



The Future's Green: Jobs and the UK low- carbon transition

by Jenny Bird and Kayte Lawton

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Challenging ideas – Changing policy

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About ippr

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Jenny Bird and Kayte Lawton are both research fellows at ippr.

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List of abbreviations

| | |
|-----------------------|--|
| BERR | Department for Business, Enterprise and Regulatory Reform |
| BIS | Department for Business, Innovation and Skills |
| BWEA | British Wind Energy Association |
| CCS | Carbon capture and storage |
| CEMEP | Commission on Environment Markets and Economic Performance |
| CERT | Carbon Emissions Reduction Target |
| CHP | Combined heat and power |
| CLG | Department for Communities and Local Government |
| CO ₂ | Carbon dioxide |
| CRC | Carbon Reduction Commitment |
| DECC | Department for Energy and Climate Change |
| DfT | Department for Transport |
| DWP | Department for Work and Pensions |
| EU ETS | European Union Emissions Trading Scheme |
| EWEA | European Wind Energy Association |
| gCO ₂ /km | Grammes of carbon dioxide per kilometre |
| HMT | Her Majesty's Treasury |
| kgCO ₂ /km | kilogrammes of carbon dioxide per kilometre |
| LCBP | Low Carbon Buildings Programme |
| LCEA | Low Carbon Economic Area |
| LFS | Labour Force Survey |
| MAC | Migration Advisory Committee |
| NAIGT | New Automotive Innovation and Growth Team |
| NVQ | National Vocational Qualification |
| OECD | Organisation for Economic Cooperation and Development |
| PV | Photovoltaic |
| R&D | Research and development |
| RDA | Regional Development Agency |
| RO | Renewables Obligation |
| SME | Small or medium-sized enterprise |
| SSC | Sector Skills Council |
| STEM | Science, Technology, Engineering and Maths |
| SVQ | Scottish Vocational Qualification |
| UCLOS | Ultra low carbon dioxide steel making |
| UKCES | UK Commission for Employment and Skills |

Executive summary

The combined challenges of meeting our climate change obligations, tackling rising unemployment and reducing labour market inequality mean that a significant restructuring of the UK economy will be necessary in the next few years. This report sets out to investigate what impact the transition to a low-carbon economy could have on jobs and employment and to identify ways in which opportunities can be taken and threats minimised. It concludes that without smart government intervention, the UK will struggle to benefit from new 'green' industries and the workforce is unlikely to be equipped with the right skills to work in the future low-carbon economy.

Since 2008 there has been a significant increase in attention to the idea of jobs in low-carbon and environmental services, known as 'green jobs' – which can help tackle climate change and unemployment at the same time – from politicians from across the political spectrum. In July 2009, the Government published its Low Carbon Industrial Strategy, which sets out how it will take advantage of the 'low-carbon opportunity', to develop Low Carbon Economic Areas and to stimulate further low-carbon innovation.

However, there is a failure to acknowledge that some jobs may also be at risk in the low-carbon transition and there could be a backlash against policies designed to tackle climate change as the potential impacts on vulnerable sectors become clear. The strategy also implies that 'green' jobs will help cut unemployment but the most optimistic estimates of new job creation fall a long way short of the numbers needed to make any significant decrease. These two problems suggest that the UK needs an economic development plan that will identify where new jobs will come from in the future, and how these jobs will be 'low-carbon compatible'.

The Low Carbon Industrial Strategy

Published in July 2009, the strategy sets out how the Government plans to take advantage of opportunities in low-carbon and environmental goods and services by removing barriers to market. The sectors included in the strategy are:

- Offshore wind power
- Wave and tidal power
- Civil nuclear power
- Carbon capture and storage
- Ultra-low carbon vehicles
- Low-carbon buildings and construction
- Low-carbon aerospace
- Chemicals and industrial biotechnology
- Low-carbon electronics and Information Communications Technology
- Business and financial services
- Carbon markets

The strategy also outlines plans for new Low Carbon Economic Areas, the first of which will be in South West England, with a particular focus on wave and tidal power. In addition, plans are included for how innovative low-carbon businesses will be supported, including financing options, business advice and through procurement policy.

How many jobs?

A number of UK studies have sought to identify which sectors are set to grow as a result of plans to reduce Britain's emissions of greenhouse gases. Analysis by Innovas, commissioned by the Government, estimates a total of 400,000 jobs by 2015. Other sector-specific studies have produced significantly lower figures than this. Projections are highly uncertain and depend on assumptions about the extent of government intervention. Nevertheless, we can identify some sectors where the UK has the strongest potential for job creation. These include the energy efficiency, offshore wind and nuclear energy sectors. Others likely to provide jobs in the longer-term include wave and tidal and carbon capture and storage.

Industries that may be exposed to risk as a result of the transition to a low-carbon economy include energy-intensive industries, such as steel, cement, aluminium and lime, and the automotive sector (although there are opportunities in developing new low-carbon vehicles). Other sectors will be affected by proposed measures like the Carbon Reduction Commitment, expansion of the European Union Emissions Trading Scheme to include aviation and zero-carbon buildings legislation.

Beyond effects on direct employment and on indirect employment in supply chains, there could also be induced effects on employment. For example, renewable energy and emission reduction policies are likely to result in higher energy prices, which could drive down consumer spending in other areas and result in job losses. But measures to increase energy efficiency would leave consumers with extra money to spend, so could end up benefiting the wider economy. However, it is not possible without further analysis to estimate the likely net effect of the low-carbon transition on employment.

Given that some jobs may be threatened, it is important that government pays more attention to how those at risk will be supported through the change. The trades union movement has campaigned for a 'just transition' which would genuinely tackle environmental problems, provide representation and employee involvement and include stable employment and long-term planning. Government needs to establish which sectors are potentially at risk and then develop strategies that would protect vulnerable jobs. This will be important where there is a risk that job losses would simply mean the transfer of carbon-intensive activities to other countries or where organisations are failing to take sufficient steps to prepare for the low-carbon transition. Where job losses are unavoidable, time must be built in to allow the support measures to be set up in advance.

The nature of new jobs

We must also consider the extent to which the transition to a low-carbon economy has the potential to exacerbate or ameliorate existing employment inequalities. Wider reforms will be needed to provide opportunities for the long-term unemployed and inactive and to tackle low pay. However, if we are to prioritise low-carbon industries for growth and use public money to push them forward, then it is right that they play a role in helping to reduce existing inequalities wherever possible.

Two important issues must be considered here: ensuring jobs are high quality and pay a decent wage, and creating employment and skills opportunities for those who need them most.

Our analysis of the Labour Force Survey and a survey of existing low-carbon employers suggests that there are good prospects for high-quality job creation in the likely growth sectors. This provides a clear argument for public support to maximise the social and economic benefits of an expansion in low-carbon employment. However, it appears that

women are less likely to be found working in some of the growth sectors (in particular jobs in construction and manufacturing) and may be excluded in the future because of continuing occupational segregation along gender lines.

We recommend that the Low Carbon Industrial Strategy should include plans for bringing more women into low-carbon growth industries like construction and manufacturing. Retention and recruitment strategies aimed women, alongside better quality, gender-neutral careers advice for young people and adults, will be key.

It is important that new jobs provide opportunities for those who need them most (including the long-term unemployed, those lacking higher level skills and people in deprived areas). In the main low-carbon growth areas some jobs (particularly those in construction or manufacturing) do appear to offer good quality prospects at lower and intermediate occupational levels. Jobs in business services offer fewer entry-level jobs.

To help people who tend to be disadvantaged in the labour market to benefit from the opportunities created by the low-carbon transition, the Low Carbon Industrial Strategy should also be more closely linked to the Government's welfare reform agenda. For example, welfare-to-work advisers could be given more information about current and future employment opportunities in low-carbon growth sectors in their local areas.

Many UK workers are trapped in low-paying jobs. Although many new 'green' jobs are likely to offer career progression opportunities, more work is needed to ensure that low wage and low-skilled workers have strong career ladders. We recommend that Sector Skills Councils and careers advice specialists work together to develop sector-specific careers ladders for low-carbon growth sectors.

Encouraging low-carbon industries

Government intervention is required if the industries that are needed for the UK to benefit economically from the low-carbon transition are to materialise. Government has a role to play where there are market failures, and there are a number of market failures in low-carbon technologies. It also has a role in identifying and targeting areas for support. This approach has worked well in other countries, such as Germany and Spain.

The Government needs to adopt clear criteria for prioritising which areas it chooses to support. We suggest that support measures should be for new technologies, that have the scope to reduce emissions, create economic advantage and create good quality jobs.

A clear set of criteria for the areas that are prioritised in the Low Carbon Industrial Strategy are lacking, as are sectors such as energy efficiency that score highly on emissions reduction and quality of job criteria but less well on economic criteria. The Strategy also fails to include technological innovations for improving the processes of established industries

For each prioritised area, government needs to develop a comprehensive package of measures that will provide businesses with incentives to invest. This should include a robust overarching policy framework, supply-side 'push' measures, demand-side 'pull' measures and the identification and removal of other barriers to development.

Support measures must also be put in place for small businesses. This will mean tailoring some existing measures to make them more appropriate or developing new support measures specifically for SMEs. A 'green ideas bank' could be established that would provide access to finance for low-carbon innovation with loans underwritten by government.

Regional and sub-regional interventions will be necessary. There is a need to mainstream low-carbon thinking through all economic development activities. At the same time, support

for new low-carbon development should be targeted at the parts of the UK with greatest need for economic development.

Developing the UK workforce

It is currently unclear what the UK's specific skills needs are for the emerging low-carbon economy. Our analysis of the best existing data, supplemented by a survey of 39 existing 'green' employers, suggests that employers in the low-carbon sector currently have two major skills problems: management, which is regularly identified as a weakness in UK firms in general; and technical, job-specific skills, including but not limited to Science, Technology, Engineering and Maths (STEM) skills.

We did not find any evidence that new low-carbon jobs would require completely new types of skills sets among the workforce. Instead, we identified four broad types of skill shortages:

- Specific skills shortages requiring substantial investment in training and development (for example, high integrity pipe welders and civil engineers)
- Skills gaps that could be addressed by 'topping up' existing workforce skills (for example training electricians to work on roofs so that they can install solar panels)
- Generic skills gaps that apply across the UK economy (for example, management and leadership skills)
- Generic 'green' skills (that is, a broad understanding of the changes needed for businesses to reduce their emissions that will be needed by all employees across the workforce).

Through our interviews with stakeholders we identified a number of problems with existing skills policy with respect to the above:

- The focus on employer demand can be problematic when it comes to low-carbon skills because it can be difficult for employers to identify future skill needs.
- Funding for adult skills is often inflexible and does not always respond to employers' needs.
- Skills funding, especially in England, is spread across the economy, with little attempt to target support where it can have the greatest impact.

An employer-led skills system is not sufficient in the context of the transition to a low-carbon economy; there is a need for government to play a more active role in setting the direction. This should include developing national skills strategies which reflect the specific priorities for economic development of each of the four nations of the UK; ensuring that a central agency, such as the UK Commission for Employment and Skills, has oversight of emerging and future skills needs and is responsible for making sure these are reflected in the commissioning process for workplace training; and a greater responsibility among Sector Skills Councils for delivering cross-sector skills, including the skills that all workers and employers will need to transform their workplaces into low-carbon workplaces.

Public subsidies for workplace training should reflect broad strategic economic priorities (provided this is in line with international and EU trade rules) rather than being spread evenly across all sectors, as is currently the case. A more flexible and relevant system of subsidies for training is also needed, including funding to 'top up' core skills, targeted at small businesses, and funding for low-carbon re-skilling.

Finally, employers need a stable and significant demand for low-carbon skills before they will invest in training or articulate a demand for publicly-subsidised training. A credible route-map for the low-carbon transition would help. We also recommend that public procurement should be used to stimulate demand for low-carbon skills.

Conclusion

The radical steps that are necessary for the UK to meet its climate change obligations will bring with them significant opportunities for economic development. In areas like offshore wind and energy efficiency, there is scope for significant job creation and most jobs are likely to be 'decent' jobs, too.

Government must take a strong lead to identify and support the growth of areas of strategic interest for the UK and in driving forward the skills agenda and ensuring that training provision is aligned with low-carbon economic development plans. And it should endeavour to ensure that plans to stimulate low-carbon industries also contribute to reducing inequalities in the labour market wherever possible.

Finally, government should acknowledge that the low-carbon transition will bring risks for employment, too. Early identification of areas of potential vulnerability is essential so that strategies can be developed to protect jobs or to support employees in finding new work. This will not only minimise political risk associated with decarbonisation but also will ensure that the transition is fair.

1. Introduction

Britain led the industrial revolution by putting to work our basic resource of coal. We led offshore oil technologies by putting to work the great reserves of North Sea oil and gas. And now we can lead the creation of a low-carbon economy through the use of nuclear power, the vast expansion of renewables ... and in the near future, I am convinced, carbon capture and storage. So millions of the new jobs of the future can be low-carbon jobs: green jobs that will inspire a new generation of school leavers about their future careers.

Gordon Brown, speech to the Low Carbon Industrial Summit, 6 March 2009

So let me tell you my vision of a good future for our economy... It's a more modern economy, where we create rewarding, good-paying jobs in the green and technological industries of the future.

David Cameron, 5 January 2009

Can you imagine the jobs we could create if we really got behind a zero-carbon Britain? In wind, in marine and tidal, in solar and biogas? Imagine the jobs we could create by greening our existing industries. We could generate a whole host of new roles. In education, tourism, architecture, agriculture, engineering, design. If we really committed to a zero-carbon transport system. And signed up to a high speed rail link from North to South. That's thousands more jobs.

Nick Clegg, speech to British Wind Energy Association, 22 October 2008

The interface between employment and climate policy is an area of growing significance. At a time when political leaders, campaigners and policymakers are seeking routes out of the recession and ways to reduce unemployment, the prospect of hundreds, thousands or even hundreds of thousands of new 'green' jobs is clearly an appealing one.

Politicians of all stripes have spoken of the promise that new low-carbon industries hold for job creation. Environmental campaigners and trade unions are also pushing the agenda, recognising the potential for a win-win situation.

But there is a flip side to the climate-employment debate that has not yet received as much public attention – the threats that the UK's climate change commitments might pose to employment. If steps are not taken to help existing industries reduce their emissions and develop new, low-carbon products, then jobs in these companies could be at risk. Clearly, job loss as a result of climate change legislation would be a bad thing in and of itself, but such a backlash could also reduce the political space that is necessary for bold action on climate change.

Tackling climate change is not optional – it is essential that countries like the UK take the lead in reducing their emissions if we are to prevent climate change from reaching dangerous proportions. The UK has committed to making its fair share of reductions through the legally binding targets set out in the Climate Change Act 2008. It is now vital that the plans to achieve these cuts maximise the opportunities for new job creation, protect existing jobs and, as far as possible, do not undermine efforts to reduce inequality in the labour market.

This report sets out to investigate what impact the low-carbon transition could have on jobs and employment and to identify ways in which opportunities can be realised and threats minimised.

Context

Tough decisions will be necessary in the next few years if the UK is to live up to its commitment to tackle dangerous climate change. The targets set out in the Climate Change Act 2008 – to reduce emissions of greenhouse gases by at least 34 per cent by 2020 and 80 per cent by 2050 – demonstrate that the Government has recognised the scale of the response that will be necessary if the UK is to do its fair share in preventing dangerous climate change. But meeting these targets will not be easy, and additional obligations under the European Union's '20/20/20' targets to increase renewable energy provision from approximately 5 per cent of the total energy mix currently to 15 per cent in 2020 will require a rapid deployment of renewable energy plant on a scale that has never been seen before in this country.

There is only a short window of opportunity to act on climate change, which means that significant action will be necessary over the next decade to put the UK on the path to a low-carbon economy.

At exactly the same time as urgent and concerted effort is needed to decarbonise the way we live and work, the UK has been hit by the fall-out of the global economic crisis triggered by the 'credit crunch' that began in 2007. The UK economy went into recession in the second quarter of 2008, causing a rapid rise in unemployment. By June 2009, 2.4 million people were unemployed, up from 1.7 million at the same point in 2008 (Office for National Statistics 2009). Unemployment is expected to peak at around 3 million by the middle of 2010. However, based on our understanding of previous recessions, it is unlikely that employment levels will return to their pre-recession levels until at least 2016.

It is clear that the financial crisis has also brought with it an end to job growth in many of the sectors that the UK has relied on in recent years to provide employment on a significant scale, and it is unclear when or if growth at pre-recession levels will resume. Employment growth in the UK over the last 10 to 15 years has been driven by three major trends: an expansion of the public sector; a house price boom fuelled by high levels of debt; and a booming financial services sector (Clifton *et al* 2009). It now looks as though each of these trends has been thrown off course by the recession.

In the immediate future, the financial sector is unlikely to grow as financial institutions try to minimise costs and rebuild profit margins. The construction and real estate sectors have contracted severely as a result of falling house prices, and wholesaling, retailing, hotels and restaurants may face difficulties if consumers continue to minimise their spending. In the short to medium term, it is clear that public spending will have to contract in order to reduce the UK's considerable fiscal deficit, which will have a serious impact on the scale of public sector employment. This means that other sectors of the economy will have to expand if employment is to return to pre-recession levels. This is unlikely to happen without appropriate government action (Clifton *et al* 2009).

However, even before the 2008/09 recession, many people experienced considerable barriers to accessing good quality employment. Employment rates for certain groups remain significantly below the national average, particularly for people with a disability or serious health-condition, people with low skills, some ethnic minorities and lone parents (Department for Work and Pensions 2007). Once in employment, these groups are also more likely to experience low pay, insecure employment and discrimination. Although female

employment has increased significantly over the last few decades, women continue to face wage penalties and other forms of disadvantage in the workplace. Previous research by ippr has highlighted the extent of low pay and poor career progression that many UK workers face (Cooke and Lawton 2008).

These patterns suggest that many people failed to benefit from the economic boom that preceded the 2008/09 recession. They also feed into wider patterns of inequality which mean that the UK is now one of the most unequal societies in the developed world (OECD 2008). Given what we know about the negative consequences of economic inequality across society, it is vital that efforts to drive employment growth should also seek to reduce labour market inequality wherever possible (Wilkinson and Pickett 2009).

The combined challenges of meeting our climate change obligations, tackling rising unemployment and reducing labour market inequality mean that a significant restructuring of the UK economy will be necessary in the next few years. This will bring risks as well as opportunities and the Government needs to be prepared to ensure the UK is best placed to benefit from these changes.

Aims and methodology

This report seeks to address the following questions:

- What is the likely impact of efforts to decarbonise the UK economy on jobs and employment, in terms of job numbers, job quality and labour market inequality?
- How can the number of new jobs be maximised?
- How can we ensure that the UK workforce is well placed to take advantage of new job opportunities?
- What lessons can be learnt from other countries that have successfully cultivated new 'green' industries?

The report is based on research carried out from January to August 2009. This included a desk-based review of evidence, development of a number of international case studies, 38 stakeholder interviews (with experts from the UK and overseas from industry, skills and education bodies, and regional and local authorities), a survey of 39 existing low-carbon employers in the UK and analysis of the Labour Force Survey (published by the Office for National Statistics [ONS]). More detail about the methodologies used is presented in Appendix 1.

Structure of the report

Chapters 2 and 3 investigate the likely impacts on employment figures and the likely nature of the jobs that will be available in the future.

Chapters 4 and 5 provide more detail on the role of government in achieving these aims – in stimulating new low-carbon industries and in ensuring the workforce is well placed to take advantage of new low-carbon job opportunities.

Chapter 6 provides some examples of how these strategies might be applied in practice, to the energy efficiency, offshore wind and renewable heat sectors.

Finally, Chapter 7 provides conclusions and a summary of recommendations.

2. The effect of the transition to a low-carbon economy on the UK labour market

'Green jobs', usually taken to mean occupations that contribute to maintaining or enhancing environmental quality, have been presented as the solution to both rising levels of unemployment and the urgent need to reduce emissions of greenhouse gases. The Government published its Low Carbon Industrial Strategy in July 2009, which set out the action it would take to advance 'green' industries in the UK.

But focusing only on new 'green jobs' is problematic for two reasons. First, it fails to acknowledge that the shift to a low-carbon economy brings with it risks as well as opportunities. Ultimately, all jobs will have to be 'green' in the future if they are to be sustainable in a genuinely low-carbon economy. This means that many existing industries will need to make significant changes to the way they do business if they are to survive the transition. There is a political risk in emphasising only the benefits, without discussing how those sectors at risk will be supported through the change, because this leaves scope for a backlash from those who face the greatest risk, and this could ultimately undermine efforts to meet climate change targets.

There is some evidence of this happening already in other countries. For example, in Australia, the coal industry has lobbied hard against the introduction of the carbon pollution reduction scheme, arguing that it will cost jobs in an industry that is a major employer (ABC 2009).

The second problem is that even if the most optimistic estimations of 'green' job creation in low-carbon industries come to pass, this would still not provide enough jobs to deal with the levels of unemployment we are currently experiencing in the UK. One of the studies that forecasts the greatest increase in job numbers in this area was commissioned by the then Department for Business, Enterprise and Regulatory Reform (BERR) from economics consultancy Innovas. It suggests that there could be 400,000 jobs in environmental and low-carbon sectors by 2015 – significantly fewer than the 2.5 million people who were unemployed in the three months to August 2009 (Innovas Solutions Ltd 2009, ONS 2009).

These two problems show that what is needed is an economic development plan for the UK, which identifies where the new jobs that will replace those lost in the recession will come from and how these jobs will be 'low-carbon compatible'. It should also show whether they are in directly-related industries, like renewable energy, or in sectors that have only an indirect relationship, such as social care or business services.

It is beyond the scope of this report to identify all areas of new job growth (although this is a question we hope to address in future through ippr's research programme). Instead we have focused on the impacts of the low-carbon transition – on areas where this might create opportunities and also where it brings risks to employment. The rest of this chapter sets out our findings in each of these areas in more detail.

New low-carbon growth areas

Since early 2008 there has been a rapid increase in politicians across the political spectrum talking of the opportunities 'green jobs' could bring to Britain's economic future. This has been driven by three factors:

- A recognition of other countries' successes in creating large numbers of new jobs in 'green' sectors (see Table 2.1 for examples)

Table 2.1: Direct jobs in renewable energy in selected countries

| | Germany (2006) | Spain (2007) | USA (2006) | China (2007) |
|-----------------------|----------------|--------------|------------|--------------|
| Wind | 82,100 | 32,906 | 16,000 | 22,200 |
| Solar (PV* + thermal) | 40,200 | 35,591 | 7,600 | 655,000 |
| Hydro | 9,400 | 6,661 | 8,000 | - |
| Geothermal | 4,200 | - | 9,000 | - |
| Biomass | 95,400 | 4,948 | 66,000 | 266,000 |

*photovoltaic

Source: United Nations Environment Programme (UNEP) (2008)

- The need to identify new areas of job growth as UK unemployment figures continue to rise
- The need to frame action on climate change in a more positive manner.

However, the term 'green jobs' itself is confusing as it has been used to mean different things by different people (see Box 2.1). There are also significant inconsistencies between the various studies that have been conducted to estimate the number of jobs that might be created in emerging low-carbon sectors in the future. This is partly due to the fact that many of the studies are based on different sets of assumptions (such as whether indirect supply

Box 2.1: What are green jobs?

Even the briefest foray into the wealth of reports that have been published on this topic in the last 12 months reveals a range of different descriptions and definitions.

Generally, the term 'green jobs' is usually taken to mean occupations that contribute to maintaining or enhancing environmental quality. The differences tend to depend on where one decides to draw the boundary. For example, historically, green jobs were generally considered to be in the fields of biodiversity and nature conservation, environmental consultancy, waste disposal and pollution control. More recently, the definition has been expanded to include 'low-carbon' jobs in renewable energy, energy efficiency, low-carbon transport fuels, climate change consultancy and carbon finance.

Some studies have sought to look beyond direct employment opportunities and have also included supply chain companies in their descriptions, even though these companies may also supply non-green industries. Some jobs appear 'green' to some and not to others – nuclear power being a prime example – and other jobs that might be expected to be considered green are often omitted from economic studies and job projections. For example, bus and train drivers rarely feature (if at all) in projected job estimates for green jobs.

There are two other variations on this theme. The first is 'green-collar jobs' or 'green and decent jobs', a term that refers to jobs that provide good quality employment opportunities as well as contribute to protecting the environment. The US-based Apollo Alliance describes green-collar jobs as being:

Well paid, career track jobs that contribute directly to preserving or enhancing environmental quality. Like traditional blue-collar jobs, green-collar jobs range from low-skill, entry-level positions to high-skill, higher-paid jobs, and include opportunities for advancement in both skills and wages ... if a job improves the environment, but doesn't provide a family-supporting wage or a career ladder to move low-income workers into higher-skilled occupations, it is not a green-collar job. (Apollo Alliance et al 2008: 3)

The second variation is 'greening the workplace', a phrase used in conjunction with campaigns that aim to make existing companies more environmentally friendly in their operations (for example by saving energy, cutting down on waste or promoting green travel options to staff).

Rather than trying to draw a boundary around a set of job titles that can be labelled as 'green', it could be argued that all jobs will need to be 'green' in the future if they are to be sustainable, as high-carbon jobs will not be viable in a low-carbon world.

chain jobs are included, how many years in the future the projections are for and whether jobs created outside of the UK are included) but this does not seem to account for all of the differences. We therefore recommend that projections of job numbers are not taken too literally, but instead are used to give an indication of the relative growth that is likely to be seen in these different sectors.

There are not many studies that compare potential job growth in different areas. The most comprehensive study is the one produced by Innovas, which includes estimations for employment in low-carbon industries in 2015. However, some of the estimations in that report have been criticised as being overly optimistic and do not tally with industry estimates. The Grantham Research Institute on Climate Change and the Environment has also produced an analysis of where the greatest job creation is likely to occur in the short-term (Bowen *et al* 2009).

Both those reports highlight energy efficiency, renewable energy and nuclear energy as areas with good potential for job creation. There is disagreement about other sectors, including carbon capture and storage (CCS) and renewable/geothermal heat. Some sectors are only examined in one of the studies. For example, the Grantham Institute report describes good job creation opportunities in upgrading to a smart electricity grid, improving road vehicle efficiency and in mass transit and rail freight. The Innovas analysis includes alternative fuels for vehicles (which has a high job creation potential) and wave and tidal energy, which comes bottom of the list in terms of the total potential employment in 2015 (Innovas Solutions Ltd 2009, Bowen *et al* 2009).

Energy efficiency/building technologies

There appears to be good scope for job creation in this sector, particularly in the short to medium term. There are a significant number of jobs in both manufacturing and installation of insulation. This number is likely to increase in the short term and then decline beyond around 2015 as markets for loft insulation, cavity wall insulation and double glazing reach saturation. Other technologies such as solid wall insulation will provide opportunities in the longer term as they are gradually taken up across the country (Energy Efficiency Partnership for Homes [EEPH] 2008).

Microgeneration technologies (such as solar heating, solar PV, and combined heat and power) also provide opportunities for job creation. Most manufacturing is currently done

Table 2.2: Summary of job estimates in the energy efficiency/building technologies sector

| Source | Description of sector | Current employment | Projected employment |
|--|--|---------------------------|--|
| Innovas 2009 | Building Technologies (doors, windows, insulation, energy monitoring and controls) | 107,000 (in 2007/08) | 154,800 (in 2014/15) |
| Energy Efficiency Partnership for Homes 2008 | Energy efficiency manufacturing Installation and servicing of microgeneration | 77,750 Less than 1,000 | 76,300 (in 2015), 3,500–8,000 (in 2020), depending on scenario |
| Jowit 2009 | Micro wind Solar PV | 1,880 1,600 | 10,000 (in 2030) 100,000 (in 2020) |
| Source | Policy proposal | Job creation potential | |
| Energy Industries Council (EIC) 2009 | £6 billion to build 50,000 new low-carbon social houses in 2009/10 | 160,000 (no year stated) | |
| | £1.5 billion for retrofitting energy efficiency measures in low-income homes | 145,000 (no year stated) | |
| | £1 billion in 2009/10 of extra investment on energy efficiency retrofitting of schools and hospitals | 21,500 (no year stated) | |

overseas but jobs in installation and servicing would accrue to the UK (EEPH 2008, Jowit 2009, UK Photovoltaic Manufacturers Association 2009).

Wind

The UK's excellent offshore wind resources and status as the world leader in terms of installed capacity have helped to boost hopes that Britain could gain a competitive advantage in this area. In addition, the skills base developed in the offshore oil and gas industry could potentially provide expertise. A key question is whether the UK will be able to benefit from manufacturing jobs in this sector, or whether turbines will continue to be imported, as they are currently. While the manufacturing industry associated with onshore wind is now well established in other European countries and is growing in the United States, China and India, offshore technology is less advanced and there is growing competition to attract the 'next generation' of turbine manufacturers.

The decision by Vestas in 2008 to close its onshore wind blade manufacturing factory on the Isle of Wight may have increased scepticism that the UK will be able to attract manufacturers to locate in the UK. However, there are still hopes that the ambitious plans to expand offshore wind capacity over the next decade and the measures set out in the Low Carbon Industrial Strategy (HM Government 2009a) will attract component manufacturers to set up in the UK, in particular those that do not already have manufacturing bases elsewhere in Europe (such as Clipper Windpower and Mitsubishi Power Systems) (Bird 2009, ENDS 2009b). However, there are still question marks over the extent to which the UK can expect to benefit from manufacturing jobs – from full turbine manufacturing, to component manufacturing or assembly jobs (see Bird 2009 for further explanation).

Table 2.3: Summary of job estimates in the wind sector

| Source | Description of sector | Current employment | Projected employment |
|--|---------------------------|---------------------|--|
| European Wind Energy Association (EWEA) 2009 | Wind (offshore + onshore) | 4,000 (in 2007) | - |
| Innovas 2009 | Wind | 87,500 (in 2007/08) | 156,800 (in 2014/15) |
| Douglas Westwood 2008 | Wind, UK-based | 16,000–26,000 | 5,000–34,000 (in 2020), depending on scenario |
| Carbon Trust 2008 | Offshore wind | - | 40,000–70,000 (in 2020), depending on scenario |
| SQW Energy 2008 | Wind, wave and tidal | 4,800 | 12,000–18,000 (in 2014), depending on scenario 23,100–56,900 (in 2020), depending on scenario |
| Boettcher <i>et al</i> 2008 | Wind | | 23,000–57,000 (in 2020), depending on scenario |

Nuclear

There are not many figures available on the potential for employment in this sector. The Innovas study projects 237,100 jobs in 'alternative fuels', which includes nuclear among other things (Innovas 2009). The Nuclear Industry Association (NIA) has said that nuclear new-build would create 'thousands of new jobs' (NIA 2008). The bulk of new jobs would be in construction, with further jobs in running the power stations once building work had been completed.

Automobile

A number of areas where the UK could build on its existing expertise in the automobile sector have been identified and include producing more efficient internal combustion

engines, diesel hybrids and hybrid powertrains, and niche electrical vehicles (such as forklift trucks and commercial vehicles) (New Automotive Innovation and Growth Team [NAIGT] 2009, EEF 2008). The Grantham Institute report also highlights efficiency in new cars, vans and heavy goods vehicles as providing good scope for job growth (Bowen *et al* 2009).

In contrast, the Innovas study claims that alternative fuels for vehicles (which includes biofuels, hydrogen, electric and plug-in hybrids) is the area with strong potential for job growth (Innovas 2009). It is not clear to what extent these jobs would build on the existing automobile industry skills base or whether they would arise from new companies setting up in this area.

Other significant sectors

A number of other sectors warrant discussion, even though they are unlikely to produce a large number of jobs in the short term.

The BWEA has estimated that the wave and tidal energy sector could only provide around 2,000 jobs by 2020 (BWEA nd). However, it is widely acknowledged that the UK has several advantages in this area, which could lead to the development of a successful industry in the longer term.

Wave and tidal technology is still a long way from large-scale deployment and so is not expected to provide many jobs in the short to medium term. But the UK has considerable natural wave and tidal resources, which makes it an ideal location for the development of technology. The country is a leader in R&D in this field with almost half of the world's device-developers located here, as well as two demonstration sites (in Orkney and Cornwall). Finally, existing UK-based manufacturers of marine propulsion systems (such as Rolls Royce and Converteam) have the potential to diversify into manufacturing wave and tidal devices. The Government has recently recognised this potential and has designated South West England as a Low Carbon Economic Area specialising in wave and tidal power (HM Government 2009a).

Many commentators are keen to see that these advantages are maintained and translated into a successful UK-based industry as the technology matures and becomes commercial. The manufacturers' organisation EEF identifies three barriers that could prevent this from happening:

- Financing the commercialisation of technology
- Obtaining planning consent and grid connection
- Limited public support for energy-related R&D. (EEF 2008)

Carbon capture and storage (CCS) is another technology currently in development that is likely to have a significant global market in the medium term. It is not clear how many jobs the CCS industry might support, but like marine renewables, it is unlikely that there will be significant employment growth in the near future.

The UK has a number of areas of strength that the development of CCS will be able to draw on, including the right type of geology for building storage sites (under the North Sea), existing offshore infrastructure from the oil and gas industry and an existing skills base in offshore engineering (EEF 2008).

Risks to existing industries

As well as creating opportunities for new industries, the low-carbon transition will affect existing industries. This means that existing sectors will need to change if they are to remain

sustainable within a low-carbon economy. Industries that produce high-carbon products or services (for example, 'gas-guzzling' cars, or power-hungry electrical items) will need to develop models that produce fewer carbon emissions. Industries that produce products or services with high *embedded* emissions (industries that emit large amounts of greenhouse gases in the process of producing and distributing their products) will need to find ways to reduce the carbon intensity of their manufacturing or operational processes.

The shift to a low-carbon economy will not necessarily have a negative impact on existing industries, but there is a risk that if companies are not willing or able to adapt, then job losses could result. Existing jobs will need to be 'greened' in order to be sustainable in the long run.

To the best of our knowledge, the Government has not yet carried out any comprehensive studies in the UK to assess the likely impact of decarbonisation on existing industries and jobs. However, some sectors have been identified as being potentially at risk, as described below.

Carbon-intensive industries

The introduction of the European Union Emissions Trading Scheme (EU ETS)¹ has already raised concerns about industries with large carbon footprints – such as cement, lime, steel and aluminium – that are covered by the scheme. It has been argued that jobs in these sectors are vulnerable to 'carbon leakage' where companies relocate to countries outside of the EU that have less stringent carbon reduction regimes (Committee on Climate Change 2008, Trades Union Congress [TUC] 2008).

The steel industry is of particular concern because although the industry employs less than 0.1 per cent of the UK's workforce, this still equates to around 25,000 jobs. These jobs also tend to be regionally concentrated in relatively deprived areas – particularly in Wales – and so the effects of losing manufacturing plant could have a significant impact at the local level (Committee on Climate Change 2008).

Some initiatives are in place to try to minimise risk to this sector. For example, the European Ultra Low CO₂ Steel Making R&D programme (ULCOS), which uses a combination of public and private funding – the European Commission funds 44 per cent of the initiative – to research new lower-carbon methods for manufacturing steel (TUC 2008, ULCOS 2009a). However, the pilot and demonstration projects that will happen under phase two of ULCOS will be located in France and Germany, not the UK (ULCOS 2009b).

As well as reducing embedded emissions, the steel industry will also need to ensure that its products are appropriate for future low-carbon markets. There are already some innovations in this area, for example producing tracks for high-speed rail, roofing that is compatible with solar panels, and towers for wind turbines.

Automobile

The New Automotive Innovation and Growth Team (NAIGT) has stressed that while the transition to low-carbon vehicles presents an opportunity for the UK, it also 'represents a significant risk, as if low carbon technology is not developed and manufactured here, the present indigenous automotive sector may see significant shrinkage and the UK will become

1. Under the EU ETS, each year the total emissions allowed from large emitters of carbon dioxide (such as electricity generators, cement, steel, glass and bricks) are capped. Tradable permits, adding up to the total value of the carbon cap, are then allocated to those industries covered by the scheme. Those who emit less than their allocation can sell any spare permits. Those who emit more must buy additional permits to cover their total emissions.

even more dependent on overseas sources' (NAIGT 2009: 7).

Policy measures are already beginning to affect the automobile industry. For example, the European regulation that the average emissions of new cars sold in Europe must be 130 grammes of carbon dioxide per kilometre (gCO₂/km) by 2015. Similar proposals for vans are expected to be announced later this autumn (Transport and Environment 2009).

Other sectors

As tougher climate change policies are developed, sectors beyond heavy industry and automobiles are likely to be affected. In the UK, the Carbon Reduction Commitment (CRC), due to be introduced in 2010, will impact on large organisations that are not already covered by the EU ETS. The vast majority of organisations taking part in the CRC will be mechanical engineering companies. A reasonably large number of business services, plastics, public sector and retail companies will also be affected (ENDS 2009b).

Other carbon-intensive sectors that are likely to be affected by carbon legislation and regulation include aviation (for example, the expansion of the EU ETS to include aviation in 2012) and the construction sector, which will be affected by new zero-carbon buildings legislation.

Induced effects

The move to a low-carbon economy will have impacts beyond the direct employment and supply-chain effects described above. For example, increasing the use of renewable energy could result in job losses elsewhere in the economy because higher energy bills are likely to drive down consumer spending in other areas. On the other hand, energy efficiency measures could provide a stimulus in the opposite direction as savings on energy bills are spent elsewhere. We are not aware of any studies into these types of impacts in the UK context. Without more detailed analysis, it is impossible to know which of these effects will be greatest, or whether they will balance each other out.

The German government recently published a report into the wider impacts of renewable energy policies on the German economy, which shows that the new jobs created in the renewables sector outweighed the jobs lost elsewhere in the economy (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety 2006). In the US, research in California has estimated that almost 1.5 million jobs were created across the economy between 1972 and 2007 as a result of household energy efficiency measures (Roland-Holst 2008).

Net effects

Most studies into green jobs in the UK have tended to focus on gross rather than net job creation figures. A study commissioned by the European Commission investigated the net impacts of the 2020 renewable energy target on jobs across the 27 member states (Ragwitz *et al* 2009). It concluded that the net effect for jobs in the UK was likely to be negative or at best only very slightly positive. This is due to the fact that the UK does not have a manufacturing base for renewable energy technologies and hence is reliant on imports to provide the necessary infrastructure. The UK is also likely to experience higher than average increases to energy prices as a result of switching to renewables, which will impact on other parts of the economy.

However, the EC report only investigated the impact of renewable energy and neglected other low-carbon policy areas – notably energy efficiency – that are likely to work in the opposite direction. Further research is needed to gain a better picture of the net impact of the low-carbon transition as well as more detail about who the winners and losers are likely

to be. This should also include the international context since decarbonisation efforts in other countries will create potential export opportunities as well as competition in some sectors.

Ensuring a just transition

Meeting our carbon reduction commitments will require a radical shift in the nature of the UK economy. It is essential that this happens so that the UK can play its fair part in preventing dangerous levels of climate change. But at the same time, it is important that the necessary restructuring happens in a way that is fair.

The concept of a 'just transition' was first developed in the 1980s by the trades union movement in the US in response to the introduction of regulation to prevent air and water pollution, which resulted in the closure of industries that contributed to the pollution. The TUC has campaigned for the same principles to be applied to industries in the UK that will be affected by low-carbon restructuring (TUC 2008).

A just transition would aim firstly to take appropriate measures to protect jobs in vulnerable industries. This will be important where there is a risk that job losses would simply mean the transfer of carbon-intensive activities to other countries or where organisations are failing to take sufficient steps to prepare for the low-carbon transition. Where job losses are unavoidable, it would provide adequate support for those people and sectors that stand to lose out as a result of decarbonising the economy. It would also ensure that new jobs created in low-carbon growth areas are 'decent' jobs (which pay a decent wage, provide decent working conditions, are accessible to the right people and offer decent career progression opportunities). This is addressed in more detail in the next chapter.

We have already described how some sectors are set to grow as a result of the low-carbon transition, while others may be threatened by the change, and discussed the importance of considering net rather than gross effects when discussing job number forecasts. However, this view is too simplistic when it comes to considering the fairness (or unfairness) of the transition. The TUC has highlighted the importance of considering the job churn that will result from decarbonisation. Even if shifting to a low-carbon economy results in net job growth, some people will still be disadvantaged. This could be because job loss and job creation occur in different geographical locations, because there is a time lag between job loss and job creation or because new and old jobs require different skills sets (TUC 2008).

The TUC sets out the three principles of a just transition as being:

1. Meaningful environmental transition and sustainable development
2. Representation and employee involvement
3. Stable employment and long-term planning. (TUC 2008)

Mainstreaming low-carbon thinking

It is also important that low-carbon thinking is mainstreamed through all areas of the Government's work and is not viewed as separate to other economic development programmes or employment policies. In future, all economic development should be 'climate proofed' and by the same token, all climate policies need to be tailored to maximise economic and employment opportunities.

The Government's record on this to date is patchy. There are obvious examples of where opportunities to link up the two agendas have been missed (for example, the car scrappage scheme could have included incentives to purchase greener vehicles and the Carbon Emissions Reductions Target (CERT) could have been structured to require professional

installation of loft insulation, as opposed to subsidising do-it-yourself insulation). The economic stimulus package announced in the 2008 Pre-Budget Report was ranked as one of the least 'green' among G20 countries (Robins *et al* 2009).

However, there are some examples of where the two agendas have been linked up more successfully – for example, the Future Jobs Fund contains some funding for 'green' jobs. The Government needs to connect employment and environmental objectives in a more consistent manner if the opportunities are to be maximised. This means that all government departments should have a stake in the strategy for a low-carbon transition. In particular, the Departments of Energy and Climate Change (DECC), Work and Pensions (DWP), Transport (DfT), Business, Innovation and Skills (BIS), the Treasury and Communities and Local Government (CLG) will have important roles to play.

Policy implications and recommendations

Although the UK has lagged behind other countries in joining up environmental and employment agendas, the prospect of gaining new 'green' jobs has put the issue high on the political agenda in recent months. However, the Low Carbon Industrial Strategy – published in July 2009 – focuses only on areas of potential opportunity for the UK and fails to identify areas of the economy that could be at risk as a result of decarbonisation. Carbon-intensive industries, such as cement, lime, steel and aluminium, are known to be at risk but other areas may be vulnerable too. The introduction of new climate policies, such as the CRC and expansion of the EU ETS will affect a wider range of industries than have so far been targeted by climate policy.

In the Low Carbon Industrial Strategy, the Government has stated a commitment to ensuring a just transition and has pledged to set up a 'Forum for a Just Transition' to consider how this will be achieved (HM Government 2009a). Beyond this commitment, however, little work has been done to build a strategy for ensuring those people who work in vulnerable sectors will be supported through the transition.

Recommendations

1. Identify threats as well as opportunities

The Department for Business, Innovation and Skills (BIS) should conduct a comprehensive study of the likely economic impact of decarbonising the UK to identify the likely potential threats as well as the opportunities to ensure that plans can be developed to support those who are vulnerable to losing their jobs. This study should also include a geographical breakdown and consideration of the skills sets required for new and old jobs. The Low Carbon Industrial Strategy should then be expanded to consider how existing industries will be supported as well as how new growth areas will be promoted.

2. Develop a strategy for supporting workers at risk

Once the sectors that are at risk as a result of the low-carbon transition have been identified, BIS should then work in collaboration with Regional Development Agencies, economic development agencies in Scotland, Wales and Northern Ireland, employees and the representative trades unions, Sector Skills Councils and the industries in question to develop a strategy for either adapting the industry and reducing the risk of job losses, or managing their decline over the long term.

The strategy should include a list of alternative career options for those working in declining industries and the support that will be necessary to access new job opportunities (including training needs and relocation needs). It will also need to identify potential funding sources to cover training and relocation costs. The original 'just transition' campaign in the US called for the establishment of a dedicated fund that would be paid for by levying a charge on the

production of the pollutants that were targeted for elimination. The TUC has suggested that the EU ETS auction revenue could be used to build up an equivalent low-carbon transition fund (TUC 2008). It is unlikely that the Treasury would agree to hypothecate funds directly but it may be possible to match spending on a low-carbon transition fund with additional income from 'green' levies and taxes.

3. Ensure sufficient time

The strategy needs to build in sufficient time to put appropriate support measures in place ahead of any job losses.

3. New low-carbon employment: maximising the social benefit

In the context of high and rising unemployment, the scale of job creation will clearly be an important concern in the debate around 'green' jobs. However, if we are serious about creating a more sustainable and equitable society as we make the transition to a low-carbon economy, we must also consider the extent to which that transition has the potential to exacerbate or ameliorate existing employment inequalities.

In this chapter we investigate the nature of some of the jobs that are likely to be created as the UK makes the transition to a low-carbon economy, and look at who might be doing them. We start by setting out some of the existing inequalities in access to work, which we will use as a basis to understand the potential impact of the move to a low-carbon economy.

Current patterns of labour market inequality

The recession has amplified the risk of unemployment for everyone, with an extra 750,000 people finding themselves unemployed in the three months to July 2009 compared with the same period in 2008 (ONS 2009). However, the risk of unemployment has not been evenly spread: young people and those with the lowest qualifications have been particularly vulnerable.

Even before the dramatic rise in unemployment began, some groups faced a disproportionate risk of unemployment or economic inactivity². Employment levels among the lowest qualified³ have been falling since at least the early 1990s, and only half of this group is currently in work (DWP 2007, DWP *et al* 2009).

Although less affected by the recession, employment rates among disabled people remain stubbornly low at less than 50 per cent. People from some ethnic minority backgrounds, particularly Pakistani and Bangladeshi, are much less likely to be in employment than the general population. These patterns fed into relatively high rates of inactivity before the recession began, despite low unemployment, with over 5 million people claiming out-of-work benefits throughout the 2000s (DWP 2009). There was also a sizeable number of long-term unemployed before the current rise in unemployment: in the first quarter of 2008, 400,000 people had been unemployed for more than 12 months (on the International Labour Organisation's definition rather than the Jobseeker's Allowance claimant count).

Significant spatial differences are also evident in the risk of unemployment and inactivity. As a general rule, since early 2008, unemployment has shown a greater increase in those areas where it was already the highest, particularly Northern Ireland, the West Midlands and Yorkshire and the Humber. These areas have tended to have an above-average reliance on manufacturing, which has seen the greatest contraction, alongside construction. In the three months to July 2009, unemployment stood at 10.5 per cent in the West Midlands and 9.4 per cent in the North East, compared with a UK average of 7.9 per cent (ONS 2009).

Once in work, many people experience low pay and few opportunities to progress. Previous work by ippr has highlighted the extent of low pay in the UK labour market: around a fifth of workers are low paid⁴, which disproportionately includes women, part-time workers and

2. Economic inactivity is when individuals are out of work and not actively seeking employment. This could include people who are retired, as well as people who are not working because they have a disability or because they are caring for someone.

3. People who have no formal qualifications or whose highest qualification is at Level 1, equivalent to a GCSE below grade C, are included in this group.

4. We define low pay as 60 per cent of median full-time earnings. See Cooke and Lawton (2008) for a fuller explanation.

people working in low-level service occupations (Cooke and Lawton 2008). Many workers become trapped in low-paying jobs because of a lack of training and career progression opportunities.

These patterns suggest that many people failed to benefit from the period of economic growth that preceded the recession. Clearly, employment growth in low-carbon sectors cannot single-handedly tackle long-standing inequalities in employment and pay. Wider reforms will be needed to provide opportunities for the long-term unemployed and inactive and to reduce the extent of low pay. However, if we are to prioritise low-carbon industries as important growth sectors, and use public money to push them forward, then it is right that they play a role in helping to reduce existing inequalities wherever possible.

We need to pay attention to two important issues in order to ensure a more equitable distribution of the benefits of employment growth in low-carbon sectors: job quality and accessibility. In identifying opportunities for job creation, emphasis should be placed on creating good quality jobs which pay a decent wage, rather than creating jobs that simply add to the already high levels of low pay in the UK. And we should aim to create employment and skills opportunities for those who need them most, including people who have been out of work for a number of years, those who lack higher level skills and people living in deprived areas. This is particularly important if the first condition is satisfied – if new jobs are of a decent quality, then they should not be restricted only to people who tend to do well in the labour market already.

The nature of new low-carbon jobs

In this section, we consider the extent to which the jobs created by the move to a low-carbon economy will satisfy the two conditions outlined above. We do this using a combination of original analysis of Labour Force Survey data and our own survey of low-carbon employers. This enables us to build up a picture of what some of the new jobs might look like.

We are particularly interested in three aspects of employment:

- Pay, particularly the extent of low pay. This is an important indicator in its own right, but is also a useful proxy for wider job quality.⁵
- Opportunities for female employment, particularly those that could help reduce the gender pay gap.
- Employment opportunities for people at different skill and occupation levels, particularly those with lower level skills.

Our data sources for this section of the report are, firstly, analysis of employment in the occupations that share key characteristics with those occupations that are likely to be created or expand as a result of the low-carbon transition. We do this by identifying occupations that are likely to grow and linking them to similar existing occupations, using data from the Labour Force Survey (LFS). This is not an exact process, but it gives an indication of what future jobs in low-carbon industries might look like. We found that growth can be expected in five broad industry sectors:

5. Aspects of job quality beyond pay can include: the level of autonomy and task discretion; job security; the relationship between effort and reward; workplace environment and workload; and workplace relations. There is some evidence that these factors can improve people's productivity in the workplace as well their general well-being (Coats 2009). Pay is an imperfect measure of wider job quality but it can provide a useful proxy measure, given the available data.

1. Utilities
2. Construction
3. Manufacturing
4. Retail and wholesale
5. Business services.

Secondly, we carried out an original survey of employers currently operating in low-carbon sectors in the UK. The data from this survey complements the LFS data and helps to identify any areas in which low-carbon employers diverge from similar companies outside the low-carbon sector. We surveyed a total of 39 employers using an online survey carried out in May and June 2009. More detail on our research methods is available in the Appendix.

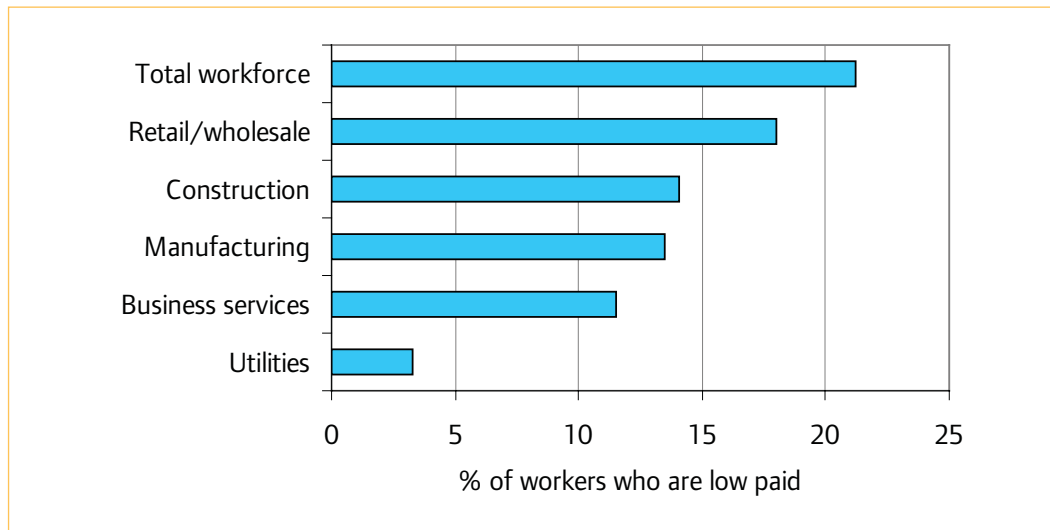
We now discuss our findings under three headings: pay and job quality; gender; and occupational and qualifications structure.

Pay and job quality

Here, we use pay both as an important indicator of job quality itself, but also as a proxy measure for broader job quality. Figure 3.1 shows the extent of low pay in the five broad sectors outlined above compared with the UK average for the overall workforce. In each of the sectors, the proportion of workers who are low paid is below the UK average of just under 22 per cent, and four sectors – business services, utilities, construction and manufacturing – have a rate of low pay which is below 15 per cent. In our survey of 39 low-carbon employers, only three reported paying staff less than £15,000 a year on average.

Figure 3.1: The extent of low pay in the five broad industry sectors, 2008

Source: Authors' calculations using LFS 2008



This suggests that there are good prospects for the creation of high-quality jobs in the sectors that are likely to grow as a result of the low-carbon transition. Apart from retail, the sectors where jobs are likely to be created are not those that we tend to associate with low pay, such as hotels and restaurants and personal services in the private sector. However, other drivers are likely to create employment growth in some of the traditional low-paying sectors, most notably in social care.

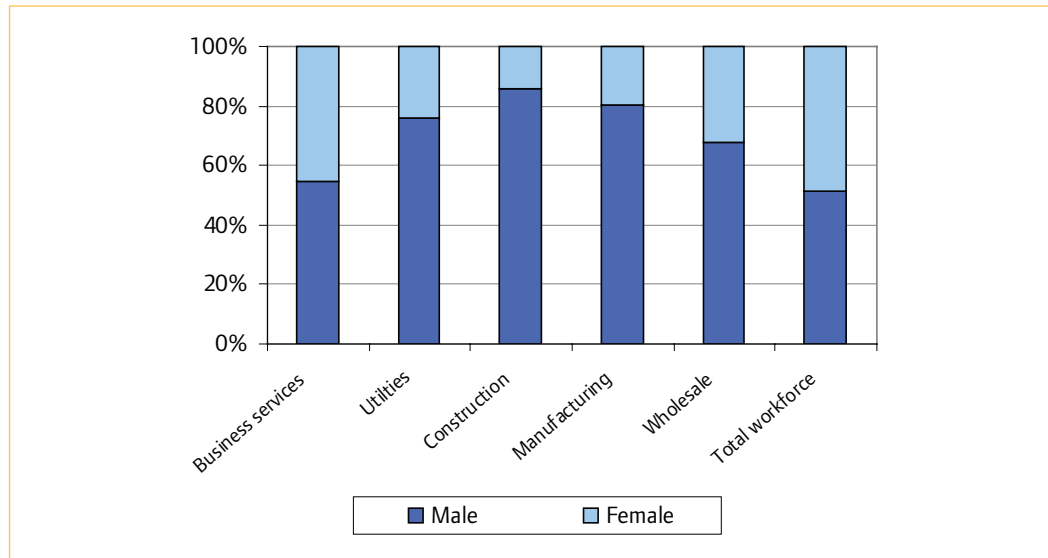
Gender

The fact that many of the low-paying sectors do not feature in our analysis of job growth driven by the low-carbon transition is a positive sign, but because of the gendered nature of employment, it does mean that women are also less likely to be found in some of the low-carbon growth sectors.

Figure 3.2 shows that the exception to this is the business services sector, where 45 per cent of the workforce is female, and where the rate of low pay is only half the national average. The business services sector is the only one of our five low-carbon sectors where the proportion of women in the workforce is comparable with the UK workforce as a whole. Both construction and manufacturing have a small proportion of women in their workforce, at 14 and 20 per cent respectively. Utilities and retail/wholesale do a little better but are still some way off the national average. The small presence of women in many of the sectors linked to the low-carbon economy reflects the absence of the key sectors for female employment in our analysis, most notably the public sector and private sector personal services.

Figure 3.2:
Gender make-up
of workforce by
sector

Source: Authors' calculations using LFS 2008/09



Our survey of employers in the low-carbon sector supports our analysis of LFS data to some extent. Our survey included eight manufacturing firms, only one of which reported that more than 10 per cent of its workforce was female. In the two construction firms we surveyed, just under a third of workers were female. However, in the 18 business services organisations, on average a third of the workforce was female, which is well below the LFS data. Very few firms reported a fifty-fifty split between men and women and across all the organisations in the survey, only a quarter of employees were female.

The presence of females in a workforce is linked to the extent of part-time working. According to the LFS a quarter of all jobs are part-time, but only 7 per cent of both construction jobs and the manufacturing jobs we are investigating are done by part-time workers. In contrast, 17 per cent of workers in the relevant business services industries are part-time, although this is still some way off the UK average.

The lack of part-time and flexible employment opportunities is likely to mean that many women are excluded from employment in some of the key low-carbon growth sectors. However, it is worth noting that 29 of the 40 employers we surveyed offered part-time working hours to at least some of their staff, while 18 also offered at least one flexible working option, including condensed hours, job sharing and annualised hours. This is positive, but there may be a mismatch between what employers claim to offer and what employees feel able to take up. It is also not clear whether employees at all levels, particularly those at more senior levels, were offered flexible working arrangements by the employers covered by our survey.

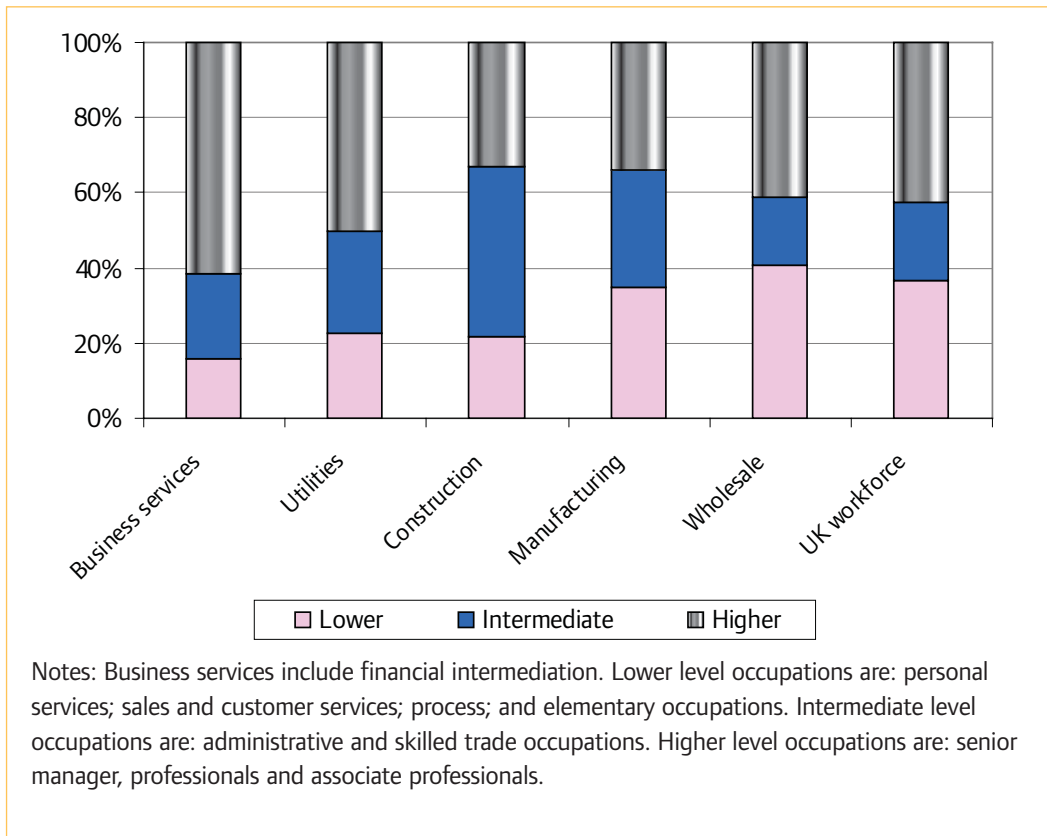
Qualifications and occupation level

Figure 3.3 shows the variety of occupational structures within the five broad sectors linked to the low-carbon economy. There are broadly four different structures:

- *Top-heavy: Business services and utilities* – Majority of jobs are in higher level occupations
- *Middle-heavy: Construction* – Employment in this sector is dominated by intermediate level jobs, the vast majority of which are skilled trades occupations
- *Evenly spread: Manufacturing* – Jobs are spread roughly equally across occupational groups
- *Polarised: Retail/wholesale* – With a large proportion of jobs at the top and bottom, and few in the middle, this is the one sector that reflects the overall occupational structure of employment in the UK.

Figure 3.3:
Proportion of workers in higher, intermediate and lower occupations, by sector

Source: LFS 2008/09



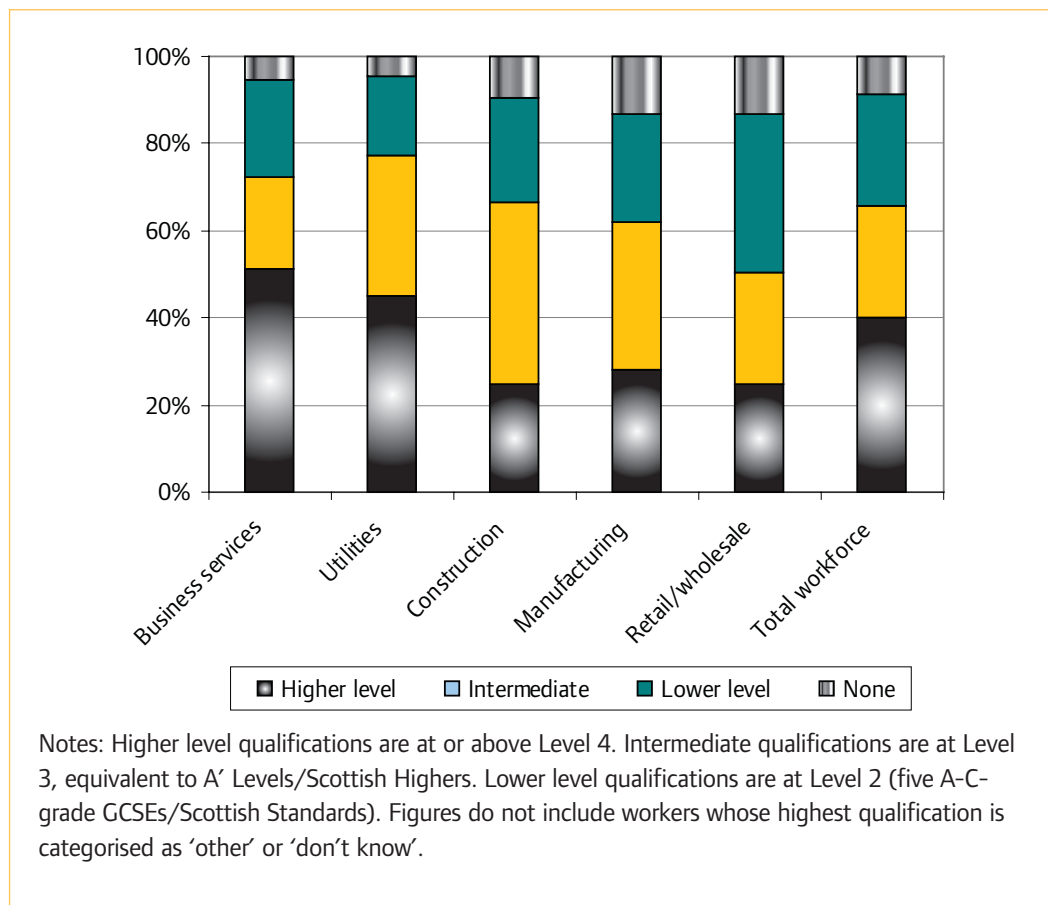
Occupational structures in the organisations that we surveyed varied considerably within sectors. In the manufacturing firms, the occupational structure was relatively balanced, although with fewer jobs at the intermediate level. Roles in the 18 business services firms we surveyed were very heavily skewed towards the higher end, and many had no employees in lower level occupations. However, three of the firms employed relatively significant numbers of staff at lower and intermediate levels. Across all the firms in the survey, only three employed unskilled workers on any real scale; and only six employed workers at lower occupational levels in any great number.

Figure 3.4 shows the proportion of workers with a highest qualification at three levels, and with no qualifications. The structure of qualifications in the different sectors broadly reflects the occupational structures discussed above:

- The majority of employees in business services and utilities have higher level qualifications
- There are fewer workers with high-level qualifications in construction, manufacturing and wholesale/retail, well below the national average
- Manufacturing and wholesale/retail also have more workers with lower level qualifications than the labour market as a whole, although only wholesale/retail has significantly more
- There is a larger than average proportion of people with intermediate qualifications in construction, utilities and manufacturing.

Figure 3.4:
Proportion of workers by level of highest qualification, by sector

Source: Authors' calculations using LFS 2008/09



Looking at occupational structures and qualifications demanded by employers is important because we need to understand the opportunities available for people with lower levels of skills, or who would struggle to find employment at higher occupational levels for other reasons. This could include people returning to work after a long period of unemployment or ill health. Our analysis indicates that construction and manufacturing in particular offer good quality job prospects at lower and intermediate occupational levels. However, many of these jobs will not be accessible to low-skilled women. Business services, by contrast, seem to offer good prospects for female employment but fewer entry-level jobs.

People who start out in entry-level jobs also need opportunities to progress. Previous work by ippr has highlighted the lack of progression opportunities for people at the bottom of the labour market, which means that people get stuck in low-paying jobs rather than using entry-level employment as a stepping stone to better quality work (Lawton 2009). One positive note is that the vast majority of employers in our survey reported that they had

training and development programmes in place for staff at lower or intermediate levels. Of the 28 organisations which employed staff at these levels, 25 offered some form of career advancement opportunity, including training, mentoring and work shadowing. Training which led to a formal qualification and in-house training were the most popular options.

Table 3.1 summarises the key features of employment in our five low-carbon sectors.

| Sector | Pay | Occupational and qualifications structure | Gender balance |
|------------------------------------|---|--|--|
| Business and financial services | Rate of low pay half national average | Top-heavy, dominated by higher level jobs | Very even, almost 50% female |
| Utilities (electricity production) | Very little low pay, less than 5 per cent | Top-heavy, dominated by higher level jobs | Relatively poor, quarter of workers female |
| Construction | Rate of low pay well below national average | Lots of intermediate level jobs | Very poor, less than 15% female |
| Manufacturing | Rate of low pay well below national average | Evenly balanced across different levels | Poor, only a fifth female |
| Wholesale and retail | Rate of low pay just below the national average | Polarised, very similar to rest of labour market | About a third female |

Policy implications and recommendations

There are two key implications of the analysis presented in this chapter that suggests a role for policy, described below.

Opportunities for the creation of high-quality jobs

Our analysis of pay levels and occupational structures in the key low-carbon industries suggests that the growth of the low-carbon sector is likely to create new jobs that offer decent wages and a degree of job quality.

Only wholesale and retail, which will account for a relatively small number of new jobs, has a greater proportion of jobs in lower occupational groups than the overall UK labour market does. This is also the only sector that currently reflects the relatively polarised nature of the UK labour market. The majority of new jobs will come from manufacturing, business services and construction, which are all sectors that currently offer well-paid jobs and a more balanced occupational structure.

These are precisely the kind of jobs that the UK should be prioritising as it looks towards its post-recession future. Our findings suggest that employment growth in these industries should be a key priority of government and there is a clear argument for public support, where it is needed, to maximise the social and economic benefits of an expansion of low-carbon employment.

Exclusion from opportunities because of gender, skill level or prior experience

Despite the prospects for positive employment growth, our findings also suggest that many people will face serious challenges in accessing some of these new employment opportunities:

First is the case of women. The business services sector looks like a very promising growth sector for women's employment, with little low pay and a strong female presence. However, it may be that within the sector women are concentrated in particular occupations, some of which may be low-paying. If so, steps will need to be taken to ensure that new employment growth does not entrench this.

In contrast, the construction and manufacturing industries appear to offer quite poor prospects for women. Action is needed to ensure that growth in these sectors does not simply reinforce existing inequalities.

The existing gendered nature of employment is not something that can be addressed by low-carbon industries on their own. It is part of broader social patterns, and requires a radical transformation of perceptions about the roles of men and women. For example, the flipside of getting more women into construction and manufacturing is to increase men's employment in the caring professions, as well as their involvement in family life. However, as the 'employers of tomorrow', low-carbon employers should be at the forefront of efforts to increase women's employment in key sectors.

Recommendations

1. Include a gender perspective in the Low Carbon Industrial Strategy

The Low Carbon Industrial Strategy should explicitly address the need to bring more women into new industries, and set out ideas for achieving this.

2. Design recruitment and retention practices aimed at women

Employers in manufacturing and construction need to build on, and expand, existing programmes that promote female employment in their sectors. Recruitment and retention practices designed to increase women's employment in these sectors could include:

- Advertising jobs in places that attract women in particular
- Jobs advertised by hours required, rather than assuming that all jobs need full-time workers
- Jobs advertised as flexitime or job-share
- Flexible working opportunities at all levels
- Career breaks
- Peer support and mentoring.

Government support, in the form of training or other forms of financial support, could also be given preferentially to organisations that promote flexible working practices.

3. Develop more gender-neutral careers advice

In the longer term, girls and young women need more gender-neutral careers advice which encourages them to explore good quality employment opportunities in growing low-carbon industries. This is particularly true for young people from lower income families, where traditional gender roles are more strongly embedded.

Second is the case of workers with low or no qualifications and the long-term unemployed/inactive. Manufacturing and construction seem to offer good opportunities for entry and career progression. However, construction in particular may require specific, intermediate-level qualifications for entry, and in the next few years new jobs may be more likely to go to construction workers made redundant during the recession rather than the long-term unemployed.

In these sectors, we need to ensure that entry- and intermediate-level jobs are accessible to the people that need them, and that career ladders are in place that allow people to progress from there (see Box 3.1). Previous research by ippr has found that career ladders have become less clear and consistent since the 1970s, and low-paid workers often lack training and development opportunities (Lawton 2009).

In business services, it is more difficult to see how employment growth here will provide very many entry-level jobs. We need to explore ways of helping people to access some of the higher level jobs.

Box 3.1 Career ladders or pathways

Formal career ladders link jobs at each level within a given sector or sub-sector, from entry level to positions right at the top. The key features of career ladders include:

- Links between roles at each stage within a sector, from entry-level to positions right at the top.
- Broad job descriptions aligned with prevailing wages and with the skills and qualifications required.
- Rationalised job titles and roles, which can read across different employers within similar industries.
- Sufficient breadth in terms of the industries covered so that workers are not trapped in narrow career routes, but retaining coherence for industry sectors.
- Links between sectors and sub-sectors so that workers can move across into potentially more rewarding sectors if they choose. (Dresser and Rogers 1999, White and Walsh 2008)

For illustrative purposes, a basic career ladder in a given industry might look something like this:

| Position | Required qualification | Average wage |
|-------------------|--------------------------|-----------------|
| Entry-level | None | Minimum wage |
| Semi-skilled | None, work experience | £6.50 an hour |
| Technician | Level 2 or 3 | £14,000–£25,000 |
| Senior technician | Level 4 | £24,000–£28,000 |
| Section manager | HND or foundation degree | £27,000–£40,000 |
| Senior manager | Degree or equivalent | £40,000+ |

A more comprehensive career pathway might also include reference to the level of work experience or specific skills required at each level, and would probably contain more detailed levels.

In Los Angeles, a coalition of community-based organisations has campaigned to ensure new ‘green’ jobs are also available to people who need them most (Box 3.2). A similar approach could prove useful in the UK.

Box 3.2 City retrofit, Los Angeles, USA

The Mayor and City Council in Los Angeles have been responsible for driving forward a number of programmes to improve energy efficiency and use of renewable energy in the city. A grassroots coalition of community-based organisations, trades unions and environmental groups – called the LA Apollo Alliance – has campaigned successfully to ensure that these activities have also brought local economic benefits, especially to disadvantaged people living in the city.

The group campaigned for, and achieved, a programme to retrofit public buildings in the city that would also include measures to help disadvantaged groups access the new employment opportunities.

These included:

- Prioritising buildings in low-income communities for retrofits
- Recruiting disadvantaged workers from city training programmes
- Adopting a ‘Project Labor Agreement’ to ensure contractors also provided good quality jobs and recruited local and disadvantaged workers
- Supporting green businesses owned by local minorities and women.

Sources: White and Walsh 2008, Los Angeles Apollo Alliance nd, Los Angeles Apollo Alliance 2009, Sickler 2009

Recommendations

5. Develop sector-specific low-carbon career ladders

Sector Skills Councils operating in each of the five broad industry sectors identified here should work together and with careers advice specialists to develop sector-specific low-

carbon career ladders, which form part of broader sector career pathways. For example, Energy and Utility Skills might design a career ladder for the wind power sector, linked to a broader energy career ladder; Summit Skills and Construction Skills could work together to develop a career ladder for building retrofits, linked to a broader construction careers ladder.

6. Develop more sophisticated labour market information

To maximise their practical impact, mapped career pathways will need to be complemented by more sophisticated labour market information about the opportunities and requirements for working in different low-carbon industries. This will help workers to understand where they are located on the jobs ladder, what they need to do to move up and what support is available. Careers services in England and in the devolved governments should lead on developing accessible information services.

7. Link the Low Carbon Industrial Strategy to the Government's welfare reform agenda

Better labour market information would also help welfare-to-work advisers help people to find good quality work in low-carbon industries. Where new employment opportunities are being created, there needs to be an understanding among people involved in delivering welfare-to-work services of the opportunities in their local area and the likely needs of employers. More broadly, further steps need to be taken to link the Low Carbon Industrial Strategy to the Government's welfare reform agenda. The DWP could take a bigger role in working with BIS to understand the changing labour market and how it can be made to work for their clients. As a first step, DWP should be one of the lead government departments in developing the next phase of the Low Carbon Industrial Strategy to ensure there is a clearer focus on employment alongside industrial policy.

Other groups experiencing labour market disadvantage

Our analysis does not allow us to look at the employment prospects for some other key groups, such as people with a disability or serious health condition and some ethnic minorities, who might be affected by the expansion of employment in low-carbon industries.

The barriers to work such as discrimination, negative employer attitudes, inflexible work practices, and low educational attainment faced by these groups are not necessarily related to specific sectors. However, given the very low employment rates experienced by some of these groups, there may be an argument for targeting new jobs at some individuals within them, which is likely to require the involvement of the welfare and skills system.

4. Maximising the opportunity: encouraging low-carbon industries

The previous two chapters have set out the potential impacts of the low-carbon transition on the quantity and quality of jobs in the UK. There is clearly scope for the creation of new, good-quality jobs in low-carbon sectors. However, these outcomes cannot be guaranteed and in many cases projections of future job numbers are dependent on the types of policies and level of intervention government is prepared to make. Similarly, it is not certain that UK citizens will automatically benefit from new job opportunities resulting from efforts to decarbonise the UK economy. If people do not possess the right skills and experience, then companies will look overseas to build up their workforce.

In order to maximise the opportunities presented by the low-carbon transition, the Government needs a strategy that will achieve two aims:

- **Encourage low-carbon industries** through stimulating the development and uptake of low-carbon infrastructure, goods and services and promoting low-carbon operations.
- **Ensure the UK workforce is able to take advantage** of new job opportunities by creating the right training opportunities and making sure jobs are accessible to all, not just certain groups of society.

This chapter looks at what government's role should be in achieving the first of these aims, by examining the extent to which governments should intervene in markets and by considering the types of support mechanisms that are available to governments. We also consider what action is required at regional and local level and how small and medium-sized enterprises might be aided.

The following chapter then addresses the second aim.

Government intervention

How far should government be prepared to intervene to ensure that the opportunities of shifting to a low-carbon economy are maximised? Should the development and delivery of new low-carbon technologies be left to the market? Or is there a role for government to play too?

Until very recently, the Government's approach has been to specify the direction of travel for the economy as a whole (by setting carbon reduction targets) and to step in to overcome specific market failures (see Box 4.1). The Government has been very reluctant to go much further than this, aiming to ensure that policies are 'technology neutral' and in particular, to avoid being seen to 'pick winners'.

Opinion on the appropriate role for Government is, however, now shifting, with an increasing number of commentators and stakeholders calling for a more strategic and interventionist approach. These include the TUC (2005), Confederation of British Industry (CBI) (2009a), Carbon Trust (2009) and the Government's own Commission on Environmental Markets and Economic Performance (CEMEP) (Defra 2007). The reasoning behind this is that since resources are finite, they should be targeted where they will make the most difference. This means identifying areas of strategic opportunity for the UK, for example, where the UK has a strong skills base or supply chain that can be built on, a generous endowment of natural resources that can be drawn on, or academic strengths (see, for example, Carbon Trust 2009, CBI 2009a, Defra 2007, HM Government 2009b, TUC 2005, Watson 2008).

This is not the same as 'picking winners', which entails supporting specific companies or technologies, but it does require identifying strategic groups of industries that show

Box 4.1: Climate change market failures and examples of UK policy responses

Social cost of carbon

The *Stern Review on the Economics of Climate Change* described climate change as 'the greatest and widest-ranging market failure ever seen' because the costs of emitting carbon dioxide are borne by society, not by the institutions or individuals who do the emitting (Stern 2006).

Policy responses include:

- The EU Emissions Trading Scheme, which puts a price on carbon by capping the total emissions that are allowed from heavy industry.
- The Carbon Reduction Commitment (CRC), due to begin in 2010, which will extend carbon trading to more sectors.

Innovation failures

These occur because investing in innovation is risky and companies are not able to reap the full benefits of their investment since these include spill-over to other companies and wider benefits for society.

Policy responses include:

- R&D funding and tax credits
- The Renewables Obligation (RO) – effectively a subsidy for electricity generated from renewable sources
- The Renewable Heat Incentive – a subsidy for heat generated from renewable sources, due to start in 2011.

Information failures

Information failures occur because it can be difficult

and costly for companies to keep on top of all the information about what is happening in a particular sector.

Policy responses include:

- Knowledge exchange programmes for businesses run by the Technology Strategy Board and the Carbon Trust.

Coordination failures

These are a 'chicken and egg' type of problem where investments by upstream and downstream companies need to occur simultaneously for either to be profitable. Another type of coordination failure occurs when collaboration between companies and universities is necessary for innovation but smaller firms are not able to achieve this.

Policy responses include:

- Packages of measures, for example support for electric car charging infrastructure and incentives for consumers to purchase electric cars.

Technology lock-in

This occurs when new technologies are incompatible with existing infrastructure, making it difficult for them to break into the market.

Policy responses include:

- Provision of new infrastructure, such as funding allocated for charging points for electric cars and district heating systems.

Sources: Navarro 2003, Rodrik 2004, Watson 2008, Meadway and Mateos-Garcia 2009, Stern 2006, HM Government 2009b

potential – what the CBI calls 'technology families' (CBI 2009a). An example is offshore wind – there are lots of companies working in this area and many different types of wind turbine design in operation. If government decides this is an area worth supporting, then support measures should apply equally to all players in the field and not just to one company or one type of turbine design.

Other countries have been more willing to embrace a more interventionist approach in order to capture economic advantages in developing low-carbon markets. For example, the German government has explained the need for 'ecological industrial policy' (see Box 4.2) (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety 2008). Other countries, including Denmark, Spain and China, have also been proactive in nurturing low-carbon industries. While many of these countries have been able to gain 'first mover advantage' in a number of different low-carbon technology families (such as wind power and solar power), the UK has lagged behind.

Box 4.2: Ecological industrial policy in Germany

The German government has acknowledged the need to develop strategic industrial policy that will further both Germany's economic interests and environmental goals. A paper published by the Federal Ministry for the Environment outlines four aims for ecological industrial policy:

- To strengthen strategic industries of the future and make industry fit for the markets of the future
- To promote innovation, initiate advances in technology and help ensure that these technologies are used and reach the market more quickly
- To adapt the industrial structure of the economy to ever-scarcer resources
- To help switch the material base of industry in important fields to renewable resources.

The paper also sets out clearly that there is a role for the state to play that goes beyond designing regulatory frameworks, setting emission reduction targets and providing incentives for innovation. It states:

It is vital that Germany focuses its research on lead markets and concentrates on core strategic areas. The state must use intelligent market-launch programmes to take new technologies out of the laboratory and into the market and to kick-start their use and dissemination. And a proactive policy also means that the 'pioneer markets' we need to ensure we have an optimum position on tomorrow's global markets have to be created today in Germany. (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety 2008: 21-22).

The UK Government has recently adopted a more proactive approach – dubbed 'industrial activism' by Peter Mandelson (Mandelson 2008) – and published its Low Carbon Industrial Strategy in July 2009 (HM Government 2009a). The Strategy highlights a number of areas where the UK is felt to have a strategic advantage, including wind, marine renewables, nuclear and ultra-low-carbon vehicles, and sets out how the Government will support the growth of these industries.

This change in direction should be welcomed. The UK cannot be a leader in every new low-carbon technology, so it is clear that prioritisation of areas of strategic importance will be necessary. But setting priorities in turn requires a clear set of criteria on which to judge different sectors. The Carbon Trust has argued that a more transparent prioritisation process is necessary to ensure that all low-carbon technologies are assessed in a consistent way (Carbon Trust 2009). The literature suggests a number of criteria that should be used to prioritise areas for support:

1. Support measures should only be for new technologies – If one of the aims of industrial policy is to stimulate innovation, then measures should only be for areas where there is genuine scope to innovate and grow new economic activity. This would include brand new industries like wave energy, or innovations in existing industries like electric cars or low-carbon steel-making processes. Low-carbon industrial policy should not be used to support mature or failing industries. The corollary of this is that policies should contain a sunset clause, where support is phased out over time, or when industries reach an agreed benchmark (Carbon Trust 2009, TUC 2005, Watson 2008).

2. Scope for emissions reductions – If industrial policy is being developed to tackle the twin aims of economic recovery and transformation into a low-carbon economy, then the extent to which an industry contributes to environmental protection should be an important consideration. Those industries and technologies that will be necessary for achieving carbon reduction targets both domestically and abroad should be given priority (Carbon Trust 2009, Defra 2007, Bowen *et al* 2009).

3. Scope for economic advantage – Related to the point above, priorities should also be able to contribute an economic benefit. This should take any natural advantages into

account (such as geographical advantages, pools of relevant technical and business skills, existing supply chains, areas of strong future demand and sectors with strong export potential) (Carbon Trust 2009, Defra 2007, TUC 2005).

To these three criteria, we would add a fourth:

4. *Scope for good quality job creation* – Priority should be given to sectors that will be able to contribute to social as well as economic goals. Areas where accessible, good quality job opportunities are likely to be created should be actively supported.

In addition to these four criteria, thought should be given to the portfolio as a whole, to ensure it retains a good level of variety. This is important because, as has been frequently stated, governments cannot be expected to be able to know which technologies will ultimately be winners and which will be losers and so, inevitably, governments will sometimes back losers. What is important, however, is that support is withdrawn as soon as it is clear that an industry or technology is failing. Rodrik suggests that making mistakes is actually part of good industrial policy since programmes that fail to support some losers are probably not aggressive or generous enough (Rodrik 2004).

Of course, withdrawing support from unsuccessful industries might be easier said than done, since it is likely that the companies in question will lobby hard for continued support. This is why the conditions for support need to be set out clearly beforehand and a clear and transparent benchmarking system should be established to aid decisions on when to withdraw support (either because industries are mature enough to stand on their own two feet or because they have 'failed').

A final consideration should be to bear in mind the international dimension – to consider where opportunities for exports might be greatest and where collaboration may be necessary.

A study by the Grantham Research Institute on Climate Change and the Environment (Bowen *et al* 2009) ranks different 'green' sectors according to six criteria:

- How soon the measures can be implemented
- Long-term social return
- Positive lock-in effects
- Domestic job creation
- Targeting areas with slack
- The extent to which spending is likely to be shifted forward in time, reducing necessary spending later on.

On this basis, the areas that score the highest are residential energy efficiency, energy efficiency in public buildings, boiler replacement programme, and lights and appliances. The sectors with the lowest scores are smart production (the use of ICT to make production processes more efficient), CCS, micro-generation, encouraging energy R&D and connected urban transportation (traffic management systems and so on) (Bowen *et al* 2009).

The Low Carbon Industrial Strategy (HM Government 2009a) does prioritise some areas in that not every sector of the economy is covered by the strategy (Box 4.3 summarises the sectors in the Strategy). The criteria for selecting these sectors, however, are not clear. The Strategy highlights the existence of a number of assessments that have 'taken into account areas of existing comparative advantage, technological strengths and natural resources' and that Government then uses these analyses 'to identify the areas of greatest economic opportunity for Britain in the transition to a low-carbon economy' (HM Government 2009a:19). Not all of these sectors would meet our four criteria. For example, nuclear is not

a new technology and it is not clear that the chemicals sector will bring major carbon savings.

One outcome of focusing primarily on economic opportunities is that the Strategy neglects areas that offer potential for growth in good quality jobs but that are unlikely to provide many export opportunities. A prime example is the energy efficiency sector, where there is strong potential for job growth as well as providing good quality job opportunities for those who are currently out of work. Energy efficiency is not identified as a priority area in the Low Carbon Industrial Strategy and although the Government has announced packages of measures to stimulate improvements in energy efficiency elsewhere (see for example the measures detailed in the 2009 Budget in Appendix 1), this in itself will not be sufficient to guarantee jobs since other aspects, such as training provision, should be given consideration.

The Government should also consider developing support schemes for innovations in industrial processes as well as products. For example, carbon-intensive industries developing innovative new production processes that result in fewer greenhouse gas emissions should be legitimate candidates for consideration (assuming the four criteria above are met).

Types of support

This section sets out the different types of policy mechanisms that are available to stimulate new industries.

Developing new low-carbon goods and services

Government support will be needed to help develop new low-carbon technologies and to bring them market. Traditionally, governments have tended to focus on the early stages of the innovation process, particularly on providing funding for R&D.

However, it has been argued that it is more important to have support in the later stages of the innovation process (demonstration and pre-commercial deployment). Deployment and scaling up of new technologies is expensive and risky because the costs will only be recouped if the technology eventually becomes commercial. As a result, this stage of the innovation process is often referred to as the 'valley of death' and without appropriate assistance, technologies are liable to fail at this phase of the innovation process.

The Commission on Environmental Markets and Economic Performance highlighted the need for increased levels of demand-side support in order to lower these risks (Defra 2007). There is now a growing consensus that support is needed right across the innovation process, providing both a 'push' by assisting supply-side activities like basic and applied R&D as well as working to stimulate demand for new technologies to 'pull' them through the later demonstration and pre-commercial deployment stages of the innovation process (CBI 2009a, Carbon Trust 2009).

Box 4.3 Sectors included in the Low Carbon Industrial Strategy:

- Offshore wind
- Wave and tidal
- Civil nuclear
- Carbon capture and storage
- Ultra-low-carbon vehicles
- Low-carbon buildings and construction
- Low-carbon aerospace
- Chemicals and industrial biotechnology
- Business and financial services
- Carbon markets

Source: HM Government 2009a

A third aspect of support is the need for governments to remove other (non-financial) barriers to the development of new technologies, for example providing the necessary infrastructure or reforming the planning system.

Finally, it is vital to provide a robust and consistent overarching framework within which innovation activity can occur. This means setting challenging yet achievable targets for carbon emission reductions across the economy and ensuring that policy measures to achieve long-term targets are implemented in a consistent and predictable manner.

Box 4.4 provides examples of the kinds of interventions that fall under each category.

Box 4.4. Types of support

Robust overarching policy framework

- Credible but challenging long-term targets for UK emission reductions and for technology deployment in different sectors
- Consistent implementation of policy measures with sufficient lead-in time to allow industry to adapt.

Supply 'push'

- Financial support for R&D activities
- Credit assistance where industries experience difficulties accessing finance (for example, providing 'soft' loans or underwriting loans)
- Pilots and testing facilities for developing new technologies.

Demand 'pull'

- Public sector procurement, in particular, forward procurement commitments that guarantee a market for products that meet low-carbon standards
- Regulation – for example, setting minimum product standards or targets for the future, such as the 'top runner' scheme that has been effective in improving energy efficiency in Japan
- Measures to stimulate low-carbon consumption such as Low-carbon Building Programme (which

provides grants for homeowners towards the costs of renewable energy products like solar panels), the Certified Emission Reduction Target (which obliges energy companies to reduce emissions from their customers, for example by providing low-energy light bulbs and loft insulation) and financial incentives for low-carbon vehicles (such as exemption from the congestion charge in London or grants towards the cost of electric vehicles).

Barrier removal

- Planning reforms – for example the establishment of the Infrastructure Planning Committee and National Policy Statements that aim to speed up planning approval process for wind farms (among other things)
- Investment in essential infrastructure – for example, port facilities that are needed to build offshore wind farms, district heating systems that developers can connect individual properties to, charging infrastructure for electric vehicles
- Encouraging collaboration between academic research institutes and commercial organisations.

Sources: Defra 2007, European Commission 2006, BWEA nd, NAIGT 2009, Foresight 2008, CBI 2009a

Box 4.3 sets out some of the different approaches that could be taken to support innovation but it is important to remember that the challenges faced by industries developing new low-carbon goods and services will differ from sector to sector. This means that different measures will be appropriate for different technologies and it will be necessary to design a tailored package of support measures for each priority area. In-depth discussions with industry stakeholders and other key stakeholders will thus be required to determine where support is needed and what government action would be most appropriate (Carbon Trust 2009). Chapter 6 provides some examples of how a tailored package of measures might be constructed for several sectors in the UK.

Support for small businesses

It is easy to focus attention on big businesses when it comes to developing an industrial strategy but it is important to consider the role small businesses will play too. Small

businesses already employ half of the UK's workforce (Clifton *et al* 2009) and they will have an important role to play in the transition to a low-carbon economy, in particular the establishment of firms developing new low-carbon technologies. Existing small businesses will have a role to play too. For example, the majority of boiler fitters, whose skills will be necessary for installing more efficient heating systems in houses, tend to work for small companies or be self-employed.

There are a number of barriers faced by small businesses. For start-ups developing new technologies, access to finance can be particularly problematic and this situation has been made worse by the continuing impact of the credit crunch. The costs of developing new technologies can also be prohibitively high for small businesses. For example, one interviewee cited as an example a product testing programme run by the Energy Saving Trust, which cost £10,000 to take part in. Large, established companies were able to afford this, but smaller firms found the cost too high and were not able to have their products tested. Clifton *et al* (2009) recommend the establishment of a 'green ideas bank' that will provide finance for low-carbon innovation. The bank would be funded by private investors, but the loans would be underwritten by the Government. This helps reduce the risk to investors and improves access to finance for low-carbon companies.

Even where grant programmes do exist, our interviews highlighted the fact that accessing them can often be difficult for small businesses. In some cases this was because appropriate grants were not available or because the nature of low-carbon businesses can be quite different to existing business models.

Government support for the development of infrastructure – particularly that which can be shared by different small businesses in 'clusters' – can also help ease some of the financial barriers faced by SMEs. Funding for innovation centres, science parks and business premises, such as those planned in the first Low Carbon Economic Area in the South West, is a step in the right direction.

Access to training can pose problems for small businesses. Many of the people we interviewed for this project told us that courses and certifications (including the Microgeneration Certification System for solar heating, solar PV, micro wind, heat pump and biomass installers) were too expensive for small businesses and individuals to consider taking them up. There were also difficulties around the times of day that training courses were available. For many people working in small businesses, it is not possible to take time out of the working day to attend classes, so there is a need to provide them either in the evening or early in the morning.

Regional and local-level interventions

As well as national-level interventions, those at the local level will be crucial in promoting the growth of new green jobs. In recent decades, job creation and job losses have not occurred in the same regions of the UK, creating an economic imbalance between different parts of the country. It is important that the future low-carbon economy is regionally balanced, ensuring good quality employment opportunities across the country (Clifton *et al* 2009). Regional Development Agencies (RDAs) and economic development agencies in the devolved administrations, sub-regional partnerships and local authorities will all have a role to play in ensuring appropriate action is taken at the local level to facilitate a successful low-carbon transition.

The Innovas study commissioned by the Government showed that existing low-carbon jobs are not spread evenly across the country. Analysis on the likely spread of new jobs across the regions is not available (Innovas Solutions Ltd 2009).

Examples from Germany and the US show that local and regional level interventions can be very successful in stimulating growth in low-carbon industries (Boxes 4.5 and 4.6).

Box 4.5. Gelsenkirchen, Germany: City of a thousand suns

The city of Gelsenkirchen, in the west of Germany, was once a major industrial hub with thriving coal, steel and glass industries. However, the coal crisis of the 1950s and the withdrawal of heavy industry led to a decline in its economy and population (Energie-Cités 2002).

In the 1990s, local officials aimed to regenerate the land abandoned by industry, with a focus on building on existing current capabilities and areas of expertise. Taking advantage of Gelsenkirchen's legacy as an energy producer, a science park specialising in energy technology was set up on the site of an old steelworks.

This project was jointly funded by the European Union, North Rhine-Westfalia Federal State Government and the utility company RWE Energy. Solar technology became an area of focus for the science park. When it opened in 1996, the solar panels installed on the roof of the building made it the largest solar power plant in the world. A cluster of solar institutions grew around the science park, including a solar cell production plant owned by Shell and a R&D site established by the Fraunhofer Institute for Solar Energy Systems.

In 2001, a mission was created to develop a solar city by the Gelsenkirchen City Council and the Ministry of Urban Development, transforming it from the 'city of a thousand furnaces' to the 'city of a thousand suns'. The city took on a voluntary carbon emissions reduction target (3.3 tonnes of CO₂ per inhabitant per year, by 2050) and the council has worked to stimulate the transition through a number of mechanisms, including administering the local agenda network, solar urban planning, energy consultancy, installation of solar systems on communal buildings, solar round table and a website (PV Upscale 2007). The State Development Agency has included requirements for solar and energy efficiency measures in land purchase contracts as well as measures to ensure new buildings are designed to offer the maximum surface area for collecting solar power (ibid).

Gelsenkirchen's mission to become a city of a thousand suns is said to have had a number of benefits in terms of its economy and education. This has stemmed from the proactive policies of local government in installing buildings with solar technology, the arrival of new research institutes and production plants, and the introduction of education with a specific focus on solar.

Box 4.6 Milwaukee, United States: Me2 Energy Efficiency programme

The city of Milwaukee, in collaboration with the Center on Wisconsin Strategy (COWS), introduced a programme called 'Me2', which aimed to both improve energy efficiency measures in residential and commercial properties and to create good quality jobs.

The city provides loans for energy efficiency measures to householders, who then pay back the loan over a

number of years through monthly instalments on their energy bills.

It is estimated that an initial investment of \$428 million in residential and commercial energy efficiency measures will save \$121 million a year on energy bills and create 5,500 jobs.

Sources: Centre on Wisconsin Strategy *et al* 2008, Rodgers 2009

Regional and local-level actors must perform a number of vital roles that cannot be carried out by central government.

First, local knowledge is required to identify regional and local strengths and vulnerabilities. Once this has been determined it is then possible to design a strategy for capitalising on strengths and reducing risk in areas that are vulnerable. Manchester city region provides a good example of where this approach has been taken. Manchester Enterprises (responsible

for leading on economic development, employment and skills on behalf of the Manchester city region) commissioned a study into the potential impact of climate change legislation on the North West and Manchester (Deloitte 2008). The report provides an assessment of challenges and opportunities for the city region that are likely to come about as a result of climate change legislation.

Second, local-level intervention is necessary to help bring together key players such as industry, research institute and education facilities. This in turn can help to establish technology 'clusters', as the example from Gelsenkirchen demonstrates.

The Government has tried to stimulate this kind of approach through the introduction of Low Carbon Economic Areas (LCEAs) as part of the Low Carbon Industrial Strategy (HM Government 2009a). The first LCEA will be in South West England, with a focus on developing wave and tidal technology. Activities under the LCEA banner will include government funding to develop the Wave Hub demonstration facility⁶, funding from the South West Regional Development Agency and the European Regional Development Fund towards the Peninsula Research Institute for Marine Renewable Energy, grant support via Business Link, a network of innovations centres, science parks and business premises, improvements to strategic port facilities and the establishment of an industry forum, convened by the South West RDA (*ibid*).

Further LCEAs are expected to be announced before the end of 2009, with a particular focus on offshore wind, marine energy, nuclear energy, carbon capture and storage and ultra-low-carbon vehicles.

Finally, it is likely that area-based approaches will be necessary to bring forward the energy efficiency improvements and decentralised energy systems that will play an important role in reducing emissions (Foresight 2008). Local government is much better placed to incentivise and support the development of these technologies than central government because it requires a detailed knowledge of the local context and because local government holds many of the appropriate powers – such as granting planning permission.

Some well-known examples of where local government has helped to stimulate these types of emission reductions include Kirklees Council's work to promote energy efficiency, Woking Borough Council's Combined Heat and Power (CHP) plant and distributed heating and cooling network, and the so-called 'Merton Rule', a planning policy developed by Merton Council in London that stipulates the inclusion of on-site renewables for new developments.

Roles for regional and sub-regional bodies

The Low Carbon Industrial Strategy sets out the role for RDAs in delivering low-carbon growth, which includes identifying regional and local advantages for low-carbon industries, coordination of local level activity and better collaboration between the different RDAs and devolved administrations (HM Government 2009a). It is right that the Government is considering the need for action at a regional and sub-regional level, but like national level interventions, all activities by RDAs, city regions and local authorities need to be 'greened' rather than low-carbon development being viewed as a separate area. Although RDAs already have a statutory purpose to contribute to sustainable development in the UK, this does not prevent RDAs from supporting high-carbon developments (regional airports being a prime example). RDAs need a clearer remit to deliver only low-carbon development to avoid building up jobs and industries that are not sustainable in the long-run.

6. The wave hub project aims to create an offshore electrical 'socket' off the coast of North Cornwall, connected to the National Grid by a buried underwater cable, to which a series of wave energy devices could be connected (www.southwestrda.org.uk/news/release.asp?releaseid=1203)

RDAs should also ensure that the Integrated Regional Strategies – likely to be drawn up by RDAs in the coming months – are consistent with the Low Carbon Transition Plan, making sure that plans to create jobs will be sustainable in the long-term, in a low-carbon economy. This also applies to economic development agencies in the devolved administrations and where economic development money is devolved to the sub-regional level – it is important that sub-regional partnerships also ensure economic plans are compatible with a low-carbon future.

The Conservative Party has outlined plans to strip down RDAs and make local authorities and their 'enterprise partnerships' responsible for development functions, should they come to power after next year's general election (Conservative Party 2009). If this happens, city region planning will be needed to replace the spatial planning role currently performed by RDAs. A greater emphasis will also be needed from sub-regional partnerships to identify potential opportunities and threats and to develop new strategies for maximising the opportunities in a low-carbon future. Sub-regional partnerships should ensure that their Economic Development Plans are consistent with plans to decarbonise the economy.

There is a key role for local authorities to play in ensuring that Local Economic Assessments take the transition to a low-carbon future into account. We recognise that local authorities may be limited to some extent by their lack of ability to raise additional funding. However, there are a number of other ways in which they can help to stimulate low-carbon industries and jobs, including:

- Using planning rules to stimulate the uptake of low-carbon technologies (for example, the Merton Rule)
- Procuring low-carbon goods and services
- Working with local employers to identify skills gaps
- Promoting low-carbon development in economic regeneration programmes. (Local Government Association 2009)

Policy implications and recommendations

Government intervention

Without proactive government intervention, the industries that are needed for the UK to benefit economically from the low-carbon transition are unlikely to materialise. It is widely acknowledged that government has a role to play where there are market failures, and there are a number of market failures that apply to the development and commercialisation of new low-carbon technologies. But this will not be sufficient – there is also a role for government to play in identifying strategic areas of the emerging low-carbon economy and targeting support measures on these areas. This approach has worked well in other countries, such as Germany and Spain.

Government needs to adopt clear criteria for prioritising which areas it chooses to support. We suggest that support measures should be:

- only be for new technologies
- for technologies with the greatest scope to reduce emissions
- for technologies with the greatest scope for economic advantage
- for technologies with the greatest scope for good quality job creation.

Government does not currently have a clear set of criteria for the areas that are prioritised in the low-carbon industrial strategy. It also appears to miss sectors that score highly on

environmental and social criteria but less well on economic criteria, such as energy efficiency. And it fails to include technological innovations for improving the processes of established industries (in particular, carbon-intensive industries like steel and cement).

Recommendations

1. Make criteria more transparent

We would urge the Government to make the criteria for selection more transparent and to ensure equal weight is given to environmental and social outcomes alongside economic outcomes.

2. Consider energy efficiency

Future consideration of low-carbon industrial development in the UK should also consider jobs in energy efficiency.

3. Consider process changes in existing industries

Consider using some of the £405 million that was announced in the 2009 Budget to support the development of low-carbon production processes as well as low-carbon products.

Types of support

For each prioritised area, government needs to develop a package of measures. This will be different for each technology family, but it should include four basic measures:

- Robust and consistent overarching policy framework
- Supply-side 'push' measures
- Demand-side 'pull' measures
- Removal of barriers.

It is vital that appropriate support measures are also put in place for small businesses, which often face different barriers to larger, more established players. This will mean tailoring some existing measures to make them more appropriate for small businesses or developing new support measures specifically for SMEs.

Recommendation

4. Government should establish a 'green ideas bank' to provide finance for low-carbon innovation, particularly among SMEs.

Regional and local-level interventions

Regional and local level government will have a key role to play in making the transition to a low-carbon economy. There is a need to mainstream low-carbon thinking through all economic development activities. At the same time, support for new low-carbon development should be targeted in the regions with greatest need for economic development.

Recommendations

5. RDAs should be given a sixth statutory purpose:

To ensure all economic development and regeneration is compatible with the UK's Low Carbon Transition Plan.

6. Government should target regions with the greatest need for economic development support when announcing the next round of LCEAs.

This should include the West Midlands, North East, North West and Yorkshire and Humber.

7. Government should consider giving local authorities powers to impose supplementary business rates, which could then be invested in developing local green industries or funding programmes to support their development (such as improving energy efficiency in public buildings).

Chapter 5. Maximising the opportunity: developing the UK workforce

The UK workforce must possess the right skills if we are to maximise the employment potential of the low-carbon transition. Otherwise, foreign firms will not invest in the UK and domestic employers will face a serious obstacle in moving into low-carbon sectors. In addition, the UK workforce may not be able to take advantage of new jobs if they do not possess the right skills sets.

This chapter considers the skills challenges for emerging low-carbon industries. We start by setting out the evidence that is currently available on existing skills challenges and those that may emerge in the near future. We then consider the scale and nature of current and emerging skills challenges, and the different ways in which they could be addressed. We finish by briefly examining whether current skills policy and delivery is sufficient to meet the challenges we identify, before moving on to our recommendations.

Evidence of skills shortages and gaps

It is difficult to gain a clear picture about where skills gaps and shortages⁷ exist in the context of low-carbon jobs. Across the labour market as a whole, we know that the UK tends to do less well than many of our European neighbours on many measures of skills⁸ (UK Commission for Employment and Skills [UKCES] 2009). We also know that employer demand for skills has failed to keep up with the significant improvements in adults that have taken place since the 1970s (Lawton 2009).

However, it is difficult to get a handle on the UK's specific skills needs for the emerging low-carbon economy. Many organisations with an interest in low-carbon employment have carried out their own surveys or analysis, often focusing on a particular sector or profession. The different sources of information can often produce contradictory messages.

There are also widespread perceptions about skills weaknesses in the UK, for example, that we lack sufficient skills in manufacturing or 'STEM' subjects (Science, Technology, Engineering and Maths), although the evidence base for these perceptions is not always clear. More broadly, there is a general lack of data about future skills needs, both in the UK and internationally, particularly data sources that take account of the effects of the 2008/09 recession (Slingenberg *et al* 2008).

Here, we attempt to set out what we know about existing skills issues as they relate to low-carbon sectors and any emerging or future problems, drawing on a number of different sources. We have tried to select those sources where there is robust evidence on skills problems, rather than anecdote or perceptions. We can supplement the existing evidence with the findings of our survey of 39 low-carbon employers, which provides some information about current skills gaps and shortages.

Table 5.1 sets out some of the key sources we have identified which contain good quality evidence about skills gaps and shortages that could have an impact on the development of low-carbon industries, although this is not an exhaustive list. In most cases, the analysis contained in the sources outlined in the table was not done specifically in relation to

7. Skills gaps exist when the existing workforce or new entrants lack some of the skills that employers require, although they are able to perform their role. Skills shortages exist when there is a lack of suitably qualified or experienced individuals in the labour market, making it difficult for employers to recruit staff.

8. Skills are often conflated with qualifications, which provide a good proxy for skills but do not recognise the range of skills that people have that are not captured by formal qualifications. We refer mainly to skills in this section because we are talking about the range of skills required for the transition to a low-carbon economy, many of which are not linked to formal qualifications.

Table 5.1: Selection of evidence on skills gaps and shortages relevant to low-carbon sectors

| Source | Skills shortages/gaps | Relationship to low-carbon industries |
|---|--|--|
| Migration Advisory Committee 2009* | Geologists: including hydrogeologists, geological engineers, and geoenvironmental engineers | Renewables planning and construction, and CCS projects |
| | Civil engineers: including structural engineers, water engineers, geotechnical engineers and marine engineers | As above |
| | High integrity pipe welders | Connection of new energy generation to the grid |
| | Electricity transmission overhead lineworkers | As above |
| | <i>Not: engineering technicians, other than aircraft component engineering technicians</i> | |
| Engineering Technology Board 2008 | Engineering technicians (qualified to Level 3 or 4, below degree level) | Multiple roles |
| | <i>No particular shortage of engineering graduates</i> | |
| CBI 2009 (employer survey) | STEM graduates | Multiple roles |
| | Workers with STEM skills at all levels | Multiple roles |
| | Technicians and graduates in energy and water industries | Renewables projects |
| DIUS 2009 (STEM study based on employer surveys) | Marine and aerospace engineers | Offshore wind installation and maintenance |
| | Mechanical and electrical engineers | Multiple roles |
| Innovation, Universities, Science and Skills Select Committee 2009b | Post-graduate-level STEM specialists | Low-carbon R&D |
| ippr stakeholder interviews | Local government planners | Planning process for renewables and microgen |
| | Engineers (all levels) | Multiple roles |
| | Energy efficiency contractors and installers | Domestic and commercial energy efficiency projects |
| | Ground source heat pump installers | Geo-thermal energy |
| | Understanding of general low-carbon behaviours in the workplace | All roles across the economy |
| ippr employer survey | Senior managers and professionals, and management and leadership skills | Multiple roles |
| | Technicians, and technical and job-specific skills | Multiple roles |
| British Wind Energy Association (Boettcher <i>et al</i> 2008) | Project managers | Renewables planning and delivery |
| | Electrical engineers | Connect new energy generation to the grid |
| | Turbine technicians | Wind turbine operations |
| TUC 2008 | Understanding of general low-carbon behaviours in the workplace and ability to influence change in the workplace | All roles across the economy |

Note: *The Migration Advisory Committee (MAC) was created as part of the points-based migration system which attempts to manage migration to the UK based on the skills of potential immigrants. The MAC regularly draws up a list of specific occupations where there is evidence that employers are having serious difficulty recruiting sufficient numbers of workers from the existing UK workforce because of a lack of relevant skills or work experience.

emerging low-carbon industries. However, our conversations with industry experts and others have enabled us to identify those skills gaps and shortages that are likely to be relevant to low-carbon employers.

The variety of occupations contained in Table 5.1 demonstrates the multi-faceted nature of low-carbon industries. In some cases there are overlaps across the different sources, but other sources are contradictory. Engineering, in a variety of specialisms, stands out as a clear cause for concern, but there is disagreement about whether we need more engineers at all levels, or whether technician or graduate level is a priority.

This lack of clarity about skills gaps and shortages in emerging low-carbon industries is likely to create confusion and uncertainty for training providers, skills funders and employers. There is a role for a central government agency to collate the existing evidence and to commission a series of robust studies into the likely future skills needs for a low-carbon economy.

On a broader level, we also found evidence that workers across the UK lack an understanding of how they can reduce carbon emissions in the workplace. Workers can sometimes also lack the know-how, confidence or support to undertake those measures. This is a challenge that applies to organisations right across the economy and needs to be a key dimension of efforts to reduce carbon emissions within business.

Evidence of skills gaps and shortages from our survey of low-carbon employers

Our survey of low-carbon employers provides some new evidence about existing skills challenges. We asked employers about 'hard-to-fill' vacancies from the last six months – vacancies where employers had struggled to identify and recruit the right person. The number of hard-to-fill vacancies is one way to measure the extent of skills shortages. Table 5.2 gives a summary of our findings on hard-to-fill vacancies from our employer survey.

In our survey, nearly half of respondents (19 out of 40) had had a hard-to-fill vacancy in the last 12 months. This is despite the fact that the survey was carried out in May and June 2009, when unemployment was high as a result of the recession. Of the 19 firms that recorded hard-to-fill vacancies, nearly half (eight) had had more than four such vacancies, suggesting that this is a significant issue for some of the organisations we surveyed.

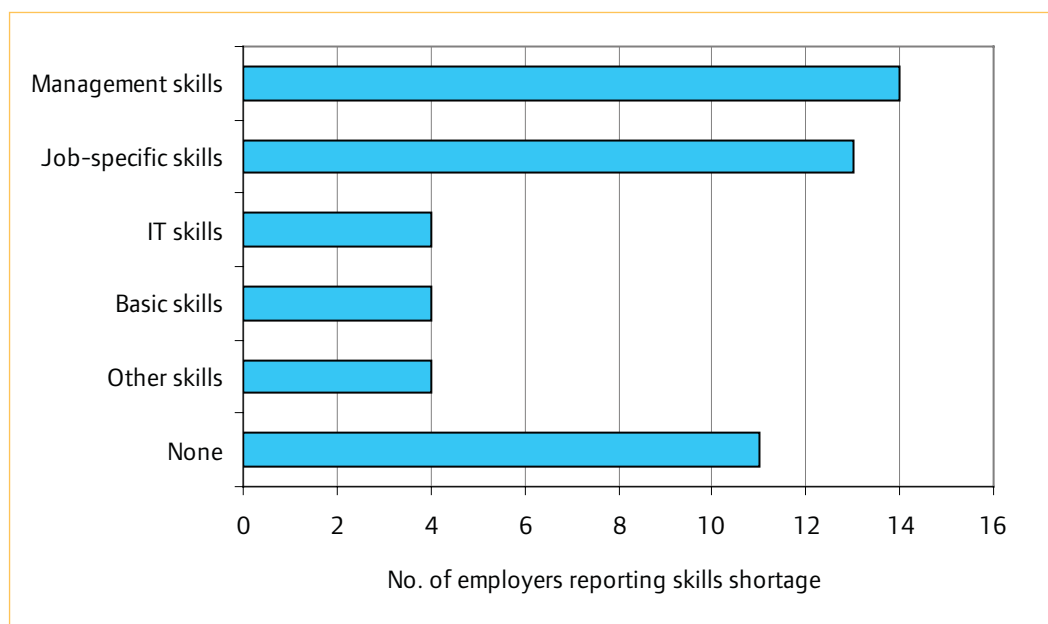
| No. of hard-to-fill vacancies | No. of firms |
|--|--------------|
| 0 | 21 |
| 1 | 2 |
| 2 | 4 |
| 3 | 5 |
| 4+ | 8 |
| Occupational level of hard-to-fill vacancies | No. of firms |
| Senior managers and professionals | 11 |
| Technicians | 7 |
| Admin, sales and customer service | 3 |
| Semi-skilled and unskilled manual | 3 |
| Reason vacancy was hard to fill | No. of firms |
| Not enough applicants with right skills/qualifications | 14 |
| Not enough applicants with the right work experience | 12 |
| Not enough applicants with the right attitudes or motivation | 5 |
| Terms and conditions, location, nature of work | 4 |

Employers found it most difficult to recruit high-calibre senior managers and professionals, although seven organisations also reporting difficulties in recruiting technical staff. In the majority of cases, vacancies were hard to fill because employers found it difficult to find people with the right skills, qualifications or work experience. Problems with the nature or location of the job were much less important. It is worth noting that a lack of appropriate work experience among candidates was almost as problematic as a lack of appropriate skills or qualifications.

Our employer survey also collected data on skills gaps within the existing workforce. Figure 5.1 shows that three-quarters of employers (30 out of 39) in our survey reported a shortage of skills in at least one area. The most common shortages identified were management and leadership skills, technical and job-specific skills, and STEM skills. Relatively few employers reported problems with IT or basic numeracy and literacy skills.

Figure 5.1: Skills gaps reported by low-carbon employers

Source: ippr online survey of 39 low-carbon employers, May and June 2009



This suggests that employers in the low-carbon sector have two major skills problems: management skills, which is regularly identified as a weakness in UK firms and by no means confined to low-carbon employers; and technical, job-specific skills, including but not limited to STEM skills. Our findings on skills gaps also reflect the results on hard-to-fill vacancies, which suggested that managers and technicians were the hardest groups to recruit.

The nature of skills gaps and shortages

The evidence presented above highlights the diversity of skills challenges for organisations operating in low-carbon sectors. Some skills shortages, like a shortage of management skills, are not unique to low-carbon sectors and need addressing throughout the UK economy. In other cases there are very specific skills gaps – like the lack of high integrity pipe welders identified by the Migration Advisory Committee – which are likely to require a targeted approach.

A key issue is the extent to which any of the jobs that will be created by the transition will be completely new and lack any clear precedents. These jobs would require brand new skills of a kind that the current UK workforce does not possess. We have not found any evidence that jobs of this nature will be created. Instead, all the evidence we have points to four broad types of skill requirement which are increasingly evident as we make the transition to a low-carbon economy:

1. Specific skills gaps requiring substantial investment in training and workforce development
2. Skills shortages that could be addressed by ‘topping-up’ existing workforce skills
3. Generic skills shortages that apply across the UK economy
4. Generic ‘green’ skills.

Substantial investment in training and workforce development

There are a relatively small number of key occupations where there is evidence that the UK is facing skills shortages and where significant investment in training and upskilling is needed. This could apply to some of the occupations listed by the MAC, such as high integrity pipe welders and civil engineers. There is an across-the-board shortage of workers with the appropriate qualifications and work experience, which is a challenge for the low-carbon sector but also for other sectors, some of which will also be strategically important to the UK.

There is a case here for public investment in the short term and in longer term training and workforce development programmes to ensure the UK has a sufficient supply of these workers. A lot of this training might be relatively lengthy and expensive. However, the evidence that we have at the moment is that these skills shortages are limited to a small number of occupations and we may not need large numbers of people doing these jobs. Therefore, the overall cost could be minimised.

‘Topping up’ existing workforce skills

In many cases, new low-carbon jobs could be carried out by individuals who already possess a base of relevant skills. They will require some additional training to familiarise them with new concepts and practices that will enable them to operate in low-carbon industries. Table 5.3 below gives some examples of the kinds of occupations that might fall into this group. Our conversations with industry stakeholders and others suggest that the bulk of new jobs will fall into this category.

Table 5.3. Top-up training for low-carbon jobs

| Current job | Core training requirement | Additional low-carbon skill requirement | New low-carbon job |
|--|--|--|--------------------------------------|
| Electrician | Apprenticeship, BTEC or NVQ/SVQ | Working on roofs; installation of solar PV panels | Solar PV fitter |
| Offshore oil or gas maintenance technician | Apprenticeship, BTEC or NVQ/SVQ | Offshore wind technology | Offshore wind maintenance technician |
| Aerospace technician | Apprenticeship, BTEC or NVQ/SVQ | Technology-specific knowledge | Wind turbine technician |
| Architect | Undergraduate degree, masters degree and paid work experience* | Energy efficiency and zero-carbon knowledge | ‘Low-carbon’ architect |
| City trader | Undergraduate degree | Carbon literacy, understanding of carbon trading schemes | Carbon trader |
| Facilities manager | No specific qualification required | Sustainability and energy management issues | ‘Low-carbon’ facilities manager |

*These are requirements to become a registered architect with the Architects Registration Board.

BTEC = Business and Technology Education Council qualification; SVQ = Scottish Vocational Qualification; NVQ = National Vocational Qualification

In many cases, occupations will evolve over time to incorporate more and more low-carbon knowledge and techniques. Many of these occupations will not be purely 'low-carbon': an electrician trained to fit solar panels may also spend part of their time doing the more traditional work of an electrician. In other cases, like the wind turbine technician, it will be easier to identify an occupation as being in a particular low-carbon industry.

It is likely that the boundaries between what is and is not 'low-carbon' work will become blurred and, in the long term, increasingly irrelevant as the whole economy makes the low-carbon transition. The key issue with many of these roles is that they are unlikely to require substantial investment in upskilling or re-skilling programmes targeted at large numbers of people (White and Walsh 2008). In many cases, the key skills already exist and the challenge is to provide workers with additional knowledge and techniques which enable them to transfer their existing skills to new and emerging industries and roles.

However, there may be some cases in which significant investment is necessary because of the scale of action required. This is most notable in the field of energy efficiency and the construction of zero-carbon homes. The Government wants all new housing to be 'zero-carbon' by 2016 and also has an aspiration for all homes in the UK to be fitted with loft insulation and cavity-wall insulation by 2015. Further, more complex, insulation and energy efficiency measures could also be undertaken in domestic and commercial properties to create additional carbon emissions reductions.

There is serious concern within the construction industry about the capacity to deliver on these goals using the existing workforce⁹ (Foresight 2008). The slump in the construction industry driven by the recession and collapse of the housing market has undoubtedly created capacity in the construction sector to focus on energy efficiency programmes, if financial support is provided. However, there is still a question about whether we have sufficient construction skills in the long run to meet demand in this area. The skill requirement for the individual may be relatively low but the overall investment necessitated by the scale of the challenge could be considerable.

In Chapter 3 we saw that the construction industry could offer opportunities for people who rely on entry-level jobs. In the interviews we carried out for this project we came across firms who employed unskilled workers to carry out insulation work and provided them with training to progress into more skilled construction roles, like fitting solar panels. In the US, community-based domestic energy efficiency programmes have been used to create good quality employment opportunities in deprived neighbourhoods, while also reducing fuel poverty. There is considerable scope for this approach to be adopted in the UK, and this is an area of work that ippr will return to in future.

Addressing generic skills shortages

We have already highlighted the fact that employers in our survey were most likely to report skills shortages around management and leadership skills. This shows that in many ways, organisations operating in low-carbon sectors operate in a very similar context as businesses right across the economy. They face the same challenges in recruiting experienced and high quality managers that many firms report, and understand the detrimental effect this can have on their businesses.

There is evidence from elsewhere that UK employers also report problems in recruiting staff with adequate skills in marketing, financial management and commercial understanding. Although the picture may change in the longer term as a result of the recession, employer

9. This was raised specifically in many the stakeholder interviews we carried out.

surveys continue to highlight concerns about skills in these areas (CBI 2009b, Innovation, Universities, Science and Skills Committee 2009b).

The current approach to skills policy is focused around industry sectors, with Sector Skills Councils being the main forum in which employers can report training needs. This has many benefits because firms in similar sector tend to face similar skills challenges but it also means that sector-specific, technical skills can take precedence over more generic, transferable skills like management, marketing and commercial understanding. Clearly, we need to find ways of ensuring that low-carbon employers have staff with sufficient expertise in management and other cross-sector skills, otherwise the growth potential of these businesses will be thwarted.

Developing generic 'green' skills

Given the range of activities that could fall under the 'green jobs' heading, it can be difficult to identify a common set of 'green' skills that would be relevant to all occupations. However, as we have already discussed, the actions required to avoid dangerous climate change will require a systematic change in the way that all organisations operate.

Businesses could be affected negatively by new climate change legislation if they do not prepare adequately in advance. Working practices and processes may need to radically alter; travel planning, energy efficient buildings management and resource management will need to become mainstream. Every employer and employee will need to be equipped with the skills necessary to adapt a range of business practices so that carbon emissions are reduced across the economy.

This is not about skills gaps or shortages in the traditional sense and these issues are unlikely to be addressed through courses or formal learning. But there is clearly a need for continued efforts to build the skills of employers and employees to tackle climate change via the workplace, through raising awareness and making sure individuals and organisations have access to the right tools.

This means more than adopting a few basic energy efficiency measures. It is about helping employers and employees to take a fundamental look at how their organisation operates in the context of climate change. Union environmental representatives already do a great deal of work in this area, and there are programmes run by the Carbon Trust and others. This work should be built on to ensure that all employees have a basic set of generic 'green' skills which helps them to understand their organisation's contribution to climate change and how this can be reduced.

This is an issue that lies outside the scope of this project and report, as we've keen to focus on the opportunities for employment creation (and the risk of job losses) as a result of the low-carbon transition. However, we want to raise the issue here as something that has emerged as a key challenge throughout our research.

Current skills policy and delivery in the UK

We now turn to a brief examination of the skills system in the UK, to help us understand how the skills we need for a low-carbon economy might be delivered.

The first thing to say about skills policy and delivery in the UK is that it is a devolved issue. This means that each of the four countries of the UK has developed its own approaches to adult skills. The set-up of adult skills, particularly in England, is also renowned for its complexity and continuous transformation, with a number of agencies responsible for different aspects. Employers often report confusion in dealing with the different organisations involved and in understanding what they are entitled to in terms of public subsidies for workplace training. Here, we attempt to set out some of the key aspects of the

system and the challenges that are created for the delivery of skills for a low-carbon economy.

Responding to employer demand

After the 2006 Leitch Review of Skills, changes were put in place to transform the skills system, especially in England, into one led by employer demand, rather than centrally planned by training providers and skills funders. Sector Skills Councils were created as supposedly employer-led bodies that gather information on the training requirements of employers in their particular sector and feed this into the skills funding agencies operating in the four countries of the UK. There are now 25 Sector Skills Councils operating across the UK.

However, a key problem emerges if employers fail to articulate sufficient demand for skills that are likely to be needed in the future. A number of our interviewees raised this as an issue in the context of the low-carbon transition: many employers in some of the key sectors, including construction, engineering and manufacturing, have yet to fully realise the impact of the transition on their future business and are therefore not yet articulating the demand for low-carbon skills to the relevant Sector Skills Council.

There are a number of reasons for this. Employers are often focused on the immediate challenges and can, understandably, sometimes fail to fully comprehend where their business needs to be in five or 10 years' time. This can particularly be the case for small businesses where they lack the expertise or capacity to look to the future. Secondly, there is some evidence that the 'stop/start' nature of some of the Government's climate change policy means that employers are hesitant to move into low-carbon sectors, and so their skills needs remain relatively unaffected. Finally, there is a wider question about the extent to which society as a whole has fully grasped the extent of the transition that is necessary and the impact it will have across the economy.

Whatever the underlying causes, the inertia around making the low-carbon transition means that Sector Skills Councils struggle to understand the future low-carbon skill demand among their employers and to communicate this demand to skills funding agencies. This in turn affects the commissioning process for adult skills. It was clear from our stakeholder interviews that in England, the Learning and Skills Council is not yet receiving sufficient demand for some of the skills that we identified above as potential areas of shortage.

Ministers have taken some initial steps to set out a more strategic role for government in determining future skills needs, in the context of a revitalised industrial policy (Denham 2008, HM Government 2009c). A high-level skills group, led by the Department for Business, Innovation and Skills, has been formed to consider the skills needs for the transition to a low-carbon economy. However, our discussions with stakeholders suggested that progress has been relatively slow, with the group focusing on the work that employers are doing to develop skills in-house. There is a concern that the emphasis will be on what a few major employers are doing, rather than looking across the board at what support around skills is needed by low-carbon industries.

Top-down targets

The Government is currently trying to combine an employer-led approach to skills with top-down targets for qualifications, including those obtained in the workplace. Government action on skills is driven by generic targets that benchmark the UK's performance against the top performing OECD countries. For example, the Government has a target to have over 90 per cent of adults qualified to Level 2 (equivalent to five GCSEs at grade A to C), and 68 per cent of adults qualified to Level 3 (equivalent to two A-levels), by 2020 (UKCES 2009).

However, these targets say nothing about what kind of qualifications will be achieved, in which industries, and how they will be matched with employer demand.

In England, these targets drive a system of public subsidies for training which does not seem to distinguish between different subjects or qualifications, or the needs of business. This is significant because there is evidence that employer demand for skills has not kept pace with improvements in workforce skills that have taken place over the last few decades (Lawton 2009). As a result the benefits of improvements in the skill level of the workforce are not being fully utilised by employers. There are many reasons for this, but it is important that future improvements in skill levels are much more closely linked to employer demand. There is also very little evidence that a simple benchmarking approach to skills will improve the UK's economic performance or productivity, because this approach says nothing about how higher skills will be applied (Keep *et al* 2006).

This is not to say that the only value in developing skills is for use in employment and that qualifications should only be designed around the needs of employers. But it does mean that there are risks in a system that is driven by very broad top-level targets for skill *supply* but lacks a vision for how skills can be applied by business. The governments in Wales and Scotland have made much more progress in setting out such a vision (Welsh Assembly Government 2008, Scottish Government 2007).

There is a clear challenge in developing an approach that responds to employer demand but also gives central agencies a role in identifying, and planning for, future skills needs. At the moment, the balance is awkwardly struck, with central targets directing the level and structure of training and employers having an increasing role in designing the content of training. The balance needs to be shifted so that employers, alongside other stakeholders, have a greater role in designing all aspects of training, free from broad and overly prescriptive targets, and at the same time government keeps an eye on the future. It is not an easy balance to strike, but it will be key for ensuring that we have the right skills to maximise the opportunities created by emerging low-carbon industries.

The availability and relevance of public training subsidies

Current entitlements to public subsidies for training vary across the UK. In England, workplace training is brokered through the Train to Gain service and funded by the Learning and Skills Council. Entitlement to public funding for training is complex, with rules linked to age, qualification and the size of the business:

- The basic entitlement under Train to Gain is that adults of all ages are entitled to full funding of basic skills training and training that results in a *full* and *first* Level 2 qualification (usually an NVQ)¹⁰.
- People aged 19 to 25 are also entitled to full funding for a full and first Level 3 qualification. Partial funding is available for older workers obtaining a first Level 3 qualification.
- Individuals in businesses with five to 10 employees are entitled to full funding for an additional Level 2 and part-funding for an additional Level 3 qualification, regardless of previous qualifications.

10. 'Fullness' and 'firstness' have been key features of skills funding in the last few years. 'Fullness' means that the course has to result in a full qualification rather than a 'credit' that can be added to other credits to make up a full qualification at a later date. This can sometimes be a more appropriate way for working adults to gain qualifications. Government has also, understandably, focused subsidies on people who lack prior qualifications at a given level, hence the 'firstness'.

- In some cases, full funding is also available for workers in larger firms for additional Level 2 and 3 qualifications and a first Level 4 qualification.

There is an additional complication in that work-based apprenticeships for young people aged 16 to 18 are fully funded by government but apprentices aged 19 to 24 only have half their training costs covered. Older apprentices are unfunded. In addition, the Government is introducing Skills Accounts in 2010 for everyone over the age of 19. Individuals will be able to access funding for training through the accounts, although it appears that eligibility will mirror many aspects of the Train to Gain system.

Elsewhere in the UK, the devolved governments have greater discretion over the amount of funding they will commit to work-based learning, with less emphasis on strict rules depending on age and level and a greater focus on key sectors:

- *Scotland:* Apprenticeships in Scotland are available to a broader age group, although funding for Level 3 apprenticeships for the over-20s is now restricted to engineering and construction. Workers in Scotland can also access funding – between £200 and £500 – for a wide range of training through Individual Learning Accounts.
- *Wales:* Discretionary funding for workplace learning is available through the Workforce Development Programme, with priority given to key strategic growth sectors, basic skills, and leadership and management skills. Funded apprenticeships are also available regardless of age.
- *Northern Ireland:* Apprenticeships in Northern Ireland are fully funded regardless of age. Funding is also available for leadership and management courses and basic skills training.

A number of problems arise from the way skills funding in England is organised:

- The many different entitlements add considerable complexity to the system and have had to be amended a number of times since Train to Gain was introduced in 2006, most recently to provide more support for training in small businesses during the recession.
- The system of entitlements linked to age and level restricts availability to certain groups identified in advance by the Government.
- Funding is focused on lower-level vocational qualifications, primarily NVQs, which appear to have almost non-existent, and perhaps even negative, wage returns (Jenkins *et al* 2007).
- Funding is overwhelmingly for full qualifications only, although this does not always match employer and worker demand.
- Funding is spread across the whole economy, with no attempt to target support where it can have the greatest impact.

This is in contrast to some of the measures adopted by the devolved governments, particularly Wales, which has set out what it believes to be Wales's strategic growth sectors and explicitly linked funding for training to these sectors (Welsh Assembly Government 2008, 2009). The devolved administrations' discretion over funding also enables policymakers to decide where to prioritise funding.

Policy implications and recommendations

We end this chapter by highlighting four key policy implications that emerge from the analysis presented above, and presenting our recommendations for how existing challenges could be overcome.

A more strategic approach to developing low-carbon skills is needed

Industry stakeholders have told us that an employer-driven skills system will not by itself create the stimulus that is necessary to increase low-carbon skills among the workforce. Government must step in to ensure that the UK has the right skills to maximise future employment opportunities.

This is not about returning to a centrally-planned system and ignoring employers. Rather, it means working with employers, Sector Skills Councils and other employer bodies to understand the current pressures on employers and the challenges they face in thinking about the extent and impact of the low-carbon transition. It also means being clear about government policy on the transition and providing the certainty that employers need to be able to invest in skills.

Recommendations: strategic skills policies and more coordination on skills gaps

1. Develop national skills strategies that reflect priorities for future economic growth

Where this does not exist already, the UK and devolved governments, working with partners, should develop national skills strategies that form part of national economic development plans. National skills strategies should reflect the UK's economic priorities and key growth sectors for the future, including low-carbon industries. National skills strategies need to complement a modern industrial policy and integrate skills with the other factors that we know are important drivers of productivity and firm success, such as product market strategies, capital investment, R&D and the application of innovation.

2. Link skills policies with economic development plans:

Policymakers in England in particular should learn from the approach taken by devolved administrations, particularly Wales and Scotland, who have recognised the importance of linking skills policies with economic development plans and efforts to increase skill utilisation. These countries have also started to think about the growth sectors they want to target.

3. The UK Commission for Employment and Skills should commission studies to identify skills gaps:

National skills strategies need to be informed by much more robust and detailed studies about the skills needs that will stem from the low-carbon transition, depending on the specific economic development plans that each nation sets out. The devolved governments should ask the UKCES to commission the relevant studies as a priority.

4. National skills strategies should feed into the commissioning process for workplace training:

National skills strategies need to feed into the commissioning process for workplace training, alongside representations from the Sector Skills Councils based on their understanding of employer demand.

5. Give the UK Commission for Employment and Skills a formal coordination role:

A central agency like the UKCES should be given a formal coordination role to ensure that the different strategies work together across the UK and do not leave gaps.

6. Identify whether skills gaps are short- or long-term:

The Department for Business, Innovation and Skills and devolved governments should ask the Migration Advisory Committee to specify which of the skills gaps it has identified are potentially long-term gaps, either because there is ongoing skill need or an ongoing lack of supply. As part of their overall skills and industrial strategy, BIS and the devolved governments could then target investment in training and work experience to fill longer term gaps. Migration could continue to fill gaps in the shorter term. The longer term nature of the remaining skills gaps mean that they could provide opportunities for people who have been out of work of a relatively long period, because they would have the time to overcome obstacles to work and take part in the necessary training.

Public subsidies for workplace training need to reflect our strategic economic priorities

The current system of subsidies in England is driven primarily by government targets rather than what employers really need. It is understandable that government wants to increase skills across the board and ensure that everyone has a minimum level of qualification. However, there are two challenges to this position: a lack of evidence about the financial benefits, both to the individual and to business, and limited public money means we have to invest where we can get the highest return.

Recommendations: target funding for training at key sectors

7. Target public funding at low-carbon industries:

Public funding for work-based learning should be targeted at low-carbon industries, and other strategically important sectors and occupations where there are known skills challenges (as long as this is permitted by international trade laws).

8. Review funding for training outside of strategic sectors:

Funding for workplace training outside these sectors should be reviewed with the possibility of re-allocating some non-productive funding towards training provision in low-carbon industries and other key growth sectors.

Industry needs a flexible and relevant system of subsidies for training

The current focus on achieving full and first qualifications at Level 2 and 3 in England is also driven by government targets rather than employer need. Recent widening of entitlement to enable more employees in small businesses to undertake subsidised training is welcome but does not go far enough.

Recommendations: public subsidies for short courses, cross-sector skills and re-skilling

9. Provide public subsidies for short courses:

Public subsidies for short courses would enable firms to top-up the skills of the existing workforce with additional knowledge about low-carbon practices and procedures. Most of these skills do not require formal qualifications of the kind that Train to Gain currently funds in England. Train to Gain introduced short course for small businesses in key skills like marketing, product design and cash flow in early 2009, indicating that this approach is feasible. Funding for short courses should be targeted at small businesses, to reduce deadweight costs, and courses should be delivered in a way that makes them accessible to small businesses and the self-employed, for example, by running courses outside business hours. Suitable short courses could also be made available to people currently out of work if they have existing skills and there is a reasonable chance that completing a course would improve their employability.

10. The UK Commission for Employment and Skills should lead on promoting cross-sector skills:

The UKCES should lead on promoting cross-sector skills through Sector Skills Councils, encouraging them to work together where appropriate to identify needs. This should include the skills and understanding that all employees and employers will need to transform workplaces into low-carbon spaces. Current provision of management and commercial skills training to small businesses should be evaluated and expanded if appropriate.

11. Make subsidies available for low-carbon re-skilling:

The erstwhile Innovation, Universities, Science and Skills Select Committee recommended a relaxation of funding rules so that individuals can gain a further qualification at the same level as a previous qualification (Innovation, Universities, Science and Skills Committee 2009a). This would have to be properly managed so that training subsidies did not become skewed towards more highly qualified individuals. However, subsidies for re-skilling

could be appropriate in particular sectors and locations to ensure that individuals and areas are able to make the low-carbon transition.

Employers need stable and significant demand for low-carbon skills before they will invest in training or articulate a demand for publicly-subsidised training

It was clear from our discussions with industry experts that employers need a market for low-carbon goods and services, and at the moment the size and shape of that market is unclear. Their incentives to invest in workforce training or to articulate a demand for low-carbon skills are therefore limited. There was a real concern among the industry stakeholders we spoke to that this is seriously limiting the development of the workforce and the UK's chances of maximising the opportunities of the low-carbon transition.

Given the strategic importance of low-carbon industries and the potential employment benefits, the public sector has a crucial role in creating a stable market in the short term. This would ensure that sufficient demand is present to develop the workforce so it is ready to capitalise as private sector demand develops more slowly.

Recommendations: use public procurement to create demand for low-carbon skills

12. Local authorities and public agencies should prioritise energy efficiency programmes:

Wherever possible, local authorities and other relevant agencies should prioritise energy efficiency programmes for residential and public buildings in their local area in order to create local demand for energy efficiency skills. New-build and infrastructure projects, whether led by local authorities, regional agencies or national government, should also have the highest standards of energy efficiency. High energy efficiency standards will mean that contractors are encouraged to ensure their workforce is adequately trained in the appropriate construction and retro-fit skills.

13. Give preference to contractors who demonstrate a commitment to training:

Within the procurement process, preference should be given to those organisations that demonstrate a commitment to appropriate training, including the use of apprenticeships and training for the existing workforce, where necessary. The mandatory use of apprentices on public sector construction projects is supported by the Chartered Institute of Building (CIOB 2009).

14. Provide practical support to procurement professionals by expanding the role of the Improvement and Development Agency for Local Government:

In our interviews, we found that sustainable procurement can be problematic if people involved in procurement do not feel confident in stipulating and assessing relevant sustainability requirements. This can mean that sustainability clauses in tender documents remain vague and of limited value, and are given a low priority when bids are assessed. Procurement professionals need practical support and guidance on the effective use of procurement to create demand for low-carbon skills. The role of the Improvement and Development Agency for Local Government in supporting low-carbon procurement could be expanded and strengthened to ensure that procurement professionals have the right skills to push for the highest standards of sustainability, within an overall context of achieving value for money. This issue also needs leadership from the highest levels to ensure that low-carbon factors are prioritised in the procurement process.

6. Case studies

Chapters 4 and 5 have set out the form that the appropriate action from government should take to stimulate new low-carbon industries and prepare the workforce to take advantage of new jobs. In this section, we apply these principles to a few example industries to show what an appropriate package of measures might look like. Our recommendations are based on interviews with key stakeholders in each of these sectors. The interviews were conducted in early 2009, prior to the publication of the Low Carbon Industrial Strategy and the Low Carbon Transition Plan.

Energy efficiency/building technologies

Robust overarching policy framework

Interviewees felt that the lack of a clear, robust policy framework was a problem for this area of industry. Employers wanted to have more clarity about the future direction of policy so that they could plan, for example, whether to expand their workforces or whether to train employees in new areas.

The 'stop-start' nature of policies in this area was also highlighted as being a problem. For example, the Low Carbon Building Programme (LCBP) and Carbon Emissions Reduction Target (CERT) were both cited as examples of policies that have not provided the consistent demand for micro-generation products or energy efficiency products that companies working in these areas were hoping for. This has proved particularly difficult for smaller companies, who have had to make employees redundant during times when demand dropped off as a result of LCBP funding running out sooner than expected or energy companies meeting their CERT targets earlier than expected. There is still uncertainty about what will happen to both of these measures beyond 2011/12 and therefore they do not provide the level of policy certainty that companies need if they are to invest and scale up their operations and take on and train new staff.

Companies working in this sector need a longer lead time (at least 18 months) before new policies are introduced, or an equivalent period of overlap between successive phases of existing policies, to ensure that they have sufficient time to plan. The Department of Energy and Climate Change should develop a three to five year programme for how it will promote energy efficiency and building technology measures.

Supply 'push'

One area of criticism in this area was the lack of suitable independent testing facilities for new micro-generation technologies. We heard how some companies have been forced to use testing facilities in other countries (such as the publicly-owned Arsenal facility in Austria) because the UK does not have this capacity.

Demand 'pull'

The uncertainty associated with the Carbon Emissions Reduction Target (CERT) and the Low Carbon Buildings Programme (LCBP) outlined above have resulted in insufficient levels of demand-side pull in this sector.

Many of the people we interviewed felt that there was a strong role for public procurement to play in creating a stronger 'pull' for energy efficiency and building technology companies. There was widespread support for replicating the kind of initiative taken by Los Angeles City Council where local authorities commit to retrofit publicly-owned buildings (see Box 3.2 above). It was suggested that this kind of initiative would help to develop the supply chains for these industries and also help bring down prices of the technologies.

On a more positive note, interviewees were pleased about the planned introduction of a feed-in tariff for small-scale renewables (which will provide an incentive to householders and other property-owners to install these technologies) and also praised the UK Building Regulations Part L (which deals with energy efficiency).

Barrier removal

Interviewees did not identify any other specific barriers associated with energy efficiency or building technologies.

Skills and training

Interviewees identified access to training as a problem for small businesses operating in this sector. The Microgeneration Certification Scheme was felt to be prohibitively expensive. It was also acknowledged that many people who are self-employed and working in this sector (such as boiler fitters) could not afford to take time away from work to attend training courses.

Offshore wind

This section summarises the findings of ippr's study of the opportunities for job creation in offshore wind, published in April 2009. See Bird 2009 for more detail. It should be noted that the interviews for this study were conducted in January and February 2009 and therefore do not reflect the package of measures to support offshore wind announced by the Government in July 2009.

Robust overarching policy framework

There was a common criticism among stakeholders about the lack of a clear plan for how the UK's renewable energy targets will be met. While the overarching targets in this area send a strong signal about the level of ambition, there is still the risk that without a more detailed delivery plan, these targets may appear unrealistic and undermine investor confidence. The Renewable Energy Strategy contains only an illustrative mix of technologies for 2020 and does not specify where new renewable capacity is likely to be situated (RDAs will be expected to set regional targets for renewable energy in their Regional Strategies) (HM Government 2009d).

Industry players do not believe that the figures the Government has put forward for capacity delivery under Round Three of the offshore wind programme (33 Giga Watts by 2020) are feasible. Until a more detailed delivery plan is developed, businesses will continue to be cautious about moving into low-carbon sectors.

Supply 'push'

Interviewees suggested that existing government grant programmes supporting R&D in this sector were spread too thinly. They also highlighted a lack of suitable testing facilities as a problem.

In its July 2009 announcement, the Government pledged to provide new funding for large-scale demonstration and dedicated testing facilities for offshore wind turbine technologies (HM Government 2009a).

Demand 'pull'

The stakeholders we spoke to suggested that the economic support mechanism – the Renewables Obligation (RO) – did not provide a sufficiently substantial subsidy.

In his 2009 Budget, the Chancellor announced a change to the RO that would increase the level of support given to offshore wind (HM Treasury 2009).

Other barriers

Difficulties with delays due to the planning system, problems accessing the grid and a lack of appropriate port infrastructure were all highlighted as barriers to the development of a UK-based offshore wind industry.

Government is in the process of reforming the planning process and has announced measures to improve access to the grid (HM Government 2009a).

Skills and training

Our interviews suggested that a comprehensive strategy for attracting more people into the sector was required. This could include engaging with careers advisers, highlighting efforts to forge links between universities and industry and providing incentives for people to take up low-carbon jobs.

Renewable heat**Robust overarching policy framework**

The criticisms that were made about the lack of clear policy framework for energy efficiency and building technologies apply equally here. Interviewees were not clear about the Government's intentions in this area and were frustrated by the stop-start policy implementation to date.

Supply 'push'

Interviewees cited difficulties in gaining access to finance as a problem, particularly for small businesses. Interviewees claimed that government funding was difficult to access, largely because low-carbon manufacturing has a different business model to 'traditional' businesses in the UK (that is, it is unlikely to turn a large profit in the short term, but has good prospects for growth in the medium term). Interviewees also pointed out that some funding (including the European Structural Fund) was channelled into other areas (such as infrastructure development).

The lack of independent testing facilities was also cited as a problem.

Demand 'pull'

The CERT and the LCBP have resulted in the same difficulties for renewable heat companies as for energy efficiency and micro-renewables.

Interviewees were positive about the proposed introduction of a Renewable Heat Incentive to increase demand for these technologies.

Barrier removal

A barrier to the introduction of district heating systems is the need for basic infrastructure that property developers can then 'plug in' to. This needs to be provided by local authorities.

Skills and training

Similar problems were identified to those in the energy efficiency sector – namely that certification schemes are too expensive and that training is not always delivered at appropriate times.

7. Conclusion and summary of recommendations

The radical steps that are necessary for the UK to meet its climate change obligations will bring with them significant opportunities for economic development. In areas including offshore wind and energy efficiency, there is scope for significant levels of job creation. It seems likely that most jobs will be 'decent' jobs too.

However, these jobs will not materialise without a strong lead from government both to identify and support the growth of areas of strategic interest for the UK but also in driving forward the skills agenda and ensuring that training provision is aligned with low-carbon economic development plans.

At the same time, government should endeavour to ensure that plans to stimulate low-carbon industries also contribute to reducing inequalities in the labour market, wherever possible, so that low-carbon jobs are decent quality, accessible to a diverse range of people and provide satisfactory career progression opportunities.

Finally, government should acknowledge that the low-carbon transition will bring risks for employment as well as opportunities for new jobs. Early identification of areas of potential vulnerability is essential so that strategies can be developed to protect jobs wherever possible, or to support employees in finding new work, where job losses are unavoidable. This will not only minimise political risk associated with decarbonisation, but more importantly, will ensure that the transition is fair.

Summary of recommendations

The effect of the transition to a low-carbon economy on the UK labour market

- The Department for Business, Innovation and Skills (BIS) should conduct a comprehensive study of the likely economic impact of decarbonising the UK to identify the likely potential threats as well as the opportunities.
- BIS should then work in collaboration with the Regional Development Agencies (RDAs), employees and the representative trades unions, Sector Skills Councils and industries in question to develop a strategy for either adapting the industry and reducing the risk of job losses, or managing their decline in the long term.
- The strategy should build in sufficient time to put appropriate support measures in place ahead of any job losses.

New low-carbon employment: maximising the social benefit

- The Low Carbon Industrial Strategy should explicitly address the need to bring more women into new industries, and set out ideas for achieving this.
- Employers in manufacturing and construction need to build on, and expand, existing programmes that promote female employment in their sectors.
- A more gender-neutral careers advice should be developed that encourages girls and young women to explore good quality employment opportunities in growing low-carbon industries.
- Sector Skills Councils should work together and with careers advice specialists to develop sector-specific low-carbon career ladders, which form part of broader sector career pathways.
- To maximise their practical impact, mapped career pathways will need to be complemented by more sophisticated labour market information about the opportunities and requirements for working in different low-carbon industries.

- The Low Carbon Industrial Strategy should be linked to the Government's welfare reform agenda

Encouraging low-carbon industries

- Government should make the criteria for prioritisation of low-carbon technology more transparent and ensure equal weight is given to environmental and social outcomes alongside economic outcomes.
- Future consideration of low-carbon industrial development in the UK should also consider jobs in energy efficiency.
- Government should consider using some of the £405 million that was announced in the 2009 Budget to support the development of low-carbon production processes as well as low-carbon products.
- Government should establish a 'green ideas bank' to provide finance for low-carbon innovation, particularly among SMEs.
- RDAs should be given a sixth statutory purpose: to ensure all economic development and regeneration is compatible with the UK's Low Carbon Transition Plan.
- Government should target regions with the greatest need for economic development support when announcing the next round of Low Carbon Economic Areas. This should include the West Midlands, North East, North West and Yorkshire and the Humber.
- Government should consider giving local authorities powers to impose supplementary business rates, which could then be invested in developing local green industries or funding programmes to support their development (such as improving energy efficiency in public buildings).

Developing the UK workforce

- The UK and devolved governments, working with partners, should develop national skills strategies that form part of national economic development plans where this does not exist already.
- English policymakers in particular should learn from the approach taken by the devolved administrations, particularly Wales and Scotland, who have recognised the importance of linking skills policies with economic development plans and efforts to increase skill utilisation.
- The devolved governments should, as a priority, ask the UK Commission for Employment and Skills to commission studies to identify skills needs that will stem from the low-carbon transition.
- National skills strategies need to feed into the commissioning process for workplace training, alongside representations from the Sector Skills Councils based on their understanding on employer demand.
- A central agency like the UKCES should be given a formal coordination role to ensure that the different strategies work together across the UK and do not leave gaps.
- BIS could ask the Migration Advisory Committee to identify which of the skills gaps it has identified are potentially long-term gaps. BIS could then target investment in training and work experience to fill longer-term gaps.
- Public funding for work-based learning should be targeted at low-carbon industries and other strategically important sectors and occupations where there are known skills challenges (as long as this is permitted by international trade laws).
- Funding for workplace training outside these sectors should be reviewed with the possibility of re-allocating some non-productive funding towards training provision in low-carbon industries and other key growth sectors.

- Public subsidies should be available for short courses that would enable firms to top-up the skills of the existing workforce with additional knowledge about low-carbon practices and procedures.
- The UKCES should lead on promoting cross-sector skills through Sector Skills Councils, encouraging them to work together where appropriate to identify needs. Current provision of management and commercial skills training to small businesses should be evaluated and expanded if appropriate.
- Subsidies for re-skilling could be appropriate in particular sectors and locations to ensure that individuals and areas are able to make the low-carbon transition.
- Wherever possible, local authorities and other relevant agencies should prioritise energy efficiency programmes for residential and public buildings in their local area in order to create local demand for energy efficiency skills.
- Within the procurement process, preference should be given to those organisations that demonstrate a commitment to appropriate training, including the use of apprenticeships and training for the existing workforce, where necessary.
- The role of the Improvement and Development Agency for Local Government in supporting low-carbon procurement could be expanded and strengthened to ensure that procurement professionals have the right skills to push for the highest standards of sustainability, within an overall context of achieving value for money.

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Appendix: Detailed methodology and list of interviewees

Method: Analysis of the Labour Force Survey, presented in Chapter 3

The analysis of employment characteristics by sector, presented in Chapter 3, draws on research conducted by the consultancy Innovas for the government department formerly known as BERR (the Department for Business, Enterprise and Regulatory Reform) to ascertain the potential for growth in the UK environmental goods and services (EGS) sector¹¹. Using a detailed list of job titles where employment growth is projected, we assigned a Standard Industrial Classification (SIC)¹² number to each role categorised by Innovas as 'emerging low-carbon' or 'renewable energy' (we did not include jobs in the 'environmental services' sector for the purposes of our analysis).

Using this process, we identified 15 SIC 'divisions' (the second highest level of the SIC system), grouped into six broad industry groups (the highest level): manufacturing, utilities, construction, wholesale and retail, business services and financial intermediation. For the purposes of our analysis the last were merged into one group because of the similarities between the two, and the relatively small size of the low-carbon finance sector. We therefore ended the process with five broad industry sectors where employment growth has been projected as a result of the transition to a low-carbon economy. This method means that, for example, when we talk about 'manufacturing' in this report, our data on manufacturing employment is based only on the seven divisions that we found represented in the Innovas report, rather than on the entire manufacturing sector. Table A1 shows the range of industry divisions that we located in the Innovas analysis.

Table A1: Standard Industrial Classification divisions included in this analysis, by sector

| SIC sector | SIC divisions included in analysis | Examples of activities in low-carbon industries |
|----------------------|--|--|
| Manufacturing | Manufacture of: Refined petroleum products Plastics Non-metal products Fabricated metal Machinery and equipment Electrical equipment Motor vehicles | Manufacture of: Bio-diesel Insulated plastic doors Electro-chromatic window glass Insulated alloy doors Wind tower turbines Power lines and cables Hybrid electric vehicles |
| Construction | All | Installation of triple-glazed window units |
| Wholesale and retail | All | Wholesaling of alternative fuels |
| Business services | Financial intermediation Computing services R&D Architectural and engineering services Other business services | Carbon credits trading Development of energy management software R&D of new lighting technologies Architectural services for geothermal energy systems Energy management advice |
| Utilities | Production and distribution of electricity | Operation of hydro-electric dam systems |

Although we lack precise figures, we expect that three sectors – manufacturing, construction and business services – will account for the majority of job growth. These sectors are currently major employers, and business services in particular will be a key growth sector in general for the UK.

11. We would like to thank Innovas for their assistance in providing this information.

12. We used the 1992 classification as this was the one used in the Labour Force Survey at the time of analysis.

We created our dataset by putting together the four quarters of the Labour Force Survey for 2008 to form a single dataset with a large sample size. We use data from every respondent identified as working in one of the 15 industry divisions, regardless of whether they work in a 'green' industry or not – it is impossible to tell using LFS data. This means that we are using data about the characteristics of jobs in an industry division to estimate the characteristics of a job in that division within the low-carbon sector. For example, we assume that someone working in architectural services outside the low-carbon economy has similar characteristics to someone providing architectural services within a low-carbon industry. We use data about everyone who works in architectural services at the moment as a guide to what jobs in low-carbon architectural services might look like.

There are many reasons why the characteristics of the two sets of people might not be similar, and so this method can only provide a guide to the possible nature of new jobs in the low-carbon sector. It is unlikely that new jobs in this sector will be identical to existing jobs as new jobs are likely to require different skills and different ways of working that could alter key features of the job and companies in the low-carbon sector may also operate in different ways to their high-carbon predecessors. However, this method does allow us to provide some useful data that help us to understand what newly created low-carbon jobs might be like.

Employer survey

We carried out an online survey of 39 employers currently operating in low-carbon sectors in the UK. The survey was conducted in May and June 2009.

Stakeholder interviews

We interviewed representatives from the following organisations:

- A2Sea, Denmark
- Spanish Wind Energy Association (AEE), Spain
- Apollo Alliance, USA
- British Electrotechnical and Allied Manufacturers' Association (BEAMA), UK
- British Wind Energy Association (BWEA), UK
- Confederation of British Industry (CBI), UK
- Creative Environmental Networks (CEN) UK
- Center on Wisconsin Strategy, USA
- Centre for Solar Energy and Hydrogen Research Baden-Wuerttemberg, Germany
- Clipper Windpower
- DIW Berlin, Germany
- E.ON, UK
- Eaga, UK
- Energy Efficiency Partnership for Homes, UK
- Federation of Small Businesses, UK
- General Electric (GE), UK
- Kensa Heat Pumps, UK
- Kirklees Council, UK
- Local Government Association, UK
- Los Angeles Academy on Construction, USA

Mainstream Renewables, UK
Mitsubishi, UK
MT Højgaard, Denmark
nkt cables, Germany
One North East, UK
Rolls Royce, UK
RWE nPower, UK
RWI Essen, Germany
SeaRoc, UK
Siemens, UK
SKF, UK
SummitSkills, UK
The Mark Group, UK
UK Commission for Employment and Skills, UK
Vestas, UK
Warwick Energy, UK
Wuppertal Institute for Climate, Environment and Energy, Germany