur within Devon is presented. This is broken down in detail by sub-sector and final end consumption within the manufacturing and services sectors.
- 4.1.2 An apportionment exercise was undertaken using previous work by the University of Exeter<sup>4</sup> which apportioned carbon emissions by sector, energy data from DECC<sup>5</sup> and economic data from ONS<sup>6</sup> and the South West Regional Accounts<sup>7</sup>. The output of the exercise was a top-down derived sub-sector breakdown of greenhouse gas (GHG) emissions arising from end user energy consumption for 2007. A full description of the apportionment exercise including assumptions made is stated within the technical annex.
- 4.1.3 The non-domestic sector is responsible for 44% of emissions. Within this, all industry accounts for 14% of which 12% is from manufacturing. The services sector is responsible for 11% of emissions. After the non-domestic sector, transport is the next largest emitter of GHGs in Devon (28%), followed by the residential sector (24%).

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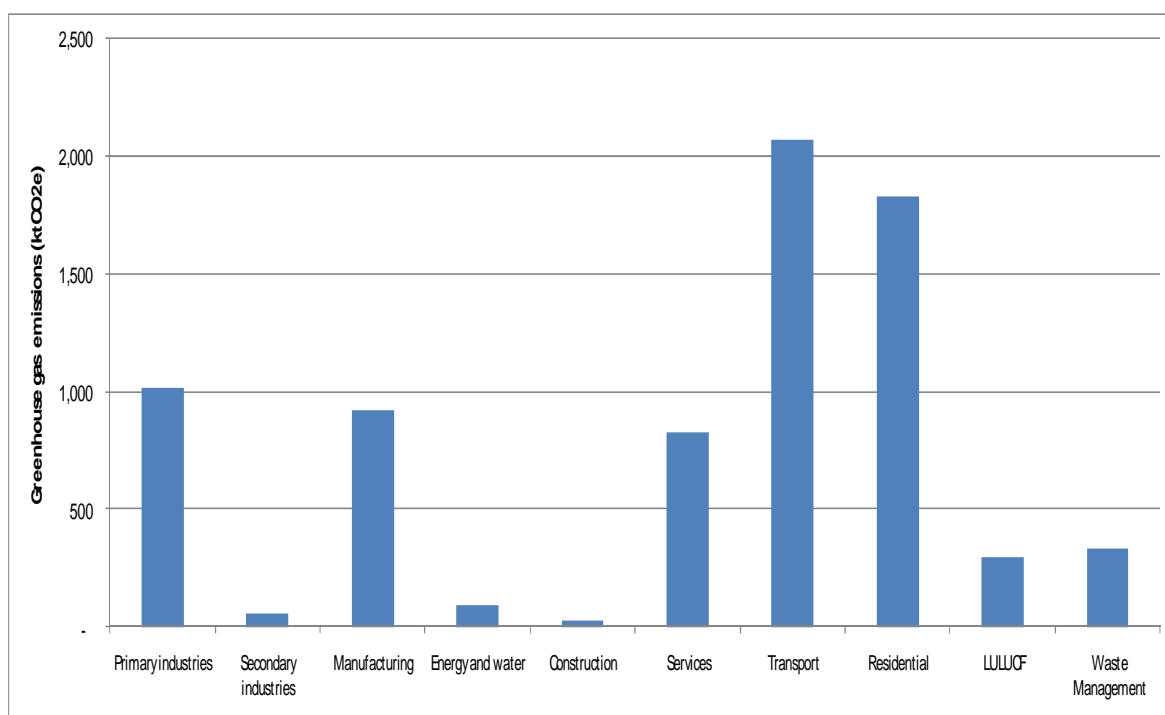
<sup>4</sup> SWEEG ID712, Contribution of Government Initiatives to Carbon Emission Reductions in Devon: Sectoral Baseline Emissions, T.A. Mitchell and G. Hitchcock, April 2010

<sup>5</sup> DECC, Energy Consumption in the United Kingdom <http://www.decc.gov.uk/en/content/cms/statistics/publications/ecuk/ecuk.aspx> (accessed 22/7/10)

<sup>6</sup> ONS, Regional Gross Value Added (GVA) <http://www.statistics.gov.uk/STATBASE/Product.asp?vlnk=14650> (accessed 22/7/10)

<sup>7</sup> South West Regional Accounts, <http://economy.swo.org.uk/south-west-regional-accounts/> (accessed 22/7/10)

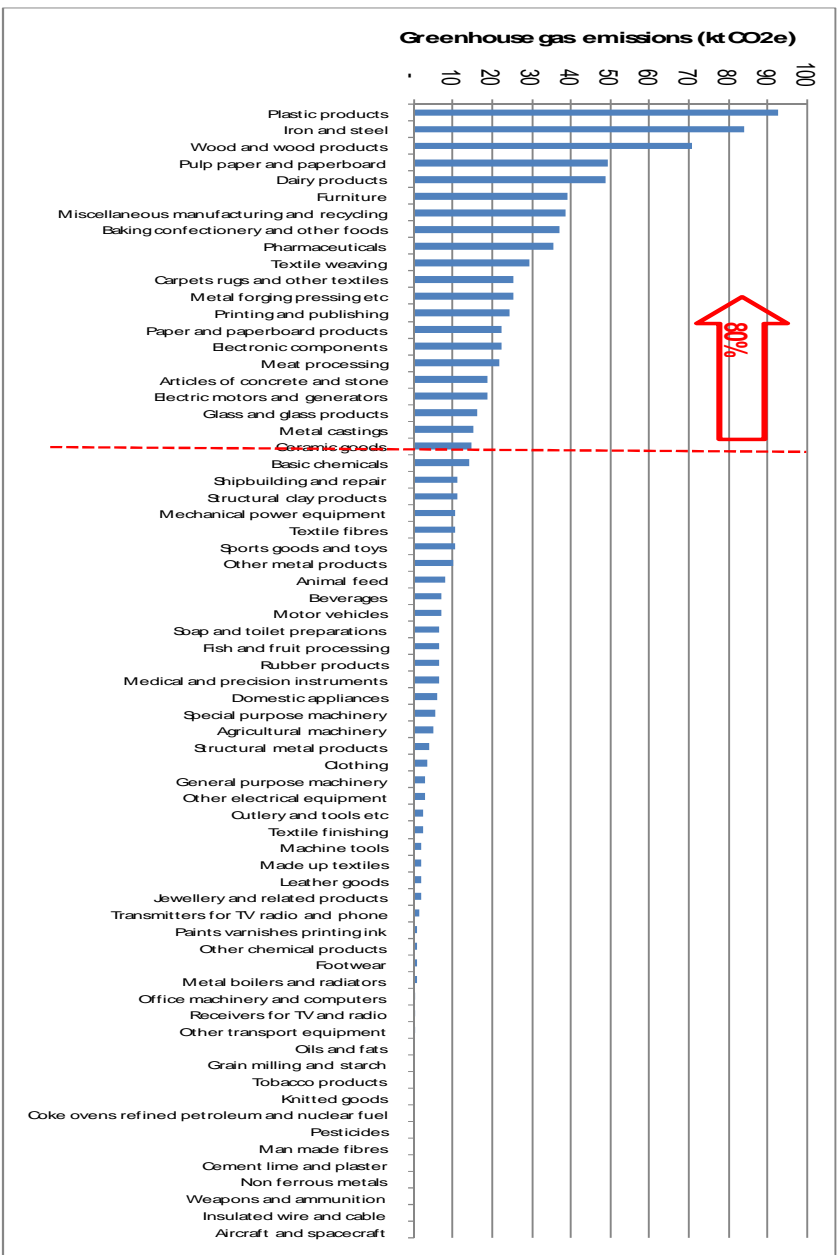
## Overall sector split of GHG emissions in Devon in 2007



### 4.2 Manufacturing and Services

4.2.1 Within the manufacturing sector, the top four out of 68 sub-sectors are responsible for a third of emissions. These are plastic products, iron and steel, wood and paper products, and pulp paper and paperboard. The top eight sub-sectors are responsible for half the emissions. These include dairy products, furniture, miscellaneous manufacturing and recycling and baking confectionary and other foods. The top twenty sub-sectors account for 80% of total emissions.

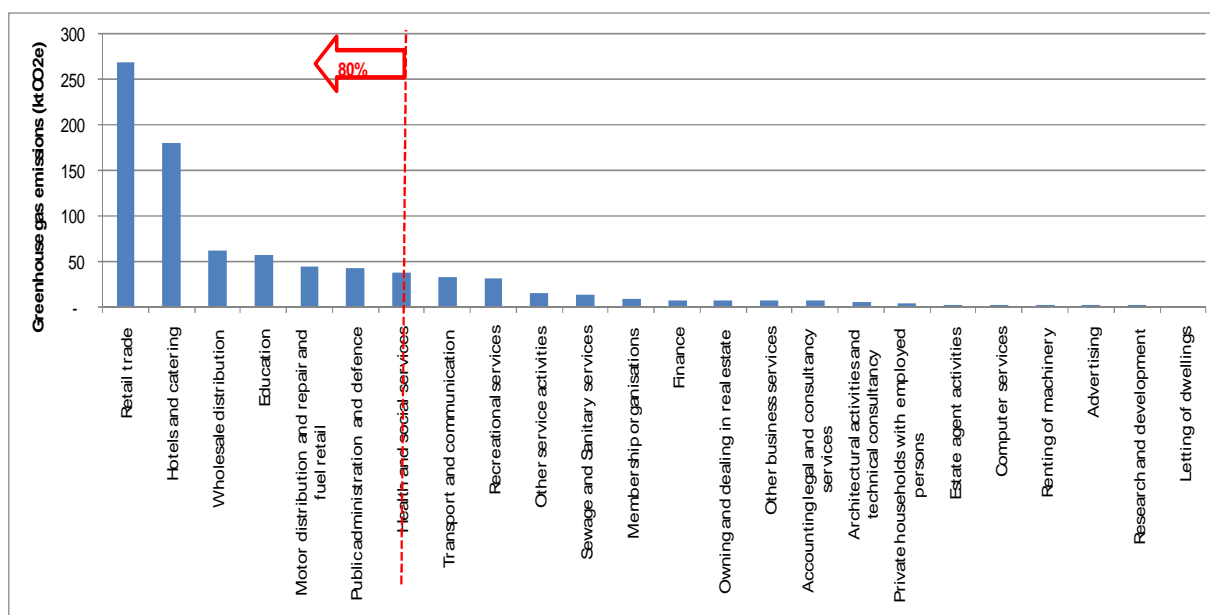
# Detailed split of GHG emissions in the manufacturing sector in Devon in 2007



## 4.2.2

One third of emissions from within the services sector are from retail trade. A further 22% are from hotels and catering. Wholesale distribution accounts for 7.4% of emissions. Education, public administration, and health account for between 5-7% each, with the public sector being directly responsible for approximately a quarter of all service sector emissions. Commercial office based activity is responsible for about 5% of emissions. The full breakdown is shown in the graph below.

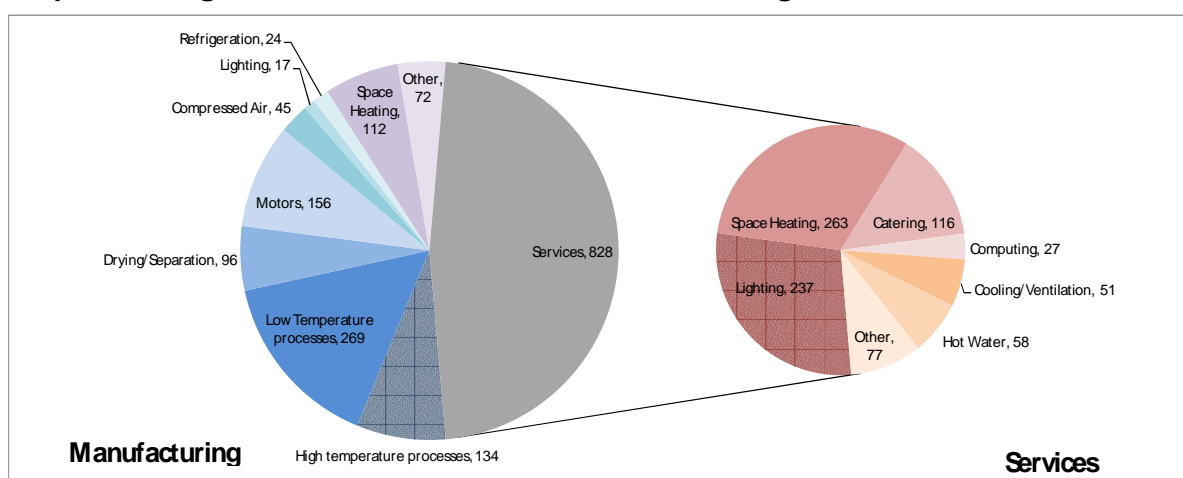
## Detailed split of GHG emissions in the services sector in Devon in 2007



**4.2.3** Within the manufacturing sector, 29% of emissions are due to low temperature processes, with a further 15% from high temperature processes. Drying, motors and compressed air are responsible for a further 10%, 17% and 5% respectively. The remainder is made up of space heating (12%), lighting, refrigeration and other uses.

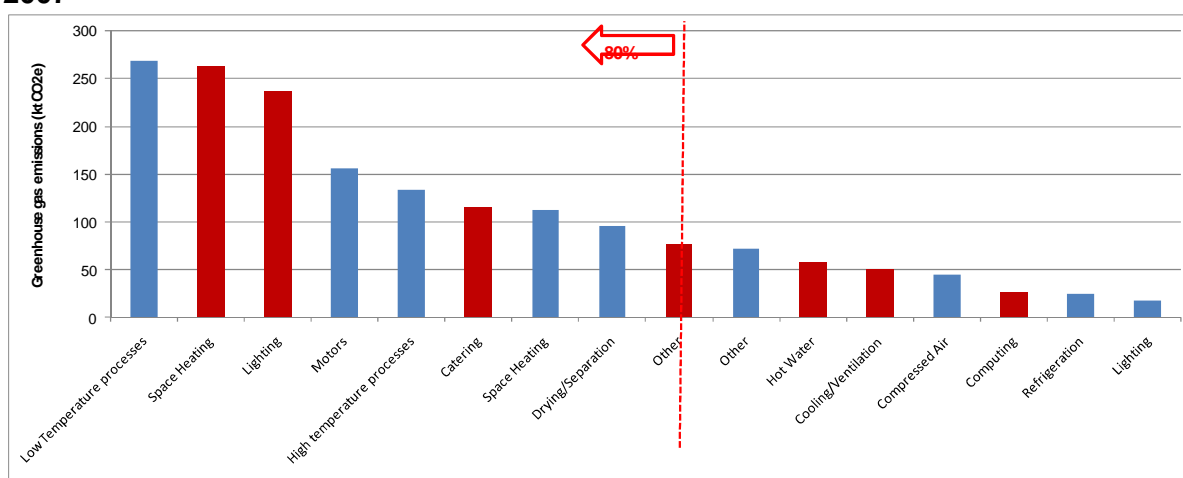
**4.2.4** Within the services sector space heating and lighting are responsible for 32% and 29% of GHG emissions respectively. The remaining 39% arises from catering (14%), other (9%), hot water (7%), cooling and ventilation (6%) and computing (3%).

## Graph showing breakdown of end use for manufacturing and services in 2007



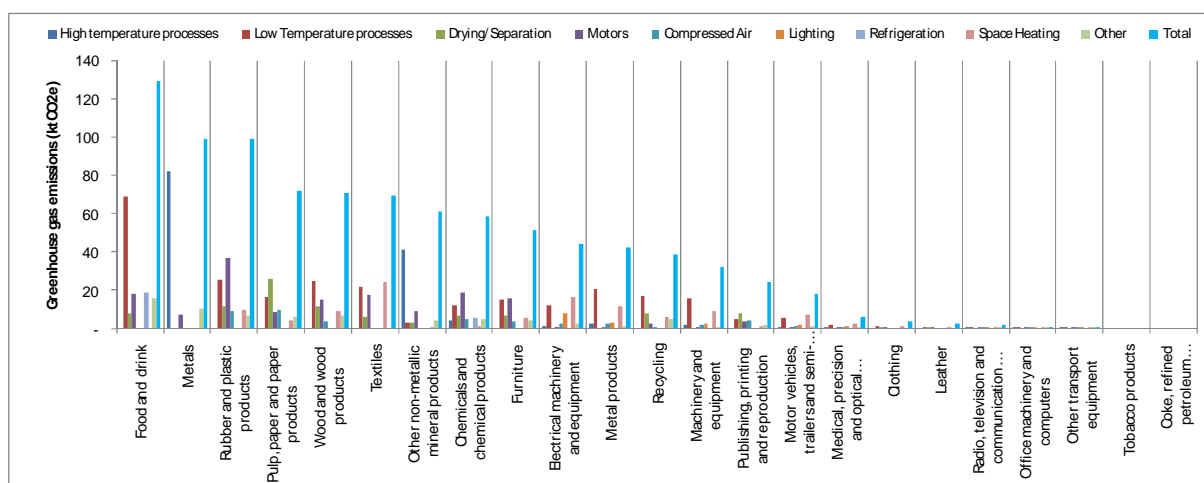
4.2.5 Across the manufacturing and services sectors combined, low temperature processes are the largest single use emitter (15%) followed by space heating and lighting from the services sector (15% and 13% respectively). Space heating and lighting in total account for 36% of total emissions across both sectors. Emissions from motors and high temperature processes in the manufacturing sector and catering in the services sector account for between 7-9% each when considering both sectors together. In total, the aforementioned end uses are responsible for three-quarters of emissions across both sectors.

**Ranked breakdown of end use for manufacturing (blue) and services (red) in 2007**



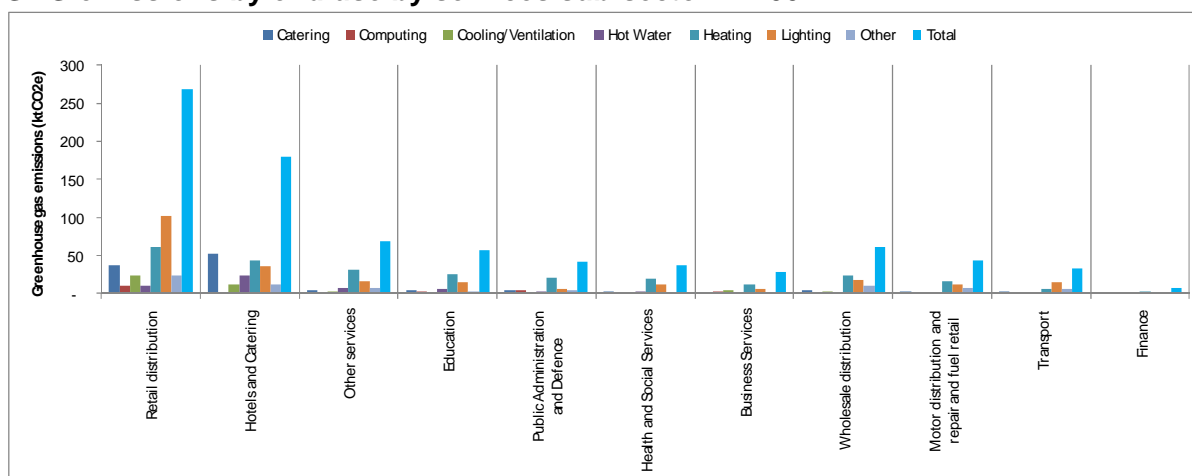
4.2.6 A detailed breakdown of emissions by end use by manufacturing sub-sector enables the most significant sources to be identified. For example, low temperature processes are responsible for over half of emissions from the food and drink sub-sector (the largest overall manufacturing sub-sector), whilst high temperature processes are responsible for 85% of emissions within the metals sub-sector. Motors (37%) are the most significant emitter from the rubber and plastic products sub-sector, whilst drying and separation (37%) is largest within the paper and pulp sector. T

## GHG emissions by end use by manufacturing sub-sector in 2007



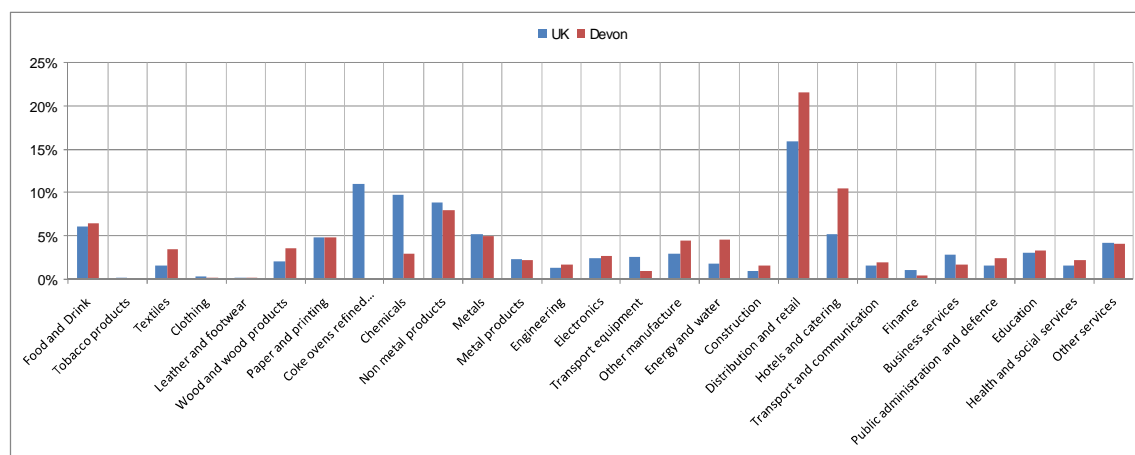
4.2.7 A similar breakdown for the services sector reveals that lighting (38%) is the most significant single emitter within the retail sub-sector and that emissions from catering are 29% of the total emissions from the hotels and catering sector. Space heating is the largest emitter from eight of the eleven sub-sectors, and accounts for between 18% (transport and communications) and 49% (public administration and health) of total emissions within a sub-sector.

## GHG emissions by end use by services sub-sector in 2007



- 4.2.8 The non-domestic sector is responsible for 55% of GHG emissions in the UK, but only 44% in Devon. The main reasons for this are the lack of any emissions from coke ovens, petrol refinery and nuclear fuel in Devon, which accounts for 11% of UK carbon dioxide emissions from the manufacturing and services sectors, and much higher carbon dioxide emissions nationally from the chemicals sector (10% in UK compared to 3% in Devon). This is because almost all of Devon's activity in the chemicals sector is in pharmaceuticals, whereas the majority of UK carbon dioxide emissions from the sector come from the manufacture of basic chemicals, which is far more carbon intensive. Devon also has lower relative carbon dioxide emissions in the non-metals sector due to most activity in this sector in the county being from plastic products, ceramic goods and articles of concrete or stone, which are less carbon intensive than the manufacture of rubber products and cement lime and plaster, which are more significant in other parts of the country.
- 4.2.9 As Devon has fewer carbon dioxide emissions from the fuel and chemical sectors, the relative impact of carbon dioxide emissions from the remaining sectors becomes greater. This is most marked in the distribution and retail, and hotels and catering sectors, which together make up 21% of manufacturing and services carbon dioxide emissions in the UK, but 32% in Devon. There are some sectors where Devon does have proportionally greater carbon dioxide emissions. Examples of these are the textiles sector where Devon's carbon dioxide emissions are mainly from weaving, carpets, and textile fibres (all of which are carbon intensive), with hardly any made up textiles, which is a far less carbon intensive process. Further examples include paper and printing where Devon has a greater proportion of pulp and paperboard manufacture, and the electronics sector where Devon has proportionally greater activity in manufacture of motors and generators and electronic components, which are the two most carbon intensive electronics sub-sectors.

## Proportion of carbon dioxide (note: not GHG) emissions in the manufacturing and services sectors in the UK and Devon



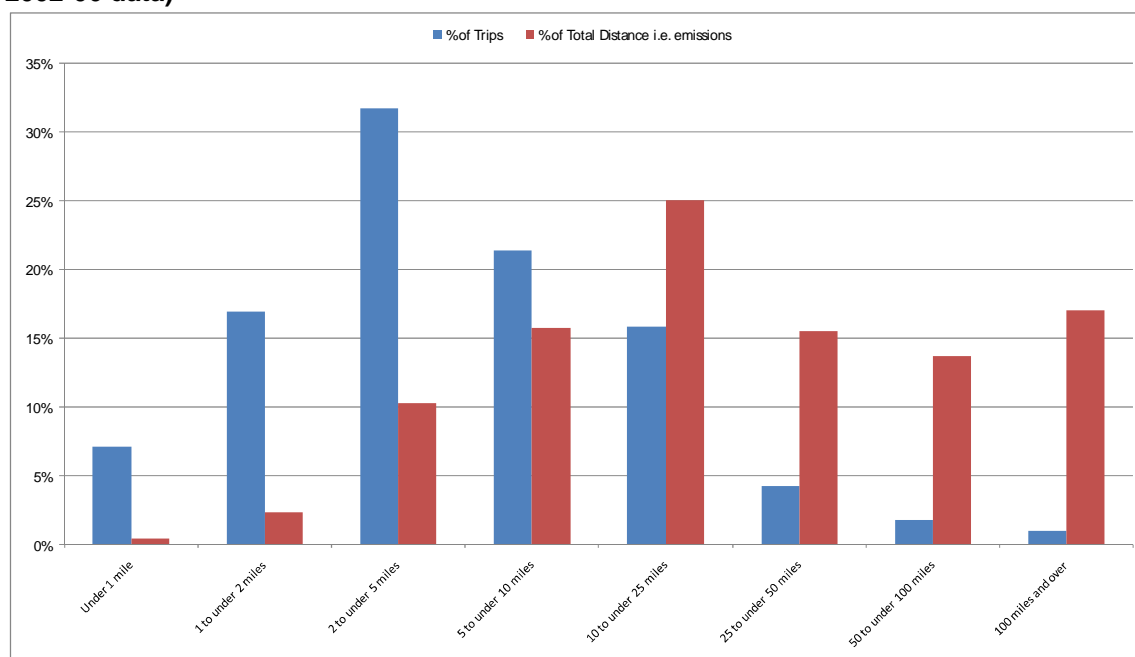
### 4.3 Transport Emissions Resulting from Industry and Services

**4.3.1** Transport is the largest single emitter of GHGs in Devon (2069 ktCO<sub>2</sub>e in 2007). Emissions from the transport sector were analysed using output produced by the University of Exeter for the DaSTS<sup>8</sup> study of transport for Devon. Full details are given in the technical annex.

**4.3.2** Over half of all trips (56%) are under 5 miles in distance, though these journeys are only responsible for 13% of emissions from car journeys. The 7% or journeys of over 25 miles are responsible for almost half of emissions (46%).

<sup>8</sup> DaSTS is the DfT's programme of regional Delivering a sustainable transport strategy (DaSTS) studies. Full details of the calculations and assumptions used in this report are given in the technical annex.

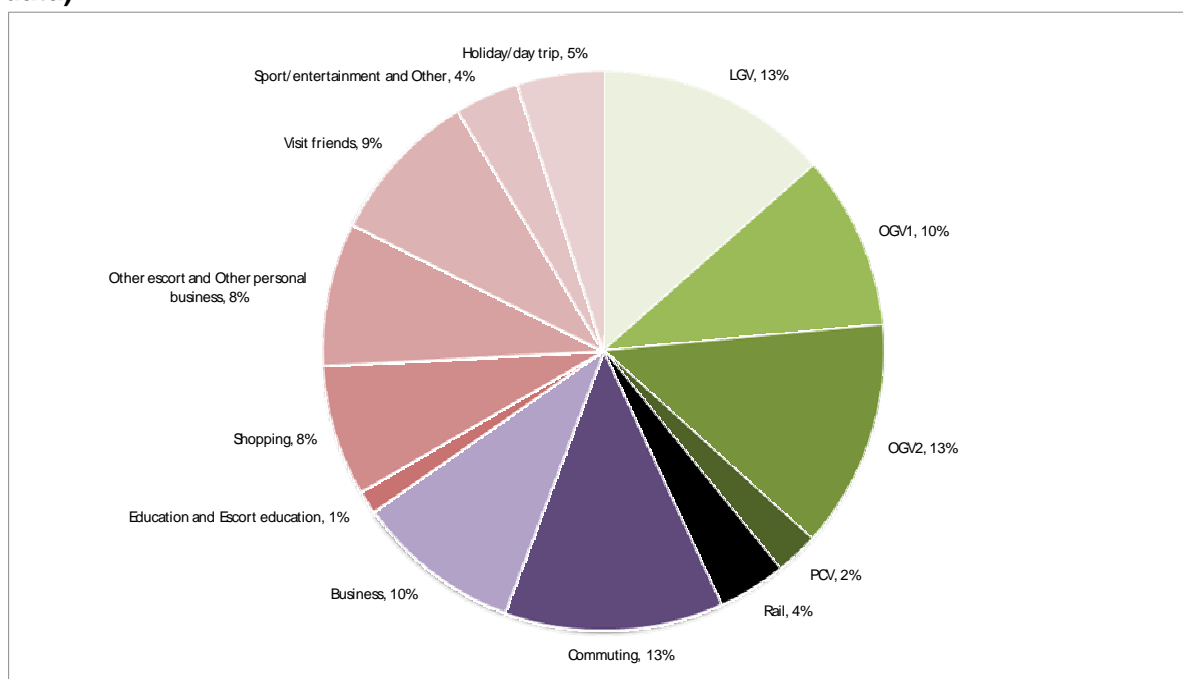
### Proportions of trip and journey distance for car journeys in Devon (based on regional 2002-06 data)



**4.3.3** The breakdown of emissions in 2007 by trip type is shown in the graph below. The datasets available do not in their present form allow for a detailed analysis of transport emissions by sub-sector. However, it can be seen that over a third of emissions come directly from vehicle types that are likely to be used by the industrial and services sectors<sup>9</sup>. In addition, significant components of emissions from car use either directly or indirectly result from industry and services.

<sup>9</sup> LGV (light goods vehicles), OGV1 (other goods vehicles type 1 i.e. up to 3 axles) and OGV2 (other goods vehicles 2 i.e. 4 or more axles, and articulated vehicles)

### GHG emissions for the transport sector by trip type (based on regional 2002-06 data)



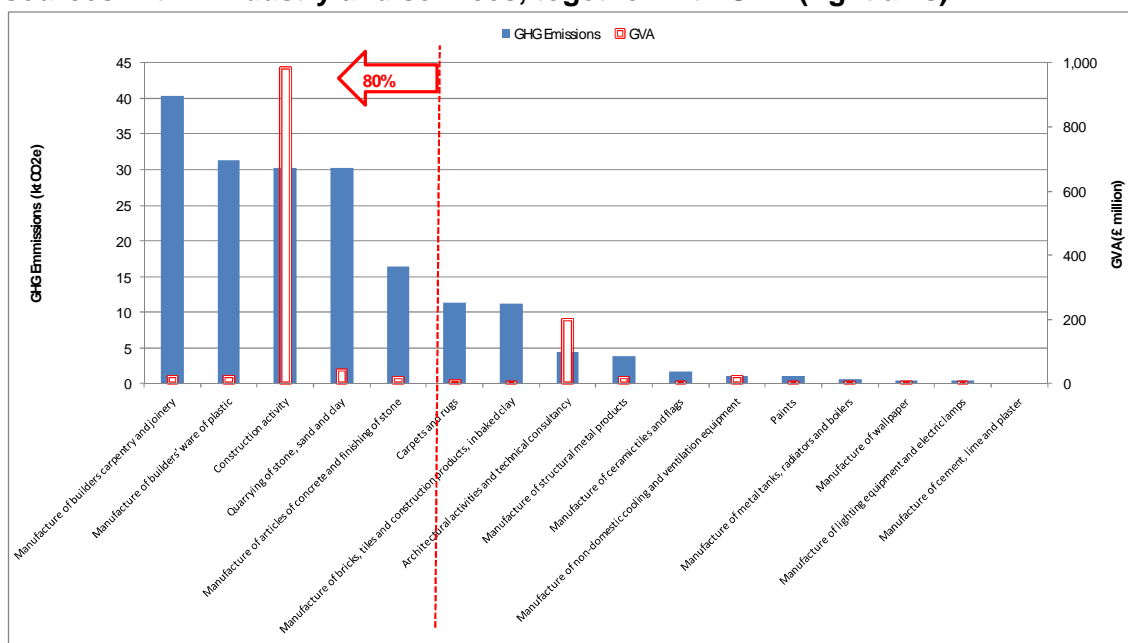
- 4.3.4** Emissions from all goods vehicles total 759 ktCO<sub>2</sub>e (36% of the total). This compares to 1,929 ktCO<sub>2</sub>e for all industry (secondary industry, manufacturing, energy and water, and construction) and services in Devon in 2007. This represents an additional 39% increase in emissions across those sectors due to transport in goods vehicles.
- 4.3.5** When car business and commuting journeys are added, this represents an additional 1219 ktCO<sub>2</sub>e – or a 63% increase in emissions. This represents 59% of all transport emissions.
- 4.3.6** Emissions from business journeys by car total 197 ktCO<sub>2</sub>e, which represents an additional 10% increase to the emissions from industry and services. Emissions from commuting journeys by car total 262 ktCO<sub>2</sub>e, or an additional 14% increase to the emissions from industry and services.
- 4.3.7** Emissions from education escort journeys by car total 28 ktCO<sub>2</sub>e, or an additional 48% increase to the emissions from the education sector, which has emissions of 58 ktCO<sub>2</sub>e.
- 4.3.8** Emissions from shopping journeys by car total 156 ktCO<sub>2</sub>e, or an additional 58% increase to the emissions from the retail trade sector, which has emissions of 268 ktCO<sub>2</sub>e.

- 4.3.9 Sports and entertainment car journeys are responsible for 4% of all transport GHG emissions, and holidays and transport a further 5%. These two sources of emissions result indirectly from the leisure industry.
- 4.3.10 In total, approximately three-quarters of transport emissions can be allocated either directly (goods vehicles, business car trips) or indirectly (car journeys for commuting, shopping, sports or entertainment and holidays or day trips) to the industry and services sectors. This results in an 81% increase in emissions to those sectors. This value would be greater still if emissions from rail and passenger carrying vehicles are added, which in total are responsible for 6% of transport emissions.

#### 4.4 Construction and Associated Impacts

- 4.4.1 The methods used to estimate emissions in Devon are based on data sources which classify “construction” as specific activity surrounding building and civil engineering projects, and specialist activities such as roofing, plumbing, and decorating. Whilst these activities do result in emissions, the process of construction has far greater impacts due to supply chains, for example, the manufacture of roof trusses, or radiators.
- 4.4.2 An estimate has been made to apportion emissions from the industrial and services sectors to construction (though transport has been excluded). The method for this process is given in the technical annex.
- 4.4.3 Emissions arising directly from construction activity total 30 ktCO<sub>2</sub> in 2007, which accounts for only 16% of emissions if indirect emissions are considered. Of the 16 sub-sectors considered which make up construction, the top five accounts for over 80% of emissions. These are manufacture of builder carpentry (22%), manufacture of builders’ ware plastic (17%), construction activity (16%), quarrying of stone, sand and clay (16%) and manufacture of articles of concrete and finishing of stone (9%).
- 4.4.4 “Construction activity” (e.g. demolition, construction, plumbing etc.) is responsible for 73% of GVA within Devon’s construction sector when indirect sources (e.g. manufacture) are also considered, with architecture and engineering services a further 15%. These two sectors thereby total 88%. Together, they are responsible for only 18% of the GHG emissions. The breakdowns are shown in the graph below.

## GHG emissions (left axis) for the construction sector including from indirect sources within industry and services, together with GVA (right axis)



## 4.5 Summary

- 4.5.1** Industry is responsible for 14% of Devon's GHG emissions of which 12% is from manufacture. Within manufacture the top four (out of 68) sub-sectors are responsible for a third of emissions, with the top 20 responsible for 80%. Almost a third of manufacturing emissions are due to low temperature processes. Services are responsible for 11% of GHG emissions, a third of which is from retail, 22% from hotels and catering, and 25% from the public sector. Within the services sector over 60% of emission are due to space heating and lighting.
- 4.5.2** Transport is the single biggest emitting sector in Devon at 28%. Of this, almost 60% is from goods vehicles and car journeys for business use or commuting. These emissions would notionally increase emissions from industry and services by 63%.
- 4.5.3** The analysis of sub-sectors has been based on classifications for which data was available. Sectors may be classified in other ways. The construction sector for example, is responsible for only 16% of emissions within a broader construction sector if indirect emissions from supply chains are considered. Emissions from construction activity are responsible of 0.5% of emissions in Devon, or would be 3.1% if indirect emissions are considered. Further examples of sectors which are comprised of other sectors include the "tourism" and "environmental" sectors, which have not been separately considered here.

## 5 Future Projections for Carbon and the Economy in Devon

### 5.1 [Introduction](#)

- 5.1.1 This section uses projections of Devon's economy expressed as GVA and employment from Oxford Economics together with projections of carbon emissions based on an apportionment exercise of the 2007 baseline emissions with growth and the impact of the Low Carbon Transition Plan. The full details of methodology, including all assumptions, are stated in the technical annex.
- 5.1.2 The analysis focuses on the manufacturing and services sectors at a greater level of detail, as they make up 85-88% of Devon's economy between 2007 and 2022. Construction makes up a further 8-9%.
- 5.1.3 The commentary in this section often refers to tables which contain the results of the economic analysis. Due to the large volume of tables generated, these too are located in the technical annex in the economic analysis section, and are numbered for referencing purposes.
- 5.1.4 The following six sections present the economic projections, GHG emissions, together with some additional indicators to describe the economy in relation to GHG emissions. The final section discusses projections for transport emissions.

### 5.2 [Employment Projections for Devon](#)

- 5.2.1 In this section, we look at employment as an important indicator of economic development.
- 5.2.2 Definition:
  - o Employment captures any formal contract between two parties: an employer and an employee. Employees may work under full-time or part-time contracts. Employment is measured in thousands of workers.

### 5.2.3 Interpretation/Caveats:

- Employment as such is a common indicator of the importance of a particular sector or sub-sector for the labour market. Ideally, employment should be expressed in working hours or, alternatively, the full-time equivalent if a particular number of hours per month or year is set as a standard. Unfortunately, Oxford Economics (2010) data does not provide this detail. Hence, comparison across sectors is problematic if the ratio between full-time and part-time is different. For a particular sector, a sensible comparison between Devon and the UK must assume that the ratio between full-time and part-time is more or less the same for both regions. Interpretation of time trends for sectors must also assume that this ratio stays more or less the same over time.

### 5.2.4 Analysis

- There is a high concentration of employment (around 80%) in the Services sector in the UK and Devon. This is not only true in 2008 and 2022 or on average, but also over the entire period of time of our analysis. Much smaller, but still with some significance are the sectors Construction, Manufacturing and Agriculture (Figures 1,a,b,c, 2a,b,c, Table T1, T2 and T3). However given the caveats of the measure of Employment mentioned under “Interpretation/Caveats” above, this concentration may be less severe as we expect that the percentage of part-time employment in the Services sector may be higher than in other sectors.

5.2.5 In Devon, the second largest sector is Construction which is followed by Manufacturing whereas this is reversed for the UK (see e.g. Table T3). Agriculture plays a more important role in terms of employment in Devon (concentration average 2008-2012: 4.28%, Table T3) than it does in the UK (concentration average 2008-2012: 1.58%, Table T3). The difference is quite remarkable.

5.2.6 During the period 2008-2022, the only sector which is forecasted to have positive employment growth is the Services sector growing at an average of 0.78% p.a. in Devon and 0.53% in the UK (Table T4). In other words, it is expected that employment will not have returned to the previous 2008 employment levels by 2022 in all other sectors (Construction, Manufacturing, Agriculture, Energy and Extraction), which is evident from the negative average annual employment growth in these sectors (Table T4).

- 5.2.7 If we look at the period 2013-2022, excluding the initial drop in employment that we expect results from the recession, we discover employment growth not only in the Services sector but also in the Construction sector (average 0.36% p.a. in Devon and average 0.54% p.a. in the UK, Table T4). Due to this development, concentration in the Services and Construction sectors increase over time whereas it decreases in all other sectors which is evident by comparing Figures 1, a, b, c for Devon and Figures 2, a, b, c for the UK.
- 5.2.8 Because of the dominance of the Services sector to the Devon and the UK economy, projected growth in that sector results in overall annual employment growth rate for the UK and Devon, despite most other sectors showing a decline in employment, even in the projected post-recession growth period as is evident from Table T4. The average annual employment growth is 0.14 % in Devon and 0.48% in the UK in the period 2012-2022 (Table T4). For Devon, employment increases by about 17.000 workers (Table T1). The Demographic Predictions for Devon suggest that the population aged between 15 and 64 will increase by about 19.000 people by 2021<sup>10</sup>. Thus, even if we assume that 80% of the working age population work in Devon (which is a rather high proportion given the Draft report of SW (2010), Work and Skills), it seems reasonable to expect that the unemployment rate should not increase as a result of the projected demographic changes in Devon. This assumes, however, that workers in declining sectors will leave the work force through natural retirement and are not laid off and/or look for employment in the Services sector. It also assumes that there is sufficient mobility across regions. This rather optimistic prediction is also backed by the forecasted unemployment rate of Oxford Economics (2010) which shows that the peak will be reached in 2012 with 2.5% and declines afterwards to around 1.8% in 2022.
- 5.2.9 The decrease in employment in the Energy, Agriculture, Extraction and Manufacturing sectors in Devon, even in the period 2012-2022, will imply some structural adjustment in the labour market. Except for the extraction sector, the annual average decrease is around 1% p.a. in Devon which is rather moderate and far less pronounced than in the UK where most of the declining sectors in terms of employment see an average annual decline of 2% and above (Table T4).

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<sup>10</sup> From table in technical annex based on projected working age growth from 2008 (interpolated between 2006 and 2011) to 2021, as compared to our analysis period of 2008-2022

- 5.2.10 Taken together, it is expected that the future changes in the labour market are much less pronounced in Devon than in the UK. As argued above, expected demographic changes should not place undue strain on the number of available jobs in Devon.
- 5.2.11 Given the importance of the Services and Manufacturing sectors for the Devon and the UK economy and the availability of sub-sectoral data, we have focussed on these sectors at a greater level of detail. The four most important sub-sectors within the Service sector in terms of employment are Distribution & retail, Business services, Health, and Financial Intermediation in Devon, with an average concentration in 2008-2012 of more than 10%. In the UK, the four largest employing Services sub-sectors are Business services, Distribution & retail, Health and Education (see Table T7). Interestingly, Education plays a slightly more important role for employment in the UK than in Devon. As is expected for a county with a high proportion of tourism, Hotels & restaurants are more important for employment in Devon than in the UK, as the South-West and Devon are popular “holiday regions” in the UK (Table T7). Also Health is more important for employment in Devon than the UK (Table T7).
- 5.2.12 All sub-sectors within the Services sector see a growth in terms of employment in the UK and Devon, except for Financial intermediation. However, excluding the effects of the recession by looking at the period 2012-2022, the sub-sector Financial intermediation is expected to grow in the UK, though still declining in Devon. This indicates that employment in Devon’s financial intermediation services is less resilient to the impact of the recession than the UK as a whole (Table T8). For Devon, average annual growth of employment is particularly strong in the sub-sectors Business services and Health but also the sub-sectors Education and Hotels & restaurants are expected to grow on average annually by 0.86% and 0.97% in 2012-2022, respectively (Table T8).
- 5.2.13 In terms of employment, it has been pointed out above that the Manufacturing sector is a shrinking sector in the UK and Devon, though this it is the second largest employer in the UK and the third largest in Devon (Table T3). Remarkably, the decline in employment applies to all sub-sectors within the Manufacturing sector, without exception, regardless whether we look at the period 2008-2022, or exclude the effects of the recession, and look at the period 2012-2022 (Table T12). The strongest percentage decline is seen in the sub-sector Textiles, though this sub-sector only plays a minor role for employment in the UK and Devon (Table T11).

5.2.14 There is no strong concentration in terms of employment within the Manufacturing sector: seven out of eleven sub-sectors see an average concentration of more than 10% over the period 2008-2022 in Devon (Table T11). Concentration is slightly more pronounced in the UK (Table T11). Given the large average annual percentage decline of employment in the Manufacturing sector across all sub-sectors in Devon and the UK (Table T12), it will be non-trivial to accommodate these changes in the labour market. This is true because the Manufacturing sector is the third largest in Devon and the second largest in the UK in terms of employment.

#### 5.2.15 Summary

- The Services Sector is the only sector with an increase in employment in the period 2008-2022 in the UK and Devon, all other sectors are expected to shrink by more than 1% on average annually. The changes are expected to be less dramatic for Devon than for the UK as a whole. Because of the very strong dominance of the Services sector for the Devon but also the UK economy in terms of employment, overall employment will grow. It appears that the growth in employment, though rather modest in particular for Devon, should be sufficient for the increase in the labour force forecasted from demographic projections for Devon as a whole. This assumes, however, that there is sufficient mobility in the labour market across sectors and regions. The most pronounced decline of employment is expected in the Manufacturing sector.

### 5.3 Economic Output

5.3.1 In this section, we look at economic output which we measure in terms of Gross Value Added, abbreviated GVA.

#### 5.3.2 Definition: Gross Value Added

- Gross value added (GVA) is the value of goods and services produced in an area, industry or sector of an economy. It is the difference between output and intermediate consumption for any given sector/industry. That is, the difference between the value of goods and services produced and the cost of raw materials and other inputs which are used up in production. GVA is measured in millions of pounds (£m) and in the Oxford Economics (2010) data expressed in 2005 prices.

### 5.3.3 Interpretation/Caveats: Gross Value Added

- GVA is commonly seen as a good proxy to measure the output of a sector or region. GVA has a close relationship with what is known as gross domestic product (GDP):  $GVA + \text{taxes on products} - \text{subsidies on products} = GDP$

5.3.4 The advantage of GVA compared to GDP is that it excludes the effects of fiscal policies on output. GVA (like GDP) is usually measured in prices of a particular year (e.g. we use 2005) in order to exclude inflation. For instance, if economic output remains the same but inflation is 5 %, GVA growth would otherwise be 5 %. With our measure, GVA growth would be 0%, which is better reflecting the realities. Finally, it should be said that GVA measures output in monetary terms and hence uses current prices. This means that prices must reflect the “valuation of society for particular goods” and assumes that there are no externalities that are not reflected in prices or distort prices. This is obviously a problematic and simplifying assumption, which we will (at least partially) correct below by putting GVA in relation to carbon emissions.

### 5.3.5 Analysis

- Similar trends are observed for projected GVA as have been discussed regarding employment. The Services sector makes up about 80 %, and the Manufacturing sector 11%, of output in the UK and Devon economy (Table T15). Due to the high average annual growth rates in the Services sector compared to other sectors in the Devon and UK economy (see Table T16), the concentration of GVA in the Services sector relative to the whole economy increases over time from 75% in 2012 to 77% in 2022 in Devon (Figures F3, a, b, c) and from 79% in 2012 to 81% in 2022 in the UK (Figures 4, a, b, c), whereas the concentration of all other sectors in Devon and the UK decreases over time. As with employment, it appears that the concentration in the Devon economy is slightly less pronounced than in the UK as a whole, which could be interpreted as more balanced in the sense of being less dependent on one sector.

5.3.6 As with employment, the three most important sectors in terms of GVA are Services, Manufacturing and Construction (Table T15, as well as Figures F3, a, b, c and F4, a, b, c).

- 5.3.7 It is interesting to observe that, in terms of economic output, the Agriculture sector in both Devon and the UK is much less important than for employment, an observation which holds for most developed economies (Table T15). In contrast, the Energy sector for both Devon and the UK is more important in terms of output (Table T15) than was reflected by employment (Table T3). The Energy sector is associated with high average annual GVA growth rates for Devon than for the UK (Table T16). We expect this to be due to the expectation of high growth rates of renewable energies in the South West and also in Devon.
- 5.3.8 The average annual growth for Devon and the UK as a whole are quite high, even without excluding the effects of the recession, by looking at the entire period 2008-2022 (Table T16). For Devon it is 1.81% and for the UK 1.82%, thus almost the same estimate. It appears to us that the weak growth assumption of Oxford Economics is still quite optimistic, considering past growth rates in the UK and most European countries before the recession. As a result of this, we think it is important to issue some caution as to whether such high growth rates can actually be obtained.
- 5.3.9 The three most important sectors (Services, Manufacturing and Construction) for the Devon and the UK economy (Table T15) also show relatively high growth rates (Table T16), which eases our scepticism about the high sectoral concentration (and hence dependency) of the Devon and the UK economy. In terms of GVA, the Agriculture sector is a stagnating sector, and the Extraction sector is seeing a dramatic decline of economic growth. However, the importance of the Extraction sector is, at any rate, small for the Devon and the UK economy, and not only for employment as was previously pointed out (Table T3), but also for GVA (Table T16).
- 5.3.10 A detailed look at the Services sector reveals that concentration in terms of sub-sectors is not very pronounced, though it is slightly more pronounced in terms of GVA than it was for Employment. For GVA, the sub-sector Education is less important than it was for Employment, both for Devon and the UK. In Devon, in 2008-2022, an average concentration of above 10% is obtained by five sectors: Business services, Distribution & retail, Health, Public Administration & defence and Transport & communications (Table T19). The sub-sector Financial intermediation is far less important for Devon than it is for the UK, as this could be expected, given the importance of this sub-sector for the City of London.

5.3.11 The largest average annual growth in Devon is expected for the sub-sectors Business services, Financial intermediation, Transport & communications, Distribution & retail and Hotels & restaurants (Table T20). Growth in the sub-sector Education is much smaller, but still around 1% in Devon and the UK.

5.3.12 It is interesting to observe that in Devon all public services (Health, Public Administration & defence, Education and Other personal services, last four entries in Table T20), are expected to grow at a much lower rate than private services (all other entries in Table T20). Among other factors, this can be attributed to cuts in public funding, which are to be expected in the future.

5.3.13 Also in the manufacturing sector, the concentration of GVA is not terribly strong, neither in the UK nor in Devon (Table T23). The four most important sub-sectors for Devon are Food, drinks & tobacco, Machinery & equipment, Chemicals & man-made fibres and Electrical optical equipment (Table T23). Very high average annual growth rates are expected for the sub-sectors Transport equipment and Chemicals & man-made fibres. Roughly speaking, the sub-sectors with the highest concentrations are also those with the highest growth rates (Table T23 and T24). In the sub-sectors Pulp, papers & printing and Textiles, output is expected to fall both in Devon and across the UK (Table T24).

#### 5.3.14 Summary

- GVA is highly concentrated in the UK and Devon with an average concentration in 2008-2012 of 76% (79%) in Services, 11% (12%) in Manufacturing and 8% (6%) in Construction in Devon (the UK). All these sectors are expected to grow with the highest growth in the Services sector. Therefore, the concentration of the Services sector will increase over time. The Energy Sector is also expected to grow considerably in Devon, though not in the UK. Agriculture is more important for Devon than the UK, though the GVA contribution to the Devon economy is only 2%. The average annual growth for Devon and the UK is expected to be around 1.8% in the period 2008-2012 and around 2.3% in the period 2012-2022, excluding the impact of the recession. Within the services sector, the largest average annual growth in Devon is expected for the sub-sectors Business services, Financial intermediation, Transport & communications, Distribution & retail and Hotels & restaurants. Within the Manufacturing sector, the highest average annual growth rates are expected for the sub-sectors Transport equipment and Chemicals & man-made fibres.

## 5.4 Labour Productivity

5.4.1 In this section, we relate economic output to labour input and analyse labour productivity.

### 5.4.2 Definition: Labour Productivity

- Labour productivity is the amount of goods and services that a worker/employee produces in a given amount of time<sup>11</sup>. We define it as the ratio of output, measured as GVA, to input, measured as employment, i.e.  $GVA/ Employment$ . Since GVA is measured in millions of pounds and employment in thousands of workers, our productivity numbers are thousands of pounds per worker.

### 5.4.3 Interpretation/Caveats: Labour Productivity

- Labour productivity can be regarded as a good proxy of the economic competitiveness of a sector or region. In a market-economy in which growth is driven (among other factors) by competition, a sector or an industry will only be successful in the long-run if labour productivity is not below that of competitors. As a tendency, growth sectors will be those sectors with a high labour productivity. Labour productivity in a sector can go up because GVA rises and/or because employees leave a sector. The last possibility is not problematic in a growing economy in which these employees are taken up by other sectors. A labour productivity growth due to GVA and employment growth where the former is faster than the latter is therefore a development that does not need much qualification. In all other cases, the development has to be interpreted in the specific context, and conclusions have to be drawn with caution. Most economists would agree that, roughly speaking, wage increases should, at least loosely, be tied to increases in labour productivity.

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<sup>11</sup> OECD (2002), OECD Manual: "Measuring Productivity; Measurement of Aggregate and Industry-Level Productivity Growth."

5.4.4 Given the caveats we mentioned under Employment above, it is evident that our measure of productivity suffers from the same shortcomings. That is, cross-sectoral as well as cross-regional comparisons are problematic as the following simple and stylized example will illustrate. Suppose industry A employs 100 part time workers, working 20 hours per week, and industry B employs 50 full-time workers, working 40 hours per week. Both produce £100 of GVA. As a result of this, industry A has a labour productivity of £1 per worker and industry B of £2 per worker using our crude measure from above. In terms of hours, and “in reality”, the labour productivity of industry A and B would be the same, namely £0.5 per hour, which more accurately reflects their relative labour productivity.

#### 5.4.5 Analysis

- Labour productivity across sectors is somewhat different in Devon and the UK (Table T27). Comparisons between Devon and the UK are difficult for the reasons mentioned above under “Interpretation/Caveats”. As expected, labour productivity is relatively low in the labour-intensive industries, which are Services, Construction and Agriculture. The low labour productivity in the Services sector may be exaggerated due to the fact that part-time employment is expected to be relatively high in this sector compared to other sectors. Moreover, it has to be pointed out that the labour productivity in the Services sector is only slightly below the average of the economy, both in Devon and the UK. The highest labour productivity is estimated for the sectors Energy, Extraction and Manufacturing in Devon, though Extraction is a relatively small part of the Devon economy in terms of Employment and GVA (Table T3 and T16), and is in decline (Table T4 and T16). Moreover, Extraction is the only sector with a declining labour productivity, at least when estimated for the period 2008-2022 (Table T28).

5.4.6 In all other sectors (Manufacturing, Energy, Services, Agriculture and Construction), labour productivity increases over time, in Devon and the UK, regardless whether the period 2008-2022 or only 2012-2022 is considered (Table T28). Interestingly, in any given sector, growth rates are quite similar in Devon and the UK. This seems to suggest that Devon neither improves nor falls back in terms of relative competitiveness compared to the UK as a whole. However, in absolute terms, it appears that Devon has a disadvantage compared to the UK in almost all sectors, except in the sector Extraction (Table T27). The difference in the Manufacturing sector appears to be remarkable which is probably due to smaller production units in Devon compared to the UK as a whole.

- 5.4.7 Even in the labour intensive industries (Services, Agriculture and Construction), labour productivity increases annually by an average of around 1.5% when measured in the period 2008-2022, though this puts some constraints on possible wage increases in these sectors if they are to remain competitive. Remarkably, in the Energy sector, average annual labour productivity improvement is well above 3 %, the highest of all sectors (Table T28), despite the absolute value of labour productivity being already by far the highest among all sectors (and hence marginal improvements should be more difficult; Table T27).
- 5.4.8 Within the Services sector, there are remarkable differences of labour productivity across sub-sectors within Devon and the UK (Table T31). Again, however, we have to take caution when drawing conclusions. For instance, in the sub-sector Financial intermediation, which is ranked first in Devon and the UK, we expect a substantially lower percentage of part-time employees than in the last ranked sub-sector Hotels & restaurants, which is labour-intensive. For Devon, the sub-sector Financial intermediation, Public Administration, Transport & communications and Business services are above the Devon average, whereas the sub-sectors Education, Distribution & retail and Health and Other personal services are slightly below the Devon average (Table T27 and T31). A similar picture emerges for the UK (Table T27 and T31).
- 5.4.9 In all sub-sectors within the Services sector in the UK and Devon, labour productivity increases (Table T32). Problematic sub-sectors are Public administration & defence, Education and Other personal services in which, in the UK and in Devon, the growth rates are far below 1% per annum, and thus substantially below the average labour productivity growth rate for the UK and Devon, which is around 1.5% (Table T28 and T32). If we add Health to these three sub-sectors, also with a low average labour productivity growth of around 1% per annum in Devon, so that the four sub-sectors represent public services in contrast to private services, then it is evident that labour productivity of private services is growing much faster than in public services. This remarkable difference holds not only for Devon but also for the UK. It is expected that this puts further strain on wages in the public sector.

5.4.10 In Devon and the UK, within the Manufacturing sector, which has a labour productivity above the average when compared against the average labour productivity in these economies as a whole (Table T27), the labour productivity in all sub-sectors of Manufacturing is above the average, except for Wood Products in Devon and the UK and Textiles and Other manufacturing in the UK (Table T35). Also in Devon and the UK, the Manufacturing sector, has average annual growth rates in labour productivity above the average in these economies (Table T28). Within the Manufacturing sector, this is also true for almost all sub-sectors, except for the sub-sector Other manufacturing (Table T28 and T36).

5.4.11 Given that we argued above that GVA growth is potentially optimistic, the labour productivity growth which we estimated may also be slightly high, which applies to all sectors and sub-sectors.

#### 5.4.12 Summary

- The labour productivities for Devon across all sectors, except for the sector Extraction are lower than for the UK as a whole. Differences are not dramatic but give rise to some concern. However, the difference between Devon and the UK for the Manufacturing sector is remarkable and therefore poses more of a challenge to the Devon economy; it may be due to smaller production units in Devon. In relative terms, difference between Devon and the UK remain almost constant over time as labour productivity growth in Devon and the UK are predicted to be more or less the same. The Services sector's labour productivity is around the average of the economy in the UK and also in Devon. The growth in labour productivity in the sub-sectors that belong to private services is larger than in the sub-sectors that are grouped in public services, both in Devon and the UK. Particular low growth rates are found in the sub-sectors Public administration & defence and Education. It is expected that the relatively low growth rates put some strain on future wage increases in the public services compared to those in private services.

### 5.5 Carbon Emissions

5.5.1 In this section, we look at the development of carbon emission in the various sectors of the Devon and the UK economy.

### 5.5.2 Definition: CO<sub>2</sub>-equivalent Emissions

- Carbon dioxide equivalent (CO<sub>2</sub>e) provides a universal standard of measurement, against which the impacts of releasing different greenhouse gases can be evaluated. Every greenhouse gas has a Global Warming Potential (GWP), a measurement of the impact that a particular gas has on "radiative forcing", i.e. the additional heat/energy which is retained in the Earth's ecosystem through the addition of this gas to the atmosphere.

5.5.3 The GWP of a given gas describes its effect on climate change relative to a similar amount of carbon dioxide and is divided into a three-part "time horizon" of twenty, one hundred, and five hundred years. As the base unit, the carbon dioxide numeric is 1.0 across each time horizon. This allows greenhouse gases regulated under the Kyoto Protocol to be converted to the common unit in terms of the "environmental harm" they impose. We measure CO<sub>2</sub>e in kilo tonnes (ktCO<sub>2</sub>e).

### 5.5.4 Interpretation/Caveats: CO<sub>2</sub>-equivalent Emissions

- The measure CO<sub>2</sub>e seems widely accepted in the literature and not really controversial. The advantage is that it takes the focus away from "only CO<sub>2</sub>" and points to the fact that there are other greenhouse gases that cause global warming. Moreover, in cost-benefit or cost-effectiveness analysis, only CO<sub>2</sub>e of the entire basket of greenhouse gases allows to identify the correct abatement costs and benefits from climate change mitigation. Particularly in the agricultural sector, many other greenhouse gases, apart from CO<sub>2</sub>, contribute to the increase of the greenhouse gas concentration in the atmosphere.

5.5.5 The methodology used to apportion GHG emissions in Devon is explained elsewhere in the technical annex, but the major assumption is that the carbon intensities for each sector are the same in Devon as for the UK. In order to calculate the projections for Devon, the percentage of emissions within a broad sector for Devon as a fraction of the UK has been applied to each policy in the LCTP, and then applied to a projected baseline emission for Devon, which assumes the same growth as national growth trends. This is a crude but unfortunately necessary simplification in the absence of better local data. The economic projections used for Devon by Oxford Economics (2010) assume a similar growth projection rate to that used in the LCTP.

5.5.6 As a result of this, the average annual percentage changes within the Manufacturing (including all sub-sectors), Agriculture, Construction, Energy and Extraction are the same across the UK and Devon, due to the assumption that the impact of LCTP policies are the same for Devon than for the UK. The only deviation from this is the average annual percentage changes between the UK and Devon for the Services sector, which results from the different relative concentrations of public and private service sub-sectors between Devon and the UK. This difference also results in a slight deviation between the average annual % changes between the UK and Devon as a whole.

5.5.7 A caveat of the construction sector is that it produces “artificially” low levels of CO<sub>2</sub>e. This is due to the fact that all of the emissions in the projections are only direct emissions produced by the sectors themselves, and do not include indirect emissions such as materials produced in other sectors for the construction sector. This results in a downward bias towards the construction sector and an upward bias on the industries that produce materials for the construction sector. For consistency, we have decided only to examine direct emissions, as we would only be able to apportion indirect emissions to the construction sector. For a full analysis of including indirect emissions, we would need to apportion indirect emissions to the other sectors as well. The effect of indirect emissions on the Construction sector is commented on separately to the main analysis here.

#### 5.5.8 Analysis

- Out of all the carbon emitters which we consider in this study (which is only a fraction of all emitters as explained in section 3 of this report), the Agriculture, Manufacturing, and Services sectors account for nearly 95% of CO<sub>2</sub>e emissions in Devon, and nearly 96% in the UK. This is true on average over the entire period 2008-2022 (Table T39), but also at various points in time (Figures 5 a, b, c, and 6 a, b, c).

- 5.5.9 In Devon, the Agriculture sector accounts for an average concentration of nearly 38%, followed by the Manufacturing sector with about 29% and the Services sector with about 27% (Table T39).<sup>12</sup> For the Manufacturing and Services sectors this is not surprising given their large share of GVA in the Devon economy (Table T15). This is different for the Agriculture sector given that this sector accounts for only 2% GVA on average in Devon in 2008-2022. Also, in the UK, the Agriculture sector shows a high average share of emissions, given the small contribution to GVA (Table T15 and T39). The LCTP projections for the UK and Devon imply that emissions decrease less on average in the Agriculture sector and substantially more in the Services sector (Table T40). The large share of CO<sub>2</sub>e emissions in the Agriculture sector in Devon suggests that environmental policy has to give some attention to this sector.
- 5.5.10 The Construction sector contributes very little to CO<sub>2</sub>e emissions in Devon and the UK, particularly when compared against GVA data (Table T39 and T15). However, as pointed out above indirect emissions of this sector are not captured, and therefore the contribution of this sector to overall emissions is substantially underestimated. Emissions from direct activity in the construction activity make up only 16% of emissions compared to if indirect emissions are considered. If indirect emissions are considered, construction would be equivalent to 5.8% of GHG emissions of the non-domestic (excluding waste) sector in Devon.
- 5.5.11 Given our methodology of linking LCTP projections for the UK to Devon, it is not surprising that average annual percentage changes are the same for Devon and the UK. The only difference relates to the Services sector, which therefore leads to slight differences between the Devon and the UK averages (Table T40). The reason is the different composition of the Services sector in the UK and Devon. More specifically, within the Services sector, the public services sub-sectors (Health, Education, Public administration & defence and Other personal services) account for an average CO<sub>2</sub>e-concentration of 25.49%, whereas in the UK they account for 30.08% (Table T43). Accordingly, the private services sub-sectors are just under 75% in Devon and 70% in the UK. Since the estimated average annual percentage emission reductions in the private services sub-sectors is 3.48% compared to 2.89% in the public sector (for 2008-2022 – Tables T41 and T42), Services sector emissions are expected to decline slightly more annually in Devon than in the UK (Table T40). However, the expected difference is rather modest.

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<sup>12</sup> The high greenhouse gas emissions for the Agriculture sector are due to non-CO<sub>2</sub> greenhouse gases mainly, which have a far higher greenhouse gas warming potential than carbon dioxide. For example, in 2007 CO<sub>2</sub> - emissions for Services are four times greater than for Agriculture.

5.5.12 Given the high average concentrations of emissions in the Agriculture and Manufacturing sectors in the UK and Devon (Table T39), and their projected lower average annual emission reduction compared to the average of the two economies at the aggregate (Table T40), it is not surprising that the concentration of emissions in these two sectors increase over time, as it is evident from Figures 5, a, b, c and 6, a, b, c. By the same token, the very high projected average annual emission reduction in the Services sector in the UK and Devon compared to the respective averages in these economies (Table T40) explains why the concentration of CO<sub>2</sub>e emissions in the Services sector declines over time, as shown in Figures 5, a, b, c and 6, a, b, c. In the Extraction, Energy and Construction sectors, concentrations remain more or less the same over time, but are at any rate very small (Figures 5, a, b, c and 6, a, b, c).

5.5.13 If we look at the period 2013-2022, accounting for the recession period 2008-2012, we see that there are higher average annual percentage declines in CO<sub>2</sub>e emissions in the Services and Agriculture sectors in Devon and the UK, whereas declines in CO<sub>2</sub>e emissions tail off slightly in the Manufacturing, Energy, Extraction and Construction sectors, decreasing from an average of -1.87% p.a. to -1.27% p.a. (Table T40). This is probably due to the fact that the production industries suffered most from the recession, which produced a kind of artificial decline in CO<sub>2</sub>e emissions. In contrast, it may be expected that due to the rather low inelasticity of demand for agricultural products, the recession had relatively less of an impact on agricultural production.

5.5.14 Overall, the LCTP projections appear to be rather ambitious as they amount to an overall emission reduction of 24.6% in the UK and 23% in Devon over the period 2008-2022.

5.5.15 Within the Services sector, the sub-sectors Distribution & retail, and Hotels & restaurants account for just over 65% of the CO<sub>2</sub>e emissions within Services in Devon (Table T43). In comparison, these sub-sectors, although also the two largest producers of CO<sub>2</sub>e in the UK Services sector, only account for 55% of the Services sector in the UK. In Devon, the Financial intermediation sub-sector is the smallest producer of CO<sub>2</sub>e emissions, accounting for only 0.81% of the Devon Services sector. Within the UK Services sector, the Financial intermediation sub-sector accounts for 7.45% of the Services sector. This is not really surprising, given that this sector plays a very small role for the Devon economy in terms of GVA, but a much bigger role for the UK economy (Table T19).

5.5.16 From Table T39 it became evident that the Manufacturing sector in the UK has twice the carbon concentration as within the Devon economy. Within the Manufacturing sector there are also many differences among the sub-sectors when comparing the relative concentrations between Devon and the UK (Table T46). One key difference is the CO<sub>2</sub>e emissions produced by Coke, oil refining and nuclear fuel, which account for just over 18% of the concentration within the UK Manufacturing sector, whereas this sub-sector does not exist in Devon. Within the Devon Manufacturing sector there is a strong concentration of CO<sub>2</sub>e emissions in five sub-sectors: Non-metal products (17.27%); Metals (15.31%); Food, drinks and tobacco (14.00%); Pulp, paper & printing (10.39%) and Other Manufacturing (9.70) sub-sectors.

5.5.17 In comparison, in the UK Manufacturing sector, there is a strong concentration of CO<sub>2</sub>e emissions in four sub-sectors, only two of which match the sub-sectors with strong concentrations in the Devon Manufacturing sector. These are: Coke, oil refining & nuclear fuel (18.05%), Chemicals & man-made fibres (16.02%), Non-metal products (14.51%), and Food, drinks, and tobacco (10.06%) (see Table T46).

#### 5.5.18 Summary

- Among the six sectors, which we consider in our economic-carbon analysis, 95% of CO<sub>2</sub>e-emissions in Devon are due to three sectors: Agriculture, Manufacturing and Services. Emissions in all sectors are expected to decrease due to the policies of LCTP. The average annual decrease of emissions across all sectors in Devon is 1.8 % in 2008-2022 (2% in the UK) and amounts to a total decrease of emissions of 23% (24.6% in the UK) over this period. Should this predicted decrease of emissions come about, this would have to be judged as major ecological achievement (in particular in the light that the economy in Devon and the UK keeps growing). The most significant average annual percentage decline of emissions will occur in the Services Sector (3.3% in 2008-2022 in Devon and the UK) and the smallest in the Agriculture sector (0.8% in 2008-2022 in Devon and the UK). In Devon within the Services sector, the sub-sectors Distribution & retail, and Hotels & restaurants are the biggest polluters. Within the Manufacturing sector the five major polluters are: Non-metal products, Metals, Food, drinks and tobacco, Pulp, paper & printing and Other Manufacturing.

## 5.6 Carbon Productivity

5.6.1 In this section, we relate economic performance to carbon emissions in order to understand better what a “balanced green economy” can mean.

### 5.6.2 Definition: Carbon Productivity

- Carbon productivity is the amount of goods and services that can be produced with one unit of CO<sub>2</sub>e released in the production process. We define it as the ratio of output, measured as GVA, to input, measured as CO<sub>2</sub>e, i.e.  $GVA/CO_2e$ . Since GVA is measured in millions of pounds in 2005 prices and CO<sub>2</sub>e is measured in ktCO<sub>2</sub>e, carbon productivity is measured in thousands of pounds per tonne CO<sub>2</sub>e (t CO<sub>2</sub>e ).

### 5.6.3 Interpretation/Caveats: Carbon Productivity

- Carbon productivity puts economic output in relation to carbon emissions and is therefore a measure of the “greenness of production”. High emissions in a sector are not bad per se, though certainly damaging overall, as long as they produce high output. Similarly, low emissions in a sector are not necessarily good, if they produce little output. Carbon productivity is therefore one possibility to capture the notion of a “balanced green economy”. On the one hand, there has to be economic production and consumption. On the other hand, this should not impact too severely on the environment. Hence, in a balanced green economy, economic growth should go along with an increasing carbon productivity. In fact, ideally, an increasing carbon productivity should come simultaneously from a higher GVA and lower total emissions and not from only one of these sources.

5.6.4 Since CO<sub>2</sub>e emissions is an input in the computations of carbon productivity, and as has been pointed out above, due to data limitations, the percentage decline of emissions resulting from the LCTP are assumed to be more or less the same for the UK and Devon across sectors. Differences in carbon productivity between the UK and Devon mainly stem from differences in the development of GVA (and not from the development of CO<sub>2</sub>e emissions) in the UK and Devon and initial differences in carbon productivity between the UK and Devon in the starting year of our analysis in 2007. In other words, initial carbon productivity differences in the UK and Devon are more or less preserved over time, as long as there are no dramatic differences in GVA development in a particular sector. This is a shortcoming of the methodology that has been adopted in this analysis, which has been necessary due to a lack of robust data sources.

#### 5.6.5 Analysis

- There are remarkable differences between the UK and Devon in carbon productivity in the six major sectors we are considering in our analysis (Table T48). In the Services sector the UK has a slight advantage over Devon; in all other sectors this is reversed. One may recall that this was different for labour productivity.

5.6.6 If we leave the Construction sector aside, due to the underestimation of emissions in this sector as mentioned above, which causes an “artificially” high carbon productivity, then only the Services sector is above the average carbon productivity in the UK and Devon (Table T48). The Energy sector is close to the average and would probably be above the average if we excluded the Construction sector. Certainly problematic from an environmental-economic point of view are the sectors Manufacturing, Extraction and Agriculture. Extraction is less worrying, as this is in any case a declining sector and accounts for a small percentage of GVA and Employment in the UK and Devon as previously indicated. (Tables T3, T4, T15 and T16).

- 5.6.7 The positive picture of the sectors Services and Energy in Devon and the UK is reinforced when considering the improvement of carbon productivity over time, as indicated in Table T49. The Services sector in particular is expected to see large carbon productivity increases (average annual improvement is around 5.7% in the period 2008-2022 in Devon and the UK). However, the negative picture of the Agriculture sector is also confirmed because not only is the absolute carbon productivity low (Table T48), but its rate of improvement over time with about 0.4% on average per annum in the period 2008-2002 is also rather small (Table T49). For the Agriculture sector, carbon productivity is low because of very high emissions in this sector, as discussed above (Table T39), and the relatively small contribution that Agriculture GVA makes to the economy, in the UK but also in Devon (Table T15). Moreover, GVA increases only modestly in this sector over time (Table T16). The Manufacturing sector as a whole is placed in between these extremes.
- 5.6.8 When comparing the changes of carbon productivity for given sectors between the UK and Devon, not too much emphasis should be given to differences which are relatively small (Table T49). As mentioned under “Interpretation/Caveats” above, initial absolute differences in carbon productivity between the UK and Devon are more or less preserved over time as the impact of LCTP’s policies on emissions in Devon have been assumed to be more or less the same on the UK. Moreover, we also found that GVA growth is not much different between the UK and Devon. A greater insight can be obtained from comparing differences across sectors within the UK or Devon. As already pointed out above, the average percentage changes p.a. of carbon productivity in the Services sector are well above the average in the UK and Devon and those in the Agriculture sector in the UK and Devon are well below the average in these economies. A negative development of carbon productivity is expected for the Extraction sector both in the UK and Devon (Table T49). This is certainly worrying, though this sector is small in terms of GVA and Employment and a declining sector anyway (Table T3, T4, T15 and T16).

- 5.6.9 Except for the Agriculture and the Extraction sectors, average annual carbon productivity increases are well above 2.5 % in 2008-2022, and this is also true for 2013-2022, both in Devon and the UK. In most sectors, this is due to a simultaneous growth of GVA and decrease of emissions over time. For most sectors, the average annual carbon productivity growth in 2013-2022 is larger than in 2008-2012, both in the UK and Devon. Given that the annual GVA growth is higher in the former than in the latter period suggests that growth and emissions are not necessarily positively correlated as this has been commonly believed in the past and sometimes empirically been confirmed. In other words, if the policies of the LCTP work as projected, then we will see economic growth with declining emissions at the same time. This is an important observation which relates immediately to the notion of a “balanced green economy”.
- 5.6.10 A closer look at the Services sector within Devon and the UK reveals huge differences across sub-sectors in terms of average carbon productivity (Table T51) and the average annual growth of carbon productivity (Table T52). Taking the average of the Services sector as a benchmark (Table T48), the following five sub-sectors’ average carbon productivities are well above the Devon average (Table T51): Business services, Financial intermediation, Transport & communications, Health and Public administration & defence in Devon. In the UK, the following five sub-sectors’ average carbon productivities are well above the average of the Services sector as a whole: Business services, Financial intermediation, Transport & communications, Education and Other Personal services. Well below average are the sub-sectors Distribution & retail and Hotels & restaurants, both in the UK and Devon. Interestingly, however, these last two sub-sectors show very high average annual growth rates in carbon productivity (Table T52).
- 5.6.11 Business services, Financial intermediation and Transport & communications in the UK and Devon show very high average annual growth rates of carbon productivity (Table T52). However, the improvements in the other sub-sectors within the Services sector are also quite remarkable and well above the respective averages in the UK and Devon economy (Table T49 and T52).

- 5.6.12 Comparing the average carbon productivity for a given sub-sector within the Services sector between the UK and Devon, there are some remarkable differences. The average carbon productivities in the sub-sectors Business Services, Education, Other Personal Services and Transport & communications are substantially higher in the UK than in Devon. For the sub-sectors Financial intermediation, Health and Public administration & defence, these pronounced differences are reversed.
- 5.6.13 In the UK and in Devon, within the Manufacturing sector the average carbon productivities of almost all sub-sectors are much lower than the averages in these economies (Table T54 and T48). In Devon, only Machinery and equipment is above the Devon overall average and in the UK no sub-sector in the Manufacturing sector is above the UK average. Many sub-sectors in the UK and Devon have an average carbon productivity below £1000 per tonne CO<sub>2</sub>e, which is low by any standards. Given these very low carbon productivities, not much comfort can be taken from the fact that the average annual growth rates of carbon productivity in most sub-sectors is above 2 % in the UK and Devon (Table T55).
- 5.6.14 Combining the insights that can be derived from Table T54 and T53, the most problematic sub-sectors in Devon are Wood products, Pulp, paper & printing and Textiles. In the UK, this applies to Non-metal products, Food, drinks & tobacco and Pulp, paper & printing. This is because in these sub-sectors not only is the average carbon productivity relatively low, but also average annual improvements are low, and in some cases even negative (Textiles in Devon and Pulp, paper & printing in the UK). This pessimistic conclusion is only balanced by the fact that these sub-sectors do not have much importance in these economies in terms of employment and GVA. (Tables T11 and T23).

### 5.6.15 Summary

- Carbon productivity appears to be a good indicator in gaining insight into what a “balanced green economy” can mean. It appears to us that this conclusion remains valid, despite we are only able to capture direct and not indirect emissions in our analysis. The projected LCTP policies imply that carbon productivity in the UK and Devon as a whole improve on average by 3.7% annually in the period 2008-2022. A particular high improvement is expected in the Services sector with an average annual improvement of 5.7%, but a particular low improvement is expected in the Agriculture sector with an average annual improvement of 0.4%. In terms of absolute values of carbon productivity, Services and Energy are doing quite well; challenging sectors are Manufacturing, Extraction and Agriculture with a low carbon productivity. In Devon within the sector Services, the following sub-sectors perform particularly well: Business services, Financial intermediation, Transport & communications, Health and Public administration & defence. Problematic sub-sectors in Devon but also in the UK are Distribution & retail and Hotels & restaurants. The average carbon productivities in the sub-sectors Business Services, Education, Other Personal Services and Transport & communications are substantially higher in the UK than in Devon. For the sub-sectors Financial intermediation, Health and Public administration & defence, these pronounced differences are reversed. The most problematic sub-sectors within the Manufacturing sector in Devon are Wood products, Pulp, paper & printing and Textiles but these sub-sectors are of minor importance in terms of employment and GVA for the Devon economy.

## 5.7 Labour Carbon Intensity

5.7.1 In this section, we look at a second indicator that helps us to relate economic performance to carbon emissions.

### 5.7.2 Definition Labour Carbon Intensity

- Labour carbon intensity is the amount of CO<sub>2</sub>e emissions released per unit of employment. We define it as the ratio of CO<sub>2</sub>e emissions to employment, i.e. CO<sub>2</sub>e/Employment. Since we measure CO<sub>2</sub>e in kilo tonnes and Employment in thousands of workers, labour carbon intensity is measured in tonnes CO<sub>2</sub>e per worker.

### 5.7.3 Interpretation/Caveats: Labour Carbon Intensity

- Labour carbon intensity is an alternative indicator to carbon productivity in order to capture the notion of a “balanced green economy”. Ideally, we are looking for a low labour carbon intensity of a sector or an economy. However, we have to be cautious with any conclusions drawn because of the caveats mentioned under Employment, which does not distinguish between full and part-time.

5.7.4 Again since CO<sub>2</sub>e emissions is an input in the computations of labour carbon productivity, similar caveats apply as has been mentioned for carbon productivity.

### 5.7.5 Analysis

- As with carbon productivity, within Devon and the UK there are large differences across sectors in labour carbon intensities (Table T57). Compared to the average performance in these economies, the Services sector performs well above the average (again, leaving aside Construction), whereas all other sectors perform well below the average, both in the UK and in Devon. Again, Agriculture is at the bottom end of the ranking. This is remarkable because employment in this sector is relatively high compared to its contribution to GVA. Obviously, the Agriculture sector’s contribution to CO<sub>2</sub>e emissions is even higher. Again, the sector is challenging for a balanced green economy due to emissions from other greenhouse gases than CO<sub>2</sub>, e.g. methane from livestock, or nitrates from fertilizers.

- 5.7.6 However, the sectors Manufacturing, Energy and Extraction also show relatively high labour carbon intensity, both in the UK and Devon (Table T57). Moreover, these sectors, as well as the Agriculture sector, show an average annual increase in labour carbon intensity, with the exception of the Energy sector in Devon, though the average percentage decrease in the Energy sector is very small (Table T58). This is certainly challenging for a balanced green economy. At first one might think that employment and emissions are somehow positively correlated, meaning there is trade-off between economic development and environmental concern. A closer look, however, reveals that in all these problematic sectors, the increase in labour carbon intensity is due to the fact that employment decreases faster than emissions. In a decreasing sector (in terms of employment), this is less worrying from an environmental point of view, though in terms of the labour market this a non-trivial development, as has been argued above in the section “Employment”. Moreover, and most importantly, the Services sector shows an increase in employment, but at the same time a decrease in emissions. The development of the economy and the environment go in the right direction simultaneously, implying, as with GVA, that it is possible to disentangle economic development from environmental destruction. This shows up in a decrease in the labour carbon intensity in the Services sector.
- 5.7.7 Despite having to be cautious of comparing labour carbon intensity for particular sectors between Devon and the UK, Devon is doing much better than the UK, according to this index, in the sectors Manufacturing, Energy and Agriculture. This is only reversed for Extraction (Table T57).
- 5.7.8 A closer look within the Services sector reveals that the average labour carbon intensity in each sub-sector is below the overall average in the Devon and UK economy (Table 57 and T60). Compared to the average labour carbon intensity in the Services sector in Devon and the UK, Distribution & retail and Hotels & restaurants are worse than the respective averages. In the UK, the sub-sectors Public administration & defence and Financial intermediation are also worse than the UK average (Table T57 and T60). Comparing Devon with the UK, there are large differences in the sub-sectors Health, Financial intermediation and Education, where in the first two of these sub-sectors the performance in Devon is much better, whereas in the last sub-sector this is reversed.

5.7.9 Throughout all sub-sectors in the Services sector, the labour carbon intensity falls over time (Table T61). The average annual decrease in the UK and in Devon is well above the average in the respective economies (Table T57 and T61). The opposite is true for the sub-sectors in the Manufacturing sector (Table T64). Only the sub-sectors Other manufacturing and Wood products show a decline in labour carbon intensity in the UK and Devon; the sub-sector Textiles shows a quite dramatic increase in labour carbon intensity, though the importance of this sub-sector for the Devon economy, as well the UK economy, is in any case very small.

5.7.10 In terms of the average labour carbon intensity, the sub-sector Coke, oil refining & nuclear fuel, which we find only in the UK economy and not in Devon, appears to be a remarkable outlier, with 1343 tonnes CO<sub>2</sub>e per worker. Chemicals & man-made fibres and non-metal products are also exceptionally high in the UK. One explanation as to why these sub-sectors have such a high labour carbon intensity is due to the fact that these sub-sectors are relatively capital and very emission intensive. As such, these sub-sectors would be expected to employ fewer workers, explaining why the labour carbon intensity is so high. As with the overall average labour carbon intensity in the Manufacturing sector in the UK and Devon, the average labour carbon intensity of each individual sub-sector is much lower in Devon than in the UK.

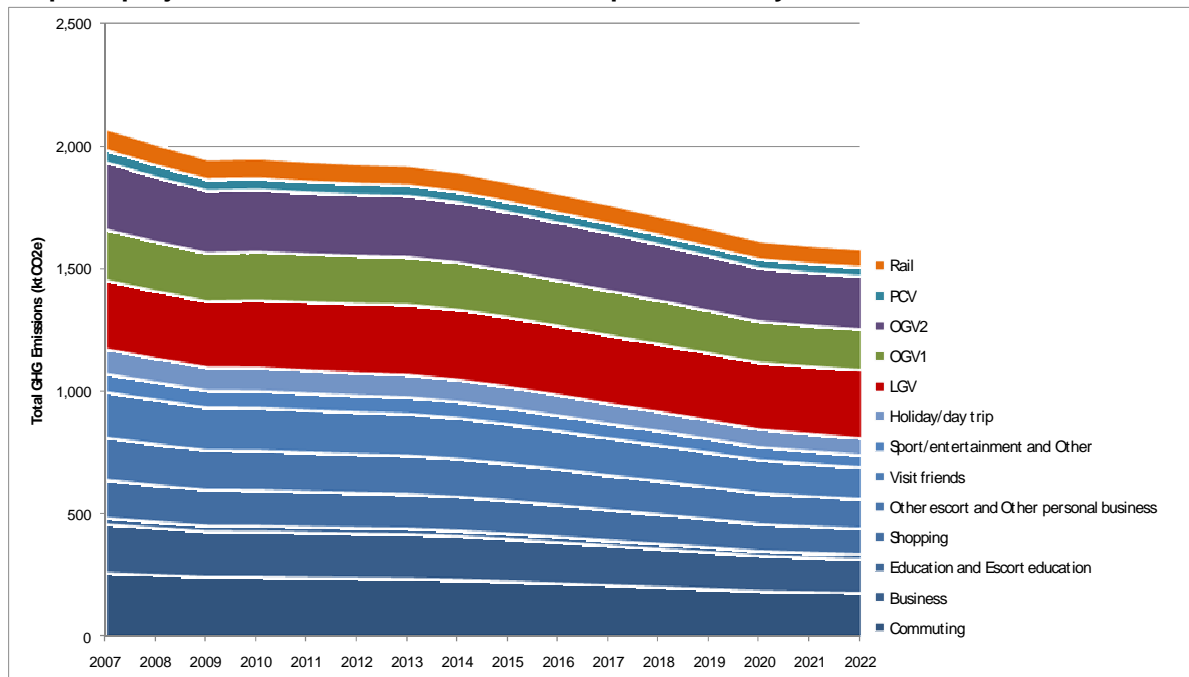
#### 5.7.11 Summary

- Labour carbon intensity appears to be an additional and/or alternative indicator to operationalise what a “balanced green economy” can mean. Also with this indicator, Construction and Services perform above the average of the economy as a whole in Devon and the UK, whereas Manufacturing, Energy, Agriculture and Extraction perform below the average. Manufacturing, Agriculture and Extraction also show no decrease but an increase of labour carbon intensity in the period 2008-2022, both in the UK and Devon. In contrast, the average annual percentage improvement in the Services sector is remarkably high and is around 4% in Devon and the UK. The labour carbon intensity in Devon is lower in most sectors than in the UK, except for the sector Extraction. In the Services sub-sectors, Distribution & retail and Hotels & restaurants have a relatively high labour carbon intensity compared to the average of the Services sector as a whole.

## 5.8 Changes to Transport Emissions

**5.8.1** Projections were made for transport emissions, with the method described in the technical annex. The projections for GHG emissions from the transport sector show that overall there is a 24% reduction in transport emissions from 2007-2022 due to the impact of the LCTP in spite of a projected growth in traffic. Emissions from car and passenger carrying vehicles (PCV) will reduce by just over 30% each, heavy goods vehicles (OGV1 and OGV2) by about 20% each, and train by 14%. The reduction in emissions from light good vehicles (LGV) will be only 1% due to a projected 44% growth in traffic over the period. The split of emissions by travel mode is broadly similar in 2022 as in 2007, with the exception that car travel accounts for 50% (down from 57%) and LGV emissions account for 18% (up from 13.5%). A breakdown is shown in the graph below.

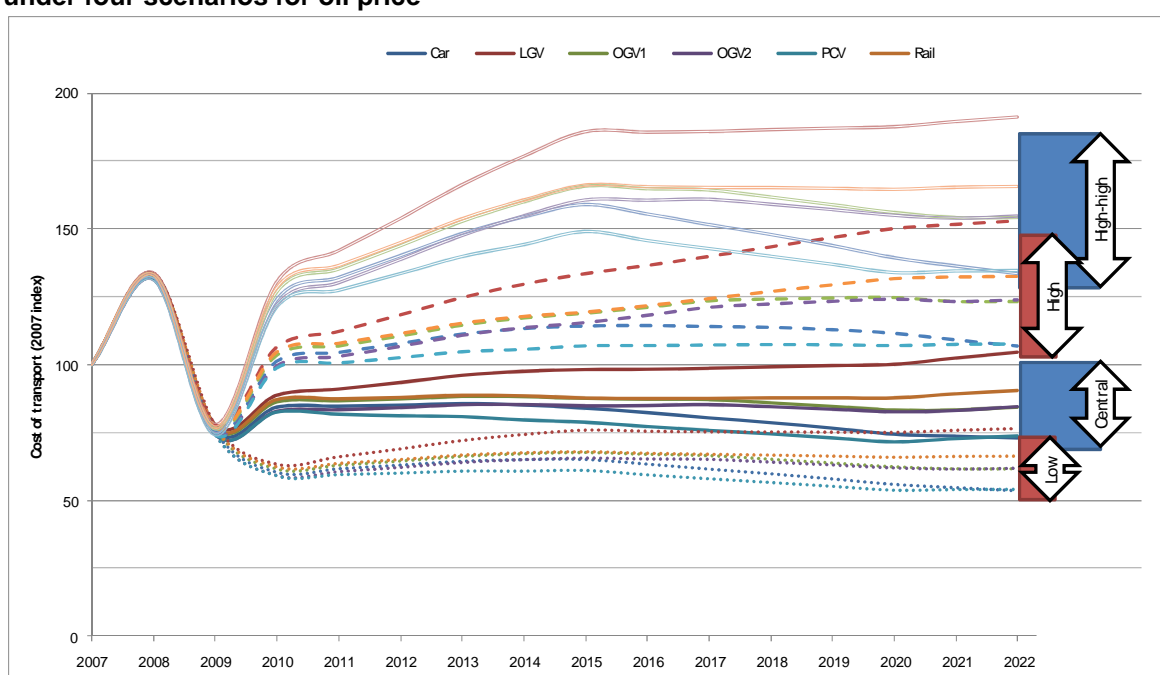
**Graph of projected GHG emissions for the transport sector by mode**



**5.8.2** Although emission in the transport sector will have fallen by 2022, the rate of emissions reductions for other sectors of the economy are greater, meaning that proportionally transport emissions will account for a relatively more significant proportion of emissions due to economic activity in Devon. For example, where in 2007 emissions from goods vehicles, and car journeys for business and commuting purposes represented an additional notional 63% increase in emissions to the industry and services sectors, in 2022 it will represent an additional 74%.

**5.8.3** Despite projected reductions in GHG emissions resulting from LCTP policies, the cost to the economy of transport may still increase. Under a central oil price scenario, the operational cost<sup>13</sup> of transport will reduce by over a quarter from the total of all journeys made by car, and by 15-16% for heavy goods transport. The cost of all LGV transport will increase by 5%. However, under a high oil price scenario the cost of transport due to cars will increase by 7%, 23-24% for heavy goods vehicles, and 53% for LGVs. Under the highest price oil scenario (oil costing \$200 a barrel in 2022) the increase in cost for all journeys made by car 33%, 55% for heavy goods, and 91% due to LGVs. This is shown in the graph below.

**Graph of projected overall change in cost relative to a 2007 base by transport mode under four scenarios for oil price**



## 5.9 Summary

**5.9.1** Objective 2 required sectors that will be important in a balanced low carbon economy to be identified. Through the use of projections for Devon's economy and GHG emissions, together with environmental indicators, this section has assessed the carbon performance of Devon's economy including sub-sectors up to 2022, compared to national projections.

<sup>13</sup> Cost refers to fuel only, and excludes capital expenditure and maintenance

- 5.9.2 It is evident that the Services sector as a whole ranks very high in terms of all our six variables which we use to measure the economic and environmental performance in the UK and in Devon. In terms of employment it is the only growth sector; in terms of GVA it is a sector which exceptional growth, labour productivity is at least moderate and certainly not at the lower end, carbon emissions are expected to decrease much faster than in other sectors and hence in terms of absolute carbon productivity and labour carbon intensity as well as in terms of the rate of improvement, the Services sector outperforms all other sectors. The above average growth in employment and in GVA compared to other sectors, however, means that the concentration of this sector in the Devon and UK economy in terms of employment and GVA increases over time with an average concentration of around 80%. This implies an increasing dependency of the UK and Devon economy on this sector which may be seen critically.
- 5.9.3 The Manufacturing sector is the second most important sector in the UK and Devon in terms of GVA and the third (second) most important in terms of employment in Devon (the UK). Compared to the Services sector, however, this sector is rather small. In terms of GVA the average concentration is around 11% and in terms of employment it is around 7% in Devon. Employment is expected to decrease quite substantially in this sector in the future, though GVA is expected to increase modestly. The labour productivity is above the average in the Devon and UK economy. In terms of carbon productivity and labour carbon intensity the Manufacturing sector's performance is below the average compared to the economy as a whole in the UK and Devon. However, carbon productivity of this sector is expected to improve quite substantially through the policies of LCTP in the future, though labour carbon intensity is deteriorating.
- 5.9.4 The Construction Sector is the second most important sector for the Devon Economy in terms of employment and the third most important in terms of GVA. After the recession this sector is expected to grow slightly in terms of employment in Devon and the UK and is also expected to grow in terms of GVA. The labour productivity is below the average in the Devon and UK economy. As we only captured direct emissions from each sector in our analysis but indirect emissions play an important role for Construction, this sector performs exceptional good in terms of carbon productivity and labour carbon intensity in our analysis.

- 5.9.5 The Energy sector will see a decrease in employment, though an increase in terms of GVA. The importance for employment and GVA for the Devon economy is, however, very small. Labour productivity of this sector is very high, though this sector performs below average in terms of carbon productivity and labour carbon intensity.
- 5.9.6 The Agriculture sector, though small, has a much higher importance for the Devon than for the UK economy in terms of employment and GVA. It is expected that the importance of this sector will decrease over time as this is a declining sector. The Agriculture sector is a challenging sector as CO<sub>2</sub>e-emissions are quite high in absolute terms, but also carbon productivity is very low and labour carbon intensity is very high. Not much improvement from the policies of the LCTP can be expected according to our computations.
- 5.9.7 Roughly speaking, measuring economic competitiveness by labour productivity, Devon appears to be below the UK average in each sector, except for the sector Extraction which plays only a minor role for the Devon and the UK economy. This relative disadvantage is not expected to change much in the future according to our computations based on Oxford Economics (2010) data. In contrast, measuring environmental-economic competitiveness by carbon productivity or labour carbon intensity, it appears that Devon has an advantage over the UK average in each sector, except for the Services sector, though the difference in this sector is small.

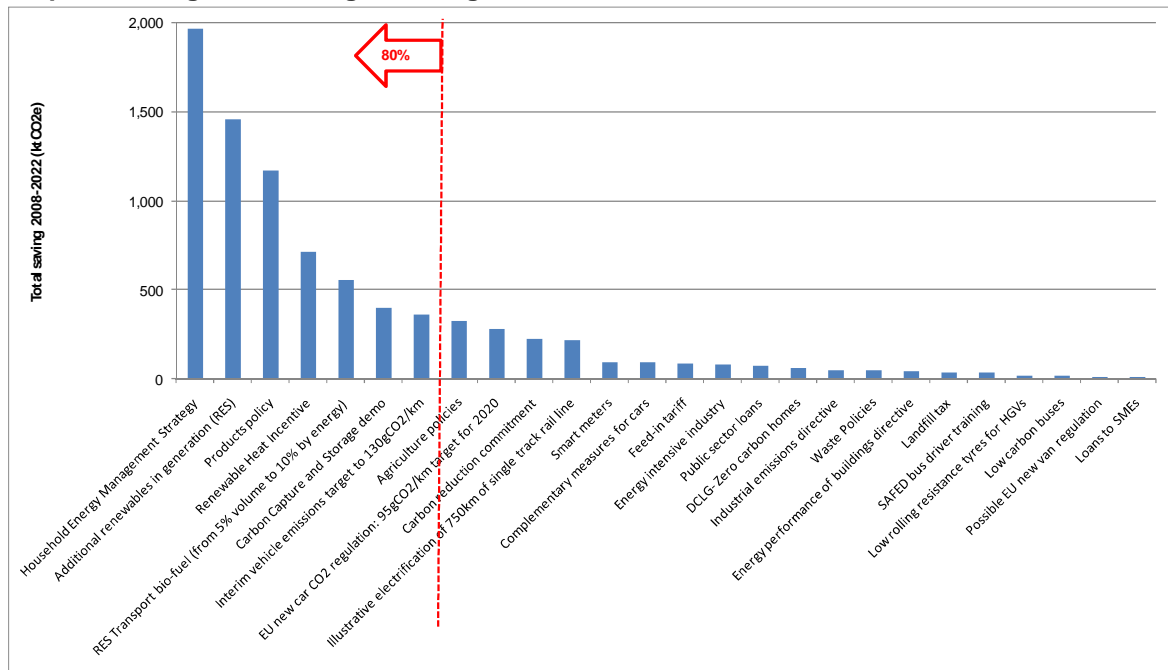
- 5.9.8 We used three indicators in order to analyse the economic and ecological performance of the Devon and the UK economy. Labour productivity is frequently used to measure economic competitiveness. Carbon productivity and labour carbon intensity have been proposed in this study to capture the notion of a balanced green economy. Obviously, it is generally true (and maybe trivial to point out) that there cannot be such thing as an ideal universal indicator because a single indicator can never capture all aspects of a problem. However, had we the choice of using only one indicator to measure environmental-economic performance, we would prefer carbon productivity over labour carbon intensity. It will be important for the future to measure CO<sub>2</sub>e emissions not only directly but also indirectly for each sector and sub-sector, i.e. computing the net release of emissions through the production and the consumption of goods, including imports and exports. This could give probably a more comprehensive picture of carbon emissions in individual sectors and sub-sectors. Based on such an accounting of emissions, carbon productivity will be an indicator that contains valuable information to identify which sectors and sub-sectors contribute to a balanced green economy. However, no doubt, this will require a much better emission data base than is currently available. Moreover, in order to be conceptually consistent, this would also require an adjustment in the way GVA is computed for the various sectors and sub-sectors. The reason is that currently GVA measures direct output of a sector, i.e. any input in the production of a sector is deducted. Hence, our current method of direct emissions and direct GVA is at least consistent for the computation of carbon productivity, though it may be argued that it is not as informative as one would wish.
- 5.9.9 It has previously been shown that 60% of all transport emissions are from goods vehicles, and car journeys for business use or commuting. Emissions from the transport sector will have fallen by 24% by 2022, although this reduction is lower than for the manufacturing and service sectors meaning that proportionally it will become a more significant emitter over time. Under a central oil price scenario, transport fuel costs would fall by 25% for car travel, 15-16% for heavy goods, and increase by 5% from light goods vehicles. Under the highest oil price scenario, fuel cost would increase by a third for cars, over a half for heavy goods vehicles, and almost double for light goods vehicles.

## 6 Specific Impact and Delivery of Policies within the Low Carbon Transition Plan

### 6.1 Impact of Policies in Devon

6.1.1 The specific savings resulting from each policy measure in the LCTP was estimated for Devon as described in the technical annex. The list of policies ranked by magnitude of GHG saved is shown in the graph below

**Graph of total greenhouse gas savings from LCTP measures in Devon from 2008-2022.**



- 6.1.2** The largest single measure is the household energy management strategy which will save almost 2,000 ktCO<sub>2</sub>e, or nearly 25% of all savings. Broadly speaking, the aim of this policy is to insulate every loft and cavity wall by 2015, install a smart meter in every home, provide “eco-upgrades” such as solid wall insulation and heat pumps to 7 million homes nationally, and increase the uptake of district heating<sup>14</sup>. The biggest impact this policy would have is due to the jobs created for the installation of the measures. This policy could increase the number of people working in the insulation and microgeneration sectors to almost 800 in Devon<sup>15</sup>. This would represent about 2.5% of all employment in Devon’s construction sector. In addition, there could be additional supply chain benefits for example insulating products and plasterboard or rendering products, though Devon has proportionally less of this activity within the county compared to the national average.
- 6.1.3** From initial estimates by the Energy Saving Trust, in the order of 400,000 energy efficiency and microgeneration measures would need to be installed in Devon’s 328,000 homes to reduce emissions by 29% between 2008 and 2020 (the UK Low Carbon Transition Plan target for housing). These measures would need to include cavity wall and loft insulation, solid wall insulation and other advanced energy efficiency measures, renewable heating, such as biomass and heat pumps, and microgeneration of electricity e.g. PV. In doing this work, 833 jobs would be sustained and over £500 million GVA generated over the period. Householders’ annual energy bills would collectively be reduced by over £50 million at 2009 prices. The Energy Saving Trust is able to produce more detailed evidence of the current state of the housing stock, opportunities for specific technologies in specific areas, and priorities for demand and supply side support to contribute to local and county wide analysis and strategy.

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<sup>14</sup> CLG and DECC, Warm Homes, Greener Homes: A Strategy for Household Energy Management, 2010

<sup>15</sup> Based on a pro-rata apportionment of 65,000 national jobs from Warm Homes Greener Homes (“there will be a core of up to 65,000 people employed in the new industry of energy efficiency, and potentially several times more down supply chains. Jobs will include installing energy saving measures and providing home energy advice”), and ONS population data for UK and Devon for 2009 i.e. 746,800 people in Devon divided by 61,398,200 people in UK multiplied by 65,000 jobs in UK equals 791 jobs in Devon.

- 6.1.4 The next largest reduction is due to additional renewable energy in the mix of national electricity generation. The local authority will need to play an important planning and coordination role regarding onshore wind farms, and infrastructure to offshore wind farms, for example the proposed Atlantic Array off the coast of North Devon. In addition, the South West was named the first Low Carbon Development Area in the UK, with a specialism in marine energy. This will build upon the Wave Hub project in Hayle, Cornwall. There may be opportunities for the port towns in North Devon to provide support, and also for manufacturing firms to supply components to this growth sector. Care would need to be taken that these interventions do not adversely affect other industries, such as fishing or tourism. Carbon capture and storage (CCS) to coal fired power stations is the sixth largest measure accounting for almost 5% of savings, though it is unlikely that there will be any direct economic benefit to Devon, as the technology will be applied elsewhere in the country (there are no coal power stations in the whole of the South West, and indeed Yorkshire and Humberside has been designated a Low Carbon Economic Area with a specialism in CCS).
- 6.1.5 The third largest measure is “product policy” which relates to the improved energy efficiency of appliances, mainly for use in homes and businesses. These savings are likely to arise through the natural replacement of equipment and therefore it should not be necessarily assumed that it will result in increased production from the manufacturing sector (and in any case, the manufacture of these items will likely not be from within the UK) or sales by the retail sector. Nonetheless, Devon does have higher concentration of economic activity in the manufacture of domestic appliances and electronic components compared to the national mix, and so these sectors should be focussing on improved energy efficiency as a growth area.

6.1.6 Of the “renewable energy cashback” mechanisms, the proposed Renewable Heat Incentive (RHI) will result in far greater savings (over eight times more) than the Feed-In Tariff (FIT). Devon has taken an active role in promoting and supporting renewable energy, through initiatives such as RE4D<sup>16</sup>. Any installations will need to be of MCS accredited products by MCS accredited installers. There are up to 34 businesses registered in Devon who are able to install renewable heat technologies, and 18 who can install electricity producing renewable technologies<sup>17</sup>. There may be scope to increase the number of Devon based installers if the RHI is confirmed, as well as potential increases to support services such as consultancy and supply chains, for example food fuel, where Devon has a rich resource<sup>18</sup>. This resource could also be exploited to help deliver the policy of increasing the fraction of biofuel within the petrol mix to 10%, which will deliver almost 7% of savings in Devon.

6.1.7 There are several policies which relate to improving the efficiency of transport vehicles, for example the 2020 target for new vehicles of 95gCO<sub>2</sub>/km, and the interim target of 130gCO<sub>2</sub>/km, and other policies surrounding vehicle, tyre and bus technology. Together these account for over 9% of savings. The proportion of economic activity (measured in GVA or jobs) is almost 7 times greater for the national average compared to Devon, and there are two other regions with Low Carbon Economic Area status with specialisms in vehicles (the North East for electric cars and the Midlands for hydrogen technology). It would therefore seem unlikely that these policies will result in significant opportunities for Devon’s economy.

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<sup>16</sup> RE4D website <http://www.re4d.org/index.php> (accessed 13/8/10)

<sup>17</sup> From MCS website <http://www.microgenerationcertification.org/> (accessed 18/8/10) based on businesses registered in Devon, of which there are 10 heat pump, 5 biomass, 19 photovoltaic, 19 solar thermal, 2 wind and no hydro or micro-CHP. Actual total numbers of businesses may be lower as many of the businesses are registered to install more than one technology type

<sup>18</sup> CEE ID724 Analysis of current supply and demand for wood fuel in Devon, Rowson A and Hitchcock G, 2010

- 6.1.8 There are a series of policies aimed at the agricultural sector which will result in 3.8% of the reduction in GHG emissions. These include encouragement of more efficient use of fertiliser, better management of livestock and manure, advice and financial support to the sector, encouraging woodland creation, reduced landfilling and uptake of anaerobic digestion. The local authority is well placed to provide awareness raising, support of local initiatives such as demonstrators or accelerator programmes, policy uptake and waste management. For example, on-farm anaerobic digestion is currently not yet fully commercially viable<sup>19</sup>, but DCC could play a coordinating role to bring together nearby farms and link suitable sites to suppliers, as well as raising awareness.
- 6.1.9 Savings from the Carbon Reduction Commitment (CRC) are expected to deliver 2.6% of the savings, and projects arising from loans to the public sector (for example from the Salix fund) a further 1%. The savings will be delivered through a combination of better energy management and upgrading of old building fabric and services. There may therefore be some very minor opportunities for Devon based manufacturing firms to take advantage<sup>20</sup>. Greater benefit may accrue from installation of measures i.e. within the construction activity sector.

## 6.2 Non LCTP Policies

- 6.2.1 In addition to policy introduced by the Low Carbon Transition Plan, the baseline trajectory for emissions change in the UK assume existing policies already in place. In Devon these measures are projected to reduce emissions by about the same amount as policies within the LCTP<sup>21</sup>. A breakdown of these policies is shown in the graph below.

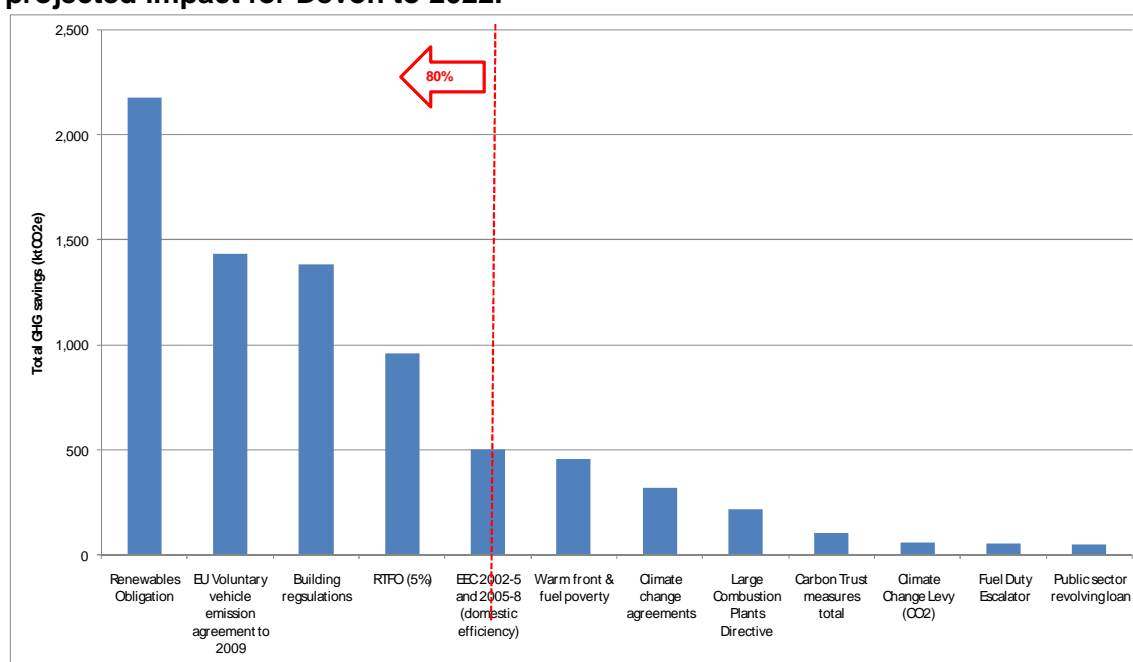
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<sup>19</sup> CEE Scientist's Report 128, The potential for on-site farm AD in Devon: A review of existing policy and literature, D Lash, 2010

<sup>20</sup> For example manufacture of non-domestic heating, cooling and ventilation equipment makes up 0.03% of Devon's GVA (approximately £4million), and manufacture of lights and lighting 0.01% (approximately £1million)

<sup>21</sup> 7,690 ktCO<sub>2</sub>e from existing policy compared to 7,727 ktCO<sub>2</sub>e for LCTP policy

**Graph showing existing (pre-LCTP) carbon reduction policies and their projected impact for Devon to 2022.**



**6.2.2** The largest of these policies (28%) is from the Renewables Obligation which results in increased renewable energy generation. Ongoing renewable energy targets have resulted in an acceleration of renewable installations in Devon. However, in 2008 the South West as a region was only 29% towards the 2010 target for renewable energy capacity, and 18% towards to 2020 target<sup>22</sup>. Whilst Devon is amongst the best performing counties in the South West, with the highest number of renewable projects and the leading county in terms of electricity generation from hydro, landfill gas and advanced treatment of waste, and heat from biomass, it lags a long way behind Cornwall, which generates almost twice as much renewable energy as Devon. Cornwall's stronger performance is mainly due to the amount of electricity generated from wind turbines, which exceed the total renewable energy generated by any other individual county in the South West. This is shown in the two tables below.

<sup>22</sup> CLG 2009 Renewable Energy Capacity in Regional Spatial Strategies Final Report

### Renewable electricity capacity installed by type 2008 (GWh)

	<i>Number of projects</i>	<i>Wind</i>	<i>Hydro</i>	<i>Landfill Gas</i>	<i>Sewage Gas</i>	<i>Advance treatment of waste</i>	<i>Combined heat and power</i>	<i>Solar PV</i>	<i>Total</i>
Cornwall and Isles of Scilly	100	43.34	1.73	11.48	0.40	0.14	0.00	0.21	<b>57.29</b>
Devon	126	3.20	6.77	15.51	0.99	2.70	0.00	0.32	<b>29.49</b>
Dorset	67	0.10	0.03	10.32	2.00	0.00	0.00	0.14	<b>12.58</b>
Gloucestershire	20	0.51	0.03	7.92	1.21	0.00	0.00	0.19	<b>9.84</b>
Somerset	42	0.51	0.03	7.92	1.21	0.00	0.00	0.10	<b>10.04</b>
West of England	14	6.01	0.00	5.45	5.75	0.23	0.01	0.04	<b>17.48</b>
Wiltshire	21	0.01	0.08	13.05	0.73	0.00	0.00	0.14	<b>14.00</b>
<b>South West Total</b>	<b>390</b>	<b>53.20</b>	<b>9.07</b>	<b>72.85</b>	<b>11.40</b>	<b>3.07</b>	<b>0.01</b>	<b>1.12</b>	<b>150.72</b>

Source: CLG

### Renewable heat capacity installed by type 2008 (GWh)

	<i>Number of projects</i>	<i>Biomass thermal</i>	<i>Heat pumps</i>	<i>Sewage gas combined heat and power</i>	<i>Solar thermal</i>	<i>Combined heat and power</i>	<i>Total</i>
Cornwall and Isles of Scilly	307	4.65	3.83	0.79	2.36	0.00	<b>11.63</b>
Devon	336	4.99	1.05	1.82	1.57	0.00	<b>9.43</b>
Dorset	93	0.57	0.21	2.12	0.20	0.00	<b>3.09</b>
Gloucestershire	43	1.87	1.13	0.00	0.02	0.00	<b>3.02</b>
Somerset	111	2.37	0.36	0.20	0.19	0.00	<b>3.12</b>
West of England	21	1.40	0.13	7.00	0.03	0.003	<b>8.55</b>
Wiltshire	22	0.27	0.14	0.37	0.05	0.00	<b>0.82</b>
<b>South West Total</b>	<b>933</b>	<b>16.11</b>	<b>6.83</b>	<b>12.29</b>	<b>4.43</b>	<b>0.003</b>	<b>39.67</b>

Source: CLG

- 6.2.3** A significant barrier to greater uptake of large scale renewable energy in Devon has been the planning process, which for example has rejected a biomass energy scheme in Winkleigh, and recently the Greener for Life anaerobic digestion plant in Tiverton.

- 6.2.4 Large scale future wind projects such as the 66 MW planned at Fullabrook and the 18 MW at Den Brook in West Devon will help increase renewable generation capacity in Devon, though have been beset by planning objections, with the most recent of these to Den Brook being rejected in August 2010<sup>23</sup>. These two projects could increase the amount of renewable electricity generated in Devon by 6 times<sup>24</sup>. The total capital expenditure for these two wind farms and the schemes at Cranbrook and Skypark and Marsh Barton are estimated at £170m. The construction phases will provide opportunities for the local supply chain and local services and direct local employment with the associated economic multipliers. Following construction ongoing operating expenditure associated will be in the order of £3m per annum providing an ongoing contribution to the Devon economy.
- 6.2.5 The installation and maintenance of further large scale renewable projects and infrastructure could provide a real benefit to Devon's economy, though this recent evidence is suggesting that delivery of schemes in the county is not at the scale that is required to meet regional targets.
- 6.2.6 The second largest policy are for voluntary emissions reductions of new vehicles, which will not directly benefit Devon's economy due to low economic activity in this sector.
- 6.2.7 The third biggest impact policy is the incremental improvements to the building regulations. These will ultimately require all new homes by 2016, and non-domestic buildings by 2019 to be zero carbon.
- 6.2.8 The definition of zero carbon allows for offsite "allowable solutions", for example from low carbon district heating schemes. Already in Devon, there are significant schemes being developed, such as the 26 MW biomass district heating scheme at the new Cranbrook community and Skypark approved by East Devon District Council, which will be the first large scale new development in the UK to employ site wide district heating and biomass CHP, and the energy from waste plant in Marsh Barton, Exeter which is due to be built over the coming two years and has the potential to supply low carbon heat to surrounding businesses.

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<sup>23</sup> BBC News Den Brook wind turbine challenge rejected by High Court, <http://www.bbc.co.uk/news/uk-england-devon-11029757> (accessed 20/8/10)

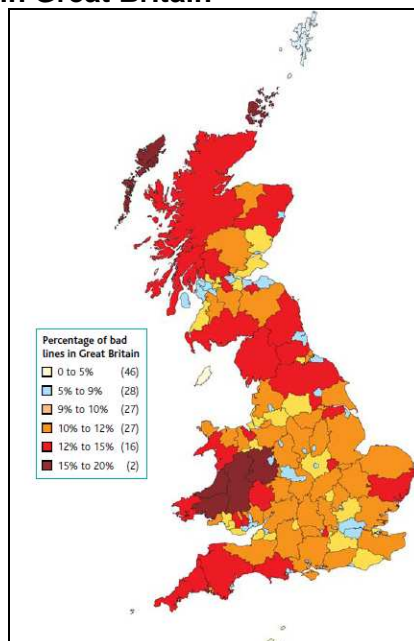
<sup>24</sup> Based on a total of 84 MW and assuming a 25% capacity factor for 8760 hours a year, giving 184 GWh compared to the 2008 Devon total renewable electricity generated of 29.5 GWh.

- 6.2.9 There are also potential future schemes in Exeter in the city centre and Monkerton which could trigger some £60 m of capital expenditure. There is also potential for both of these schemes to connect to existing buildings and homes. DCC's waste strategy envisages the development of waste to energy facilities connected to district heating in other parts of the county, for example in Barnstaple, with each scheme involving capital expenditure in the order of £40m. Such schemes represent great opportunities for Devon's economy.
- 6.2.10 Existing domestic energy efficiency policy is expected to deliver around 12% of the carbon savings of the existing policy measures. Again, this is a significant area where there are good local opportunities for local businesses.
- 6.2.11 Other significant policies include the national plans for the next generation of broadband technology<sup>25</sup>. Broadband technology could reduce emissions in Devon by reducing the need to travel through changing the way we travel, work, shop and live. In addition it could increase productivity. It is estimated that the first generation of broadband provided a boost to GDP of some 0.5% - 1% a year.
- 6.2.12 The UK strategy includes the Universal Service Commitment that every user will be able to access a 2 Mbps connection by 2012, and a longer term ambition to provide extensive high speed broadband. Currently, speeds of up to 50 Mbps are achievable through Virgin Media Ltd's national cable network, which covers 50% of the population. The national strategy has proposed a Next Generation Fund to help subsidise the "final third" of homes and small businesses – those who are more challenging to provide a service to. This should be of assistance to Devon, which has some of the worst connection in the country (shown in the map below). The planned target for mobile network technology of broadband speeds of 50 Mbps in urban and sub-urban centres going down to 4-5 Mbps in rural areas may be to Devon's disadvantage – or at least would exacerbate the economic and demographic gaps between Exeter and more rural parts of the county.

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<sup>25</sup> BIS 2009, Digital Britain Final Report, <http://webarchive.nationalarchives.gov.uk/+/http://www.culture.gov.uk/images/publications/digitalbritain-finalreport-jun09.pdf> (accessed 20/8/10)

## Percentage of bad lines in Great Britain



Source: BIS

### 6.3 The New Government

6.3.1 At the time of this report, the coalition government formed following the 2010 general election has had its first 100 days in office. Its focus has been on a comprehensive and credible plan to deal with the nation's debts and significantly accelerate the reduction in the budget deficit over the course of this Parliament. As such, many decisions on existing policy have been surrounded in uncertainty, at least until the spending review in October 2010.

6.3.2 The key points<sup>26</sup> concerning the low carbon economy which emerged from the June 2010 budget were that the energy tax framework will be reformed to encourage investment, the possible creation of a Green Investment Bank (GIB), and the establishment of a Green Deal for householders to enable them to invest in improvements using savings from future energy bills.

6.3.3 The Green Investment Bank Commission recommended<sup>27</sup> that in its first phase the GIB focuses on proven technologies with highest impact, citing energy efficiency projects, enabling technology such as smart grids, and offshore wind.

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<sup>26</sup> DECC June 2010 Budget – key announcements  
[http://www.decc.gov.uk/en/content/cms/news/budget\\_june10/budget\\_june10.aspx](http://www.decc.gov.uk/en/content/cms/news/budget_june10/budget_june10.aspx) (accessed 23/8/10)

<sup>27</sup> Green Investment Bank Commissions 2010, Unlocking Investment to Deliver Britain's Low Carbon Future

- 6.3.4 In addition, the Government proposed to make the tax system fairer through a potential fair fuel stabiliser to smooth the effects of oil price fluctuations, and to introduce fuel discounts for rural areas, with possible pilot schemes in Scotland.

## 6.4 Summary

- 6.4.1 Objective 3 required an appraisal of the likely growth sectors that will arise as the UK Low Carbon Transition Plan is implemented and where this has implications for the Devon economy, including future employment and economic output. This section has summarised the impacts of the policies within the LCTP and the potential impact to Devon's economy.
- 6.4.2 The Low Carbon Transition Plan contains policies that will ensure the UK meets its GHG emission reduction targets. A quarter of all those reductions in Devon will come from the household energy management strategy which will account for a quarter of savings by 2022. The aim of the policy is to insulate all cavity walls and lofts, provide smart meters, insulate solid walls and increase uptake of lower carbon heat generators. The policy could increase the number of people working in the insulation and microgeneration sectors to 800, which would represent about 2.5% of people employed in the construction sector.
- 6.4.3 Regarding large scale renewable energy policy, there may be opportunities for North Devon ports to provide support to marine technologies, and for manufacturing firms in supplying components. The local authority will also need to provide a leadership role, especially in planning. The evidence has suggested that installation of renewable technology in the county has been slower than required, especially when compared to Cornwall. Care will need to be taken that the impacts of these renewables do not adversely affect other sectors, for example fishing in the case of marine technologies, or tourism in certain areas, and also that they do not disproportionately disadvantage those living close by. Producing biofuels locally could also represent a growth area.
- 6.4.4 Energy cash-back schemes for small scale renewables should increase the size of the market for micro-generation installers, though the Renewable Heat Incentive has yet to be approved by the new government.

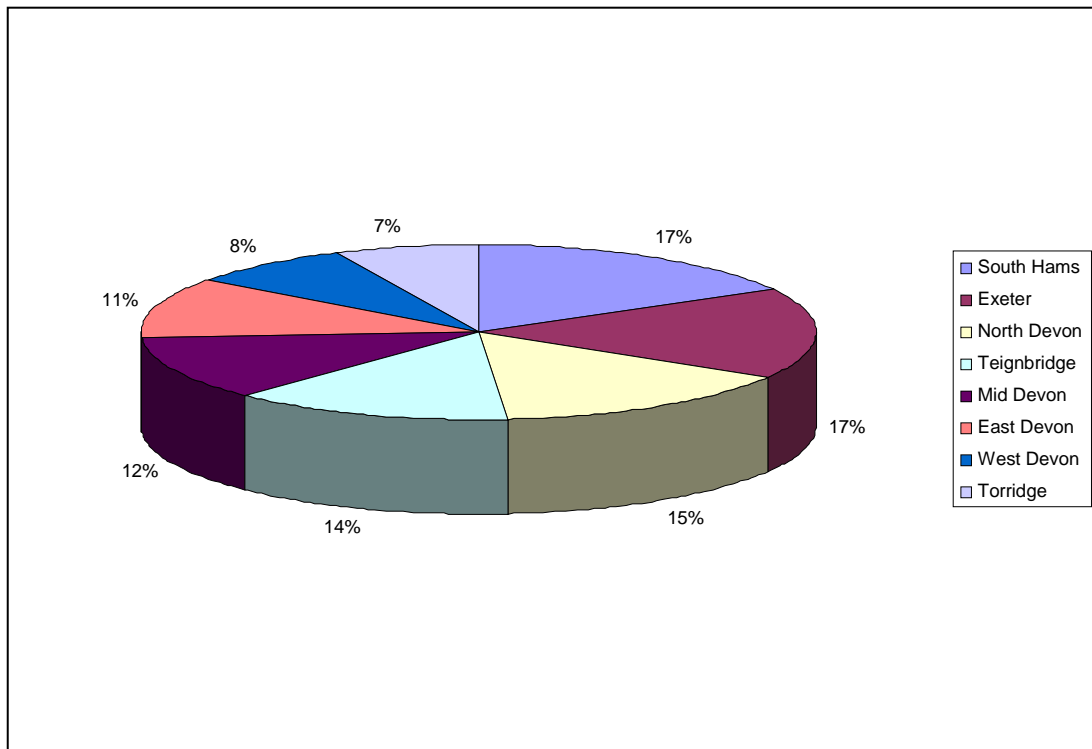
- 6.4.5 There are some large impact national policies that are of limited advantage to Devon, for example improving the energy efficiency of new appliances – though Devon does have a higher local intensity for manufacture of domestic appliances and electronic components – and emissions targets for new vehicles, or combined capture and storage to coal power stations. The Carbon Reduction Commitment is also likely to represent only a minor growth area.
- 6.4.6 Policy aimed at reducing agricultural emissions should represent an area where Devon should take a leading role, given the higher intensity of agricultural activity in the county.
- 6.4.7 It is worth noting that existing carbon reduction policy is forecast to reduce carbon emissions by approximately the same as measures in the LCTP.
- 6.4.8 The increased provision of broadband may also have the potential to both reduce emissions and improve productivity in Devon. There will likely be a bias towards those based in urban and suburban areas which could exacerbate economic and demographic gaps within the county.
- 6.4.9 There is still uncertainty surrounding policies within the LCTP, though the new government have indicated that there will be reforms to the energy tax framework, a Green Investment Bank, and a Green Deal for householders to make improvements. In addition, there may be fiscal mechanisms introduced to reduce the effects of oil price fluctuations, and to reduce the impact of high energy prices to rural consumers.

## 7 A Spatial analysis of Devon's Non-Domestic Emissions

### 7.1 Spatial Distribution of Carbon Emissions within Devon

7.1.1 An analysis of present carbon dioxide<sup>28</sup> emissions was undertaken with data sources and assumptions stated in the technical annex. Emissions broken down by district are summarised in the chart below. South Hams and Exeter have the highest emissions which are more than twice those of West Devon and Torridge.

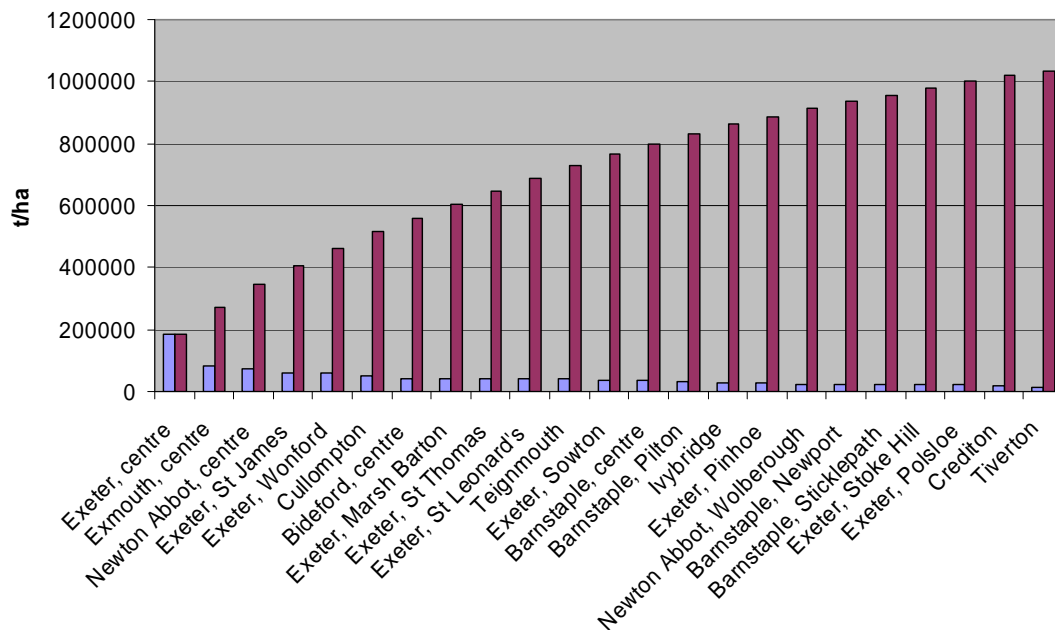
**Non-domestic CO<sub>2</sub> emissions in Devon by district.**



7.1.2 Ranked emissions per hectare for MLSOA (mid-level super output area) non-domestic electricity and gas consumption converted to tonnes CO<sub>2</sub> are illustrated in the graph below. 80% of these emissions occur in the 23 top ranked MLSOAs. Exeter city centre, the highest area, emits 5% of Devon's electricity and gas CO<sub>2</sub> emissions.

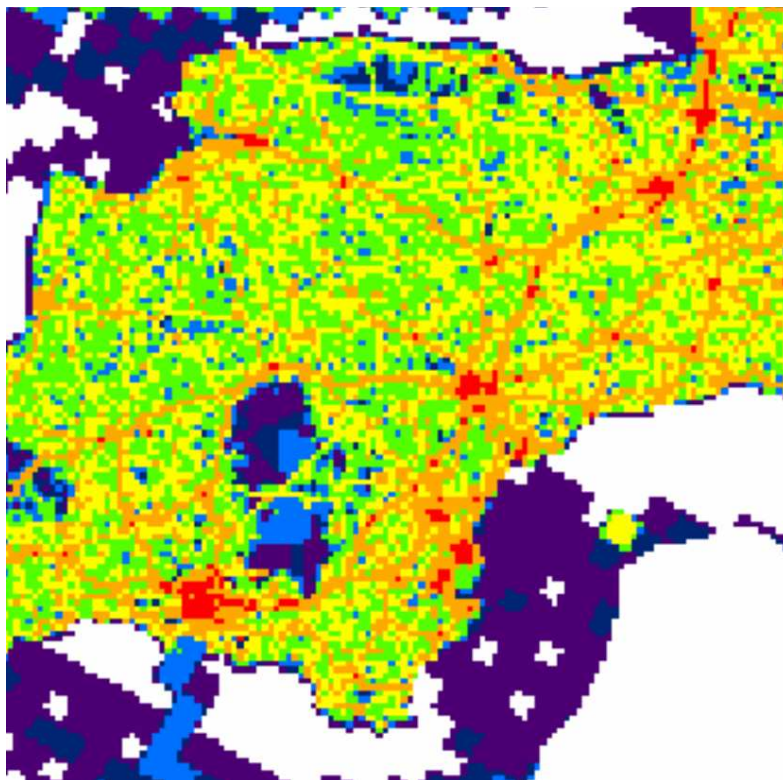
<sup>28</sup> Spatial data was generally available for energy or carbon dioxide only. This has been presented here as a proxy for all GHGs, and gives an indication of the spatial distribution of emissions within the county

**CO<sub>2</sub> (absolute and cumulative) emissions for the 23 highest emission MLSOAs in Devon in t /ha**



**7.1.3** The CO<sub>2</sub> map below shows emission from all sources and highlights towns and cities and the road network as the major emitters with low emissions in the national parks and scattered rural areas.

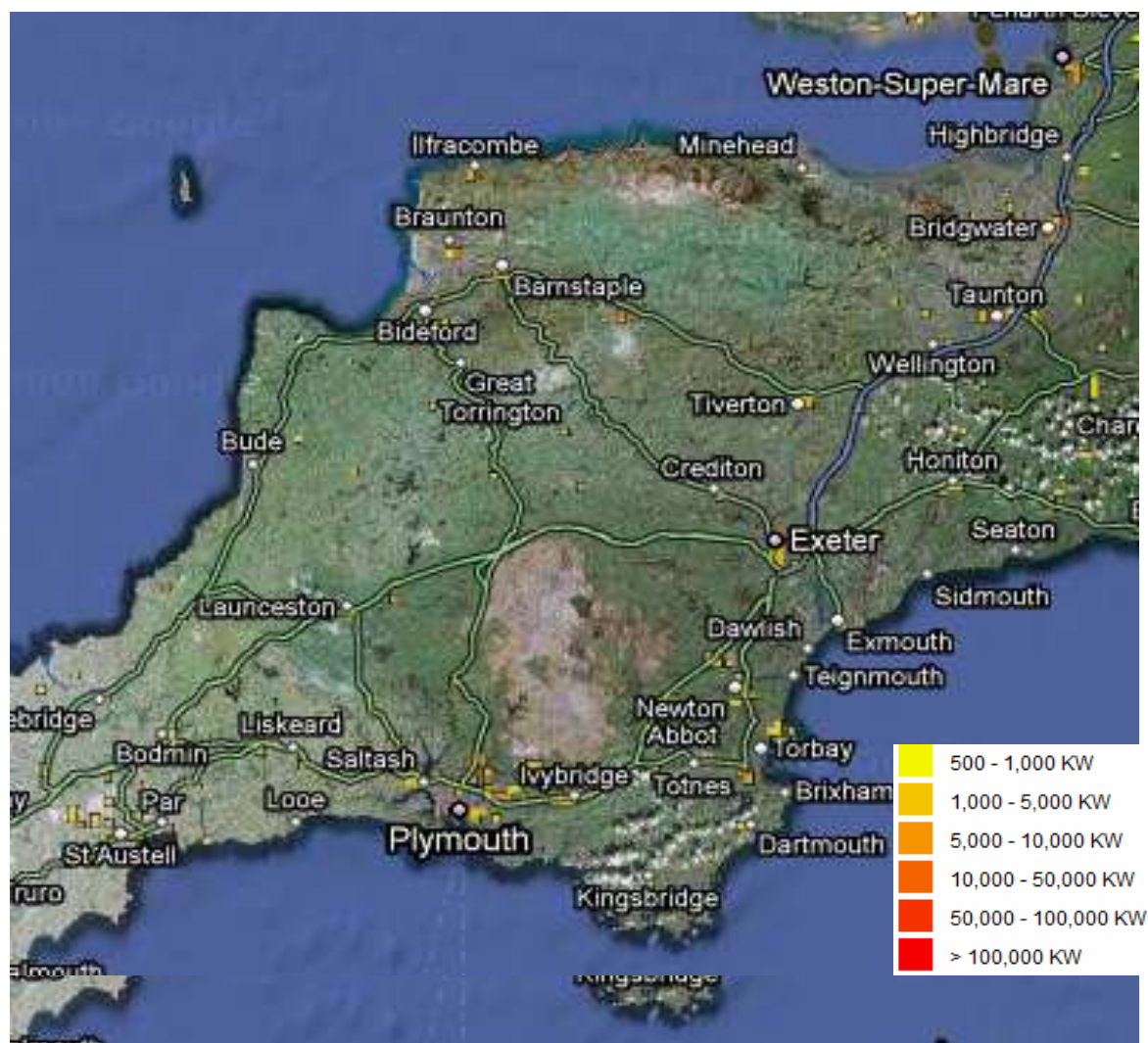
**Map of carbon dioxide emissions 2006 (as C) in t/km<sup>2</sup>**



Source: National Atmospheric Emissions Inventory (NAEI)

7.1.4 The map below shows industrial emissions across the county. The significant sources occur nearby to Exeter and Plymouth and in the corridor between Exeter and Torbay. There are also some intensive sites near Barnstaple.

**DECC heat map for small industrial emission in Devon in kW**



Source: DECC

7.1.5 The point source emissions identified by the EU ETS (Emissions Trading Scheme) allocation and the NAEI point source listing ranked in descending emissions are tabulated below. The emission allocations for Devon EU ETS sites total 119 ktCO<sub>2</sub>, some 6% of 2007 non-domestic emissions compared with 41% nationally. Steer Point Brickworks, the largest non-domestic emitter, is the source of 1% of Devon's non-domestic emissions.

- 7.1.6 These data suggest that no one manufacturing industry or group of industries is a significant emitter at a countywide scale, although emissions from the three brickworks (2.5% of all non-domestic emissions), two paper mills (1.2%), two food producers (1.2%) and the public services (0.8%) – RD&E Exeter, University of Exeter and Met Office – are noteworthy.

#### Point source CO<sub>2</sub> emissions identified by EU ETS and NAEI in Devon

<b><i>EU ETS point sources in Devon</i></b>			
<b>Source</b>	<b>Location</b>	<b>Sector</b>	<b>EU ETS allocation tonnes CO<sub>2</sub></b>
Wienerberger Ltd	Steer Point Brickworks Brixton, Nr Plymouth	Ceramics	19,804
Exeter Power Limited	Exeter	Electricity	18,532
St Regis Paper Company Limited	Higher Kings Paper Mill Cullompton	Pulp & Paper	15,647
Ibstock Brick Ltd	Pinhoe Factory Exeter	Ceramics	14,608
Glanbia Foods plc	Taw Valley Creamery North Tawton	Food and Drink	14,100
Imerys Minerals Ltd	Herreschoff Kilns Lee Moor, Plympton	Ceramics	12,538
Premier Ambient Products (UK) Ltd	Ambrosia Creamery Lifton	Food and Drink	10,138
RD&E NHS Foundation Trust	Exeter	Public services	7,971
Arjo Wiggins Ivybridge Limited	Stowford Mill Ivybridge	Pulp & Paper	6,005
Total			119,342
<b><i>NAEI point sources in Devon</i></b>			
<b>Source</b>	<b>Location</b>	<b>Sector</b>	<b>NAEI t CO<sub>2</sub></b>
University of Exeter	Exeter	Public services	5,013
Met Office	Exeter	Public services	1,063
Western Power	Princetown	Electricity	188
Western Power	Lynton	Electricity	125
Dartington Glass	Torrington	Ceramics	82

Source: EU ETS and NAEI

**7.1.7** The carbon reduction commitment (CRC) applies to organisations below the EU ETS threshold and although the CRC covers all energy use, it is triggered by consumption of more than 6 GWh of electricity per year. 6 GWh is the threshold for businesses to fit ½ hourly electricity meters. MLSOA electricity statistics enables the number of half hourly electricity meters to be identified. There are 1,239 ½ hourly electricity meters in Devon, which is only 2.8% of the total (43,253). The highest penetration is in Exeter (4.4%), the lowest in Torridge (2.2%). Although half hourly meters consume 1.17TWh of the 1.96TWh consumed (60%), 0.79TWh of non-domestic electricity and associated other energy is sold through the remaining 42,014 meters and perhaps represents a similar number of businesses which are not covered by carbon reduction policy

**7.1.8** The Environment Agency publishes a list of permitted industrial operators. There are some 23 permitted sites in Devon (see table below). Although allocated to electricity emissions and therefore not allocated to a single sector as such, it is worth noting that the Langage power station is set to become by far and away the largest point source of CO<sub>2</sub> emissions in Devon<sup>29</sup> emitting 2,164 ktCO<sub>2</sub>, or 12% more than Devon's entire non-domestic sector.

#### OPRA permitted sites in Devon (excluding waste sites)

Operator Name	Installation name	Type	Industry	Area	Post Code
Centrica Langage Ltd	Langage Energy Centre	Industries	Power Generation	Plymouth	PL7 5AW
Plessey Semiconductors(was X Fab)	Plymouth Semiconductor Foundry	Industries	Electronic component manuf	Roborough	PL6 7BQ
South West Metal Finishing Limited	Southwest Metal Finishing Ltd	Industries	Metal Plating	Exeter	EX2 8TJ
Bale Environmental Ltd	Honiton Waste Oil Treatment Facility	Industries	Waste Oil Treatment	Honiton	EX14 1SQ
BOCM Pauls Ltd	BOCM Pauls Ltd Exeter Feed Mill	F&D	Animal Feed mill	Exeter	EX2 7LN
OSS Group Ltd	OSS Group Ltd Exeter	Industries	Waste Oil Treatment	Woodbury Salterton	EX5 1EN
2 Sisters Food Group Ltd(was Lloyd Maunder)	Willand Abattoir	F&D	Chicken abattoir	Cullompton	EX15 2PJ
AB Agri Ltd (was ABNA Ltd)	ABNA Ltd Cullompton Animal Feed	F&D	Animal Feed mill	Cullompton	EX15 1BS
Arjo Wiggins Ivybridge Ltd	Ivybridge Paper & Pulp	Industries	Paper and Pulp	Ivybridge	PL21 0AA
Devon Valley Ltd	Devon Valley Mill	Industries	Paper and Pulp	Exeter	EX5 4PJ
Southern Valley Feeds Ltd	Spry Mill	F&D	Animal Feed mill	Lifton	PL16 0BA
St. Regis Paper Company Limited	Higher Kings Mill	Industries	Paper and Pulp	Cullompton	EX15 1QJ
Andigestion Ltd (was Summerleaze)	Holsworthy Biogas Plant	Industries	AD plant	Holsworthy	EX22 7HH
Uffculme Feedmill Ltd	Uffculme Feed Mill	F&D	Animal Feed mill	Cullompton	EX15 3AX
West Devon Meat Ltd	Hatherleigh Meat Processors	F&D	Abattoir	Hatherleigh	EX20 3HT
Buckfast Spinning Co Ltd	Buckfast Carpet Yarn Spinners	Industries	Carpet Yarn Spinners	Buckfast	TQ11 OEB
Exeter Power Ltd	Exeter Power OCGT Power Station	Industries	Power Generation	Exeter	EX2 8NY
Heathcoat Fabrics Ltd	Tiverton Textile Manufacturer	Industries	Textile Manufacture	Tiverton	EX16 5LL
Milk Link Processing Ltd	Milk Link Processing, Crediton	F&D	Milk processing	Crediton	EX17 2AH
Swallowfield PLC	Swallowfield PLC Bideford Site	Industries	Cosmetics manuf	Bideford	EX39 4LQ
The Cheese Company	Taw Valley Creamery	F&D	Cheese Manuf	North Tawton	EX20 2DA
Herbert S Hooper	Devon Biofuels	Industries	Biodiesel manuf	Crediton	EX17 5BA
William Brown	Greeneearth Biodiesel	Industries	Biodiesel manuf	Crediton	EX17 1DN

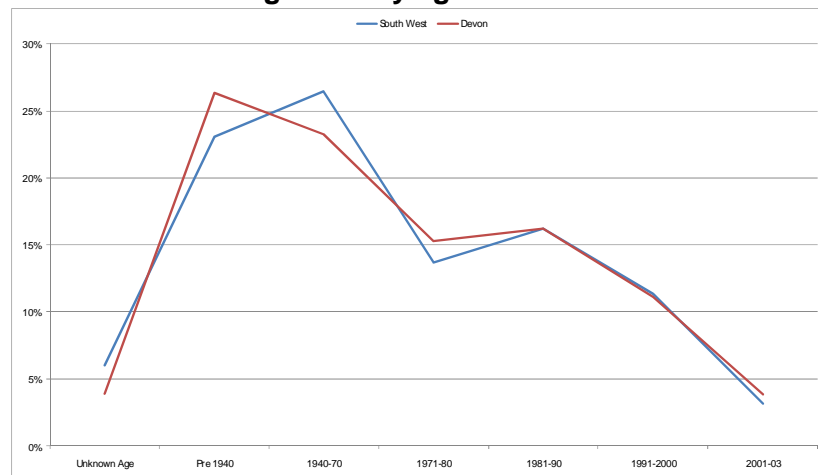
Source: Environment Agency

<sup>29</sup> . Assuming a capacity of 890 MW generating 7,017 GWh/yr (assuming a load factor of 0.9) consuming 11,695 GWh of natural gas (assuming an efficiency of 60%)

## 7.2 A Spatial Analysis of the Non-Domestic Building Stock in Devon

7.2.1 The distribution of the non-domestic building stock in Devon was extracted from a government publication<sup>30</sup> (the full data are given in the technical annex). From the graph below, the age of building stock in Devon is similar to the South West, with Devon having a greater proportion of pre-war buildings compared to the South West.

**Age of non-domestic building stock by age for the South West and Devon**

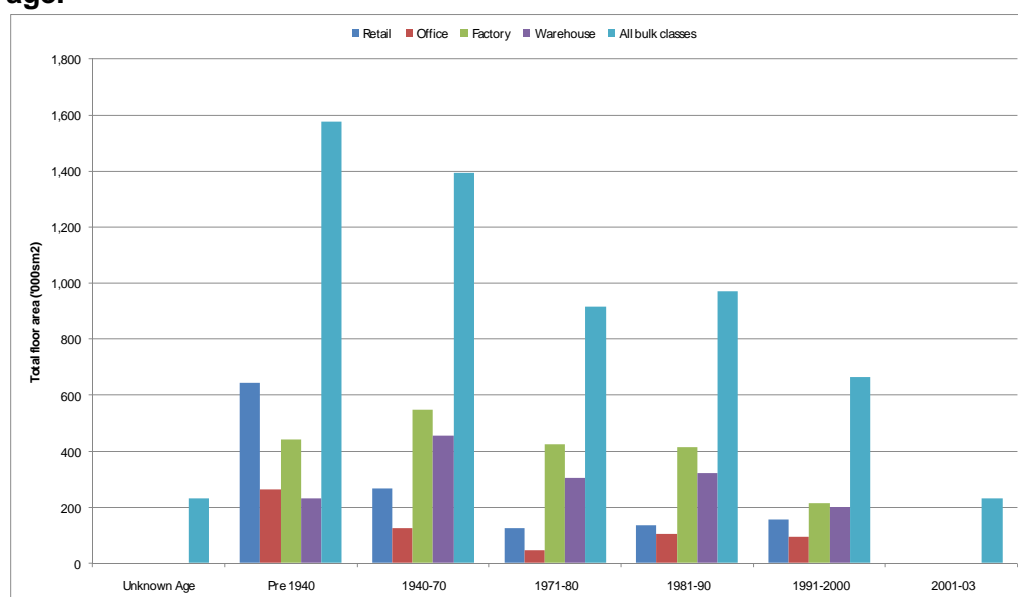


Source: ODPM

7.2.2 The most typical age grouping for retail is pre 1940 which makes up 46% of all retail space. There is generally a decreasing amount of retail space remaining in each subsequent later age grouping. A similar pattern can be seen for office space, where over a third is pre-1940. The age distribution of factories is more even, however two-thirds of factory space pre-dates 1980. On average warehouses are the newest building type, although still about 60% were built before 1980. The breakdowns are shown in the graph below.

<sup>30</sup> ODPM 2005, Age of Commercial and Industrial Local Authority Level 2004 England and Wales, <http://www.communities.gov.uk/documents/planningandbuilding/pdf/149147.pdf> accessed 23/8/10

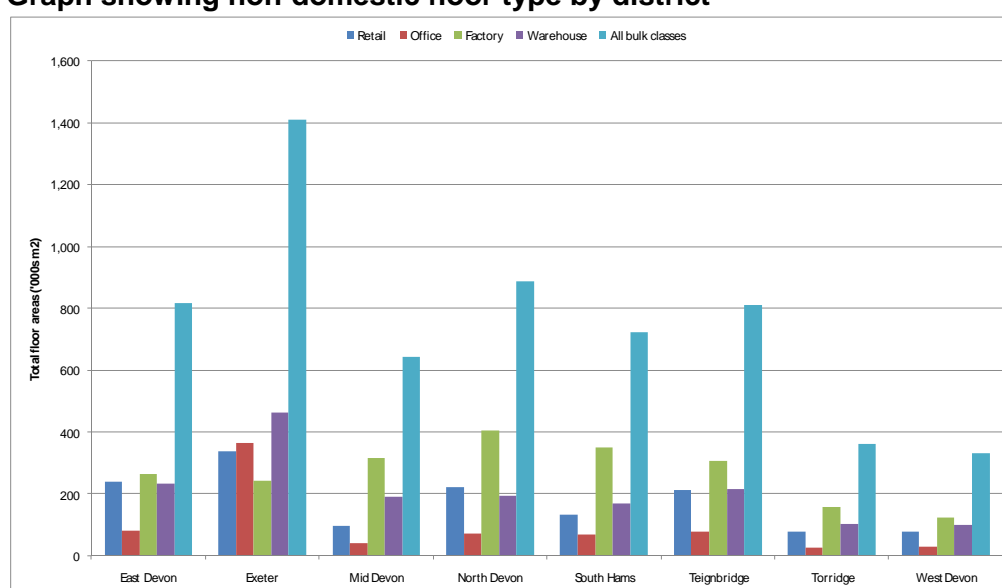
**Graph showing the floor areas of non-domestic building types in Devon by age.**



Source: ODPM

**7.2.3** Within Devon, Exeter has far and away more of every non-domestic building type than any other district with the exception of factories. In fact, there is relatively little office space outside of Exeter. There is a reasonable amount of retail space in East Devon, North Devon and Teignbridge. Factories are well spread out across the county though there is a smaller concentration in Torridge and West Devon. Similarly, warehouses are relatively well spread out with a concentration peak in Exeter, and little area in Torridge and West Devon. The breakdowns are shown in the graph below.

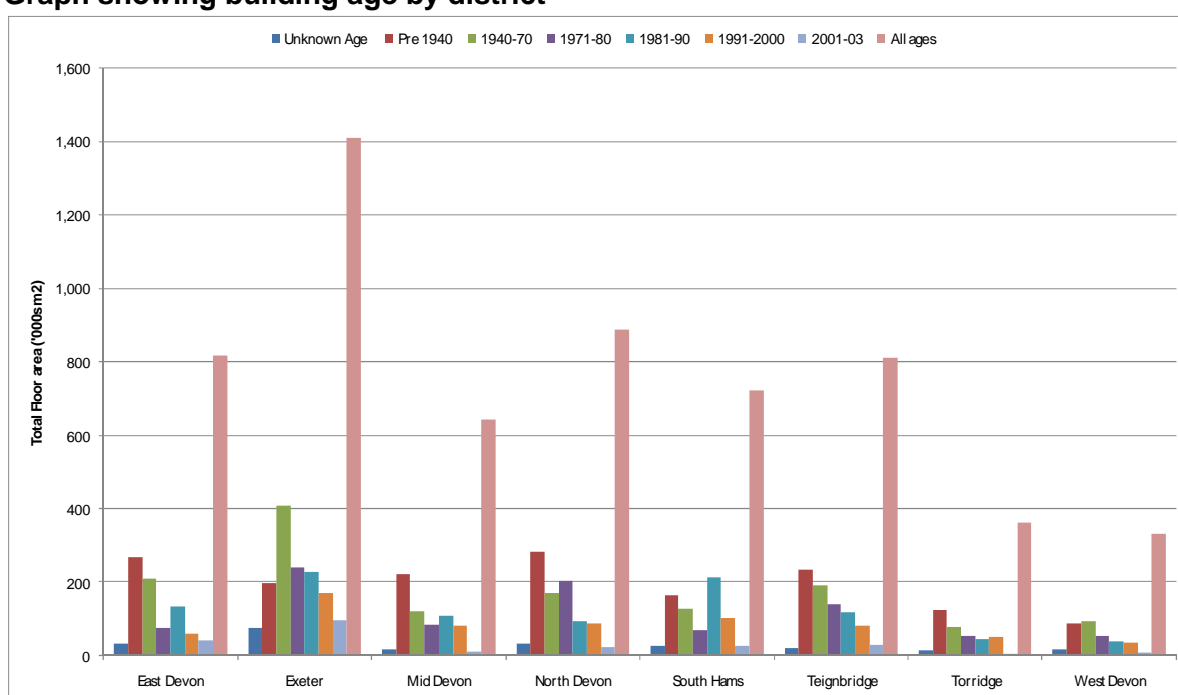
**Graph showing non-domestic floor type by district**



Source: ODPM

**7.2.4** The age profile of the non-domestic building stock varies by district. Generally, there is a legacy of older buildings in almost every district, with pre-1940s buildings being the most significant age grouping. In Teignbridge and Torridge there is a uniform decrease in area of building within each newer age grouping. In other districts there are mini-peaks that buck the trends – for example 1980s buildings in East Devon and South Hams, or 1970s buildings in North Devon. In Exeter, there is a slightly different pattern, with a far greater proportion of buildings built between 1940-70 as opposed to pre-1940. This is probably the result of post-war rebuilding. In addition, there is a greater proportion of floor area built after 2001. The breakdowns are shown in the graph below.

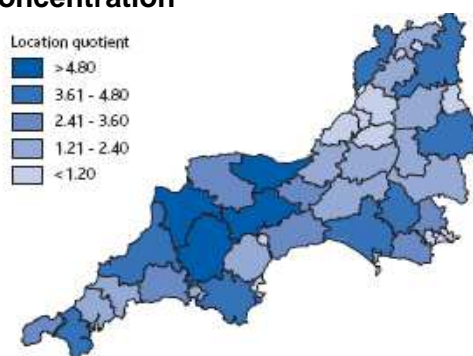
**Graph showing building age by district**



Source: ODPM

**7.2.5** The South West is a region that is strong in the Food and Drink Sector, and Devon is strong within the region as is shown on the map below. The South West as a whole has over 60 companies employing more than 200 people within the organisation, has the largest agricultural area in Britain, more than 30% of the countries dairy production and the strongest organic sector with over 26% of all organic farmers. The locations of businesses are typically rural, and 80% of these businesses have fewer than 10 employees.

## Concentration of food and drink employment in the South West – Devon has a higher than average concentration



Source: SWRDA<sup>31</sup>

### 7.3 New Development

- 7.3.1 New development will play an important role in the reduction of carbon emissions.
- 7.3.2 In 2009 the Government announced that non-domestic buildings should be zero carbon by 2019 with public sector buildings zero carbon in 2016. It is anticipated that this policy will be implemented through the sequential tightening of building regulations. In October 2010 new non-domestic buildings are required to reduce CO<sub>2</sub> emissions by 25% from 2006 levels.
- 7.3.3 While the definition of zero carbon has not been finalised it is anticipated that zero carbon will be achieved 70% by onsite measures and connected heat with the remainder being met through allowable solutions (mostly) in the locality.
- 7.3.4 Achieving low carbon development will not therefore only be a function of the new building but the locality in which it is built. The spatial distribution of new development can therefore reduce the cost of meeting low and zero carbon new development (bringing a competitive advantage to the locality) and bring about the reduction of emissions in the new building(s) and potentially nearby existing buildings.

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<sup>31</sup> South West of England Regional Agency, Economics Review Issue 4, Second Quarter May 2006

- 7.3.5 Most importantly new development provides a unique opportunity to consider the optimisation of heat generation and use. Significant carbon savings can be achieved by co-locating complimentary heat loads and considering the co-generation of electricity and heat (combined heat and power, or CHP). The relatively high cost of heat distribution makes it important to consider heat distribution in the early stage spatial planning of new developments. The mixes of uses, densities and layouts of new developments should consider heat distribution. The relationship between new development and existing buildings should also be considered as existing buildings may provide a demand for or source of low carbon heat.

## 7.4 Summary

- 7.4.1 Objective 4 of this study was to identify carbon intensive industries and spatial hotspots around the county to provide an understanding of the spatial implications arising from the analysis.
- 7.4.2 Exeter dominates the spatial distribution of CO<sub>2</sub> emissions in Devon (17%).
- 7.4.3 An analysis of CO<sub>2</sub> emissions from electricity and gas consumption shows that 80% of these emissions arise from 23 MLSOAs (out of 144). Nine of these are in Exeter. The other higher emission areas are in towns across the county including Exmouth, Newton Abbot (2), Cullompton, Bideford, Teignmouth, Barnstaple(4), Crediton and Tiverton.
- 7.4.4 There are few larger industrial emitters in Devon. The spatial pattern of emissions is more determined by co-location of many smaller emitters in denser built-up areas.
- 7.4.5 Only 2.8% of non-domestic electricity meters are likely to be required to register for the Carbon reduction Commitment leaving the vast majority of organisations unaffected by current CO<sub>2</sub> emissions reduction policy.
- 7.4.6 Devon has a similar age distribution of the non-domestic building stock as the South West, with the highest concentration occurring with pre-1940s buildings. Retail and offices tend to be located in older buildings, with factories and finally warehouses being more modern and evenly grouped. Exeter dominates the amount of non-domestic building, especially office space but also retail and warehouse. Factories are more evenly distributed. Torridge and West Devon are the sparsest districts. The county's building age profile is reflected when looking at district level, though in Exeter there is a concentration of post-war development.

7.4.7 New development will have an important role to play, particularly in providing local decentralised heating networks and electricity generation. Devon has taken a lead on this issue through the 26 MW biomass district heating scheme at Cranbrook and Skypark, and there are other future potential future sites to consider as part of new development, for example at Barnstaple, Newton Abbot, and Monkerton (Exeter).

## 8 Skills for a Low Carbon Economy

### 8.1 Skills Analysis

- 8.1.1 The transition to a low carbon economy will require new skills and the adaptation of exiting skills to different tasks. The development of low carbon skills is a challenge nationally and locally.
- 8.1.2 DEFRA's report "Skills for a low carbon resource efficient economy" (Pro EnviRo 2009) concluded that:
- 8.1.3 Overall, the evidence base on low carbon skills is weak, with available research focused on high level and numbers of significant gaps in the evidence base were identified.
- 8.1.4 Moving to a Low Carbon and Resource Efficient Economy (LCREE) will require a fundamental transition in behaviour and application of skills and knowledge. Understanding and awareness is a crucial issue. The interchangeable use of terms such as sustainable development, green, eco, environmental is causing confusion. Each term means different things to different people and there is a lack of clarity in the economy as a whole as to the characteristics of a LCREE and consequently what the skill requirements may be.
- 8.1.5 While there was evidence of a latent demand for LCREE skills – demand is not currently being articulated by employers and as a result the current skills delivery framework is ill equipped to anticipate and respond. Organisations do not have the right levels of understanding of the skills requirements and implications of a LCREE and consequently of the importance and potential benefits of integration of LCREE skills into their businesses. Only when these links and a clear business case are made will businesses demand LCREE training. This leaves us in a 'Catch 22' situation – understanding and awareness are the key to stimulating demand for skills but in a demand led skills delivery system, an expression of demand is required from the organisations for the skills delivery sector (especially Sector Skills Councils) to respond to.

- 8.1.6 It is considered unlikely that current levels of skills training capacity will be sufficient to meet demands in the event of increased conversion of latent potential demand to actual demand, though further evidence based work and forecasting are recommended to quantify this.
- 8.1.7 LCREE skills need to be considered by, and integrated into, the whole of the skills delivery system.
- 8.1.8 The report includes a low carbon skills “checklist” which includes skills in design, waste, energy, water, buildings, transport, materials, finance, management, policy and planning (the full checklist is reproduced in the technical annex to this report). The checklist clearly illustrates that the range of skills required extends beyond renewable energy for example.
- 8.1.9 In March 2010 the Government launched a consultation “Meeting the Low Carbon Skills Challenge”. The consultation document provides extensive coverage of the issues. Consultation ended on 23<sup>rd</sup> June and the Government’s response, anticipated in the autumn, is likely to provide important analysis and policy guidance.
- 8.1.10 In 2009 the Government designated the South West Low Carbon Economic Area for wave and tidal power to develop low carbon economic opportunities through the creation of new demonstration facilities, such as the Wave Hub project in Cornwall, investment in world class academic and research strengths such as PRIMarE marine research institute, a new network of science parks and businesses, new port infrastructure and the creation of an industry forum based in the region.
- 8.1.11 Extensive material on employment and skills in the South West and Devon is available from the Skills and Learning Intelligence Module (SLIM) and the South West Observatory (SWO) whose recent work includes “Green Skills Green Jobs” for the South West (January 2010), the “Devon Sub-regional Employment and Skills Analysis” (February 2010) and “Work and Skills Analysis 2010” for Exeter Heart of Devon (May 2010).

8.1.12 Locally, Renewable Energy 4 Devon (RE4D) commissioned Step Ahead Research to undertake a Devon Renewable Energy Skills and Training (DREST) project in 2008. Findings on skills provision are summarised in the table below. It should be noted that there has been some improvement since the report, for example the City and Guilds qualification for PV installation can now be undertaken at Petroc<sup>32</sup> in Barnstaple.

#### Skills providers in renewable energy in Devon in 2008

Technology	Provision	Comment
Wind	None	Clear need for one or more of the Devon HE Colleges to run City and Guilds 2373 (Certificate in Installing and Testing Wind Turbines) when it becomes available.
PV	None	Clear need for one or more of the Devon HE Colleges to run City and Guilds 2372 (Certificate in Installing and Testing Domestic Photovoltaic Systems).
Hydro	One	The 1 day course held by Hydro Generation might have met some demand in the past, but in the future, an equivalent to the CAT 5 day course for engineers has been highlighted as being key to assisting the growth of hydro power companies.
Solar thermal	Two	Devon benefits from a reasonable range of short course training providers for qualified, experienced plumbers and heating engineers to attend in order to become part of a competent solar thermal workforce.
Heat pump	Two	Representing reasonable provision from installer companies who aim to develop installer networks

Source: RE4D

8.1.13 Regen SW has commissioned short studies of micro-generation skills in the South West and in 2009 identified that three of the seven providers in the region (PGL in Exeter, Nu-Heat in Honiton and North Devon College) are in Devon. There would still appear to be a shortage of skills providers for renewable energy in the South West and Devon.

#### Skills providers in renewable energy in the South West in 2009

South west Provider	Technology					
	Solar Thermal	G/ASHP	PV	Biomass	Wind	Hydro
PGL Construction	X					
SWAAT	X	X		X		
Global Energy Direct	X	X				
Trade Services	X	X	X	X		
Nu-Heat	X	X				
Grant Engineering	X	X				
North Devon College	X	X	X			

Source: RegenSW

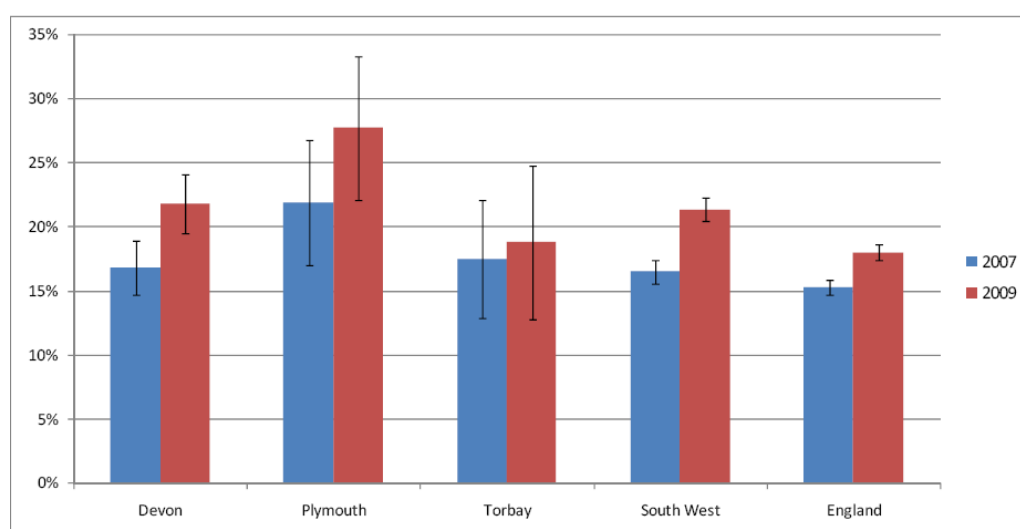
<sup>32</sup> formerly called North Devon College

8.1.14 In spite of this, Devon's leading position, an outcome of the RE4D project, has established the county as a leading provider of vocational micro-generation skills and puts it in a strong position to both build on its position, and to supply a proportion of the 500 new micro-generation FTEs which Regen predict will be required in the South West to 2020.

8.1.15 A recent assessment (July 2010) of the economic contribution of the renewable energy and energy efficiency sectors in the South West by DTZ for Regen SW shows that the number of FTE's in the renewable energy sector grew from 2,900 in 2008 to 5,160 in 2010 an increase of 78%. In the same period the energy efficiency sector grew by 8%. Devon will have benefited from this substantial growth and the on-going demand for these low carbon skills in the South West is clear.

8.1.16 Less specific skills gaps in Devon are identified by SLIM's "Work and Skills Analysis 2010" for Exeter Heart of Devon May 2010. The graph below shows the proportion of employers with skills gaps indicating that overall Devon has a similar skills gap to the South West and a slightly higher skills gap than nationally.

#### Proportion of Employers with skills gaps



Source: Slim

8.1.17 The report concludes that the most significant issue for the South West is the levels of technical/practical skill gaps, which are amongst the highest of any English region alongside the South East and West Midlands.

8.1.18 In higher education the University of Exeter and the Met Office in Exeter make Devon an international skills centre. This centre of expertise is a key strength for the development of low carbon skills in the county.

8.1.19 Knowledge Transfer Partnerships (KTPs) is a UK-wide programme whereby a company employs a recently qualified person (associate) who is supported by an academic institution. For every £1m of government spend the average benefits to the company amounted to an £4.25m annual increase in profit before tax. 60% of associates are subsequently offered and accept a job in their host company. The South West as a region is second only to the South East in terms of number of KTPs (see technical annex), and there may be around 27 KTPs in Devon at any one time. Examples of KTPs which have helped move towards a Low Carbon Economy have taken place at Riverford Organics (vegetable box scheme provider) and Axminster Carpets, with the University of Exeter as the academic organisation. The projects have focussed on reducing the carbon emissions of these businesses.

8.1.20 Devon is host to a large number of voluntary and community climate change organisations. Friends of the Earth have identified 46 such groups in Devon. As a result of this, the Devon Climate Action Network<sup>33</sup> (Devon CAN) was formed in March 2009 to connect these groups, with the aim of sharing information and expertise, speaking with a common voice and organising joint funding and training activities<sup>34</sup>. Transition Towns are local grassroots initiatives which have arisen in response to the twin threats of climate change and peak oil, with the aim of building resilience against their impacts. Devon is also home to the first Transition Town in the UK, in Totnes<sup>35</sup>. There are 11 transition groups with a further 22 emerging as shown in the map below. The power of this grassroots movement should be harnessed and supported to help move towards a Low Carbon Economy.

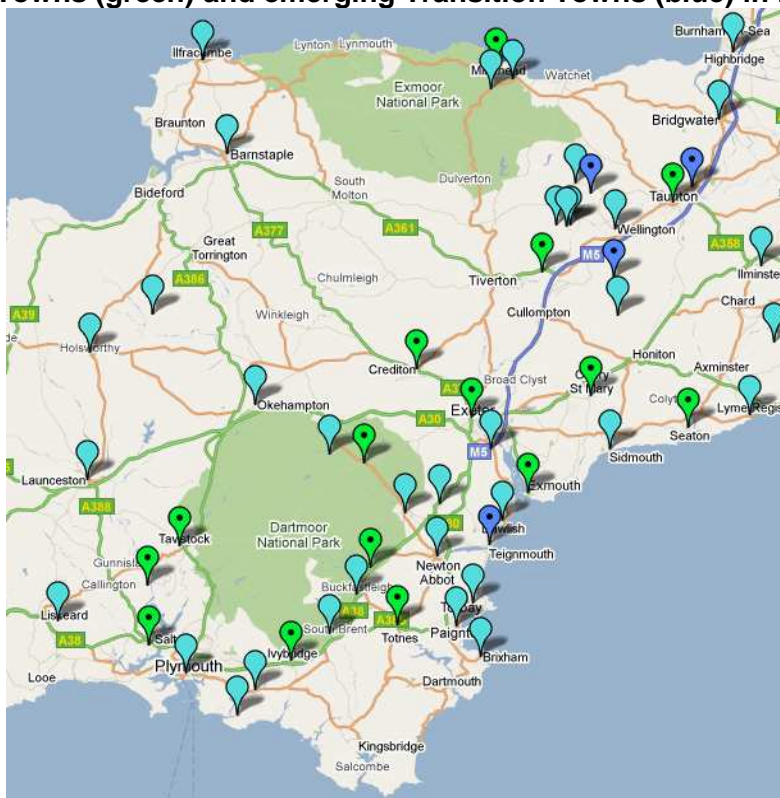
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<sup>33</sup> Devon Climate Action Network <http://devonclimateactionnetwork.ning.com/> (accessed 24/8/10)

<sup>34</sup> [http://journals.copperstrings.com/UserConsole/ViewJournal.aspx?Title=Devon\\_Climate\\_Action\\_Network\\_\(Devon\\_CAN\)\\_Launches&ArticleID=2075](http://journals.copperstrings.com/UserConsole/ViewJournal.aspx?Title=Devon_Climate_Action_Network_(Devon_CAN)_Launches&ArticleID=2075) (accessed 24/8/10)

<sup>35</sup> Transition Town Totnes <http://totnes.transitionnetwork.org/> (accessed 24/8/10)

## Transition Towns (green) and emerging Transition Towns (blue) in Devon



Source: Google Maps

8.1.21 Continued investment in low carbon skills is essential to deliver the low carbon economy. The RE4D project has demonstrated that targeted interventions can play an important role in promoting supply and demand in low carbon technology and, if well managed, can result in stimulating skills provision thereby creating a virtuous circle which delivers the sector growth evidenced by Regen's recent survey. Devon's relatively strong position in vocational and higher level skills provision and the transfer of regional initiatives to Local Enterprise Partnerships and local authorities present an opportunity for Devon to link skills provision more directly to business needs and further develop skills provision in the county. Devon's resources, experience and established low carbon training provision give an opportunity for the county to become a national leader in low carbon skills.

## 8.2 Summary

8.2.1 The evidence suggests that there is a skills gap in the areas that will be required to deliver a low carbon economy. In general terms, Devon has similar skills gaps to the South West, and a larger gap than compared to the country as a whole. Whilst there is a latent demand for low carbon skills, this is not being translated to jobs and training. The Local Authority will have an important role in raising awareness and launching initiatives.

- 8.2.2 Devon has achieved this for renewable technologies where it has taken a strong leadership position through RE4D, and the designation of the South West as a Low Carbon Economic Area for marine technologies may help. However, there are likely still skills shortages even in the renewables sector, and it is important to note that this sector is only a fraction of the overall skills that will be required in a low carbon economy.
- 8.2.3 Devon's relatively strong position in vocational and higher level skills provision and the transfer of regional initiatives to Local Enterprise Partnerships and local authorities present an opportunity for Devon to link skills provision more directly to business needs and further develop skills provision in the county. Knowledge Transfer Partnerships have been a success in Devon and there is the potential to increase the number of projects. There is also a strong grassroots climate change movement in Devon which should be harnessed and supported. Devon's resources, experience and established low carbon training provision give an opportunity for the county to become a national leader in low carbon skills.

## 9 Opportunities and Threats Associated with the Transition to a Low Carbon Economy in Devon

### 9.1 Definition of Low Carbon Economy

- 9.1.1 The term Low Carbon Economy is gaining prominence though has been interpreted in many different ways. A list of example definitions can be found in the technical annex. The Devon County Council definition of a low carbon economy is that '*A low carbon economy is an economy that has a minimal output of greenhouse gas emissions, it is prosperous and sustainable, delivering economic growth within environmental limits.*' In addition, the economy must be balanced with regard to economic prosperity, social wellbeing and environmental limits.
- 9.1.2 In this report, the existing baseline in Devon, and projections for greenhouse gas emissions and the economy have been discussed against the policy background presented in the Low Carbon Transition Plan, and indicators to assess Devon's performance have been introduced.
- 9.1.3 Objective 1 of this study required an explanation of what a low carbon economy means for Devon, and what it might look like in reality. By 2022 GHG emissions in the county will have reduced by around a third of their 2007 levels, with a greater proportion of savings coming from the services and residential sectors, as compared to industry, transport and agriculture. In some aspects this transition will have occurred due to advances made elsewhere, for example in the cars that are driven and the appliances that are used, or carbon capture and storage to coal power stations. In other areas however, the local changes could be significant, for example to the fabric of Devon's housing stock, and the amount of local installed renewable energy capacity, both large and small scale. These changes bring with them opportunities and challenges that Devon's economy must rise to. Additional developments, for example rising oil prices or advances to broadband technology will bring additional challenges and opportunities that may result in changes to the way we work and live in Devon.

## 9.2 Analyses of Challenges, Threats and Opportunities Presented by a move to a Low Carbon Economy

9.2.1 This report has set out to analyse the implications of a move to a low carbon economy for Devon. Objective 5 of this study required a thorough assessment of the challenges, threats (vulnerabilities) and opportunities provided by a move to low carbon economy, for the Devon economy. This has been addressed by undertaking four SWOT analyses. Justification for this approach is provided in the technical annex.

9.2.2 The following sections contain the SWOT analyses addressing objective 5 of the study.

## 9.3 SWOT Analysis: The Devon Economy

### 9.3.1 General

- Greenhouse gas emissions from Devon activity arise from a range of sources. The largest single emitting sector is the non-domestic sector which is responsible for 44% of emissions. Of these, almost a third is from agricultural emissions, with most emissions being due to methane and nitrous oxide emissions. A further 28% are from manufacturing, and 25% from services. Construction is responsible for 0.4% of emissions if only construction activity is considered, but 6% when indirect emissions from supply chains are allocated (emissions from other sectors would go down accordingly). The transport sector is responsible for 28% of emissions. Of these, almost half of emissions are for journeys of over 25 miles, and about three-quarters of transport emissions are directly or indirectly from industry or business (including commuting, shopping, entertainment and holidays), which would add a notional 81% to the emissions from those sectors. Residential emissions account for about a quarter of emissions in Devon.
- The concentration of emissions in Devon is dominated by urban areas. 80% of Devon's non-domestic carbon dioxide emissions<sup>36</sup> are located in 23 MLSOAs, nine of which are in Exeter, where the city centre is responsible for 5% of all non-domestic carbon dioxide emissions in Devon. Of the remaining high consuming MLSOAs, four are in Barnstaple, two in Newton Abbott, and one each in Exmouth, Cullompton, Bideford, Teignmouth, Crediton and Tiverton. There are few larger industrial emitters in Devon with the total of those allocated

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<sup>36</sup> Note: not including other GHGs, which are highly dominant in the agriculture sector.

emissions under the EU ETS representing 6% of the counties CO<sub>2</sub> emissions compared with 41% nationally. The spatial pattern of emissions is more determined by co-location of many smaller emitters in denser built-up areas. On average, business sites in Devon are smaller for every sector than the national average with the exception of the textiles, clothing, chemicals and other manufacture sector.

### 9.3.2 Strengths

- In most sectors carbon productivity is higher and labour carbon intensity is lower in Devon than in the UK as a whole. This should make Devon better placed to move further towards a Low Carbon Economy and make the county more resilient to increased costs associated with carbon emissions
- Concentration in terms of GVA and employment is less pronounced in Devon than in the UK. This should make Devon more resilient to threats to specific sectors, and more adaptable to change.
- Devon is rich in natural resources for the provision of renewable energy, having a good wind resource, two coastlines and a rich biomass resource. This should help increase renewable energy generation in the county which in turn will grow the market for installers and manufacturers of renewable energy technology.
- Devon is a leader in renewable energy provision in the South West, having the highest number of installed projects and being second only to Cornwall in terms of generated energy. The local authority has taken a proactive stance through initiatives such as RE4D. This gives Devon a good platform from which to build. Large scale projects such as Fullabrook and Den Brook will significantly increase the amount of renewable energy generated in Devon.
- Devon is in the process of developing large district heating schemes, for example at Cranbrook and Skypark, and an Energy from Waste Scheme in Exeter, with the potential for more of such schemes in the future.
- Devon benefits from the presence of the Met Office and the University of Exeter, which is a key strength for the development of low carbon skills in the county. These institutions are also world leaders in the field of research into climate change.

- The South West has 9% of agricultural land area devoted to organic growing compared to the England average of 4%. In addition, the region has a third of the nation's organic producers<sup>37</sup>. Organic farms are likely to be more resilient to fluctuations in oil prices and in addition there is a growth in demand for organic produce.
- Devon is home to a large grassroots movement regarding the climate change and low carbon agenda, with almost 50 of such community groups, as well as the country's first Transition Town, in Totnes. The vision and dedication of such organisations provide an important community led response to delivering change in the face of the threats posed by climate change and oil dependency, which should complement the action of the local authority and others.

### 9.3.3 Weaknesses

- The service sector is the only sector which shows projected growth in employment. This may result in greater strain on businesses in other sectors such as manufacturing, and may limit the ability of these businesses to invest in the future with as much certainty. However, this must be balanced with the opportunities presented by making sound efficiency improvements to their operations, and a likely increase in demand of efficient goods going forward.
- Devon has proportionally higher transport emissions than nationally due to the size and rural nature of the county, and the sparse road infrastructure in some areas. There is a greater dependency on private car use and providing quality public transport is both expensive and challenging. Devon will need to be more innovative in the way it supplies its goods and services if it is to reduce transport emissions by as much as more urban areas will be able to.
- Devon has proportionally higher emissions from agriculture due the sector being more significant to Devon's economy than the national average. Agriculture is a carbon intensive sector due to emissions of methane from livestock and nitrous oxide from fertilisers, which are far more potent than carbon dioxide as greenhouse gases. The sector therefore shows low labour productivity, low carbon productivity and a high labour carbon intensity with not much improvement expected. However, this only goes to demonstrate that the agricultural sector is one where greater savings can be made in Devon than nationally, and

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<sup>37</sup> Agriculture in the South West 208/2009

<http://www.farmbusinesssurvey.co.uk/regional/commentary/2008/southwest.pdf> (accessed 23/8/10)

that Devon could reap the rewards of being at the forefront of innovation in this sector.

- There are areas of national policy which will provide boosts to areas in which Devon has less economic activity or expertise than in other regions of the country, and as such those regions would be the beneficiaries of those policies. Examples of these include the development of carbon capture and storage technology for coal fired power stations, the electrification of the rail network, and the development of electric and hydrogen powered vehicles.
- In spite of Devon's leadership position, the evidence has suggested that installation of renewable technology in the county has been slower than required, especially when compared to Cornwall. Possible reasons for this include lengthy and unsuccessful planning processes for large scale schemes. These barriers will need to be better overcome in the future.
- Devon's rural geography has made the development of good broadband connections challenging and the county lags the rest of the country. Although broadband technology is set to rapidly improve over the coming decade, the improvement will be greater in urban areas; Devon risks being left behind by the digital revolution.
- It is likely that there is a skills shortage in Devon for the roles required within a Low Carbon Economy. In general terms, the skills gap in Devon is similar to that found in the South West, and larger than the national average. The skills gap is greatest for practical/technical tasks. Devon based businesses should be articulating the low carbon skills they will require, and the county's training and education establishment should be developing courses to meet this demand.
- Labour productivity in most sectors tends to be lower than in the UK; forecasts suggest that this situation is unlikely to improve. This is due to a combination of less high value economic activity together with more labour intensive processes in Devon compared to nationally. The result of this is lower average wages in Devon.
- Only 2.8% of non-domestic electricity meters are likely to be required to register for the Carbon reduction Commitment. Although these cover 60% of Devon's non-domestic emissions, the vast majority of organisations (who are responsible for the other 40%) are unaffected by current CO<sub>2</sub> emissions reduction policy.

- Business sites in Devon are typically smaller compared to the national average (for example, a quarter of businesses are below the VAT threshold), making it potentially harder to make large scale reductions in emissions across the county, as it is harder to engage with small businesses, and also they may have less resources to improve carbon intensity.
- Most non-domestic buildings were built prior to the introduction of energy efficiency requirements in the Building Regulations, meaning that most non-domestic businesses are likely to be in thermally inefficient premises. It is likely to prove a challenge to upgrade these, especially where the premises are rented. Demolition and replacement is not happening at a rate anywhere near fast enough to meet the required emissions reductions.

#### 9.3.4 Opportunities

- Upgrading the energy performance of existing dwellings through retrofitting measures will reduce emissions more than any other measure in the LCTP and presents a huge opportunity for Devon's economy. Based on Government figures, employment in the insulation and renewable sector could increase to 800, representing about 2.5% of employment in the construction sector, with EST estimating there could be the potential for up to 10,000 jobs. There may also be additional employment opportunities for energy management and upgrading of commercial buildings due to the CRC, although this opportunity will not be as significant as those in the domestic sector. The potential Green Investment Bank and Green Deal for householders should help deliver these efficiency measures.
- The potential fuel duty discount for those in rural areas could eventually be of greater benefit to Devon than elsewhere in the country, bringing more people out of fuel poverty. It may also indirectly improve the viability of rurally located business.
- The timeline for improvements to the energy performance of new buildings will result in an increased demand for district heating solutions. Devon is already making good progress in this area, and it could become an area of expertise.
- Large scale renewable energy will have an important role to play in Devon, both through the South West's designation as a Low Carbon Economic Area for marine technology and the proposed offshore Atlantic Array wind farm, as well as through installation of more

established technologies. There may be opportunities for the port towns in North Devon to provide support, and also for manufacturing firms to supply components to this growth sector. There may also be opportunities to provide training and make Devon and the region the area of national skill and expertise in marine technologies.

- The feed-in tariff (FIT) and renewable heat incentive (RHI) schemes for small scale renewable energy provide the opportunity for a significant increase in activity in the renewables sector. Devon has a proven track record in supporting the development of this sector.
- Although emissions from agriculture in Devon are high (there is four times more agricultural activity in Devon than nationally), there are real opportunities for Devon emerging from the LCTP around policies aimed at of more efficient use of fertiliser, better management of livestock and manure, advice and financial support to the sector, encouraging woodland creation, reduced landfilling and uptake of anaerobic digestion. Due to Devon's rich agricultural background and specific research based expertise at the Centre for Rural Policy Research at the University of Exeter and North Wyke Research in Okehampton, Devon could take a strong position in improving reducing emissions from agriculture.
- The improvements in broadband technology will change the way we travel, shop and live. This should result in improved productivity and reduced travel.
- Devon have demonstrated that it can play a leading role in developing skills through RE4D and the county's learning institutions gearing up to provide training for the renewables sector, although there are still gaps in training provision. There is an opportunity for Devon to develop training courses in many of the other skills that will be required in a Low Carbon Economy.
- Planned strategic growth around Exeter, Barnstaple and Newton Abbot will require high levels of sustainability to be embedded in those schemes, and this will help to develop skills and provide economic benefits to the county. This may include district heating as well as new highly energy efficient dwellings and commercial buildings.
- The environmental technologies sector which includes businesses in pollution control, waste management, environmental services and renewable energy is a priority sector in the Regional Economic Strategy.

### 9.3.5 Threats

- The LCTP was produced under the previous national administration. The new coalition has shown signs that austerity measures will mean that some of the measures proposed and which have been assumed in this report may not have public funding available to them. This pressure on funding places the carbon reduction agenda at risk. In conjunction with this, the recession has meant that carbon reduction has fallen in terms of priorities. However, potential policies such as the Green Investment Bank and Green Deal for householders should bring confidence to investors and ensure that some action does occur, with the former potentially helping to initially deliver efficiency measures, grid upgrades, and offshore wind e.g. Atlantic Array.
- The RHI has not yet been confirmed, even though it is planned to come into force in April 2011. It has been projected to deliver approximately eight times more emissions reductions than the FIT. Until it is confirmed by Government, those involved in the renewable heat sector face great uncertainty. In addition, planned review periods to both schemes could see the value placed on each unit of renewable energy produced decreased, which would reduce uptake of smaller scale renewables and negatively impact on the economic prospects of the sector.
- Employment in the manufacturing sector is projected to decline quite substantially. This may place a strain on certain sectors, with those involved in energy intensive processes being at increased risk due to projected energy price increases. In Devon, sub-sectors within the textiles (weaving, carpets, textiles), pulp and paperboard, and electronics (motors, electrical components) sectors comprise more energy intensive processes and show greater economic activity than nationally. Should certain energy intensive industries downscale their operations, there should be a reduction to Devon's emissions, though this should not be viewed as a genuine carbon reduction in a global sense unless it is due to a reduced demand for a product, perhaps due to increased efficiency. The risk is that without demand reduction, emissions would simply be outsourced to another place. In addition, Devon's economy needs to be robust enough to provide employment resulting from contraction to the manufacturing and other sectors.
- There is projected to be a 24% reduction in transport emissions by 2022. However, as emissions from other sectors are predicted to fall at a faster rate, transport will become a more significant source of emissions in relative terms. For example, where in 2007 emissions from

goods vehicles, and car journeys for business and commuting purposes represented an additional notional 63% increase in emissions to the industry and services sectors, in 2022 it will represent an additional 74%. Under a central oil price scenario, the overall cost of transport fuel will reduce by a quarter for car journeys, 15% for heavy goods transport, but increase by 5% for total light good vehicle journeys. Under the highest oil price scenario the increase in cost for all journeys made by car will be 33%, 55% for heavy goods, and 91% due to LGVs.

- Devon's population already has a lower proportion of people of working age compared to the national average. This is projected to become more pronounced over time, especially in more rural parts of the county. Exeter is the only area where the effect is not as pronounced, although even there the rate of growth of the population as a whole exceeds that for working age population. A lower proportion of those of working age will place increasing pressure on public services and infrastructure, as well as increase the threat of issues such as fuel poverty.

## 9.4 SWOT Analysis: Manufacturing in Devon

### 9.4.1 General

- Manufacturing is responsible for 12% of emissions in Devon. Of these, a third of emissions arise from the manufacture of plastic products, iron and steel, wood and paper products, and pulp paper and plasterboard. A half of all manufacturing emissions arise when dairy products, manufacture of furniture, miscellaneous manufacturing and recycling and baking confectionary and other foods are added to these sub-sectors. In total, the highest emitting 20 (of 68) sub-sectors are responsible for 80% of emissions. Within the manufacturing sector, 29% of emissions are due to low temperature processes, with a further 15% from high temperature processes. Drying, motors and compressed air are responsible for a further 10%, 17% and 5% respectively. The remainder is made up of space heating (12%), lighting, refrigeration and other uses. Point source emitters identified by the EU ETS reveal that the three brickworks are responsible for 2.5% of all non-domestic carbon dioxide emissions, two paper mills responsible for 1.2% and two food producers also responsible for 1.2% of non-domestic carbon dioxide emissions. On average, manufacturing sites in Devon are smaller (in terms of employee numbers) for every sector than the national average with the exception of the textiles, clothing, chemicals and other manufacture sector.

### 9.4.2 Strengths

- Devon has lower emissions in the manufacturing sector compared to the UK due to less activity in sectors with intensive industrial processes. The most significant difference is a lack of manufacture of fuel (coke, petrol, nuclear), and a significantly smaller manufacture of chemicals sector. As a result, carbon productivity from manufacturing is much higher than in the UK and labour carbon intensity in this sector is substantially lower than in the UK.
- Manufacturing is the second largest sector in terms of GVA. Growth is moderate but above many other sectors in the Devon economy. Maintaining manufacturing activity will be very important to Devon's economy.
- Labour productivity of manufacturing is above the Devon average for all sectors and is expected to improve with high average annual rate. This improvement is due to projected increases to GVA combined with falling

employment, indicating an improved efficiency to processes in the manufacturing sector. It is important that the reduction in employment can be balanced by increased employment in the remainder of the economy, with projections demonstrating significant increases in employment in the services sector.

#### 9.4.3 Weaknesses

- There are areas of national policy which will provide boosts to areas in which Devon has less economic activity or expertise than in other regions of the country, and as such those regions would be the beneficiaries of those policies. Examples of these include the development of carbon capture and storage technology for coal fired power stations, the electrification of the rail network, and the development of electric and hydrogen powered vehicles.
- The labour productivity for manufacturing in Devon is below that in the UK as a whole. This indicates that the mix of manufacturing activity in Devon is not as efficient as nationally. This is mainly as Devon does not have any refinement of fuel, and a significantly smaller chemicals sector. These two sectors have very high labour productivity values. In addition to this, labour productivity values are lower for every sector in Devon apart from in extraction and public administration.
- The carbon productivity of the manufacturing sector is much below the average of the Devon economy, though the expected improvements are quite significant. This is because manufacturing is an inherently more carbon intensive process than, for example, services.
- About three quarters of manufacturing businesses<sup>38</sup> employ fewer than ten people. It will be much harder to engage with those businesses, and therefore harder to improve their carbon productivity.
- About two-thirds of factories in Devon were built before energy efficiency was made a requirement of the Building Regulations. This means that heat loss from factories is higher than it could otherwise be, and retrofitting measures is likely to be challenging. Space heating is responsible for about 12% of manufacturing emissions, so whilst this is a weakness, it is not as pronounced as for the services sector.

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<sup>38</sup> From Devon Business Link 2007 data.

#### 9.4.4 Opportunities

- The LCTP policy to upgrade the performance of existing dwellings could provide opportunities for Devon's manufacturing sector to develop innovative products for example insulating products, or plasterboard or render solutions, although presently Devon has proportionally less of this type of manufacture activity than other areas in the country.
- There may be an opportunity for Devon manufacturing firms to innovate solutions that will help with the delivery of zero carbon buildings, for example Passivhaus certified products or offsite prefabricated solutions.
- The LCTP policy which will result in increased efficiency of appliances for use in homes and businesses could provide a competitive advantage for Devon based firms involved in the development of such products. Devon does have higher concentration of economic activity in the manufacture of domestic appliances and electronic components compared to the national mix, and so these sectors should be focussing on improved energy efficiency as a growth area.
- Manufacturing businesses who can access capital could take advantage of the currently generous returns available through the FIT compared to other potential investments. Manufacturing sites are also less likely to be located in areas of high visual amenity, making wind turbines potentially a more feasible proposition than for other sectors.
- There are real opportunities to develop a strong biomass and biofuel sector, with Devon's rich resources and national policy promoting biomass for both heating and transport fuels.
- Emissions from within the manufacturing sector vary by source depending on the sub-sector, as shown earlier in the report, although the greatest emissions are from low temperature processes, motors, high temperature processes, space heating, and drying in that order, which account for over 80% of all emissions. It is likely however that targeting the highest emitting processes within each sub-sector will be the most effective strategy to reduce overall emissions in Devon, and increase the competitiveness of those businesses. This could be achieved by active promotion of specific measures to sub-sectors, or forming delivery groups, perhaps led by the local authority and procurement frameworks to implement measures. Target measures could focus on low temperature processes for the food and drinks sector, high temperature processes in the metals sector, motors in the plastics sector, drying within the pulp and paper sector etc. A study for

Defra on climate change agreements identified that cost effective measures were available in the manufacturing sector, which on average would achieve an 18% reduction in CO<sub>2</sub> emissions<sup>39</sup>.

- There may be some very minor increased opportunity for local manufacturing businesses from the CRC, although the scope of the scheme only covers a very small percentage of Devon's manufacturing output.
- The environmental technologies sector which includes elements of the manufacturing sub-sectors general purpose machinery, electric motors and recycling, is a priority sector in the Regional Economic Strategy.
- There are few larger industrial emitters in Devon. The spatial pattern of emissions is more determined by co-location of many smaller emitters in denser built-up areas. The location of these emitters in denser built up areas provides an opportunity to implement more strategic local lower carbon energy solutions, for example utilising waste heat better. In order to achieve this, the significant barriers so far encountered regarding investment, competition and different approaches to long term planning between private organisations will need to be overcome. It is likely that this can only be achieved through regulation or an external injection of capital.
- High GVA growth is expected in the sub-sectors Transport equipment, Chemicals & man-made fibre, Machinery & equipment and Electrical and optical equipment; labour productivity in these sectors is very high and expected to improve over time by very high rates. These sub-sectors also have carbon productivity values well above the average of the manufacturing sector as a whole and also show high rates of improvement. This should help improve Devon's carbon emissions within a balanced economy.
- Devon has had several successful KTP schemes which have resulted in reduced energy use and increased profitability to those businesses. There is the potential for many more KTPs between the University of Exeter and businesses in Devon which would result in increased competitiveness to those businesses, increased skilled jobs in the county, and research output from the University.

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<sup>39</sup> ETSU (2001) Climate Change Agreements – sectoral energy efficiency targets, Version 2 AEA Technology

#### 9.4.5 Threats

- Employment in the manufacturing sector is expected to decline quite substantially. This leads to increased dependency on the Services sector.
- The sub-sectors Pulp, paper & printing and Textiles are declining in employment and GVA; they also show very low carbon productivity. As activity in these sectors reduces, there would be a subsequent reduction to Devon's headline GHG emissions. This should not be seen as a successful reduction of emissions in a global sense if demand for paper and textiles remains similar, as the decline in Devon's manufacturing sector would be met by imports, with the associated emissions in effect outsourced. Efforts should be made to improve the carbon productivity of these sectors to help their productivity and economic prospects.
- Increased oil prices are likely to hit energy intensive manufacturing businesses such as those in the wood products or textiles sectors hardest. Unless energy efficiency savings can be made, then this would affect the profitability of those businesses.
- There is projected to be a 13% reduction in transport emissions from all goods vehicles by 2022. In 2007 emissions from goods services represented a notional increase of 39% to the industry and services sectors. In 2022 this will have increased to 50%. Under a central oil price scenario, the overall cost of transport fuel will reduce 15% for heavy goods transport, but increase by 5% from total light good vehicle journeys. Under the highest oil price scenario the increase in cost for all journeys made by car will be 33%, for heavy goods vehicles it will be 55%, and 91% for total travel by LGVs.

## 9.5 SWOT Analysis: Private Services Sector in Devon

### 9.5.1 General

- Services are responsible for 11% of GHG emissions in Devon. Of these, three quarters are from the private sector. The majority of these (43%) are from retail trade, with a significant component coming from hotels and restaurants (29%). Together with wholesale distribution (10%) this makes up over 80% of private sector service emissions. Lighting is responsible for almost 40% of retail emissions and together with heating and catering make up 75% of emissions from the sector. These three end uses also make up about three quarters of emissions from the hotels and catering sector, though the emphasis between them is changed with catering making up almost a third of emissions from that sub-sector. For other private sector services, heating and lighting together typically make up two-thirds of emissions for each sub-sector. Services sites in Devon are smaller (in terms of employee numbers) for every sector than the national average.

### 9.5.2 Strengths

- Private services play an import role for employment in Devon and employment is expected to grow well above the average of the Devon Economy. The same is true for GVA.
- Labour productivity is very high compared to the average of the Devon economy. This makes it one of the most competitive areas of economic activity in Devon.
- The financial intermediation sector shows a carbon productivity value much higher than the UK average. This should give Devon's commercial businesses an advantage over national rivals.

### 9.5.3 Weaknesses

- There are a large proportion of private firms in rented accommodation. In this situation there is limited opportunity or incentive to make long term decisions to improve the energy performance of their premises, for example fabric or services improvements, or through taking advantage of the FIT.
- Only 2.8% of meters will qualify for the CRC. Although this covers 60% of energy use, the remaining 97% of meters, many of which will be for small businesses, fall outside of carbon dioxide reduction policy. Devon has a higher proportion of SMEs than the national average and engagement with these has traditionally been highly challenging.
- Labour productivity is lower than the UK average in all sub-sectors of private services, placing Devon at a disadvantage compared to nationally. This is reflected in lower average wages.
- Business services, transport and communications and distribution and retail show lower carbon productivity than the UK average.
- Almost a half of retail is accommodated in pre-war buildings, with about three-quarters having been built before 1980. Energy efficiency requirements as a part of the Building Regulations were only introduced in 1982 and so it is likely that the majority of retail is located in thermally inefficient premises. Heating is responsible for about a quarter of retail emissions. Moreover, it will be a challenge retrofitting fabric improvements, especially where the premises is rented. Likewise over two-thirds of office space and warehouse space was built before the introduction of Part L of the Building Regulations, and these spaces will face the same challenge as retail space. For offices in particular, there is a significant proportion of pre-war stock.

### 9.5.4 Opportunities

- Space heating, lighting, and catering are the largest sources of emissions from the private sector. If these could be tackled then it is likely that this would both increase the competitiveness of Devon based businesses, and reduce emissions from the county. This could be achieved by targeted information aimed at specific sectors, together with disseminating best practice and procurement processes established in the public sector.

- There is a genuine opportunity for any businesses who can successfully reduce emissions from heating from non-domestic buildings, many of which are older and where fabric upgrades may be more challenging. The opportunity could involve more intelligent zoning and controls to building services, or newer technologies like heat pumps.
- The recession and current high number of vacant premises provides a good opportunity to make intrusive interventions to the non-domestic building stock, for example through fabric improvement, though the challenges of capital investment and reduced cashflows for landlords would need to be overcome.
- The LCTP policy which will result in increased efficiency of appliances for use in homes and businesses could provide a competitive advantage for Devon based firms if they decide to fully embed energy efficiency into their procurement processes. As energy costs rise, the value of specifying more efficient products will increase.
- Private sector firms who can access capital could take advantage of the FIT for relatively attractive financial returns. The benefit will be greatest for early adopters as the generation tariff for each unit of energy produced is linked to the year of installation. Businesses considering the FIT should act soon as there is a risk that generation tariffs could be reduced when the scheme is reviewed, which is estimated to be in mid-2012.
- Improvements to broadband technology may result in increased flexibility for businesses, for example homeworking or working from remote hubs thereby reducing the need to travel.
- There will be increased demand for quality consultancy services around the environmental and low carbon sector as Government policy and regulations tighten.
- Potential increased fuel prices and public consciousness of the need to travel less may result in increased tourist numbers to Devon. In 2007 spending by tourists staying overnight was over £1.2 billion, of which over £450 million remained as income to Devon<sup>40</sup>. This makes tourism an important sector to Devon (around 4.5% based on total Devon 2007 GVA). There are twice as many tourism business in Devon than the average. Based on trends observed from 2003-2007 there have been increased trips from domestic and overseas visitors (domestic

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<sup>40</sup> DCC 2007, Tourism Trends in Devon 2007

outnumber overseas by ten to one) with most coming from the economic group AB and C1 (with an increased and rising split towards those from AB). Visitors arrive mainly by car and from the south of the country, with an increasing trend towards those from within the region. Devon businesses in the tourism sector can capitalise on possible increased visitor numbers. Promotion through schemes such as the Green Tourism Business Scheme could increase the competitiveness of Devon based businesses.

- There is projected to be a 31% reduction in transport emissions from cars by 2022. This is broadly in line with the savings from the industry and services sector. The rate of fall in car emissions is greater than emissions from retail trade, meaning that in 2007 car transport for shopping represented a notional increase in emissions of 58% to that sector. This will fall to 48% in 2022, even before other effects such as more efficient delivery through internet based shopping are considered. Under a central oil price scenario, the overall cost of transport fuel from car journeys will reduce by 25%.

#### 9.5.5 Threats

- Oil price increases could affect the balance sheets of local businesses through increased heating and electricity bills, and fuel costs associated with the sector could increase by 33% under the highest oil price scenario.
- Improvements to broadband technology internationally may increase competition for the services provided by businesses in Devon, perhaps from abroad. In addition, slower improvements to broadband in rural areas may increase disparity across the county.
- The impacts of climate change, for example a greater frequency of extreme events could potentially lead to greater uncertainty for those in the tourism sector. Conversely, an increased number of tourists could place additional strain on the infrastructure, especially roads, within the county.

## 9.6 SWOT Analysis: Public Services Sector in Devon

### 9.6.1 General

- Services are responsible for 11% of emissions in Devon. Of these, a quarter is from the public sector. Of these, Education is responsible 28% of these emissions, with public administration and health about 20% each. Space heating is responsible for almost half of emissions, with lighting representing a further 25-30% in the education and health sectors. Lighting, catering and computing make up a further third of public administration and defence emissions, in broadly equal proportions. The EU ETS and NAEI have identified that collectively the RD&E hospital, the University, and the Met Office, all in Exeter, are together responsible for 0.8% of non-domestic carbon dioxide emissions. Services sites in Devon are smaller (in terms of employee numbers) for every sector than the national average.

### 9.6.2 Strengths

- Public services provide an important employer in Devon, though growth will be smaller than in private services. In addition, carbon productivity in Health, Public Administration & defence is much higher than average in the UK.
- Devon County Council has targeted “A World Class Environment” as a local priority and has been awarded a green flag for working with local people to tackle climate change. It has brought important issues such as recycling and the need to reduce CO<sub>2</sub> to the attention of hundreds of thousands of Devon residents. This has resulted in high levels of recycling and reduced carbon emissions that cause global warming.
- In 2008, Devon County Council was awarded 4 stars – the highest score available – by the Audit Commission, to reflect how well the local authority is delivering and improving services to local people and communities

### 9.6.3 Weaknesses

- Labour productivity in the services sector tends to be somewhat lower in Devon than in the UK economy.
- In the educational sector carbon productivity is much lower and labour carbon intensity much higher than in the UK as a whole.
- Over 40% of office based activity is accommodated in pre-war buildings, with about three-quarters having been built before 1980. Energy efficiency requirements as a part of the Building Regulations were only introduced in 1982 and so it is likely that the majority of office based activity are located in thermally inefficient premises. Heating is responsible for up to half of office based emissions. Moreover, it will be a challenge retrofitting fabric improvements, especially where the premises is rented. Perversely, the potential for carbon reduction may be greater in some of the pre-war offices, where there is likely to be better potential for daylight than in offices from the 1960s, where the prevalence of fluorescent lighting resulted in deeper plan buildings which are also more prone to requiring artificial cooling.

### 9.6.4 Opportunities

- Local authorities are well placed to support new technologies and their associated infrastructure, for example electric vehicles. This technology will require supporting infrastructure where the local authority will be strongly influential through the planning process, as required in the supplement to PPS1. Taking a lead on this is arguably more important in a county such as Devon where emissions from transport are higher than elsewhere.
- Emissions from the public sector are strongly focussed on space heating. If reducing space heating energy consumption could be tackled in a strategic way across the public sector, for example through a programme of building fabric upgrades, boiler replacements, or system control upgrades, then it is likely that significant reductions in emissions would occur. Lighting is the next largest emitter, and again a strategic approach could more efficiently deliver large savings.
- The LCTP policy which will result in increased efficiency of appliances for use in homes and businesses could provide a competitive advantage for the public sector in Devon based through procurement policy. There is a real opportunity for combining procurement strategies and to choose approved suppliers for a range of energy consuming goods.

This could potentially incorporate consideration of procurement from Devon based firms, which would provide additional benefits to Devon's economy. As energy costs rise, the value of specifying more efficient products will increase.

- The public sector is well placed to share good practice with the wider business community to help improve carbon productivity across the county.
- The Government is preparing to overturn a 34-year-old ban on councils supplying electricity from small-scale green schemes into the grid<sup>41</sup>. This paves the way for the public sector to be able to take advantage of the FIT. The public sector is arguably better placed than the private sector to make such long term financial commitments.
- Some public sector tasks could benefit from improvements to broadband technology, which could lead to regional hubs and more efficient use of serviced space.
- The carbon reduction commitment (CRC) will capture the majority of the public sector and so provides a real opportunity for Devon to show leadership and reduce its own emissions, and to pave the way for those in the private sector to follow suit.
- Health is an important sector for the Devon economy for employment and GVA and is expected to grow further. The same is true for Education.
- There is projected to be a 31% reduction in transport emissions from cars by 2022. This is broadly in line with the savings from the industry and services sector. Approximately 11% of all car journeys are associated with the public sector, for commuting, business journeys and education and education escort journeys<sup>42</sup>. Under a central oil price scenario, the overall cost of transport fuel from car journeys will reduce by 25%.

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<sup>41</sup> Independent 6/8/10 Councils to sell electricity to the national grid in green initiative <http://www.independent.co.uk/environment/green-living/councils-to-sell-electricity-to-the-national-grid-in-green-initiative-2044814.html> (accessed 10/8/10)

<sup>42</sup> Based on the public sector making up on average 31% of the workforce between 2008-22 and allocating commuting (22% of all car journeys) and business journeys (17% of all car journeys) to the public sector on a pro-rata basis, with all education and escort journeys (2% of all car journeys) allocated to public sector activity.

- There are 92,482 pupils in Devon in 317 primary and 37 secondary schools<sup>43</sup>. There is the opportunity not only to reduce emissions associated with those schools through a strategic approach to efficiency interventions (e.g. shared frameworks for measures), but also for those pupils to take positive examples of improvement home with them (and vice versa).
- There are 25 hospitals, 164 doctor's surgeries, 111 dental surgeries, 134 pharmacies and 77 opticians in Devon<sup>44</sup>. Of the NHS estate, the Royal Devon and Exeter hospital in Wonford accounts for 36.5% of total energy consumption, even accounting for the gas CHP plant at that site – one of the few functioning examples in the county. The North Devon District Hospital in Barnstable accounts for a further 12.1% of the total energy consumption, with the Royal Devon and Exeter hospital in Heavitree accounting for a further 6.4%<sup>45</sup>. Together these three sites account for 55% of the total energy consumption of the estate in Devon. Focussing on these three sites could result in large savings for Devon as a whole.

#### 9.6.5 Threats

- It is expected that anticipated spending cuts will lead to a slower growth in the public than in the private service. Reduced funding available to local authorities and the public sector may have a severe impact on issues such as the transition to a low carbon economy within the sector, as budgets become stretched and providing front line services becomes increasingly challenging.
- Devon has an aging population, and one that is aging faster than the national average. The dependency ratio (the ratio of those under 16 and above retirement to those in working age) is 72% for Devon compared to 61% for UK. This is set to increase to 83% by 2026. The increase in proportion of dependant to working aged population is far greater in rural areas, for example in South Molton the working age population will decrease by 1.3% from 2006 to 2026, set against a total population increase by 17%. The notable exception is Exeter, where overall population only increases by 4% more than the working age population over this period. These trends will put added pressure on public services, especially so in more rural areas.

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<sup>43</sup> DCC Education Statistics <http://www.devon.gov.uk/index/learning/educationstatistics/edstats-schoolcensus.htm> (accessed 23/8/10)

<sup>44</sup> Devon Primary Care Trust, <http://www.nhs.uk/ServiceDirectories/Pages/Trust.aspx?id=5QQ&v=0>

<sup>45</sup> Hospital Estate and Facilities Statistics <http://www.hefs.ic.nhs.uk/ReportFilter.asp>

- Under a very high oil price scenario, fuel prices could increase by 33% even including all carbon reduction policy. Devon has higher transport emissions and costs than average due to its large size and rural nature. This will therefore significantly affect business journeys and commuting from public service activity, placing a greater strain on those services.

## 10 Acknowledgements

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