

The Green Economy in Bristol and the West of England

A Report to Bristol Green Capital



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Commissioned by Bristol Green Capital

The Bristol Green Capital Partnership is a free membership organisation whose aim is to make Bristol “a low carbon city with a high quality of life for all.”

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Executive Summary

This report surveys the environmental technologies sector in the West of England, and the national policy landscape. It recommends strategic collaboration on Resilience Planning, a process of integrative thinking and doing which draws on local strengths to meet local needs on a sustainable basis. These strengths include: the innovation of businesses, the data gathering and analytical power of academia and third sector groups; research on materials and processes by universities and companies; policymaking powers in local authorities; awareness raising by voluntary, community and other groups, and the lifestyle, voting and purchasing actions of citizens. These attributes can be brought together into a process which works to optimise the longer-term viability of the region as a place to live, but also drives investment and expertise toward meeting not only the needs of the region, but of the wider world. The commercial

benefits of doing so could be huge. This report concludes with a call for the region to take a national lead on the development of Resilience Planning.

Section One explores some of the major green economic activities in Bristol and the West of England, estimating the present status, and the future potential of the green economy in the region, and placing it in a national context. Section Two examines the policy environment, including the overall strategic aims of the government, and some of the key policies that it will use to drive development in the sector. The section concentrates on policies that have perhaps the most relevance to the region, and highlights the challenges of working with what has become a notably unstable policy environment. Annex A summarises other major aspects of the green economy, citing a number of local examples.

Baseline Figures

In 2009/10, the UK was ranked at number six in the world, with 3.7% of global sales of low carbon good and environmental services (LCEGS). The South West region was ranked fifth in the UK in 2010, with 8% of national sales.

The South West Environmental iNet at the University of the West of England (UWE) substitutes the term LCEGS for environmental technologies (ET). They provide the following data on the status of the sector in the West of England in 2010:¹

- Estimated value in sales: £2.4 bn
- Estimated number of companies: 1,086
- Estimated number of jobs: 19,292

For comparison, the employment figure for the South West was estimated by the iNet at 77,700 in 2010/11. More detail on the West of England figures is provided in the table below, which breaks them down and ranks them by unitary authority.

The West of England ET sector has mirrored the national trend in its domination by five sectors:

alternative fuels, alternative fuel and vehicles, building technologies, wind and geothermal energy.

Table 1. Numbers of Sales, Companies and Jobs in the West of England Environmental Technologies Sector in 2010

Region	Sales (£m)	No. of Companies	No. of Jobs
Bristol	1,144.6	513	9,144
South Gloucestershire	582.8	262	4,628
Bath and NE Somerset	350.7	158	2,800
North Somerset	340.2	153	2,727
Totals	2,418.30	1,086	19,292

The sector as a whole grew by 4.8% from 2009/10 to 2010/11 in the region, and is forecast to reach 5.5% annual growth by 2014/15, which is above the forecast national average of 4.5%. The highest year-on-year increases are anticipated in carbon finance and in four energy subsectors: wind, wave and tidal, carbon capture and storage, and photovoltaic energy. Between 2005 and 2008, growth in renewable energy was around 160%, compared to 10% for the economy as a whole. It slowed to 75% between 2008 and 2010.

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The single most important aspect of driving low carbon economic development is the existence of, and confidence in, a stable, well designed and implemented policy environment. The coalition government's handling of green policy in 2011 has been much criticised by groups within government, industry and the third sector. This has applied in general, and in specific cases, such as the Feed-in Tariff and the Green Deal.

The role of government and the media in communicating the issues around energy investment has also been critiqued in a recent policy brief co-authored by Lord Nicholas Stern. It argues firstly that, "some standard models used in policy analysis are structured in ways that are inherently misleading. Second, [...] that the expenditure involved in making the transition to a low-carbon economy must be analysed as an investment, rather than being seen simply as a net cost or solely as a direct cost to the public purse. Third, it emphasises that this investment can drive an economic recovery. Fourth, it makes clear that the transition to the low-carbon economy is likely to be dynamic, innovative and a period of strong growth. And fifth it highlights the importance of the credibility of policy in fostering new investment."

Given that renewable energy is in many ways a precondition for a greener economy, its low cost deployment will allow many more sectors of the economy to decarbonise their operations and commercial offerings. This applies equally to the public and domestic sectors.

This report is only a beginning. It reflects the nature of the 'green economy' at this time, in that the areas which receive most investment are the ones which are studied, and therefore could provide data for Section 1. This is challenged in 'Annex A: Other Green Economy Aspects,' which briefly explores other important subjects which should be studied in detail. It covers peak oil, various aspects of sustainable design and retail, the food system, wellbeing and sustainability, and the activities of third sector groups. Time and space constraints precluded examination of other major issues such as green building, waste and procurement. This group of approaches and issues is vital to understand in developing a sophisticated concept of a resilient economy.

The economist Milton Friedman said: "Only a crisis—actual or perceived—produces real change. When that crisis occurs, the actions that are taken depend on the ideas that are lying around." The idea of Resilience Planning is one which should allow us not only to soften the local impact of any external shocks in the event of crisis, but to offer the model to other regions nationally and internationally. This will require an understanding of four key elements. Firstly, how to successfully integrate the systems a city region relies upon to function. Secondly, the degree of non-substitutable input and output dependencies the local area has on global systems, including food, energy, trade, finance and major resources. Thirdly, how to optimise local human, financial and institutional resources to design and deliver a resilience strategy. Fourth, how to collectively push for more sophisticated policy to support this integrative approach. Strategic collaboration, in addition to individual effort, is vital in taking this agenda forward in a meaningful way. The term 'Resilience Planning' is an attempt to offer a unifying concept, incorporating principles and objectives which guide the development of resilience and prosperity.

The West of England can choose *how* it responds to the challenges of the times, but not *whether* to respond. It has the distinct benefits of a relatively healthy economy, abundant academic excellence, innovative and successful companies, a skilled and diverse workforce, a vigorous third sector, and many natural assets. It has difficulties with political short-termism and party political division, and with joined-up thinking and doing between the unitary authorities, and between other major organisations. It is a great challenge to overcome long-standing difficulties of this kind, but the benefits of doing so, and thereby adding to the energetic private sector activity described in this report, will prove worthy of the effort. Resilience Planning is a concept borne directly out of the research process for this report, looking at local assets, needs, threats and opportunities.

Drawing on the deep and wide pool of resources in the region and exploring how we can co-create a resilient, prosperous place is not only vitally necessary, but an exciting opportunity to literally make our own future. The challenges of the times are such that no amount of ambition is too great.

Executive Summary

Recommendations

1. Explore and develop the principles and objectives of Resilience Planning in the city region; this unifying concept for ongoing strategic collaboration draws together economic development and opportunity with planning, investment, local decision-making, national policy, education and skills, innovation, technology, social capital and well-being. It will chiefly integrate and optimise energy, transport and food systems.
2. All local actors should be able to contribute to the development of Resilience Planning. The process will require regular contact between businesses, academia, local authorities, third sector groups and communities, particularly with regard to system design, exploration of revenue-raising opportunities and green innovation for the region.
3. Regularly assess the extent to which local actors can work within existing legal and policy frameworks to enact strategies suggested through Resilience Planning, and identify specific cases where policy engagement work can be pursued collectively which would facilitate it.
4. Produce a study which provides a much broader understanding of the concept of 'green economy' as referred to in summary in Annex A of this report. A focus on the implications of peak oil and other resource depletion issues will help to inform local and regional strategy on remaining competitive and functional under such conditions.
5. Assess the implications of growth in the carbon finance sector for Bristol.
6. Assess the potential for powering the region by renewable energy, examining technical and investment issues. Any excesses could provide export value. The 25 GW energy gap facing Britain in the next decade will require investment that could pay off significantly in energy security terms for both business continuity and service provision. Local investment in local energy assets would also minimise the level of local finances leaving the region to pay for energy imports.
7. Create a regularly updated resource on both conventional and innovative funding mechanisms for renewable energy and energy efficiency investment; maintain a similar resource on the evolving policy environment.
8. Invest annually, through a consortium of funders, in updates of the database currently supplied by K Matrix (used by UWE to supply the bulk of the data for this report), which studies the entire environmental technologies sector in detail.

Section 1: Development in Green Technologies

Introduction

The main purpose of the work is to establish an estimated baseline of the status of the 'green economy' in Bristol and the West of England, and to assess drivers and opportunities for future development. The geographical scope of the work covers the city region of Bristol and the West of England. The four unitary authorities are Bath & North East Somerset Council, Bristol City Council, North Somerset Council and South Gloucestershire Council. Data and analysis on the South West is

often cited as there is more work done on this region than the West of England, mainly as the government uses this approach for regional and national analysis. Baseline data includes the numbers of companies operating in the LCEGS sector, the number of employees, and the value of company sales. In addition, this section discusses the challenge of defining the sector.

Defining a Green Economy

Defining a 'green job' and a 'green economy' is a work in progress. Although it has become a well-worn phrase in the past few years, it is nevertheless true: *all* jobs should be green jobs. But what does 'green' mean? The definition would point to low or no environmental impact. Products and services, entire value chains, cradle to cradle: all ecologically benign. But what of social and cultural impacts? What of environmental justice, of equality? The discussion can quickly move into the far less steady terrain of values, of value judgements, and of interests. So, how might we create a definition that everyone can agree on, or on outcomes, or frameworks and processes that everyone can work with? A quick glance towards the international climate change agreement process, under the United Nations Framework Convention on Climate Change (UNFCCC), and we can see how treacherous and contested this terrain truly is.

This is perhaps part of the reason why we tend to work with definitions around low or no carbon technologies, high levels of energy efficiency, and other less obviously value-laden issues. The focus on technologies, policies and processes does not avoid it altogether however. The policy environment is a minefield, and will be discussed in more detail in Section Two.

Aside from the developing ET sector, what is of interest at regional level is perhaps the matter of

new business models, and commercial opportunities, with an environmental and/or social dimension. Bottom-up innovation in these areas is emerging all over the world, and will at times require top-down policy to foster and allow it to flourish. This includes social enterprises, cooperatives, non-profits and small businesses. Some of these will be touched on briefly in Annex A of the report.

But, we must be realistic in asking how green and sustainable any job can be within a dirty, unsustainable system. How can we 'clean up' and decarbonise existing jobs and sectors, and innovate around new goods and services? The challenge we face is in making 'green' the new convention, moving it from the periphery to the core of our economy. In the process, this should ultimately make the term 'green job' redundant. Given the needs of the economy and the challenges of the age, this becomes a matter of making a virtue of a necessity. However, section two discusses some of the critiques of the design and implementation of green policy in the UK, making it clear that the low carbon transition is a fiendishly complex task.

A major international report from 2009 on the green economy discusses some of the complexities and subtleties of the matter of definition: "A green economy is an economy that values nature and people and creates decent, well-paying jobs. Technological and systemic choices offer varying

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degrees of environmental benefit and different types of employment. Pollution prevention has different implications than pollution control, as does climate mitigation compared with adaptation, efficient buildings vis-à-vis retrofits; or public transit versus fuel-efficient automobiles. It is of course preferable that the most efficient, least polluting options receive priority. But these are not either-or choices, as all of these options are needed to bring about a more sustainable, low carbon economy. But they do suggest 'shades of green' in employment. Greater efficiency in the use of energy, water, and materials is a core objective. The critical question is where to draw the line between efficient and inefficient practices. A low threshold will define a greater number of jobs as green, but may yield an illusion of progress. In the light of the need to dramatically reduce humanity's environmental footprint, the bar needs to be set high – best available technology and best practices internationally should be seen as the most appropriate thresholds. And, given technological progress and the urgent need for improvement, the dividing line between efficient and inefficient must rise over time. Hence, 'green jobs' is a relative and highly dynamic concept."²

Market Development

The transition to a greener economy in the 21st century is almost universally recognised as both necessity and opportunity, on a vast scale. Recognition of the threats from climate change, as well as the commercial and practical opportunities it presents, have had significant effects on policies, practices, products and processes, all over the world. It is bound up with issues around resources, rights and responsibilities, with ecology and equality, with finance and fuel, with carbon and community.

The climate issue saw a huge leap forward in 2006, when *The Stern Review* and *An Inconvenient Truth* were released. A report on economics and a documentary on climate change did what decades of environmental campaigning had arguably failed to do: they got the issues into the mainstream in a major way. Politicians, business leaders and celebrities all flocked to the cause, and pushed the

US green economy campaigner and author Van Jones defines a 'green collar job' as "a family-supporting career-track job that directly contributes to preserving or enhancing environmental quality". He sets out three core principles that define a green economy: equal protection for all, equal opportunity for all and reverence for all creation."³

The UK coalition government published the document *Enabling the Transition to a Green Economy* in August 2011. It sets out their view on the 'green economy', and the policy measures used to promote and develop it. On the matter of definition it states, "A green economy is not a sub-set of the economy at large – our whole economy needs to be green. A green economy will maximise value and growth across the whole economy, while managing natural assets sustainably."⁴

While this report does not offer its own formulation of a green economy definition, it is clear that in dealing with the subject in the regional context, the environmental technologies sector is a useful, if incomplete picture to draw.

issue of carbon and other greenhouse gas emissions way up the political agenda. Energy security became increasingly prevalent in geopolitical discussions as the Iraq war and other international affairs forced governments to confront the reality of the era of cheap oil drawing to a close. Then, in December 2007, the US economy began to dip after 73 months of sustained growth. On the 11th of July 2008, in response to Iranian missile tests, oil prices briefly traded at a record high of \$147.27 for a barrel of light, sweet crude. Increasingly, the logic of energy security and decarbonisation asserted itself, just as the global financial crisis and the ensuing recession pushed climate issues back out to the political periphery. Karl Rove, former advisor to US President G.W. Bush, announced in November 2010, "Climate is over."

Since then the noisy political discussions around

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decarbonisation have petered out in the face of immediate economic difficulties. Yet, the markets for low carbon goods and services have prospered despite the economic downturn. From 2005 to 2010, total global capacity of many renewable energy technologies grew at rates of between 15% and 50%. In 2005, just 55 countries had renewable energy promotion policies of some kind. By early 2011 this had risen to 118. Globally, the sector employs over 3.5 million people directly, and is attracting growing investment; 2010 saw \$211 billion invested worldwide, up from \$160 billion in 2009. Renewables made up nearly half of the 194 GW of new electricity generation capacity added in 2010.⁵ The UK added

0.9 GW of onshore and offshore wind capacity and was in the top three nations for biomass additions in 2010. London's financial sector helped the UK become number two in the world in carbon finance the same year.

Clearly, the private sector has warmly welcomed the commercial opportunities that climate action presents. The following section explores the growth in the sector most readily associated with 'the green economy,' that of Low Carbon and Environmental Goods and Services (LCEGS), referred to as Environmental Technologies (ET) in the iNet analysis.

Low Carbon and Environmental Goods and Services (LCEGS)

The methodology section of the *Low Carbon and Environmental Goods and Services (LCEGS) Report for 2009/10*, published by the Department for Business, Innovation and Skills (BIS) in July 2011, details the challenges of establishing definitions and scope. Their definition emerged from five years of work with government and UK industry

associations. They state that definitions of LCEGS are evolving, and that it is an umbrella term, currently covering around 2,800 activity sub-headings in the Standard Industrial Classifications (SIC), including both supply chain activities (componentry & assemblies) and value chain activities (R&D, Supply & Training). The report

Table 2. LCEGS: 24 Subsectors and Global Sales 2009/10 in £m

Environmental	£m	Renewable Energy	£m	Low Carbon	£m
Water Supply and Waste Water Treatment	244,731	Wind	373,155	Alternative Fuels	517,354
Recovery and Recycling	194,708	Geothermal	288,884	Building Technologies	407,135
Waste Management	146,633	Photovoltaic	149,730	Alternative Fuel/ Vehicle	333,165
Energy Management	76,713	Biomass	147,163	Nuclear Power	93,391
Air Pollution	28,901	Renewable Consulting	17,737	Additional Energy Sources	45,204
Contaminated Land	27,845	Hydro	13,657	Carbon Finance	35,284
Environmental Consultancy	24,518	Wave & Tidal	2,065	Carbon Capture & Storage	13,863
Noise & Vibration Control	6,619				
Environmental Monitoring	4,536				
Marine Pollution Control	3,673				

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excludes areas that are under investigation in the realm of “new boundaries”, such as cleaner manufacturing, process and materials, and adaptation and resilience. The activity types that are included are: design/development, manufacture, supply, distribution, installation, maintenance, operations, R&D, consultancy, support services and retail. To be included in the analysis, a company had to derive a minimum of 20% of sales from the LCEGS sector.

They break the sector down into 24 sub-sectors (Level 2 markets), which are divided into the three broad categories of Environmental, Renewable Energy and Low Carbon. The 24 Level 2 markets are subdivided into 119 Level 3 markets, which have been subdivided into 791 Level 4 markets. These are then subdivided into approximately 2,800 activities.⁶ The table below shows the value of the 24 sub-sectors in 2009/10. Asia dominates the market with 38% of global sales, with the Americas and Europe next at 30% and 28% respectively. This market share split has been constant from 2008 to 2011.⁷

Growth in the sector globally has been impressive, though it has slowed in some places in the last year. In 2009/10 LCEGS sales were valued at £3.2 trillion. This shows an annual increase from 2007/08 to 2008/09 of 3.1% and from 2008/09 to 2009/10 of 1.8%. Growth in UK sales, from 2008 to 2011 was 4.3% on average. Compare this with the US at the lower end

Table 3. Global Value of LCEGS Sales in £m by Top 10 Countries for 2009/10

Country	Total £m	Rank	% of Total
US	629,303	1	19.7
China	426,610	2	13.3
India	199,115	3	6.2
Japan	197,816	4	6.2
Germany	135,677	5	4.2
UK	116,780	6	3.7
France	98,228	7	3.1
Brazil	92,513	8	2.9
Spain	87,345	9	2.7
Italy	85,262	10	2.7

with -0.5% in 2008/09-2009/10, and 15.9% at the top end in the Philippines.⁸ Table 3 shows the global value of the top 10 countries and percentage of world total.

The UK was positioned at number six in the world in terms of market share in 19 of the 24 sub-sectors of LCEGS, and was seventh in four others. Interestingly, it is ranked number two globally in terms of Carbon Finance, due overwhelmingly to the influence of London as a financial capital.⁹

Table 4. UK LCEGS Sales, Jobs and Companies from 2007 to 2011

	2007/08	2008/09	2009/10	2010/11
Sales (£bn)	106.5	-	116.8	122.2
Employment	908,262	909,782	914,273	939,627
Companies	52,271	52,258	51,611	51,682

Note. Combined data from BIS, 2011 and iNet, 2011

The number of UK LCEGS companies shrank year on year from 2007 until 2010, where it showed recovery up to 2011.¹⁰ The shrinkage may be due to a mixture of factors, including company closures and market consolidation. Employment in and sales from UK companies have shown steady growth over the same period.¹¹

In 2011 the Pew Environment Group in the US published *Who's Winning the Clean Energy Race 2010 edition*. The data, provided by their research partner, Bloomberg New Energy Finance, assesses and ranks the G-20 nations in terms of their activity in the clean energy field. The report focuses on financial, investment and technological trends. “Our primary focus is on investment, which is the fuel that propels the innovation, commercialization, manufacturing and installation of clean energy technologies.”¹²

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Table 5. UK Investment, Installed Capacity and Distribution of Investment

Finance and Investment (2010)	
Total Investment	\$3.3 billion
G-20 Investment Rank	13
Percentage of G-20 Total	1.6%
5-Year Growth Rate	49%
Installed Clean Energy (2010)	
Total RE Capacity	7.5 GW
Percentage of G-20 Total	2%
5-Year Growth Rate	21%
Key Renewable Energy Sectors:	Wind 5,200 MW Biomass 2,000 MW
Key Clean Energy Targets	2020 (15% of energy consumption)
Distribution of Investment by Sector (2005-10)	
Wind	60%
Other renewables	16%
Efficiency/low carbon tech/services	11%
Biofuels	10%
Solar	3%

Compiled from key data in Pew, 2011, p.45

The *Report on the Environmental Technologies Sector 2011* by the UWE-based South West Environmental iNet (innovation network) provides detailed analysis of regional activity. They use the same data sources as the government departments BIS, Department of Energy and Climate change (DECC) and Department for Environment, Food and Rural Affairs (DEFRA), and the same methodologies and definitions. The data source is a UK consultancy called K-Matrix.¹³

Whereas the Government have used LCEGS, the Environmental iNet South West uses the term Environmental Technologies, or ET. Their published analysis shows that of the 24 Level 2 sub-sectors, five have been notably ahead in sales, employment and growth contributions at both national level, and in the West of England: alternative fuels, alternative fuel and vehicles, building technologies, wind and geothermal energy.¹⁴ At the UK level in 2009/10, they had the following market shares respectively: 15%, 11%, 12%, 11% and 9%.

The sector as a whole grew by 4.8% from 2009/10 to 2010/11, and is forecast to reach 5.5% annual growth by 2014/15. The highest year-on-year increases are anticipated in carbon finance and in four energy subsectors: wind, wave and tidal, carbon capture and storage, and photovoltaic energy.¹⁵

The report estimates the value of UK ET exports in 2010/11 at £11.8 billion, increasing 3.9% as they had the previous year. The top five export areas by value were alternative fuels, building technologies, photovoltaic, wind and water/waste water, accounting for £6.9 billion in 2010/11 or 58% of all exports. The ET sector as a whole made up 9.6% of all UK exports in that period. The top destination countries are China (7%), Hong Kong (5%, en route to other destinations in Asia), Spain (4.3%), South Korea (4%) and Taiwan, India and Pakistan (3.5% each). The domination of Asian countries is unusual for UK exports, which are generally dominated by the United States and Europe.¹⁶

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Table 6. Value of Sales (£m), Numbers of Companies and Jobs in ET Subsectors in the West of England

Activity Area	Unitary Authority											
	City of Bristol			South Gloucestershire			Bath and NE Somerset			North Somerset		
	S	C	J	S	C	J	S	C	J	S	C	J
Additional Energy Sources	10.1	5.0	92.0	5.1	2.0	47.0	3.5	2.0	32.0	3.3	1.0	30.0
Air Pollution	12.2	3.0	110.0	5.7	1.0	51.0	3.2	1.0	28.0	3.8	1.0	34.0
Alternative Fuel/ Vehicle	120.6	61.0	988.0	72.7	35.0	578.0	38.7	20.0	319.0	46.1	23.0	384.0
Alternative Fuels	265.7	121.0	2,132.0	120.4	56.0	935.0	81.5	38.0	651.0	85.3	38.0	679.0
Biomass	56.1	24.0	444.0	28.0	12.0	225.0	16.4	7.0	130.0	13.4	6.0	110.0
Building Technologies	169.0	81.0	1,291.0	65.6	32.0	502.0	37.7	18.0	288.0	33.8	16.0	261.0
CCS	5.1	2.0	50.0	2.8	1.0	27.0	1.5	1.0	15.0	1.7	1.0	16.0
Carbon Finance	1.8	1.0	9.0	1.4	-	7.0	0.9	-	5.0	0.7	-	4.0
Contaminated Land	8.5	3.0	69.0	7.7	2.0	63.0	3.8	1.0	30.0	3.5	1.0	28.0
Energy Management	32.7	16.0	264.0	19.7	10.0	163.0	14.3	7.0	119.0	9.5	5.0	76.0
Environmental Consultancy	7.8	1.0	75.0	3.6	1.0	35.0	1.9	-	18.0	1.7	-	16.0
Environmental Monitoring	1.1	0.0	12.0	0.7	0.0	8.0	0.5	0.0	5.0	0.4	0.0	4.0
Geothermal	73.7	33.0	569.0	43.3	20.0	348.0	27.6	13.0	216.0	22.1	10.0	171.0
Hydro	3.1	1.0	35.0	2.5	1.0	26.0	1.5	1.0	15.0	1.3	1.0	14.0
Marine Pollution Control	0.7	-	5.0	0.9	-	7.0	0.6	-	4.0	0.5	-	4.0
Noise & Vibration Control	2.7	1.0	24.0	1.1	1.0	10.0	0.8	-	8.0	0.6	-	5.0
Photovoltaic	34.2	14.0	264.0	17.2	7.0	130.0	10.0	4.0	78.0	11.8	5.0	93.0
Recovery and Recycling	87.0	35.0	683.0	40.5	17.0	321.0	27.7	11.0	221.0	20.0	8.0	159.0
Renewable Consulting	5.3	2.0	47.0	2.6	1.0	23.0	1.4	1.0	12.0	1.5	1.0	14.0
Waste Management	54.9	25.0	471.0	-	-	261.0	15.9	7.0	138.0	17.2	8.0	145.0
Water Supply Waste Water Treatment	99.0	48.0	881.0	55.7	26.0	489.0	28.5	14.0	248.0	32.1	15.0	280.0
Wave & Tidal	0.4	0.0	3.0	0.5	0.0	3.0	0.3	0.0	2.0	0.3	0.0	2.0
Wind	92.9	37.0	631.0	55.0	21.0	371.0	32.6	13.0	217.0	29.7	12.0	200.0
Totals	1,144.0	513.0	9,144.0	582.8	262.0	4,628.0	350.7	158.0	2,800.0	340.2	153.0	2,727.0

Notes. S = Sales, C = Companies, J = Jobs. Top Five Sectors in bold. CCS = Carbon Capture and Storage. - = no data.

Section 1: Development in Green Technologies

Regen SW Jobs and GVA Studies

Regen South West, a sustainable energy organisation based in Exeter, commissioned several studies on the number of jobs in, and the economic contribution of, the renewables and efficiency sectors in the South West region. The studies took place in 2005, 2008 and 2010. Comparing employment in renewable energy (RE) and energy efficiency (EE) sectors, between the studies in 2008 and 2010, RE shows 70% growth, against 8% in EE. For RE, this was attributed to growth in size and number of companies operating in the sector. Between 2005 and 2008, growth in renewable energy was around 160%, compared to 10% for the economy as a whole. It slowed to 75% between 2008 and 2010.¹⁷

Table 7. Regen SW Data on Renewables and Efficiency Jobs and GVA 2005-2010¹⁸

	2005		2008		2010	
	RE	EE	RE	EE	RE	EE
Gross FTE	1,140	-	2,900	4,300	5,160	4,660
Net FTE	-	-	4,000	5,600	6,000	5,430
Direct GVA	£34m	-	£215m	£294m	£251m	£153m
Net GVA	-	-	£288m	£379m	£293m	£178m

The study ranks the UK regions in market share and value of sales, with the South West ranking fifth, closely followed by both the West Midlands and Scotland.

Table 8. Market Share and Value of LCEGS Sector in Top 7 UK Regions in 2010

Region	%	Value (£bn)
London	20	20.9
South East	12	13.0
North West	10	10.3
East of England	9	10.2
South West	8	8.7
West Midlands	8	8.5
Scotland	8	8.5

The Regen SW report for 2010 found that the ET sector in the South West should see “significant growth” in future due to a number of factors around policy, the existing cluster of companies and activities in the region, and its “environmental assets”, which include the coastline and other sites for deployment of renewable technologies.¹⁹

Section 1: Development in Green Technologies

Energy Savings Trust Jobs and GVA Modelling

The Energy Saving Trust's (EST) Domestic Sustainable Energy Economic Impact Model estimates the direct, net and net additional economic effects of installing a range of different microgeneration technologies and domestic energy efficiency measures. It calculates both Gross Value Added (GVA) and jobs supported (Full-Time Equivalency or FTE). The modelling tool was used in a 2011 analysis of emissions reduction options and

predicted effects in the West of England. The table below shows emissions from 2005 by unitary authority, the reductions required by 2020 to meet the 34% target set out in the Climate Change Act, and the reductions possible under a given reduction scenario for the region. The measures are cavity wall insulation, loft insulation, solid wall insulation, solar PV, solar thermal and boiler upgrades.

Table 9. EST CO2 Reduction Estimates to Meet 2020 Target

Area	2005 Emissions (tonnes)	34% Reduction (tonnes)	Reduction from Installed Measures (tonnes)
Bath & NE Somerset	1,125,850	253,746	125,951
Bristol	2,488,680	560,901	238,518
South Gloucestershire	2,678,420	603,492	368,679
North Somerset	1,587,060	357,633	226,698
Total	7,880,010	1,775,772	959,846

Note. Combined data from tables on pages 3 and 6 of EST, 2011.

Direct Effects

This is an estimation of the direct effects that the measures modelled have on GVA and job creation. It estimates the value of direct sales (the total cost of installation), the levels of employment directly

supported by installation demand, and the GVA directly created (the levels of employment supported times the average GVA/head for installation).

Table 10. 2020 34 Percent Reduction Scenario Modelled by EST²⁰

Economic Impacts	West of England	Bath & North East Somerset	Bristol	North Somerset	South Gloucestershire
Sales	£ 1,416,597,877	377,053,095	415,912,701	284,120,473	384,511,608
Jobs	FTE 5,779	1,436	1,760	1,130	1,452
GVA	£ 357,756,950	89,211,088	108,381,617	70,000,776	90,163,469

Note. Jobs figures rounded from original

UK Greenhouse Gas Emissions

The drivers of the green economy are mainly to be found in the agendas of energy security and the response to climate change, in both mitigation and adaptation. Mitigation is seeing the largest interest and investment, to some extent because the prescriptions also meet the objectives of energy security. Reducing energy demand and carbon emissions through efficiency savings and moving to energy from renewable sources are both areas where government intervention through policy and incentivisation can drive activity. The reduction of GHG emissions was written into law in the Climate Change Act of 2008 under the Labour government. To measure progress, annual emissions from across the various sectors of society are reported by DECC. Provisional estimates of UK greenhouse gas (GHG) emissions from 2010 showed increases from 2009 figures across all sectors. Between 2009 and 2010:

- UK emissions of the six greenhouse gases covered by the Kyoto Protocol rose 2.8%, 566.3 to 582.4 million tCO₂e (tonnes carbon dioxide equivalent)
- CO₂ (accounting for ~84% of UK emissions) rose 3.8% in total, from 473.7 Mt to 491.7 Mt (million tonnes)
- CO₂ rose 13.4% (10.1 Mt) in the residential sector, 3.3% (6.0 Mt) in the energy supply sector, and 2.4% (1.8 Mt) in the business sector.²¹

The increases are attributed primarily to increased

residential gas use, fuel switching from nuclear to coal and gas for electricity generation, and rising demand. The residential sector made up around 17% of all CO₂ emissions, at 85 Mt. There was a 13% increase in emissions between 2009 and 2010, due mainly to cold weather and the need for space heating. Some nuclear power stations suffered technical problems that necessitated the switch to more coal and gas, increasing emissions from this sector by 4% between 2009 and 2010. At 156.2 Mt, emissions from power stations, accounted for almost one third of all CO₂ emissions. The business sector made up around 16% of all CO₂ emissions in 2010, at 78 Mt. This was 2% higher than in 2009, but provisionally estimated to be 29% below 1990 levels in 2010. The Industrial process and public sector accounted for 9 Mt each, dropping 47 and 39% since 1990 respectively. The agricultural sector was estimated to have emitted 4 Mt of CO₂ in 2010, 22% down on 1990 levels. Waste management produced 0.3 Mt in 2010. Net land use, land use change and forestry emissions dropped from emissions of 3 Mt in 1990, to absorption of 5 Mt in 2010.²²

Government Strategy

The Labour government produced *The UK Low Carbon Industrial Strategy* in 2009 that set out the means to ensure that British businesses and workers are “equipped to maximise the opportunities and minimise the costs” of transitioning to a low carbon economy.²³ Added to this were two further principles. The first was a long-term strategic approach to setting stable frameworks for business and consumers. The second was a pragmatic approach to the role of government and markets in the transition, with regard to increasing the cost of

carbon progressively, encouraging, and removing barriers to, low carbon innovation and climate change adaptation. A key statement in the document is that the government intended to target “proportionate government intervention” at areas where British businesses could take a leading global role.²⁴ These areas are listed as: offshore wind, wave and tidal power, civil nuclear power, ultra-low carbon vehicles, renewable construction materials, renewable chemicals and low carbon manufacturing. Note that there is no mention of solar PV.

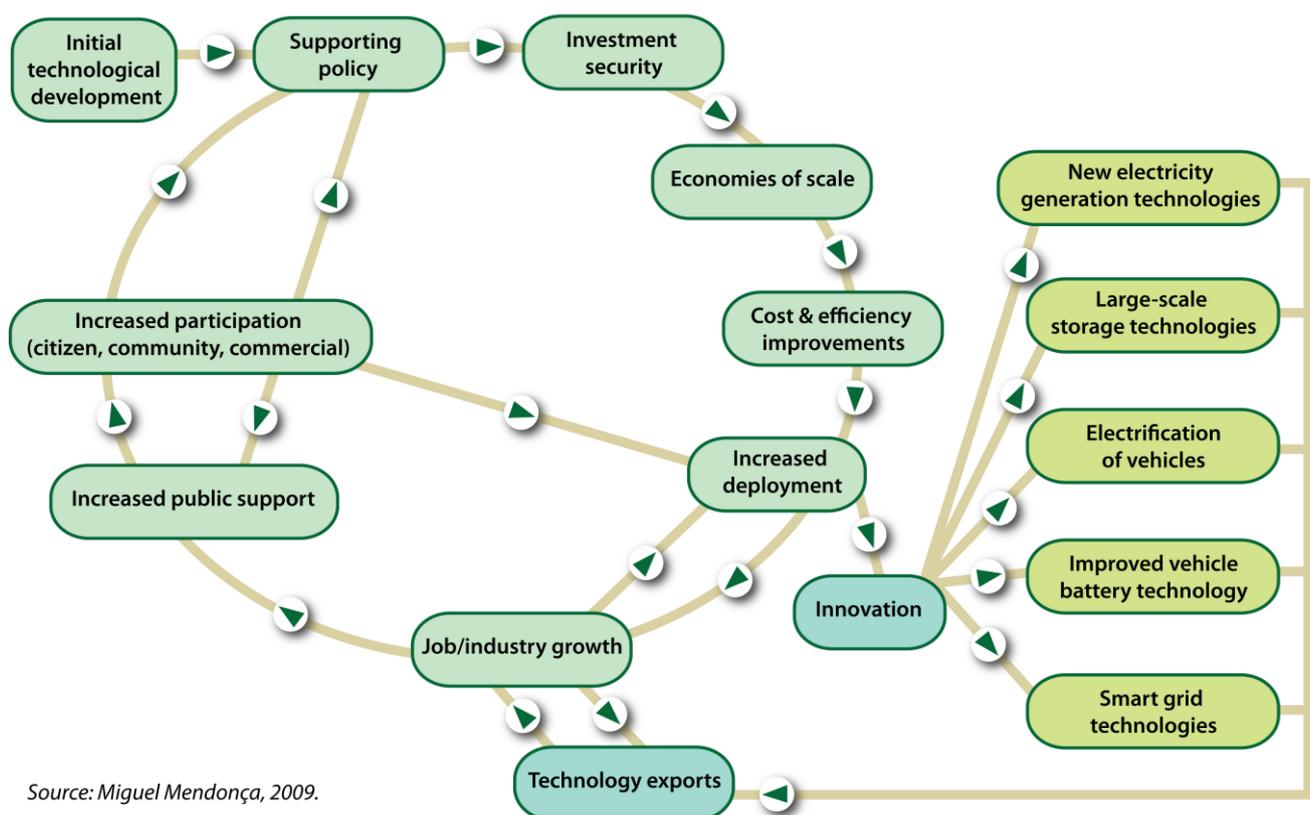
Section 2: Policy

In August 2011, the Conservative-Liberal Democrat coalition government published *Enabling the transition to a green economy: Government and business working together*, a document that is more or less a position paper. It provides an overview of the current government's conceptualisation of the green economy, and the methods it seeks to employ in achieving the transition to a low carbon economy, including approaches to public and private sector collaboration. The vision contains four key statements on the nature of the green economy. It states that it will: grow sustainably and for the long term; use natural resources more efficiently; be more resilient; exploit comparative advantage. The paper includes a useful 'Green Economy Policy Timeline,' a chart showing the various strands of green policy that this government is using or intends to use. It is not significantly different from the approach taken by the previous government. The Timeline shows the

variety of relevant policies and incentives which they are deploying or amending from 2011 to 2050.²⁵ They cover a variety of sub-sectors, on energy, transport, waste, food, water, natural environment, biodiversity, payment for ecosystems services, green investment, emissions trading, carbon pricing, climate change risk assessment and adaptation.

Public policy can provide stable conditions for investment which foster long-term growth in a sector. This growth creates a positive feedback as developing sectors breed innovation, exports, jobs and increased scope for participation. The figure below shows how technologies such as PV become commercialised through policy support. The diagram leads from the top left corner.

Figure 1. The Interaction of Policy, Investment and Innovation



Source: Miguel Mendonça, 2009.

Policy Drivers

Carbon Budgets and The Carbon Plan

To drive the transition to a low-carbon economy, the previous Labour administration set in law The Climate Change Act 2008. The Act contains legally binding GHG emissions reduction targets, which are set at a minimum of 34% of 1990 levels by 2020, and a minimum of 80% by 2050. To meet these targets, the government set in law three five-year carbon budgets: 2008-12, 2013-17, 2018-22; a fourth budget, running from 2023-2027, was set in law at the end of June 2011 by the present coalition government.

The means of achieving the reductions laid down in the carbon budgets are set out in *The Carbon Plan*, published in December 2011. It uses a variety of scenarios to show how the budgets could be met, and what the 2050 outcomes may look like. The document updates and supersedes the 2009 *Low Carbon Transition Plan* from the Labour government.

Of the group of principles in the document, two are of key interest to local action: 'be facilitative', and 'be inclusive.' The former says, "Government's role should be to set the legal and market frameworks and to provide the information to enable businesses, households, local areas and communities to play their part." The latter says, "Our efforts to cut greenhouse gas emissions should not be forced through top down by Government. We should make this change by enthusing our whole society, in line with our commitment to localism." The other principles are, in short, about taking a joined-up, long-term, national and international approach.²⁶ One of the methods of 'enthusing' society is the interactive tool created to allow interested parties to play with a large number of variables related to energy choices and see what the sum of these choices would lead to.

2050 Pathways Analysis

The Carbon Plan references findings from the *2050 Pathways Analysis* report.²⁷ One of the key messages is on the doubling of electricity demand to 2050 through rising use in heating and transport. This is set against the need to replace a number of nuclear and coal-fired power stations that are coming to the end of their working lives in the next decade.²⁸ The management of supply and demand, and the choices made to meet emissions reductions are central to this challenge.

In addition to the report, a dedicated web tool, the '2050 Pathways Calculator,' has been created which allows anyone to explore future energy pathways towards mid-century.²⁹ The goal is to meet the 80% GHG reductions target set out in the Climate

Change Act, and balance supply and demand. Energy sources and energy savings measures are included, as are transport, waste, livestock, energy management and storage issues. Three graphs are adjusted dynamically as selections are made: energy demand, UK energy supply and GHG emissions. An 'Implications' menu allows you to analyse choices in terms of their implications for: all energy types; electricity; energy flows; energy security; area of land required; and the 'story' that the choices create, in terms of how our lives and the economy as a whole will be affected.

The report details six potential 'pathways,' exploring varied contributions from different energy generation and saving technologies and strategies. Importantly,

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it lists a number of uncertainties and common themes that arise in all of the pathways:

- Ambitious per capita energy demand reduction is needed. The greater the constraints on low carbon energy supply, the greater the reduction in demand will need to be.
- A substantial level of electrification of heating, transport and industry is needed.
- Electricity supply may need to double, and will need to be decarbonised. A growing level of variable renewable generation increases the challenge of balancing the electricity grid.
- Sustainable bioenergy is a vital part of the low carbon energy system in sectors where electrification is unlikely to be practical, such as long haul freight transport and aviation and some industrial high-grade heating processes.
- The pathways also show an ongoing need for fossil fuels in our energy mix, although their precise long term role will depend on a range of issues such as the development of carbon capture and storage.
- Emissions from agriculture, waste, industrial processes and international transport make up a small proportion of emissions today, but by 2050, if no action were taken, emissions from these sectors alone would exceed the maximum level of emissions for the whole economy.³⁰

This list provides a clear, concise insight into the dilemmas facing Government. However, public opinion is largely behind renewable energy

development. The Sunday Times commissioned a Yougov poll from November 2011 which included the question, 'Thinking about the country's future energy provision, do you think the government should be looking to use more or less of the following?'³¹ Table 11 below gives the responses by percentage.

Solar is clearly ahead in terms of popularity, and even wind power, a notoriously contested technology in the UK, is some way ahead of the next most popular, nuclear. Fossil fuel energy sources prove much less popular. The survey records the political affiliation of each respondent, which is interesting to examine. Self-identified Conservative voters give notably less support to wind and solar than do Labour and Liberal Democrat voters.

Government statements in the above documents suggest that they are not 'picking winners' but laying down policy that can let the market pick the most efficient technologies and measures. A major discussion on energy politics, lobbying, path dependency and other factors which prevent a truly 'free' market operating in this sector is beyond the scope of this report, but all are major issues in determining what the real pathway will involve.

The following section gives a brief description of some of the key policies of relevance to the West of England ET sector, with some case studies for illustration. In places there will also be some detail on critiques of the schemes or their handling.

Table 11. Responses to Energy Question in November 25 2011 Sunday Times Survey

Question	Energy Type				
	Solar	Wind	Nuclear	Coal	Oil
More than at present	74	56	35	16	10
Less than at present	6	19	27	43	47
Maintain current levels	12	15	23	25	27
Not Sure	9	9	15	17	17

CRC Energy Efficiency Scheme

The CRC is a mandatory scheme aimed at improving energy efficiency and cutting emissions in large public and private sector organisations. These organisations are responsible for around 10% of the UK's emissions. The scheme features a range of reputational, behavioural and financial drivers, which aim to encourage organisations to develop energy management strategies that promote a better understanding of energy usage.³²

Lloyds Banking Group, the UK-based financial services group, provides a case study of CRC activities. Lloyds approached the CRC by setting out a Group-wide Environmental Action Plan called the Smart & Responsible programme, which tracks and reports on performance towards long-term targets. Emissions reductions targets for their property portfolio are set at 20% by 2015 and 30% by 2020 against a 2009 benchmark. On-site energy use was reduced by 4% in 2010, exceeding the 3% target. A further 3% reduction was set for 2011. In addition, they have implemented the following:

- energy audits at over 50 Lloyds TSB sites, delivering 9.25% savings on average.
- an energy optimisation, reduction and monitoring scheme, rolled out to 948 sites with significant energy supplies.
- installation of electricity voltage reduction units at 40 properties reducing annual power consumed at these sites by an average 9.76%.
- installation of boiler controls on 216 boilers in 52 properties. The technology provides an 11% reduction in gas consumption.
- installation of loft insulation at 1,000 branches (estimates based on Energy Saving Trust data indicate they could achieve energy savings of 10%).
- raised temperatures in data halls and IT server rooms without adversely affecting computer systems.
- made energy consumption a key performance target for engineering managers and facilities managers, incentivising staff to deliver on energy efficiency.
- contractually obliged M&E maintenance suppliers to maintain and identify opportunities to improve energy efficiency.³³

EU Emissions Trading System (EU ETS)

The policy formerly known as the European Union Emissions Trading Scheme. The EU ETS was introduced in 2005 as a policy to help the EU meet its Kyoto Protocol GHG emissions reduction target. This was set at 8% on 1990 levels by 2012. The 2011 draft progress report from the European Commission to the European Parliament and Council shows that the EU-27 is currently on target for the first Kyoto Protocol commitment period (2008-2012). Based on estimates from provisional 2010 data, EU-15 emissions are 10.7% below the base-year level, and EU-27 2010 emissions are approximately 15.5% lower. At the same time, GDP rose by 39% and 41% respectively.³⁴ This is suggestive of a level of 'decoupling,' as discussed below.

The EU ETS is a type of 'cap and trade' system. GHG emission levels from factories, power stations and other installations are capped, and emissions allowances are granted up to this level. Companies exceeding the cap can buy allowances from others who have generated a surplus by remaining below the cap. The limited number of allowances maintains their tradable value. Each company must surrender an amount of allowances at the end of each year to cover their emissions. Failure to do so results in the imposition of fines. Any spare allowances can be kept for future use, whether to cover future emissions or to trade. In principle, the system should result in least-cost emissions reductions, and should reduce total emissions over time, by reducing the number of allowances in the system.

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The system operates in the EU-27 and Iceland, Liechtenstein and Norway. It covers many sectors, including power production, refineries, iron and steel works, and factories making cement, glass, lime, bricks, ceramics, pulp, paper and board. Emissions from aircraft will come under the scheme in 2012, and in 2013 petrochemicals, ammonia and aluminium industries and other gases will join, when ETS Phase III (the third trading period) commences. At present, the system covers close to 50% of EU CO₂ emissions and 40% of total GHG emissions. The EU will seek to increase the effectiveness of the system in Phase III, when the allowance auctioning system will be modified. The EU hopes to link the EU ETS to a global carbon market in future.³⁵

In the UK, CO₂ emissions saw a fall of 10% from 2008, when the first commitment period began, to 2010. The amounts were 265.1 MtCO₂ and 237.4 MtCO₂. The Environment Agency's Report on 2010 EU Emissions Trading System emissions data, published in November 2011, suggests several reasons for the drop. These include the economic downturn, abatement incentivised by the ETS, and a move towards power generation from renewables and nuclear and away from coal.³⁶ Their figures state that EU emissions rose by 3% in 2010 compared to 2009, due to a level of comparative economic recovery. However, given that the average industrial production index was 6.7%, they suggest some

decoupling between industrial production and CO₂ emissions.

It is worth considering the question of decoupling briefly. Professor Tim Jackson provides a detailed analysis of the issue in his 2009 book *Prosperity Without Growth*. He takes the 450 ppm target set out in the IPCC's Fourth Assessment Report and explores the implications for decoupling. This requires global CO₂ emissions to drop below 4 billion tonnes, which means an average rate of decline of 4.9% per year. However, population growth is expected to result in a global population of nine billion by 2050. Under a business as usual (BAU) scenario, CO₂ emissions would grow close to the rate of the average income: 1.4%. By 2050, CO₂ emissions would therefore be 80% higher than today. Economic output would then require a carbon intensity of below 40 gCO₂/\$, which is 21 times more carbon-efficient than today. If the population enjoyed the same level of income as the EU average, the carbon intensity figure would need to be 55 times better. If income growth was to continue at 2%, the figure would need to be 130 times better, at just 6 gCO₂/\$. That 2% growth would mean, by the year 2100, the global economy would be 40 times larger than that of today, and each dollar of output would be required to have a carbon intensity of less than zero.³⁷

The Green Deal

The Green Deal is a market-led framework for carbon reduction through domestic and commercial energy efficiency measures, and will be launched in October 2012. It was created under the Energy Act 2011, and is out to public consultation at the time of writing (closing on 18th January 2012). Its stated central purpose is to reduce carbon emissions cost-effectively, and is driven by the legally-binding carbon budgets established through The Climate Change Act 2008.³⁸

The scheme allows private companies to offer residential or commercial customers an energy

efficiency retrofitting service, which they then recoup the value of through the monthly energy bills attached to the property. The 'deal' remains with the property, regardless of future ownership, until it is paid off. The mechanism is based on a 'golden rule', which will be set out in legislation: the cost of any retrofit deal must be less than the expected energy cost savings.³⁹ The scheme will work together with the new Energy Company Obligation (ECO), and will replace the Carbon Emissions Reduction Target (CERT) and the Community Energy Saving Programme (CESP), both of which will expire in 2012. CERT was mandatory, whereas the Green

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Deal and ECO are to be ‘market-led.’

The proposals set out eight points on the mechanism, with applicable laws and standards:

1. The expected financial savings must be equal to or greater than the costs attached to the energy bill, known as ‘the golden rule’ of the Green Deal.
2. The measures must be approved and the claimed bill savings must be those accredited through this process.
3. The measures installed must have been recommended for that property by an accredited, objective adviser who has carried out an assessment.
4. The measures must be installed by an accredited installer.
5. For householders, the Green Deal provider must give appropriate advice within the terms of the Consumer Credit Act and take account of the individual circumstances of the applicant.
6. The Green Deal provider must have consent from the relevant parties, including the express consent of the current energy bill-payer.
7. The presence of a Green Deal must be properly disclosed to subsequent billpayers (e.g. new owners or tenants) alongside energy performance information.
8. Energy suppliers must collect the Green Deal charge and pass it on within the existing regulatory safeguards for collecting energy bill payments – including protections for vulnerable consumers.⁴⁰

The ECO is also being designed at present to work with the Green Deal. The ECO is an obligation on ‘big energy suppliers’ to provide targeted support for ‘hard to treat’ homes and low income and vulnerable households. These two elements are dealt with by the Carbon Saving Obligation (CSO) and the Affordable Warmth Obligation (AWO) respectively. The CSO supports homes which do not satisfy the ‘golden rule’, most likely those packages which include solid wall insulation. The AWO will be available to those households which are both in private tenures and which currently fall under the CERT Super Priority Group.⁴¹

The consultation document describes the vision for a successful Green Deal: “By 2020, we will have seen a revolution in British property. Millions of us will live and work in greater comfort, through upgraded and

insulated properties which do not cost the earth to heat, with smarter controls and meters helping us manage our energy use, and generating our own heat or electricity. Fewer of us will struggle with our fuel bills, unable to reach basic standards without spending a huge proportion of the weekly budget. And for many people this will mean a more attractive home – modern measures like external solid wall insulation can transform a tired pebble dash terrace into a tidy, smart façade; internal measures can be the catalyst for new render or repainting; replacing an inefficient boiler can be done easily whilst renovating the kitchen.”⁴²

In late November 2011, DECC officials announced £200m of new and additional Government funding to provide a special time-limited ‘introductory’ offer to boost the early take up of the Green Deal. Energy and Climate Change Secretary Chris Huhne said: “This big injection of Government funding delivers on our promise to ensure the Green Deal hits the ground running, and make it as attractive as possible so that people start to benefit from day one.” He made the point that the sooner people take up the scheme, or “Green Deal” their home, the sooner they would see the benefit. Additional anticipated benefits of the policy include private sector investment of around £14 billion over the next decade, and at least 65,000 insulation and construction jobs by 2015.⁴³

However, the policy has already been heavily criticised by the Committee on Climate Change (CCC). In an open letter of December 2011 to Chris Huhne, this group of the government’s own climate advisers stated that in their view, the scheme was fundamentally flawed. It has been reported that they expect the scheme to reach just 2-3 million homes, rather than the 14 million it is intended to reach. One of the main contestations is that the current CERT (Carbon Emissions Reduction Target) scheme, which places an obligation on energy suppliers to save carbon through efficiency retrofits and renewables generation, works better than the proposed market-led Green Deal and ECO mechanisms are likely to.⁴⁴ It remains to be seen whether government will respond to this fundamental point of criticism from such an influential and informed group.

The Feed-in Tariff (FIT)

A Feed-in Tariff is a renewable energy policy that pays producers a fixed rate per unit of electricity fed into the grid. Most countries and states modify the design in certain ways, as does the UK, but in principle it is the same. It covers a range of technologies up to 5 MW in size. The table below shows the total number of installations and capacity receiving the Feed-in Tariff, accurate at the time of writing.

Table 12. UK Feed-in Tariff Installations and Capacity from 01 April 2010 to 20 December 2011.

Technology	Total Installations	Total Installed Capacity (MW)
Photovoltaic	134,619	516.532
Wind	2,036	34.451
Micro-CHP	314	0.317
Hydro	254	17.509
Anaerobic digestion	14	11.627
Totals	137,237	580.436

Note. Data from from Ofgem FIT installations online database⁴⁵

The scheme has been very successful for domestic PV, with 131,831 of the 137,237 installations across all technologies, totalling 389.6 MW of capacity. As well as domestic installations, there are categories recorded for industrial, commercial and community projects. The scheme is said to have created 29,000 jobs since its introduction, and generates between £150m and £230m in revenues from income tax and national insurance.⁴⁶ This is now under threat, according to the November 2011 report prepared by Element Energy for Friends of the Earth and the 'Cut Don't Kill' coalition. The key findings of the analysis are that:

- DECC's uptake assumptions imply a loss of between 18,000 and 29,000 jobs in the industry, depending on whether the Energy Performance Certificate 'C' rating requirement is introduced [as a requirement for home installations to receive the tariff]
- This would result in a loss to the Treasury from income taxes/NI of between £150m and £230m per year

- The future PV deployment rate used in DECC's Impact Assessment represents a fall of 50-95% relative to installations in 2011
- Treasury inflows from the PV sector are currently £275m per year from employment taxes and VAT on domestic installations, not accounting for corporation taxes, indirect spending in other sectors etc.⁴⁷

John Cridland, Director-General of the Confederation of British Industry (CBI), said in a speech in November 2011, "... last week the government announced a dramatic cut in the solar Feed-in Tariff. A reduction was already on the cards from April 1, but this will now come in by mid-December – before the consultation period has even ended. This is the latest in a string of government own goals, following the Carbon Reduction Commitment becoming a pure revenue-raiser and the North Sea oil and gas tax. As you all know, moving the goal posts doesn't just destroy projects. It creates a mood of uncertainty that puts off investors. They wonder what's coming next. Some companies have invested heavily in solar photovoltaic systems, and in the supply chains needed to install them. That commitment has been undermined by the Feed-in Tariff decision – and so industry trust and confidence in the government has evaporated. This bodes poorly for investment in future initiatives."⁴⁸

During the period of researching this report, the UK Feed-in Tariff has undergone a great deal of upheaval. There has been a case brought by Friends of the Earth and two solar companies, Solar Century and Homesun, against the government over its handling of the policy. In particular, the case centres on the decision to more than halve the PV tariff from 43.3p to 21p with only a few weeks' notice, and argues that this was both premature and unlawful, and had led to the abandonment of unfinished or planned projects, and created an immediate threat to jobs in the industry. Insufficient notice of the tariff cut was provided, and they came into force 11 days before the consultation on the proposed changes had closed. The judge supported this view, finding the Government's behaviour "legally flawed."⁴⁹

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The judge ordered the 12th of December date to be struck out of the consultation. Provided there is not a successful appeal, the Government will be unable to change the tariffs until after they are put before Parliament for 40 days. This sets the date for cuts to be implemented to 19th of February 2012 at the earliest. In addition, the Government cannot make such a proposal in the future.⁵⁰

Friends of the Earth (FOE) and other coalition partners are calling on the Government to abandon its appeal of the ruling, and instead:

- Establish a system which enables Feed-in Tariff support to fall in line with the falling cost of solar technology - but in a stable fashion that supports the continued growth of the industry and jobs
- Increase the overall budget for Feed-in Tariff projects using tax revenues generated by jobs created by the scheme
- Exclude housing association, school, council and other community projects from the damaging proposal to give multi-building projects even lower financial support
- Only require solar projects on homes to install loft and cavity wall insulation where that is possible - rather than imposing much tougher energy efficiency conditions which would make 9 out of 10 householders ineligible for the scheme. Government

plans would disproportionately exclude poorer people from benefitting from the system.⁵¹

The day after the judgement, a damning report was published jointly by the Energy and Climate Change Committee and the Environmental Audit Committee. They summarised their view by calling the handling of the policy review “clumsy”, saying that the Government “is undermining confidence in energy policy and hurting the UK solar industry by rushing through panicked changes to Feed-in Tariffs (FiTs) without adequate notice to consumers and installers alike.” The group also warns that proposals to require homes to meet a ‘C’ rated energy efficiency standard before they can receive solar FITs will limit uptake to wealthier households only, and cause “fatal” damage to the industry. Under such plans, 86 percent of homes would need to upgrade their insulation levels in order to qualify, increasing upfront costs by £5,600 to £14,000, excluding the cost of the panels themselves.⁵²

At the time of writing, the government has stated it will appeal the decision, with Climate Minister Greg Barker tweeting that “Budget means 4 every 1 new taker @ 43p, 2 homes won't get it at 21p.”⁵³ He refers to the cap the government placed on the scheme, of £867 million. This is the budget FOE refer to above, saying it should be raised.

Local Energy Assessment Fund (LEAF)

In response to the FIT outcry, particularly over the damage to community energy schemes, the government announced a £30m Local Energy Assessment Fund (LEAF). Of this amount, £10m is targeted at community projects, and £20m at the existing public sector energy efficiency loan scheme. This applies to schools, hospitals and universities. The LEAF will take the form of a competition, open to organisations including parish councils, voluntary associations, development trusts and faith groups. Around 200 community organisations should get around £50,000 each, towards development of energy efficiency and renewable energy generation projects. The scheme only applies to projects that can be completed by the end of March 2012. The LEAF will be managed by a consortium of community networks

administered by the Energy Saving Trust.

In addition, a further £20 million in loans has been made available for public sector energy efficiency projects in England before the end of March 2012. These loans are provided for energy efficiency projects that are expected to pay for themselves within five years through savings on energy bills. Similar to the Green Deal, repayments are made from these savings. The fund is expected to help public sector organisations make investments that might not otherwise happen due to the economic constraints, through removing the barrier of upfront cost. The anticipated energy efficiency projects are expected to deliver savings of around £46m on energy bills and 210,000 tonnes of carbon.⁵⁴

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The day after the joint report on the FIT from the select committees was published, a letter was sent to the government from The Church of England and the National Trust, and co-signed by the sustainability think-tank Forum for the Future and charitable

consultants Carbon Leapfrog. Again, it called on the government to rethink plans to cut the FIT so hard and fast, and establish a target for community energy.

The Renewable Heat Incentive (RHI)

The Feed-in Tariff model was investigated in relation to modification for incentivising renewable heat production. The Renewable Heat Incentive (RHI) was launched on 28 November 2011, initially for non-domestic generators. It is considered the first incentive of its kind in the world, and is expected to lead to 14,000 industrial and 112,000 commercial and public sector installations by 2020. It is also open to not-for-profit and community generators.⁵⁵

Similar to the Feed-in Tariff for electricity, the scheme pays generators for 20 years based on each kWh of heat produced by any eligible technology, but it differs in a number of ways. Notably, it is paid by the government, on a quarterly basis through Ofgem, the national energy regulator (with an initial budget of £860m). Payment will be made on the basis of the metered amounts of heat generated, except for biomethane, which is paid by the metered quantity injected into the grid. Payments are fixed once an installation is registered for the RHI, but annual inflation adjustments will be made. It is not clear at present if this refers to the fixed rate, or to new installations. Eligible technologies include solid and gaseous biomass, solar thermal, ground- and water-source heat pumps, on-site biogas, deep geothermal, energy from waste and injection of biomethane into the grid.⁵⁶

The RHI is being rolled out in two phases. Phase 1 of the scheme primarily covers non-domestic generators in the industrial, business and public sectors (which are responsible for 38% of the UK's carbon

emissions). Households not heated by mains gas can apply for funding under the Renewable Heat Premium Payment scheme, a £15m grant fund for air-source and ground-source heat pumps, biomass boilers and solar thermal. There are minimum energy efficiency criteria, and householders must agree to monitor the performance of their heating system through a survey. In addition, the Government will pay for a significant sample of homes to receive meters to monitor their energy use. Phase 2 is expected to allow all domestic households to participate, and it will cover more technologies. Delays in the introduction of Phase 1, due to issues with European state aid rules, mean that the launch of Phase 2 is not set at the time of writing. The Renewable Heat Premium Payments are being used to help government assess and manage the roll-out of the different technologies, partly in order to control budgets. This may be in response to the higher than expected interest in large-scale solar parks under the FIT.⁵⁷

As with the FIT, installers and equipment (for small and medium-sized plants up to and including 45 kWth) are required to be certified under the Microgeneration Certification Scheme (MCS) or equivalent standard. Tariff levels have been set at a rate that makes the investment worthwhile when compared with lower cost conventional heat systems. Operators of biomass systems above 1 MWth are required to report quarterly on the sustainability of the biomass feedstock where used for combustion and biogas production.⁵⁸

The Green Investment Bank (GIB)

This initiative, conceived by the previous labour administration, is described by BIS as “the world’s first investment bank solely dedicated to greening the economy,” and is aimed at supporting growth in UK-based green sector businesses. Its stated mission is “to provide financial solutions to accelerate private sector investment in the green economy. Capitalised with £3 billion, the GIB will play a vital role in addressing market failures affecting green infrastructure projects in order to stimulate a step up in private investment.”⁵⁹

A leaked document from the Treasury and BIS has given cause for concern on a number of points. The

document restated the capitalisation figure to “up to £3bn”, and could be operating more as a commercial bank, forced to make an annual profit of at least 3.5 percent. It will be expected initially to target four sectors (offshore wind, waste processing and recycling, energy from waste generation, and non-domestic energy efficiency), and may in future fund the Green Deal. It was also stated however, that no investment project could receive more than five percent of the bank’s funds, which would potentially preclude offshore wind and other major investments. Further, Chris Huhne admitted that it may not be able to begin borrowing until after the current parliament, in 2016 at the earliest.⁶⁰

Renewable Transport Fuels Obligation (RTFO)

The Renewable Transport Fuels Obligation was introduced in 2008, and functions in a similar way to some of the other green policies active in the UK. It is an obligation on transport fuel suppliers to include a certain amount of biofuel in the mix, or else pay a given amount of money as a penalty. It requires the proportion of biofuel to rise annually until 2013, when it will reach 5% supplied by volume. The obligation is applicable to organisations supplying more than 450,000 litres of fossil fuel in a given year, and is assessed according to who owns the fuel when it crosses the duty point (the point when a fuel becomes chargeable for duty). Those owners receive one Renewable Transport Fuel Certificate (RTFC) per litre of biofuel, or kilogram of biomethane, supplied. These certificates are tradable between participants in the RTFO scheme, and can potentially provide revenue to suppliers. As with the CRC, participants must surrender the appropriate number of certificates to demonstrate compliance. Again, failure to do so then requires buy-out for each

litre of biofuel that should have been supplied. A limited number of certificates can be carried over into the next year. Under the current scheme, biofuel suppliers must provide information on the GHG savings, and environmental and social impacts of their fuels in order to earn a certificate.⁶¹

The RTFO has been altered under an Amendment Order in order to comply with the EU Renewable Energy Directive (RED) on two key points. Firstly, the transport elements of the RED require Member States to ensure that a minimum of 10% of the energy used in transport is from renewable sources by 2020. Secondly, mandatory sustainability criteria for biofuels and bioliquids have been set. The verification must be provided independently, and is required before an RTFC can be issued. There is also an incentive introduced termed a ‘double reward’ for transport fuels derived from feedstocks classified as wastes, residues, ligno-cellulosic and non-food cellulosic materials.⁶²

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Low Emission Vehicles (LEVs)

With a view to major decarbonisation of road transport by 2050, the Government has set up an inter-departmental group called The Office for Low Emission Vehicles (OLEV) to create policy in this area. It connects human and budgetary resources from the Department for Transport (DfT), BIS and DECC. OLEV seeks to drive uptake of ultra-low emission vehicle technologies, including electric, plug-in hybrid, and hydrogen-fuelled vehicles. Provision of over £400 million has been announced for this purpose. In addition, OLEV has responsibility for managing the regulatory framework around emissions from and efficiency developments in conventional vehicles.⁶³

A Plug-in Car Grant scheme has been set up, offering 25% towards the cost of an eligible ultra-low emission vehicle, up to a maximum of £5,000. The

offer is stated as 'technology neutral,' covering any of the categories with tailpipe CO₂ emissions of 75 g/km or less, and is open to both individuals and businesses. Both the scheme and the subsidy level will be regularly reviewed to take account of cost dynamics in the evolving market. The first review of the Plug-in Car Grant is due in early 2012.

Currently available eligible models are: Citroen CZero; Mitsubishi i-MiEV; Peugeot iOn; Nissan Leaf; Smart fortwo electric drive. Forthcoming models are: Chevrolet Volt; Renault Fluence ZE; Tata Vista; Toyota Prius Plug-in Hybrid; Vauxhall Ampera. As of 30 September 2011, the scheme had attracted 786 claims out of 910 eligible cars that were registered in the same period.⁶⁴

Climate Change Levy (CCL)

The Climate Change Levy (CCL) was introduced in 2001 as a driver for energy efficiency and GHG emission reductions in the private sector. It is applied as a specific rate per nominal unit of energy. The CCL is chargeable on the industrial and commercial supply of taxable commodities for lighting, heating and power by consumers in a number of business sectors: industry; commerce; agriculture; public administration; other services.

The revenues raised through the CCL are 'recycled' back to business through a cut in employers' national insurance contributions of 0.3%. The levy does not apply to taxable commodities used by domestic consumers, or by charities for non-business use.⁶⁶

The levy is charged on taxable supplies, which are certain supplies of the following taxable commodities: electricity; natural gas as supplied by a gas utility, petroleum and hydrocarbon gas in a liquid state; coal and lignite; coke, and semi-coke of coal or lignite; petroleum coke. The following are not

Table 13. Climate Change Levy rates (updates from 1 April 2011)⁶⁵

Taxable commodity	1 Apr 2011 - 31 Mar 2012	1 Apr 2012 - 31 Mar 2013
Electricity	0.485 p/kWh	0.509 p/kWh
Gas supplied in Great Britain by a gas utility or any gas supplied in a gaseous state that is of a kind supplied by a gas utility	0.169 p/kWh	0.177 p/kWh
Gas supplied by a gas utility to a person who intends to cause the gas to be burned in Northern Ireland	0.059 p/kWh	0.062 p/kWh
Any petroleum gas, or other gaseous hydrocarbon, supplied in a liquid state	1.083 p/kg	1.137 p/kg
Any other taxable commodity	1.321 p/kg	1.387 p/kg

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taxable commodities for levy purposes: oil; road fuel gas; heat; steam; waste as defined in statute. Some supplies are excluded or exempt from the levy. Others have a reduced or half-rate.

To help energy-intensive organisations, the Government has negotiated Climate Change Agreements (CCAs) in some sectors. These agreements give organisations an 80% discount on the Climate Change Levy, as long as they reach additional CO₂ reduction targets. There are currently ten major energy intensive sectors and over thirty smaller sectors with agreements. The major sectors are: aluminium, cement, ceramics, chemicals, food and drink, foundries, glass, non-ferrous metals, paper and steel.⁶⁷

Several other measures have also been put in place to help businesses become more energy efficient:

- 100% first-year capital allowances for energy-saving investments. Businesses making qualifying investments can deduct the full costs of these from their corporation tax or income tax bills. The Carbon Trust manages the Enhanced Capital Allowance scheme.

- An exemption from the CCL for electricity generated from 'new' renewables (such as solar power and wind power – but not large-scale hydro-electric schemes or some energy from waste).
- An exemption from the CCL for the fuel input to 'good quality' combined heat and power (CHP). This CHP has to be verified by the CHP Quality Assurance Programme
- The Carbon Trust also provides a range of products and services to help businesses reduce their carbon emissions.⁶⁸

According to DECC, CCA figures for 54 sectors in 2010 show that 28.5 million tonnes of carbon were saved, exceeding the goal of 25.8 MtCO₂/year with savings of 28.5 Mt. Thirty-eight sectors met their targets after emissions trading, and 24 missed their targets and so made up the difference through purchase of EU ETS carbon allowances. The spirits industry had notable success with the scheme, resulting in around £2.6m of tax breaks. For example, 71 Spirits Energy Efficiency Company (SEEC) facilities raised their energy efficiency levels by 25 per cent since 1999. They now have 66 whisky distilleries being powered by biomass plants running on Scotch whisky by-products.⁶⁹

Policy Conclusions: The Fundamental Need for Stability

The most important aspect of driving low carbon economic development is having a stable, well designed and implemented policy environment. As mentioned above, multiple sources from within government, and from industry and the third sector, have criticised the coalition government's handling of green policy in 2011, most notably with regard to the Feed-in Tariff. It is a useful case study on the differing needs and wants of interest groups. This section looks at some of the commentary on the issue of stability specifically, and on communications and policy handling more broadly.

In June 2011, a policy brief entitled *The basic economics of low-carbon growth in the UK* was

published jointly by the Grantham Research Institute on Climate Change and the Environment, and the Centre for Climate Change Economics and Policy. It sets out what may be inferred as a response to the negative treatment of climate change mitigation and adaptation by both government and the media. The work discusses the economic approaches upon which public policy for low-carbon growth should be based. It argues five major points: Firstly, that "some standard models used in policy analysis are structured in ways that are inherently misleading. Second, [...] that the expenditure involved in making the transition to a low-carbon economy must be analysed as an investment, rather than being seen simply as a net cost or solely as a

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direct cost to the public purse. Third, it emphasises that this investment can drive an economic recovery. Fourth, it makes clear that the transition to the low-carbon economy is likely to be dynamic, innovative and a period of strong growth. And fifth it highlights the importance of the credibility of policy in fostering new investment.”⁷⁰

On the relationship between stability and investment, the authors argue, “One of the easiest ways to stimulate growth and set the public finances on the path to sustainability is to unlock the record pool of private saving rather than drawing on scarce public funds. Credible long-term policy signals would leverage private investment in renewable energy, smart networks and communities, energy efficiency and low carbon vehicles [...]. Hesitation and nervousness in policy undermine confidence, as is all too evident from the recent instability of capital and energy markets. These markets are policy-led, and thus have the potential to provide a degree of much needed investor certainty at a time of general uncertainty in the macroeconomic environment, which is holding back investment. Now is the time to lay out the comprehensive policy framework that can create the clarity and confidence in the future of low-carbon technologies that the private sector seeks.”⁷¹

The concrete result of such instability is that the UK has become a less attractive place to invest. Ernst and Young produce an annual index of the attractiveness of investment in countries around the world. The May 2011 report points to DECC’s fast track FIT review, the “ongoing review of the proposed Electricity Market Reform (EMR) and the announcement of the early Renewable Obligation Certificate (ROC) banding review” as the key factors in the UK dropping in the all renewables index.⁷² The brief notes that investment dropped from €7.8bn in 2009 to €2.3bn in 2010.

More difficulties are identified in the wind sector: “the UK fell two points in the wind index as growth in onshore developments slowed to 504 MW in 2010 (down from 793 MW in 2009), taking total onshore capacity to 3.9 GW. Grid connection and planning bottlenecks continue to create project delays.”⁷³ On solar it comments, “In March, the UK Government announced the results of its fast track review of FIT

rates, reducing tariffs by as much as 72% for projects up to 5 MW from 1 August 2011. This is more bad news for a market that has already seen an exodus of developers due to uncertainty over the long-term political outlook in the UK, resulting in a three point decrease in the solar indices.”⁷⁴

The Pew Environment Group produce a similar annual analysis on renewable energy deployment, and made the following observations on policy uncertainty in the 2010 review: “After achieving a fifth-place ranking for clean energy investments in 2009, the United Kingdom dropped out of the top 10 in 2010. Investment levels in 2009 were driven by large volume financings for offshore wind energy and the government’s commitment to strong action on climate change. But 2010 brought a new government to Great Britain, and investors appear to believe that there is a high level of uncertainty about the direction of clean energy policymaking in the country.”⁷⁵ They go on to say, “The United Kingdom saw a sharp 70% decline in clean energy investment [...]. A sharp decline in offshore wind energy investments and uncertainty surrounding the policy perspective of a new government appeared to have stunted 2010 investments.”⁷⁶

The frustration for interested parties is that there seems to be little that can be done to influence the matter of stability. The policy world is highly contested because it often sets the interests and values of one part of society against another. The policy debates around renewable energy in particular have brought this into the open around the world. The late German MP Hermann Scheer produced many texts and speeches on the political dynamics of renewable energy, and the battles with the conventional energy sector and their political allies.

What seems clear is that the Treasury has had a major influence on the policy environment. It has been reported that Conservative sources have claimed that lobbying, the perceived extra costs of green policies, particularly with regard to energy bill rises, have had an influence, as have issues of affordability in the economic climate. The Environmental Audit Committee (EAC) stated that they blame a “lack of transparency” for the fears around the influence of carbon-intensive industry

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lobbying on policy. Labour's Joan Walley, chair of the EAC, said, "The Treasury still doesn't get climate change, or the risk it poses to global stability and economic prosperity. Green investment should be seen as a 'win-win' solution to our economic problems; helping to stimulate growth and rebalance the economy, at the same time as reducing pollution."⁷⁷ This statement echoes those of the Grantham Institute policy brief referred to above, and of many other political figures and institutions, who assert that the pursuit of a green economy is both a necessity, and a major economic opportunity.

Solar PV in particular may well have had a rough ride due to the lack of strategic interest in the technology in government industrial policy. As referred to in the section above on Government Strategy, the technologies that the government wishes to support are mainly offshore wind, and wave and tidal. Some solar technology research and development work is being done in the UK, and some supply chain work is linked to the industry, but it appears that the view taken is that only the technologies where the UK may build on its comparative advantage are worth incentivising strongly. This would partly explain the treatment of PV, as would the notion that the Treasury views the Feed-in Tariff as a tax-free measure which interferes with the capacity to pay tax. From government documents and statements, interviews and press reports, this seems to be a solid conclusion.

The suggestion that the government is indeed 'picking winners,' contrary to its statements on the matter, is also fairly solid. This implies that in order to make the kind of progress, in terms of commercially activity and renewable energy generation that the region would like to, there will be a requirement to strategically collaborate on policy advocacy. Many interests locally will already be engaged in this way, but it would be politically powerful for the region as a whole to produce evidence on the need for a policy environment suited to its objectives. The West of England is already a significant player in the field, as evidenced in Section One of this report. It may well be that its continued growth will depend to a certain extent on its ability to operate collaboratively in the policy space, and call for the measures which will allow it to prosper.

Given that renewable energy is in many ways a precondition for a greener economy, its low cost deployment will allow many more sectors of the economy to decarbonise their operations and commercial offerings. This applies equally to the public sector, and to the domestic sector. It has already been shown in many areas of technology that commercialisation brings innovation and cost reductions, and the various sectors of society in the region have much to gain through individual and combined efforts to green the local economy.

Other green economy aspects

As the definitions section suggests, the low carbon, green economy has many faces. It is not just renewables and energy efficiency. It is about using resources more wisely, it is about reuse, repurposing, recycling, and the creation or improvement of materials, products and processes. It is almost

certainly about changing mindsets, and arguably, perhaps the logic and nature of the macro economic system itself. Beyond the environmental technologies sector, and other green goods and services, there are many other pertinent approaches and activities taking shape locally and at the national level.

Greening Retail: Marks and Spencer Plan A

The UK economy is dominated by the service sector, estimated at over 77% in 2010. Within this, retail plays a major part. Of the UK's retailers, Marks and Spencer is commonly considered to be a retailer that truly 'gets it', on the subject of greening their offerings and operations. In 2007 they launched a programme called 'Plan A', for a number of stated reasons: "to embed the sustainable management of relationships and resources across our operations and beyond, thereby driving cost savings, accelerating innovation, and safeguarding the future of our supplier, employee and customer bases."⁷⁸ Plan A has the guiding vision of making the company the world's most sustainable retailer. This is built upon seven pillars: Climate Change, Waste, Natural Resources, Fair Partner, Wellbeing, How We Do Business (embedding Plan A in systems and processes) and Involving our Customers. There are 180 commitments relating to material impacts, and ambitions regarding going carbon neutral, sending

zero waste to landfill and paying factory workers a fair living wage. Reported benefits include £70m of cost savings in 2010/11, which they have reinvested internally towards increased resilience. Notable co-benefits include improved staff motivation, increased supply chain resilience and anticipation of changing risk and regulation.

The company has chosen to open up potential for new markets in a number of areas by supporting innovation projects in energy efficiency, water consumption, dual fuel vehicles, sustainable textile fabrics, reducing food waste, lower-fat dairy products, sustainable farming and moving freight to rail. They are further committing to a target of making all their products tick at least one Plan A box by 2020, for example Fairtrade, organic or free range. The purpose is to influence the whole retail value chain, from suppliers to customers.⁷⁹

Selling services, not products

Again on the subject of retail, the government's Waste and Resources Action Programme (WRAP) has called for £180 billion per year of household spending to shift from buying to hiring items, and estimate that 90% of the tool market could make this switch by 2050. Several dedicated websites have emerged which facilitate this approach, including Ecomodo, Zilok and Rentmyitems. The term 'rentrepreneur' has been coined for people hiring

their household items, or even their house and car, to locals, tourists or visiting business people. The DIY chain B&Q is examining the potential to move to a hiring model. Research shows that many household tools have a very short working life, with the average power drill being used for just 15 minutes in its life.⁸⁰

Dow Chemical has explored this approach in its SafeChem business, where they sell a cleaning

service rather than the cleaning product; their expertise with the chemical molecule, rather than supply of the molecule, is being commercially exploited. Interface carpets have pioneered such

ideas with their 'floor covering' service model replacing carpet sales. BskyB have long operated a rental model with their set top boxes and satellite dishes for television.⁸¹

Upcycling

Upcycling is a process of making new things from old materials. The term was coined in 1994 in relation to treatment of waste streams, but is of course something that humans have been doing for thousands of years. However, providing a new conceptual framework for the green economy context may be useful. A case in point is Tatty Gem's. A Bristol woman has turned a hobby into a business, working both alone and in partnership. She creates one-off pieces of clothing and accessories from old materials, either to her own design or through commissions, and describes her work as follows, "Most of my pieces are one-offs, inspired by the materials themselves and embody a uniqueness that cannot be found on the high street. As a designer/maker I have a duty to our planet and to our children's future. All my creations are made in a studio powered by 100% renewable energy. I use only reclaimed and recycled materials and endeavour to buy organic and fairtrade if 'new' is necessary. Each raw material is scrutinised, planned and utilised to

create as little waste as possible. Off-cuts are used in other creations and when eventually my scraps can get no smaller, they are used for stuffing or recycled. My prices reflect the love, time and effort that has been given to the creation to ensure a minimum wage so that I can continue to practice in an environmentally sustainable way. When buying 'Tatty Gem's' you can feel confident that you have chosen to buy ethically and own a piece of truly Sustainable Style. Tatty Gem's is closely linked with 'The Fancy Tat Collective', a collective of eco-fashion designers and ethical businesses promoting sustainable design and running workshops within the local community, at festivals and privately teaching and inspiring people to work with recycled resources."⁸² This text displays many of the aims, values and processes at work in the 'green' sector. Saving resources, using renewable energy and minimising waste and environmental damage are central, and the "duty to our planet" and future generations is explicit.

Materials Science

The economy at large faces challenges in both continued supply of finite resources, and in producing new materials which are more environmentally-friendly in terms of their weight, embodied energy and ease of recycling. Bristol has two major centres dedicated to the development and commercialisation of new materials: the Advanced Composites Centre for Innovation and Science (ACCIS)⁸³ based in the Faculty of Engineering at the

University of Bristol, and the National Composites Centre (NCC)⁸⁴, based at the new Bristol and Bath Science Park.⁸⁵ Both centres are collaborative platforms for academia and business to develop new materials for use in areas such as transport, renewable energy and civil engineering. The centres work with partners such as Airbus UK, Rolls-Royce, GKN Aerospace, Agusta Westland, Vestas Wind Systems and Umeco.⁸⁶

Sustainable Design and Greening the Creative Industries

Design is an aspect of sustainability so fundamental it could almost be missed. The previous sections on selling services, upcycling and materials science are all connected with it, as are the first two sections of the report, on both environmental technologies and policy. The UK is internationally recognised for its capabilities in design and design education, ranking fourth globally in 2009.⁸⁷ In 2010, a Design Council sector survey mapped the industry, calculating its size at 230,000 designers, making it the largest design industry in Europe. Despite the recession the sector continues to expand. Since 2005 the design industry has grown 29% with earnings up by £3.4bn.⁸⁸ The British Design Industry (BDI) predicts the role design will play in sustainability will continue to grow and generate income for the design sector.⁸⁹

The South West is home to some of the most innovative and successful creative sectors in the UK. The region was named as a Creative Industries National Exemplar in the UK Government's Creative Britain strategy in 2008. There are 39,400 employed in South West core creative industries (working in 9,600 businesses).⁹⁰ Just over 15,000 designers work in the region, an increase of more than 50% since 2003.⁹¹ The creative sector in Bristol employs around 11,500 people (12% of all employees in the city), and generates £727m (6%) of the city's GVA.⁹²

Bristol is a major regional centre of excellence in animation, natural history production, digital media and new technology, and has recently been named by NESTA as one of the UK's top ten creative hotspots.⁹³ The city is home to Oscar®-winning Aardman Animations and the BBC's world-renowned Natural History Unit, and has the strongest digital media supply chain outside London. Creative sectors also include design and architecture, books and publishing, visual arts, theatre and performing arts, festivals and carnivals, street art and Europe's leading circus school. Creative quarters such as the Watershed Media Centre and the Tobacco Factory contribute to its accolade of 'Second Media City'.⁹⁴

There is a major opportunity for Bristol and the region to use its comparative advantage in creative, digital, media and design to pioneer and lead in the development of the green economy. Creative organisations that help create new sustainable products and services, shape new creative outputs and truly sustainable business models will be the business leaders of the future.⁹⁵

An ecological framework and systems thinking are essential core concepts that entail a "new way of seeing the world and a new way of thinking [...] in terms of relationships, connectedness, and context."⁹⁶ This requires creative thinking both upstream and downstream to help reconnect people to nature.⁹⁷ Building on notions of cyclic, solar, safe, efficient and social,⁹⁸ 'Cradle to Cradle' provides a comprehensive 'closed loop' framework to lead the way.⁹⁹ It distinguishes two main cycles modelled on the elegance and efficiency of natural cycles and ecosystems. The biological cycle is composed of biodegradable materials which can be returned to the soil and the technical cycle, composed of 100 % 'pure' technical materials provides a model for technical 'upcycling' and subsequent product generations, again and again. All materials and processes are chosen for human and ecological safety.¹⁰⁰

The underlying idea is pure raw material back into raw material, and materials awareness or materials science can help develop this new way of thinking. This cyclical, 'regenerative' concept is key to a Circular Economy (CE). The CE is founded on five principles: waste is food; diversity is strength; energy must come from renewable resources; prices must tell the truth, and the shift from products to services. Other leading models identified for creatives in the field of sustainable design include: 'Biomimicry',¹⁰¹ Bioregional's 'One Planet Living',¹⁰² The Natural Step Framework¹⁰³ and Forum for the Future's 'Five Capitals Framework'.¹⁰⁴ In conjunction with this, adopting principles such as design for longevity, disassembly and reuse can shift the strategic emphasis from efficiency to sufficiency to reduce

material flows. The power of designers is catalytic,¹⁰⁵ and Bristol is in a good position to act as hub of creativity to re-shape both entire production processes and consumption habits in the region.

The Food System

The food system is a critical part of the economy at all levels, and is responsible for 10% of employment in the Bristol city region, and 30% of the UK carbon footprint. These figures are drawn from the 2011 report, *Who Feeds Bristol?: Towards a resilient food plan*. It references the 2009 *How Low Can We Go?* report from WWF-UK and FCRN (Food Climate Research Network), which states that in order to reach the UK's target of 80% CO₂ reduction by 2050, a cut of 70% in food-related emissions will be required.

Who Feeds Bristol? concludes by setting out a clear case for a food systems planning process for Bristol and the city region, "Food systems planning provides cities with the opportunity to build a green economy

with food at its heart in a way that builds a mutually supportive relationship between the city and its hinterland. It enables the development of a 'productive green infrastructure' embedded within the city, where green spaces have multiple benefits and can function as 'green corridors' linking the city with its rural surroundings, for example: cycle and walking routes; food production; leisure space; carbon sequestration; nature conservation; improved recycling of nutrients and energy. This approach can facilitate the design of smart 'closed loop' systems that make efficient use of both organic waste and renewable energy resources for agriculture that are generated by the city, and the application of green building technology and adaptive re-use of sites and buildings."¹⁰⁶

Social Enterprises, Cooperatives, Community Groups and Charities

The National Council for Voluntary Organisations estimates that there were 5,316 environmental groups working in the social enterprise sector in the UK in 2007/08, with an income of £2.38 billion and assets of £4.25 billion.¹⁰⁷ Bristol is home to many social enterprises and organisations, which five years ago was estimated at over 1,000, with 9,000 employees and an annual turnover of over £230 million.¹⁰⁸

Although there was little time or scope within this report for an exploration of this sector in the region, there are known to be many third sector organisations operating in areas including energy, transport, local and organic food, wood products,

property and now on local currency. These organisations provide employment, goods and services, and opportunities for the development of skills, entrepreneurship, social capital, regeneration and local resilience. Numerous benefits are created through these activities, meeting local needs and empowering individuals and communities.

Well-being and Sustainability

The connections between well-being and sustainability are explored by the New Economics Foundation (nef), in a number of papers, and specifically in a 2006 paper for DEFRA entitled *Sustainable development and well-being: relationships, challenges and policy implications*. It states: "This report takes a broadly 'needs based' approach to the concept of well-being, in which it is assumed that well-being depends on the fulfilment of certain physical and psychological needs. In this view, individual well-being is a function of the extent to which both physical and psychological needs are satisfied. Hence, the relationship between well-being and environmental sustainability hinges on whether the material conditions, actions, behaviours and attitudes promoted by the prevailing social, economic and political situation act to support, or interfere with, the satisfaction of these underlying needs."¹⁰⁹ The authors point out the challenges for sustainability presented by delivering long-term well-being if it is narrowly defined as perpetually rising economic growth, affluence and consumption. The report goes on to look at the possibilities for a strong, stable economy which does not exhibit the same environmental and well-being impacts as the current economic system based on "unsustainable material consumption."¹¹⁰ The nef report *The role of local government in promoting wellbeing*, is a more recent work from 2011, which considers well-being in terms of the local context. It is useful in highlighting the broad range of factors which influence well-being at this level, and explicitly recognises "the need to consider nurturing psycho-social wellbeing alongside material wellbeing."¹¹¹

In November 2010, the ONS was asked by the Prime Minister to establish a formal national debate on well-being, and look at measuring it at the national level. In February 2011, nef responded with a report entitled *Measuring our Progress - The power of well-being*. They argue that, "a successful society is one in which people have high levels of well-being which is sustained over time. Accordingly, progress can be measured in terms of three key 'spheres':

- Goals: universally high levels of well-being
- Resources: sustainable use of environmental resources
- Human systems: activities that achieve

intermediate objectives such as a stable and productive economy, a cohesive society, good housing, and so on

We should also consider the relationships between these spheres. The key relationship is between resources and goals: how efficient are we at achieving the goals we seek given the resources we have? But the constituent parts of this relationship must also be considered: how efficient are our human systems at using resources sustainably, and how efficient are our human systems at delivering our goals?¹¹² Nef's key argument is that, "a sustainable view of progress is one that recognises well-being as the goal of societal progress instead of intermediate aims such as economic growth."¹¹³ The ONS launched a consultation on well-being as a national indicator in October 2011, to close 23rd January 2012. Through their "What matters to you?" national debate, ONS developed ten key themes or 'domains' which may become the indicators which will provide the basis for measurement of the UK's national well-being. The ten domains are: Individual well-being, Our relationships, Health, What we do, Where we live, Personal finance, Education and skills, Governance, The economy, and The natural environment.¹¹⁴

Bristol's 'Happy City' project is a not-for-profit organisation dedicated to promoting happiness and well-being through various activities and events. Co-founder Mike Zeidler summarises the links between happiness and sustainability: "Happiness is humankind's most enduring desire. There is abundant evidence to show that a focus on happiness as a measure of our prosperity and goal for society necessarily addresses environmental, social and economic concerns - in other words, every aspect of sustainability. Replacing GDP growth with happiness as a new paradigm for human development is a major cultural shift. This cultural shift is critical to the behaviour changes required on any path towards sustainability. Investment in the thinking skills which enable people to understand and function effectively in a new paradigm is not an intangible distraction from real and urgent tasks, but a make-or-break factor in the success of sustainability work."

Conclusion: The Need for Strategic Collaboration

The 'greening of the economy' is an essential task of the era in which we live. The costs of decarbonisation are vast, and the challenge of doing this successfully with regard to containing climate change, in the face of the desperation of indebted governments to reignite economic growth, is equally daunting. Trying to decide which measures to invest in, and how to push through policy support in an era of austerity, are the specific challenges which relate to the bulk of this report. The closing section, however, attempts to illuminate some of the many other elements that are critical parts of the picture. It is not just what we do, but how we do it, and how soon, that will make the difference. Making preparations for the disruptions to be caused by peak oil in the decades to come is of major importance to the resilience of the region. The development of resilient local food and transport systems will require greatly enhanced integrative systemic thinking.

Bristol and the West of England still have the luxury of choice as to the shape these things can take. However, an analysis of the converging crises of the era makes indisputable the claim that we will need to attempt to plan for an economic situation we have not yet encountered. The social, political and technical complexities around the integration of so many factors, and the matter of creating sufficient investment to support these changes are challenging enough. However, it is likely to be our vision, and our will to work collectively on planning concretely for a reality that does not yet exist, that will be the major hurdles. Making the leap of imagination, out of our immediate concerns and constraints and into action, will require the energy of true inspiration.

Figure 3. Bristol - Companies, Sales and Employment (2010)

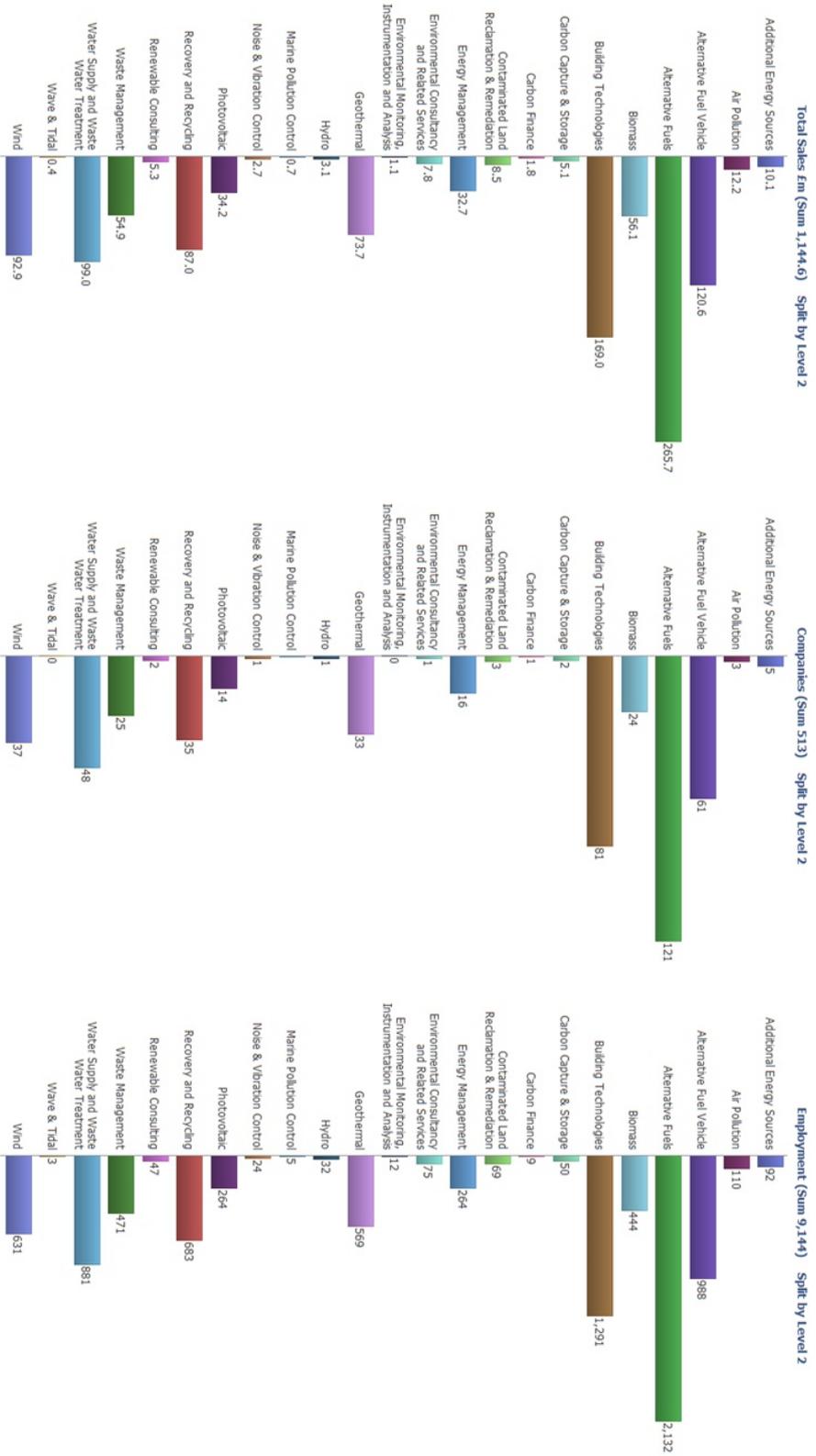


Figure 4. South Gloucestershire - Companies, Sales and Employment (2010)

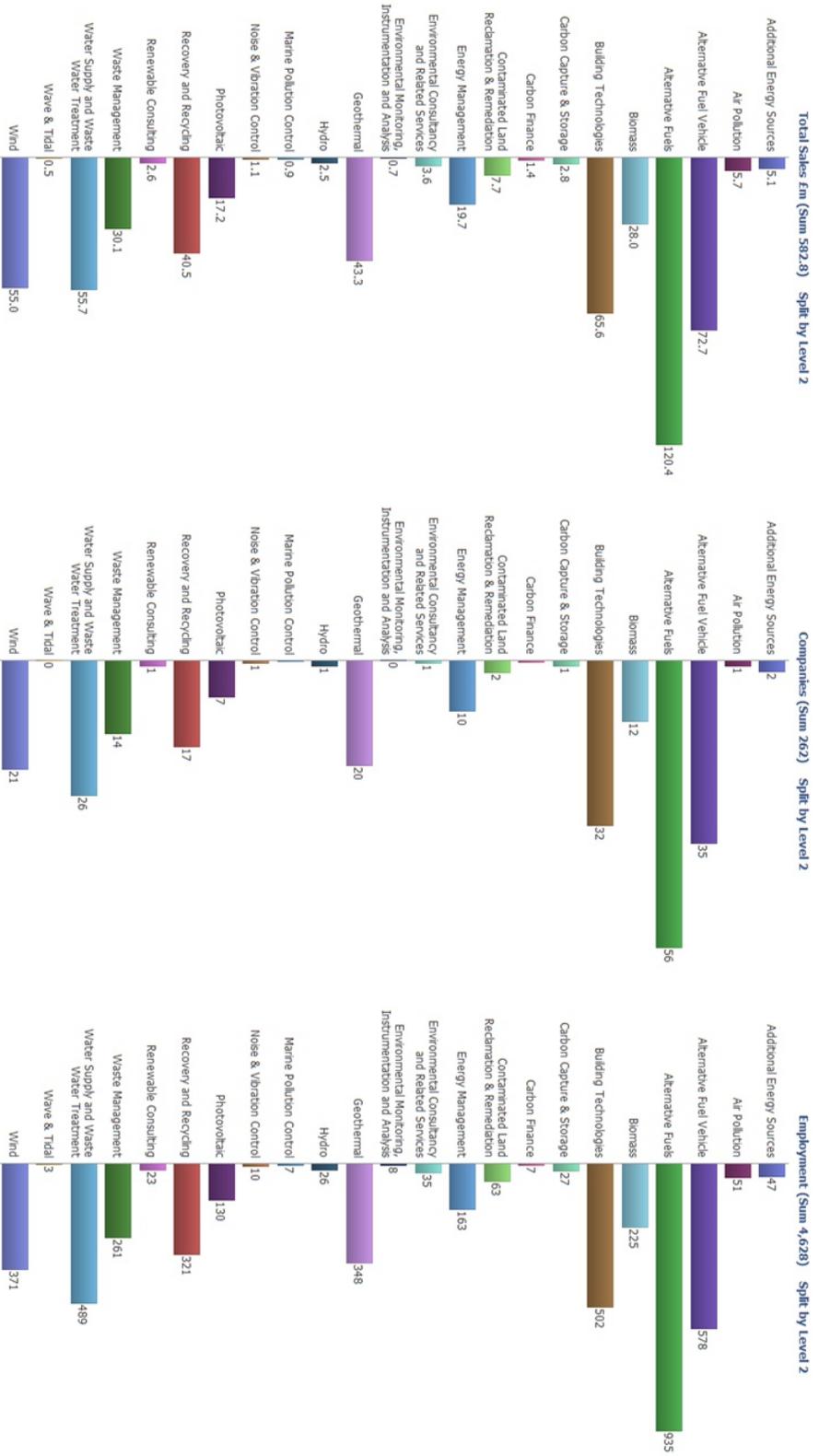


Figure 5. North Somerset - Companies, Sales and Employment (2010)

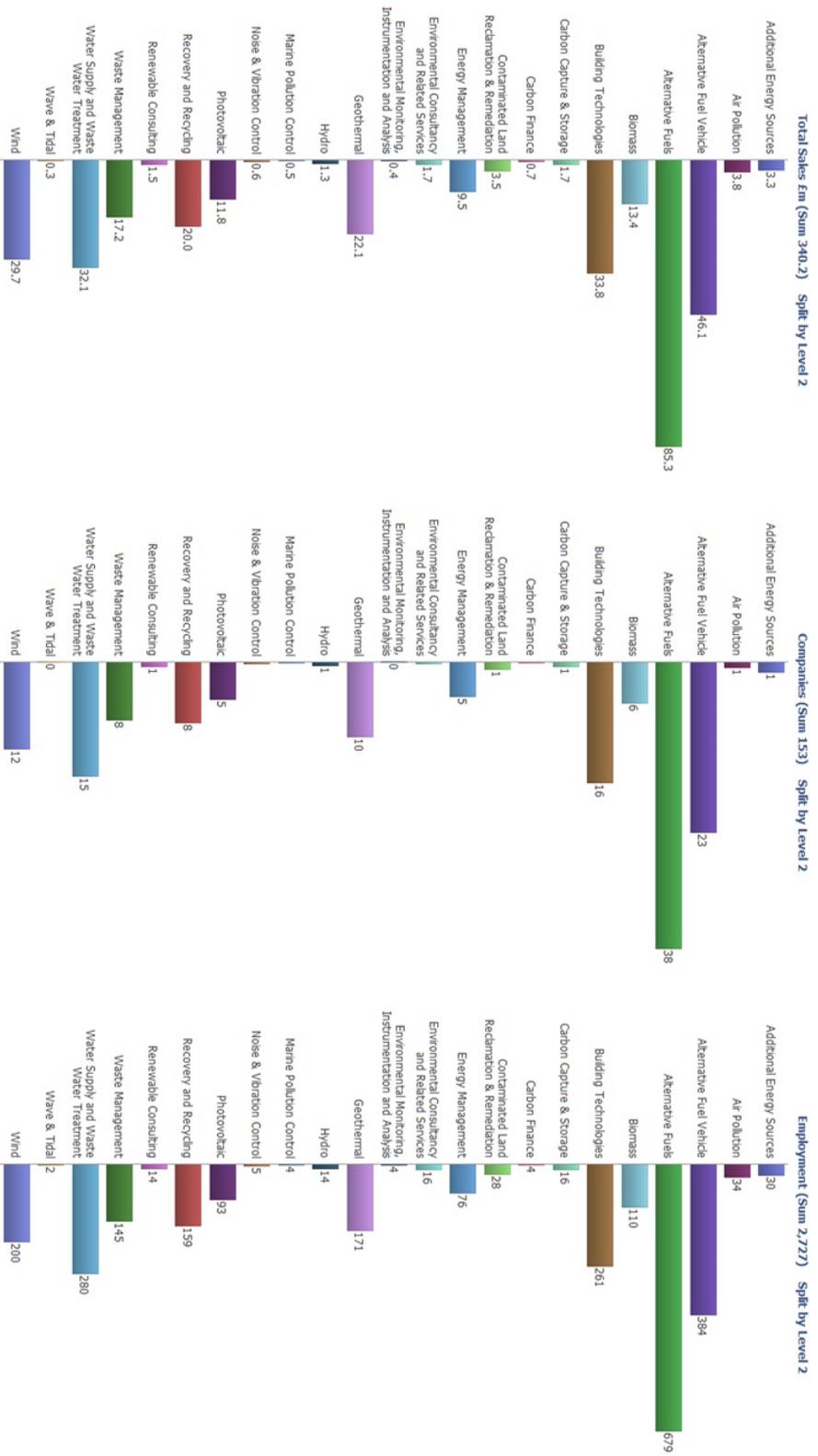
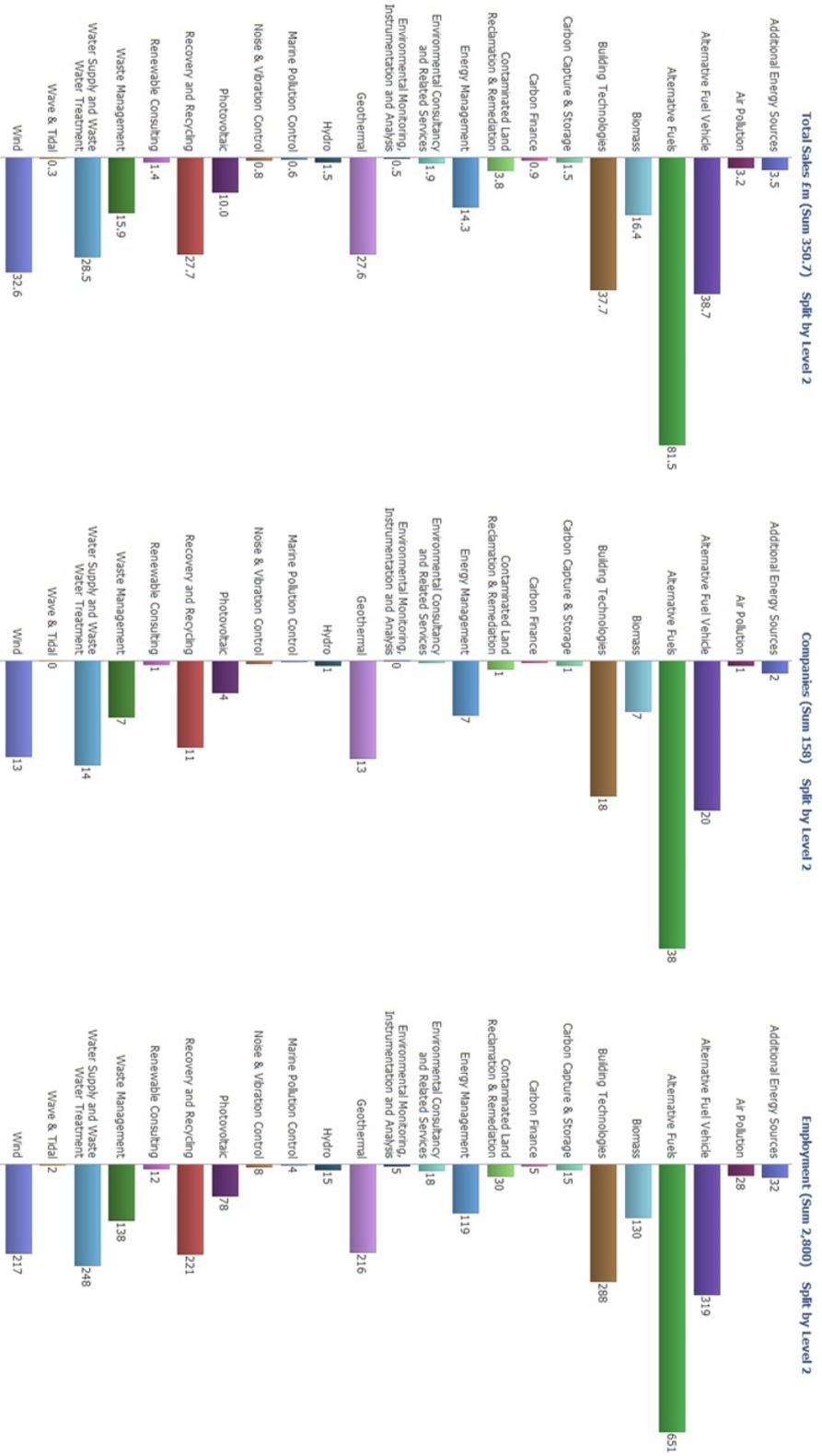


Figure 6. Bath and North East Somerset - Companies, Sales and Employment (2010)



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