

For more information about:  
**ConstructionSkills Insight** contact

**Lee Bryer**  
Research & Development Operations Manager  
ConstructionSkills  
0344 994 4400  
lee.bryer@cskills.org

**ConstructionSkills website**  
<http://www.cskills.org>

<http://www.cskills.org/contact-us/index.aspx>

**Research pages on cskills.org**  
<http://www.cskills.org/sectorskills/researchfromssc/index.aspx>

# Understanding Future Change in Construction

**FINAL REPORT OCTOBER 2010**

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# 1. Executive Summary

## 1.1 Overview of research

The aim of this research is to establish an evidence base for ConstructionSkills on future skills across the construction sector. This takes the form of a high level overview of where the construction industry is expected to be in the short term (1-3 years), medium-term (3-5 years) and long term (5-10 years), and the resulting generic skills and training needs. The evidence base is to be enlightened by current construction industry views, utilised to underpin future research requirements and inform strategic thinking.

It should be noted that this Executive Summary relates to England, Scotland and Wales; key findings specific to Wales and Scotland are available as separate summary reports.

## 1.2 Research methodology

In order to obtain robust and objective feedback, a multi-faceted approach was adopted, to gather data through a range of separate routes. The combination of all research outputs have been used to inform this final report for ConstructionSkills.

### Literature review

The early stages of the research involved an in-depth literature review of industry policy across England, Scotland and Wales, covering the following main areas of interest:

- Innovation
- Renewables
- Zero Carbon
- Low Carbon
- Change
- Environment

The literature review undertaken at the outset of the project was subsequently updated throughout the process to take into account all additional relevant documentation and legislation that was produced during the lifespan of this research.

The second stage of the project involved detailed primary research; focus groups took place to explore industry's reactions and responses to the key industry drivers.

### Approach to the focus groups

Four focus groups took place across Great Britain between March and June 2010. These were attended by representatives from nearly 70 stakeholder organisations, including those within, as well as impacting upon, the construction sector. A wide range of stakeholders from all sub-sectors of the industry were invited to the events with the objective of gathering a broad variety of views from all aspects of the industry; of those that agreed to attend, participants spanned employers, training providers, Assembly representatives, Government bodies (including Sector Skills Councils and Regional Development Agencies) and representative bodies.

The focus groups were held in the following locations:

Region	Location	Date
Wales	Cardiff	31st March 2010
Scotland	Glasgow	22nd April 2010
England	London	9th June 2010
England	Kegworth (Midlands)	10th June 2010

### Structure of sessions

Focus groups commenced with an introduction from a representative from ConstructionSkills, which was followed by a presentation by Pye Tait on the relevant policies and likely drivers expected to impact on the construction industry, in order to set the research into context.

In Cardiff, London and Kegworth, participants moved into two separate breakout groups following the presentation, and each group then took part in discussions lasting approximately two and a half hours, with a short break midway through. Each breakout group was structured so that the broadest possible mix of participants spanning a range of stakeholder groups were grouped together, in order to gain views from the perspectives of all different groups.

In Glasgow the total number of participants was lower than anticipated and therefore only one breakout group was necessary.

Each focus group consisted of a recorded<sup>1</sup> round-table discussion forum focusing on the following topics:

#### Reaction to the environment, low carbon and zero carbon agenda:

- Short, medium and long term vision for the construction industry
- Other drivers
- Implications of change
- Barriers and market opportunities

#### Responses to the environment, low carbon and zero carbon agenda and other key drivers identified:

- Innovation
- Attitudinal change
- Skills and knowledge development

### Telephone interviews

The final stage of the project consisted of a series of in-depth qualitative telephone interviews with key stakeholders in the construction sector, to explore the emerging issues in more depth. As with the approach to the focus groups, a wide range of organisations – spanning SMEs to larger companies - were asked to provide their views, in order to gain robust input from a representative sample across all sub-sectors within the construction industry.

Of those that agreed to take part, interviews were carried out with 10 stakeholders based in England, 10 stakeholders based in Scotland and 9 stakeholders based in Wales. The feedback spanned the following sub-sectors as outlined below:

Region	1	2	3	4	5	6	7	8	9	10
England		✓	✓	✓	✓	✓	✓	✓		✓
Scotland		✓		✓	✓	✓	✓			✓
Wales	✓	✓			✓		✓		✓	✓

#### Key:

- |                      |   |
|----------------------|---|
| 1. Architecture      | 7. Building – domestic and commercial   |
| 2. Civil Engineering | 8. Consultancy (energy/environmental/design)  |
| 3. Insulation        | 9. Nuclear  |
| 4. Renewables        | 10. Other stakeholders (including professional forum, Government and skills bodies) |
| 5. Environmental     |   |
| 6. Low/Zero Carbon   |   |

### Methodological considerations

When reading this report it should be taken into consideration that opinions expressed represent the views of individuals and are not necessarily representative of their organisation or stakeholder group as a whole.

### 1.3 Overview of anticipated future change in the construction industry

Table 1: Short term drivers, implications and responses affecting the construction industry

	DRIVERS	IMPLICATIONS	RESPONSES
SHORT TERM (1-3 YEARS)	<p>Impact of the recession and the current economic climate means that the industry as a whole and in particular SMEs, is expected to focus on 'survival' in the short-term</p> <p>Budget cuts outlined in the Comprehensive Spending Review (October 2010) likely to impact upon capital projects, particularly schemes in the public sector</p> <p>Focus on profitability, remaining competitive and retention of market share</p> <p>Rise in carbon reduction and energy commitments across England, Scotland and Wales</p> <p>Public sector procurement processes requiring industry to evidence environmental/ sustainability policies</p> <p>Increasingly stringent procurement procedures</p> <p>Increase in prefabrication and off-site construction, with a corresponding decrease in traditional craft skills on site</p> <p>Costs a key driver for the consumer as well as the industry</p> <p>Legislation in relation to low and zero carbon, and renewables - "a stick that has to be wielded" (representative of the Built Environment Forum)</p>	<p>Industry has lost a percentage of its workforce and may contract still further as a result of the economic downturn and cuts to public spending</p> <p>Lack of clarity in relation to Government funding (scope and availability) across all nations</p> <p>Clarity needed from Governments in all nations on definition of zero and low carbon</p> <p>Likelihood that skills development will be limited unless there is a clear market opportunity to be gained as a direct result</p> <p>Very limited investment into training, skills and qualifications among SMEs in particular as they fight for survival; skills gaps in air tightness; thermal bridging, project management; design and planning</p> <p>Leaner and more efficient on-site construction processes to be sought – focus on waste management and recycling</p> <p>Rising number of framework agreements and lengthier procurement processes to impact on SMEs – likely to lead to higher costs for tendering, and fewer opportunities as PQQs become more stringent due to European regulations</p>	<p>Innovative and agile approach to remain competitive and retain market share expected to continue, although unlikely to be significant conversions of research into commercial opportunities, as limited scope for investment and risk-taking – particularly in relation to new 'untested' technologies due to the impact of the recession</p> <p>Industry responsive to the key driver of new legislation – focus on 'build tightness' rather than new technologies; however skills gaps remain in relation to air tightness and bridging</p> <p>Other skills gaps such as site management and design need to be addressed in the short-term but skills and training likely to remain at the bottom of the agenda in all nations and all sub-sectors among SMEs; focus will be on 'fight for survival' during the economic downturn</p> <p>Expected increase in building applications ahead of new regulations</p> <p>Decreasing numbers of apprentices (from a pre-recession high) expected in Scotland</p> <p>Increase in virtual 'bite-sized' modular learning</p> <p>Increase in number of expert energy consultants</p>

<sup>1</sup> Participants were informed in advance of the discussion that sessions would be recorded for the sole purpose of analysis and reporting

<sup>2</sup> This is also presented as a timeline of key anticipated changes in Section 3 of this report

**Table 2: Medium term drivers, implications and responses affecting the construction industry**

	DRIVERS	IMPLICATIONS	RESPONSES
<b>MEDIUM TERM (3-5 YEARS)</b>	<p>More joined-up support for the construction sector, such as an 'information hub' for employers</p> <p>Ongoing research and development – innovation in waste reduction and making new products out of waste for the construction industry and other markets</p> <p>Increasing legislation pertaining to low carbon, zero carbon, waste management and renewables</p> <p>Increasing numbers of procurement frameworks. More PQQ processes even for small contracts; European regulations governing procurement processes</p> <p>Commercial opportunities – but the consumer is driven by cost; social and environmental responsibility of low priority by comparison</p> <p>Limited lending from banks available to develop innovative technologies</p> <p>Threat of overseas competition within the EU in particular – already strong evidence of improvement in skills in key areas such as retrofit</p>	<p>Within SMEs, enhancement of core skills likely where industry can perceive a market opportunity, for instance the emergence of solar thermal installation skills</p> <p>However potential skills shortage for the sector as a whole, due to existing workforce moving towards retirement age; loss of personnel during the recession; reduction in number of apprentices and negative perception towards the sector (due to the recession) which may be a 'turn off' for potential new entrants</p> <p>Training solutions likely to be more geared towards companies rather than individuals – with a view to meeting Government targets for all nations in relation to carbon reduction and energy efficiency</p> <p>Growth in renewables sector expected as the sector aims to meet Government targets across all nations</p> <p>Some uncertainty in relation to the availability of Government funding across all nations expected to remain at this stage but some incentives may be offered in relation to meeting renewables targets</p> <p>Construction industry as a whole will continue to contract until c.2014</p>	<p>More cross-sector collaboration, such as technology companies working with system manufacturers</p> <p>Ongoing research and development – innovation in waste reduction and re-using waste products for the construction industry and other markets; innovation in respect of sustainability and eco-houses</p> <p>Opportunities to develop wind hydro energies and marine energy, particularly in Wales and Scotland</p> <p>Decommissioning of some power stations expected, but new power station to be built in Anglesey expected to create opportunities in Wales. Energy Island programme in Anglesey projected to create up to 5,000 jobs for the construction sector and support growth of wind, tidal, biomass, micro generation and hydrogen schemes</p> <p>Focus on retrofitting – opportunities to achieve low and zero carbon legislative targets</p> <p>Increasing focus on improving productivity</p> <p>Numbers of apprentices expected to start to rise again in Scotland</p> <p>Clarity needed in relation to specific skills requirements in the renewables sector</p>

**Table 3: Long term drivers, implications and responses affecting the construction industry**

	DRIVERS	IMPLICATIONS	RESPONSES
<b>LONG TERM (5-10 YEARS)</b>	<p>Structure of industry expected to shift; in part this could result from an increase in collaborations and mergers in previous years</p> <p>Availability of cheaper and more efficient 'off the shelf' energy solutions following advancements in technology</p> <p>Increasing legislation pertaining to low carbon, zero carbon, waste management and renewables</p> <p>Increase in modular housing</p> <p>Government support to develop new housing expected across Wales and England in particular</p> <p>Cost expected to still be the key driver for the vast majority of consumers and employers</p> <p>Budget rise for the Department of Energy and Climate Change by 2015</p>	<p>Potential loss of a number of SMEs as a result of the impact of the recession</p> <p>Establishment of more affordable technologies that are compliant with legislation</p> <p>Social housing programme to be driven by Local Authorities</p> <p>More affordable technologies likely to become standard for new builds in the future</p> <p>Skills shortage likely to remain an issue for the sector as a whole, as the impact of the ageing workforce is felt</p> <p>Opportunities to improve carbon efficiency through new design and ongoing maintenance working practices</p> <p>Opportunities for increased collaboration between industry and universities/colleges to ensure skills and training in alignment with industry requirements</p> <p>Need for focus on continuing development of waste reduction/recycling processes and techniques</p>	<p>Establishment of more affordable technologies that are compliant with legislation and likely to become standard for new builds in the future</p> <p>Better consumer awareness of longer term benefits of reduction of carbon emissions and sustainable products may result in attitudinal and cultural shifts; increased consumer demand for low and zero carbon domestic homes; more interest in solar and geo thermal</p> <p>Clearer picture of the renewable energies that will best serve the market for the future</p> <p>Industry as a whole will be leaner, with more efficient working practices; opportunity to strengthen internal bid writing processes in response to stringent procurement requirements</p> <p>A large number of SMEs, particularly in rural locations in Scotland and Wales, may have created partnerships with other organisations in order to survive</p> <p>Development of new skills particularly in insulation, micro-generation and heating systems; increasing focus on multi-skilling through the availability of flexible virtual learning platforms</p> <p>Growth of marine and wind technologies particularly in Wales and Scotland; Anglesey predicted to become the hub for low carbon energy generation in the UK following investment into the Energy Island programme</p> <p>Savings will be achieved in construction</p>

## 2. Detailed Findings

### 1.4 Key findings

A number of drivers have been identified that are expected to prompt changes for the construction sector which could have far-reaching impacts, in relation to skills and training, productivity, innovation, and the overall structure of the industry.

The impact of the recession, coupled with the threat to construction schemes as a result of Government spending cuts, means that survival is the biggest immediate driver for the construction sector as a whole, particularly for small and medium sized enterprises (SMEs) which comprise the majority of the sector. Commercial drivers such as profitability and retention of market share currently take precedence over legislative and policy drivers, such as low and zero carbon targets.

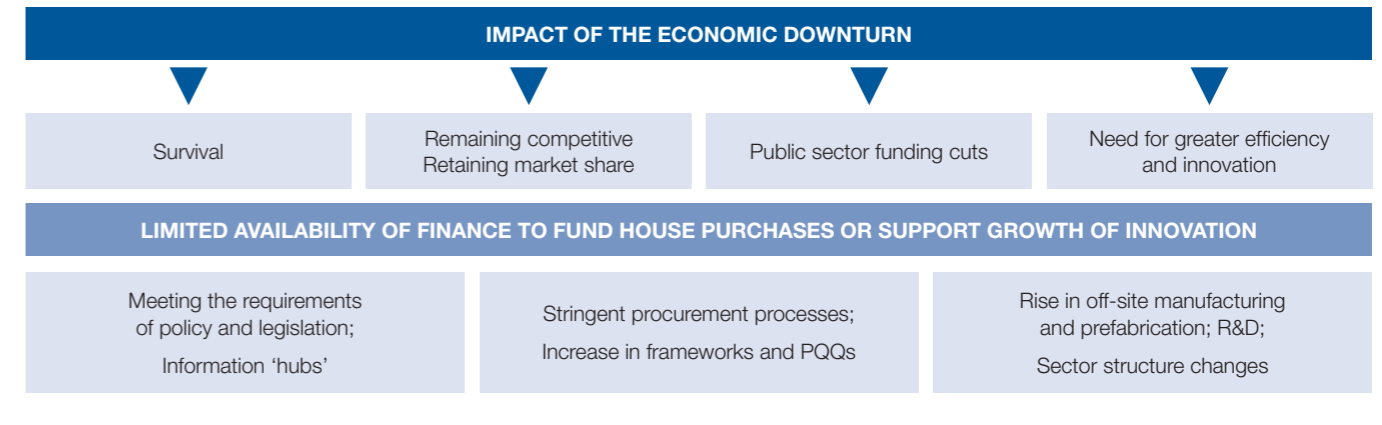
Over the medium to longer term, banks will be in a position to influence the recovery of the industry, given that as lending starts to improve, in consequence this will stimulate opportunities in the market.

Although most organisations acknowledge that addressing skills and training needs of their employees is of great importance, the impact of the recession means that actual investment into skills development will remain at the bottom of the agenda for the vast majority of employers in the short-term. Commercial drivers are likely to impact on upskilling, as many organisations will typically only invest in training where there is an opportunity in the marketplace that can be realised. The sector will therefore experience inevitable skills shortages over the medium to longer-term as the country emerges from recession.

Over the medium to longer-term, low and zero carbon targets together with the growth of the renewables sector, particularly in Wales and Scotland, are expected to drive the development of some new skills, but the risk of skills shortages and gaps could remain significant unless action is taken to address this. The three key priorities of the Scottish Government at the present time are: economic productivity, reducing carbon emissions and supporting key public services. These priorities are therefore likely to be protected from funding cuts and could make a difference to the development of the industry in Scotland.

The conversion of innovative ideas into actual market opportunities is likely to be constrained by lack of investment; with individuals and organisations less willing to take risks in relation to untested products and processes. However as the country recovers from the economic downturn over the longer-term, and costs in respect of the 'green' agenda begin to come down, there will be more opportunities for the industry, for example in retrofit – but to maximise these opportunities, development must be facilitated largely through improvements to productivity, increased collaboration with academia, Government support and better consumer awareness of the carbon agenda. Much of the onus for change will also be on the organisations themselves – with contractors now typically expected to take on more of the design role –undertaking this function effectively is clearly critical.

### 2.1 Drivers



“ ‘Need’ is the social need to reduce carbon, improve the thermal performance of existing buildings, and respond to the climate change commitment.

‘Demand’ is driven by the market, taking into account cash or other incentive/disincentive.

Focus group participant, Midlands

#### 2.1.1 Impact of the recession

It is the drivers behind the low and zero carbon agenda that resonate most with the construction industry, although many respondents acknowledged that over the longer-term, increasing legislation in relation to the 'green' agenda will be a catalyst for change.

For the vast majority of respondents, the key future drivers within the construction industry are less about social and environmental responsibility and more to do with survival in a challenging economic climate and future business prosperity. One respondent highlighted that in a tough economic climate, the construction sector is the first to suffer.

The private sector has been severely impacted by the recession, notably in the commercial, industrial and private housing sectors.<sup>3</sup> Some public sector funded projects are expected to survive, such as the Olympic Park development – however many planned improvements to schools have been halted by the Coalition Government. An average growth in construction output of 1.7% per year between 2010 and 2014 has been forecast but it is likely that the private sector will see an increase, whilst public sector construction will face cuts in public spending.

<sup>3</sup> ConstructionSkills Network Blueprint 2010 – 2014; and, Foresight Group, 2008, Powering Our Lives: Sustainable Energy Management and the Built Environment – Final Project Report; and, BIS (2009), Skills for growth: The national skills strategy

There have been substantial losses in employment across the whole of the construction industry – which is expected to peak in 2011 at 400,000, which represents a 15% decline. Unemployment figures, however, have remained relatively static and therefore this suggests that a proportion of the workforce in the construction sector may have moved out of the industry altogether.

Respondents from all sub-sectors and all nations have indicated that the current economic climate has brought about a cloud of uncertainty about what can be planned for and what can be achieved in the future - particularly in relation to the short term future of the construction industry.

Participants attending the focus group in Wales raised the point that banks have become more cautious in their lending to support construction and property development - especially concerning technologies that are not tried and tested, in the sense that they have not been widely adopted by the consumer. The impact of lending policies is likely to hit smaller business more significantly.

Once the economic climate starts to improve over the longer-term, the housing sector in all nations is likely to pick up following an injection of Government support. In Wales the Assembly Government has committed to an increase in affordable housing. Whilst the Government in Scotland is also committed to housing development, it is possible that activity in England will be implemented more quickly, as the need there is more acute.

### 2.1.1.1 The Comprehensive Spending Review

In the October 2010 Comprehensive Spending Review, the Chancellor revealed that capital spending will increase by £2bn to £51bn in 2011, and will drop to £49bn, £46bn and back up to £47bn in the subsequent three years. While a better outcome than expected for the UK as a whole - public sector capital spending will reduce more significantly - by 17%.

In the UK, Capital spending on transport, education and housing will drop. The Department for Communities and Local Government's capital budget will shrink by almost three quarters, falling from £6.9bn this year to £2bn by 2014/15.

There will be further investment in energy for the UK, with headlines as follows:

- The Department of Energy and Climate Change will see its annual budget rise to £2.7bn by 2014/15, a real terms rise of 41%;
- The Green Investment Bank will be created, supported by £1bn of funding;
- £200m will be invested in offshore wind;
- £1bn will be invested in creating a carbon capture and storage demonstration plant;
- £860m of funding will be spent on the Renewable Heat Incentive, to be introduced from 2011/12;
- Capital spending on nuclear decommissioning will increase over the next four years<sup>5</sup>.

In Wales and Scotland, the devolved Governments are particularly concerned about the disproportionate impact of cuts on their respective nations, as opposed to the wider UK picture.

The Welsh Assembly Government's total funding will be cut by £900m, with capital funding, in real terms, falling by 40%<sup>6</sup>. The Scottish Government's total funding is set to be cut by £1.3bn in cash terms for the 2011-2012 financial year, with cuts to capital expenditure of £800m<sup>7</sup>. The Scottish Government has stated that the cuts are putting its infrastructure programme (worth £3.3bn in 2010-2011) "at risk"<sup>8</sup>.

The decisions of the Comprehensive Spending Review have been included here to provide as broad a view as possible of the current context for the construction sector. This information was not available at the time of the focus groups and in-depth interviews, however respondents did provide their views in the context of anticipated funding cuts. The full extent of the impact that these cuts will have on capital and refurbishment construction projects and for the sector as a whole is, at the time of writing, unclear.

### 2.1.2 Commercial Drivers

Commercial factors, notably a focus on profitability and retention of market share, will be key drivers for the whole of the industry over the short, medium and longer-term.

“ *The developer will not invest if the consumer will not buy.* ”

Director, architecture company  
(Wales & England)

The consumer is expected to be driven predominantly by cost; while social and environmental responsibility is a consideration, it is not the main priority – however over the longer-term increased levels of awareness among consumers in relation to the 'green' agenda is likely to start generating demand. Similarly the industry will typically only invest in support of the 'green' agenda, and working practices in relation to achieving low and zero carbon emissions, if there is a clearly recognised commercial opportunity for doing so – therefore this is likely to increase as demand rises.

Larger organisations have more scope than small and medium enterprises (SMEs) to invest in corporate social responsibility – but it is the SMEs that comprise the vast majority of the sector as a whole.

### 2.1.3 Policy and legislation

The legislative drivers concern low and zero carbon targets, and associated regulations that are scheduled to impact upon the construction sector in the short, medium and longer-term. Grants or other forms of financial incentive to support the sector in meeting targets are not expected to be widely available in the short-term; many respondents noted that a scheme of some kind may have to be introduced in the long-term, otherwise the changes will not take place.

<sup>4</sup> ConstructionSkills Network Blueprint 2010 – 2014

<sup>5</sup> <http://www.theconstructionindex.co.uk/news/the-construction-index-news/How-construction-is-affected-by-the-spending-review>

<sup>6</sup> <http://wales.gov.uk/newsroom/firstminister/2010/101020spending/?lang=en>

<sup>7</sup> <http://www.scotland.gov.uk/News/Releases/2010/10/20083324>

<sup>8</sup> <http://www.scotland.gov.uk/News/Releases/2010/10/20083324>

Wide-ranging legislative targets driven by the 'green' agenda and policy-makers are already impacting on parts of the sector, notably domestic and commercial construction. Targets set for the UK typically override all others set in Wales and Scotland; however specific targets set for the devolved nations are also included here to highlight differences and similarities across all nations. In the UK public sector non-domestic buildings are targeted to be zero carbon from 2018, and remaining non-domestic buildings from 2019.<sup>9</sup> Increased levels of energy efficiency will be embedded through Building Regulations and the Code for Sustainable Homes<sup>10</sup> (the latter does not apply to Scotland).

By 2020 "low carbon skills will have to be fully embedded into the mainstream UK economy."<sup>11</sup> Carbon reduction targets and commitments to increased energy efficiency and renewables are expected to increase in prominence in the short-term, and over the medium to longer-term, additional legislation is expected to be introduced.

The UK Government's Low Carbon Transition Plan has placed the focus on:

- cutting emissions;
- maintaining secure energy supplies;
- maximising economic opportunities; and
- protecting the most vulnerable.<sup>12</sup>

For domestic homes, the Transition Plan sets out targets to achieve smart meters in every home by 2020 and previously pledged £3.2 billion of support to help homes become more energy efficient.<sup>13</sup> A number of respondents from the home building sector expect to see more stringent energy efficiency standards in England for new builds by 2013.

In Wales the low and zero carbon priorities are high on the agenda – the Welsh Assembly Government has set a target of 55% reduction in carbon emissions (over the 2006 Building Regulations) as the target for the first changes in devolved Building regulations.<sup>14</sup> This is to take effect from 2013.

A programme of support in improving domestic energy efficiency standards will be introduced, in relation to the installation of new technologies and creation of community-level energy generation projects.<sup>15</sup> A further objective for Wales is to generate up to twice as much renewable electricity per year by 2025 (compared to present day) and by 2050 – at the latest – have almost all energy needs met by renewable electricity (e.g. through wind and marine sources).<sup>16</sup>

The Welsh Strategic Energy Performance Investment Programme, Arbed, has an objective to stimulate and deliver investment into the energy performance of existing domestic housing, which will generate 'green' jobs in the built environment supply chain, reduce carbon emissions and reduce fuel poverty. The first phase is expected to benefit 20 communities in Wales' strategic regeneration areas.

There is some concern in Wales that even where legislation is due to be implemented sooner than in England, private sector development is likely to take place in England as associated costs are not as high. However respondents have also acknowledged that housing associations and Local Authorities will be compelled to react to the legislation.

In Scotland<sup>17</sup>, the Renewables Action Plan has set a headline target of 20% of energy use to be sustained by renewable sources, by 2020 – comprising renewable electricity, renewable transport and renewable heat.<sup>18</sup> Under the Renewables Action Plan 50% of Scotland's electricity is to be generated from renewable sources by 2020. This target was revised following a Ministerial announcement in September 2010, and is now to achieve 80% electricity from renewable sources by 2020<sup>19</sup>. An initial focus on industrial, commercial and public sectors, will be followed by a strong emphasis on improving standards of existing housing stock (some 50% of Scotland's heat use in the domestic sector) such as retrofitting micro-renewables.<sup>20</sup>

Scotland's target is to achieve total zero carbon buildings by 2030 – with phased zero net carbon emissions for space heating, hot water, lighting and ventilation by 2016-17.<sup>21</sup> Very low carbon standards will be introduced in 2013<sup>22</sup> - but there will be gradual increases in energy standards between 2010 and 2013, with the introduction of the Scottish Building Standards 2010 aiming for a 30% reduction in carbon emissions beyond current standards.<sup>23</sup> The Climate Change (Scotland) Act

2009 sets a target to reduce emissions by 80% by 2050, and at least 42% by 2020.

The Scottish Government's Zero Waste Plan (2009) has the objective for no more than 5% waste to be landfilled and 70% recycling of municipal waste by 2025.

Regulations are perceived to set minimum standards across all nations, with the majority of respondents suggesting that businesses are likely to look for the cheapest and most efficient way of meeting those requirements.

Participants in Wales suggested that legislation would need to pay greater attention to compliance, monitoring and sign-off processes, to ensure that corners are not being cut. Failure to pay correct attention to legislation may impact on build quality and the effectiveness of carbon reduction and energy saving measures. Some respondents in England and Scotland felt that the 'green' agenda will act as a constraint on businesses, due to costs incurred in implementing actions required to meet the targets.

Feedback from Scotland also suggests that current targets are unlikely to be achieved within the timescales as currently set out.

<sup>9</sup> BIS (2008), Strategy for Sustainable Construction  
<sup>10</sup> Ibid.

<sup>11</sup> Aldersgate Group (2009), Mind The Gap: Skills for the Transition to a Low Carbon Economy

<sup>12</sup> HM Government (2009), The UK Low Carbon Transition Plan: National strategy for climate and energy

<sup>13</sup> HM Government (2009), The UK Low Carbon Transition Plan: National strategy for climate and energy

<sup>14</sup> Building regulations powers transfer to Wales on 31st December 2011

<sup>15</sup> WAG (2010), A Low Carbon Revolution: The Welsh Assembly Government Energy Policy Statement

<sup>16</sup> Ibid.

<sup>17</sup> A new Low Carbon Strategy is due to be published for Scotland, following consultation in early-mid 2010, and this may impact upon targets

<sup>18</sup> Scottish Government (2009), Renewables Action Plan

<sup>19</sup> <http://www.scotland.gov.uk/News/Releases/2010/09/23134359>

<sup>20</sup> Scottish Government (2009), Renewable Heat Action Plan for Scotland: a plan for the promotion of the use of heat from renewable sources

<sup>21</sup> Sullivan (2007), A Low Carbon Building Standards Strategy For Scotland

<sup>22</sup> Ibid.

<sup>23</sup> Scottish Building Standards Agency: [www.sbsa.gov.uk](http://www.sbsa.gov.uk)

#### 2.1.4 Procurement processes

“ *The staff need to know the detail behind those environmental policies...to demonstrate (within tenders) how they are going to deliver a carbon reduction target needed by a client.*

**Focus group participant, Scotland** ”

Changes in legislation are likely to translate into Local Authority contractual requirements - meaning that procurement processes are expected to become another important driver as companies will have no choice but to respond.

Pre-qualification questionnaires (PQQs) are placing increased importance on environmental and sustainability policies held by tendering organisations; as well as quality standards and experience and skills relating to specific materials and processes, including waste management. Changes to procurement processes are therefore expected to act as a conduit for businesses to drive through changes within their organisation in order to adapt and survive in a competitive market.

Over the medium to longer-term, procurement requirements are expected to become even more stringent for all parts of the sector – in part led by regulations introduced by the EU. Respondents consider that this will have a particularly strong impact on SMEs, as the costs and time incurred to pass through PQQ stage, even for relatively small contracts, are continually increasing. Increasing numbers of framework agreements are expected to be implemented which will add to the pressure particularly for SMEs.

In the Midlands a number of participants at the focus group felt that procurement processes will continue, in many cases, to be governed by ‘best price’. This view was echoed by participants in London. This is a significant concern in Wales in particular – which is heavily reliant on the public sector, and where there is an abundance of SMEs that could find it very difficult to reduce costs in order to compete with larger organisations based outside of the country.

In Scotland organisations are facing issues in procurement among Local Authorities, as there appears to be no common strategy, which can make the process extremely time-consuming.

“ *If we are not careful, European regulations will strangle the industry*

**Managing Director, construction company (Wales)** ”

However the changing procurement processes could also help to develop the structure of the industry, given that SMEs will have to adapt by improving internal structures and processes that will enable them to respond appropriately to the demanding requirements.

#### 2.1.5 Information and support

Respondents are expecting to see the growth in availability of information and knowledge for the sector as a whole – potentially through the form of an ‘information hub’ or knowledge sharing partnerships for organisations. This is likely to develop over the next 3 to 5 years, as employers and universities recognise the need for increased collaboration to help them to address and respond to changes in the industry.

The scope of overseas competitors to upskill and develop capacity to provide low and zero carbon based solutions and working practices will be another catalyst for improved knowledge and communications within the sector in the short-term.

Collaborations and mergers could increase over the longer-term, which in turn could affect the whole structure of the industry. In the short-term, SMEs in particular are keen to forge stronger networks that may result in commercial opportunities.

#### 2.1.6 Research and development

The growth of off-site manufacturing, modular housing and pre-fabrication in recent years is expected to continue. With tightly controlled processes to improve construction efficiency and minimise waste, this is a key driver owing to the implication for traditional construction skills, particularly on new build sites.

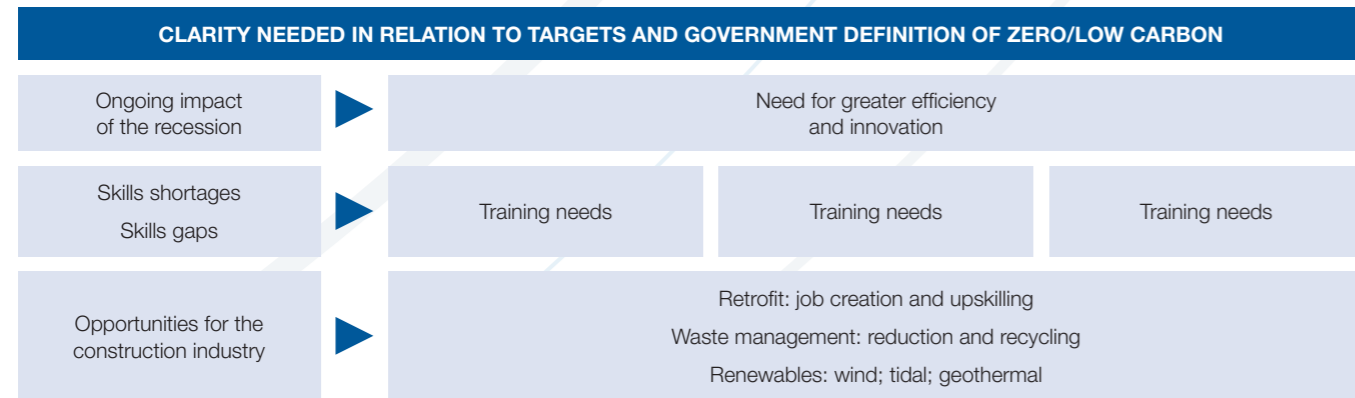
In the longer-term, more ‘off the shelf’ solutions may be developed in response to energy efficiency targets as a result of concentrated research and development. Innovation in waste reduction and increased means of recycling waste products is anticipated for the commercial and domestic built environment in particular over the next 3 to 5 years.

There is likely to be an increase in requirement for innovative methods of construction, with a subsequent increase in training needs, reduction in demand for some trades on-site but increase of others in factories (e.g. creation of pre-fabrication), and more computer aided design. The use of new materials may also have an impact on industry requirements, in terms of training and development, and increased specialism in off-site activities.<sup>24</sup>

<sup>24</sup> 2020 Vision: The Future of UK Construction: Executive Summary



## 2.2 Impacts



### 2.2.1 Clarification of targets and definitions

Feedback from the vast majority of all respondents highlighted that there is a call from the industry for more guidance from Governments in all nations on whether targets and dates relating to carbon reduction will change or remain the same, and more importantly, clear definitions of low and zero carbon, and what will be expected of them in consequence. Without this information, SMEs in particular find it very difficult to identify how they should be responding.

Furthermore there is a lack of clarity for the consumer in relation to regulations and quality standards for domestic homes.

There is significant uncertainty and lack of clarity surrounding the definition of 'zero carbon' - compounded by the fact this has previously been subject to change and may differ between domestic and commercial construction projects. This definition is currently being reviewed by the Zero Carbon Hub. However it should be taken into consideration that few contractors are, as yet, addressing Code 4 requirements as the focus is still on Code level 3 needs.

Feedback from Wales described how 'Code 5' previously represented a 100% improvement in regulated energy (heating/lighting/ventilation). This was subsequently changed to a 70% improvement, with the remaining 30% attached to unregulated areas ('allowable solutions').

The impact of this uncertainty could lead companies to question how well current targets will hold up in the future. The potential changes to legislative requirements was another reason put forward by organisations – and by SMEs in particular – for the limited investment into training during the current economic climate. Respondents also felt that in order to engage SMEs, the agenda needs to be simplified as well as clarified.

A number of respondents in the domestic and commercial construction sector expressed concern that "corners will be cut" due to the pressure of keeping costs low, if regulations are not clearly defined.

Clarification is needed as to how improvements in carbon reduction and energy efficiency are going to be measured and verified. This is particularly important when considering the need to sell the benefits to clients. In Wales, reference was made to the CRC energy efficiency scheme – formerly known as the Carbon Reduction Commitment - as a means of providing a carbon footprint measure - whilst it was commented that this would apply to large businesses and not necessarily make a huge impact due to the large concentration of smaller businesses in Wales; sub-contracted providers that comprise many of the SMEs will also need to respond to the requirements.

The Energy Performance Certificate (EPC) which applies ratings to buildings and became a requirement for public buildings in 2001, is also a driver.

Participants in most focus groups referenced tariff structures for power and heat as methods for encouraging the use of alternative technologies.

Some respondents from Wales commented that tariff structures do not necessarily relate to the most efficient and cost-effective technologies. One example given was the inclusion of ground source heat pumps, with the view that air heating - not included in the tariff - is arguably a more effective type of heat capture.

### 2.2.2 Ongoing impact of the recession

Across all sectors SMEs are considered to be at risk – but particularly in Wales, where the region is so heavily dependent on the public sector. First time buyers are likely to face difficulties in securing mortgages in the short to medium-term; this will impact on the domestic housing sector.

The risk of a double-dip recession could result in still more redundancies for the construction industry. The sector as a whole is expected to contract until at least 2014. Respondents expect that a proportion of SMEs will not survive this period unless diversification into new areas can be achieved. However this would require investment.

In the longer-term, the effects of the recession are expected to be still apparent in relation to the workforce in the sector. Feedback from the focus groups suggested that fewer<sup>25</sup> new entrants – graduate and apprentices – are currently entering the industry as the impact of the recession on the sector has been an off-putting factor; and as there is already an ageing workforce in many sub-sectors, there could be severe skills and labour shortages in the long-term.

In the short-term there is a lack of clarity in terms of the availability and type of Government funding across all nations. Over the next 3 to 5 years however, respondents expect to see incentives to develop the renewables technologies and processes.

<sup>25</sup> Compared with typical numbers over the past 10 years

### 2.2.3 Impact on small and medium organisations

“SME's are just scrabbling to get work. Learning opportunities are available, for example seminars and conferences in relation to upskilling but companies are not interested unless there is a commercial opportunity.”

Representative of  
Constructing Excellence

Respondents strongly felt that it will be the larger businesses that will be more adept at flexing in response to the key industry drivers and meeting client demands, in the short to medium-term. For example Skanska's Green Initiative includes the publication of a book on green building solutions ('Green Thinking'), as well as implementing this expertise on major construction projects worldwide, and participating in Green Building Councils across Europe.<sup>25</sup>

Survival is the biggest driver for SMEs - more so than ever in the current economic climate. SMEs do not necessarily have the time, the inclination and the resources to respond to the sustainability agenda.

Smaller businesses are likely to be more reactive than proactive, to change that is 'thrust upon them' as a result of the drivers. As the bulk of the industry comprises SMEs, this is likely to mean that upskilling will take place only over the medium to longer-term and perhaps then only when they are compelled to do so, be it in response to legislative requirements or to capitalise upon market opportunities.

The scope of a principal contractor's commitments to change, however, is likely to impact upon the supply chain and provide the opportunity to take those smaller companies on the 'journey'. Most respondents agreed that this would be a positive effect in the form of upskilling for the medium-term, but could also result in small businesses excluded from large contracts being left behind.

The expected increase in framework agreements and more stringent procurement processes will impact strongly on SMEs. A number of respondents believe there to be many obstacles for smaller contractors that will be unable to submit successful bids.

“This is likely to close the door for many SMEs where they bid unsuccessfully to be on the framework. The effects of this will be felt for the next 5 years.”

CEO, housing company (Wales)

Many of those based in rural locations, particularly in Wales and Scotland, are unlikely to be able to expand their resources to overcome these barriers, and lack both the infrastructure and willingness to transport their workers to other parts of the country where work is available. The rise in VAT from January 2011 will exacerbate the problems.

One respondent based in Wales cited an example of a recent PQQ round where 30 bids were submitted to undertake a building project in Wales. Of the 5 that passed this stage, only one company was actually based in Wales.

Gaining representation from SMEs at consultation and knowledge sharing events presents a significant challenge due to the financial loss that might be incurred for a small business owner to step away from the business even for one day. It is vitally important that SMEs are engaged with the sustainability agenda in order to ensure that the construction sector as a whole is able to meet the targets and legislative requirements that are forthcoming.

Participants at the Midlands focus group described the need to incentivise SMEs using a 'carrot rather than a stick' approach, in order to bring them on board - such as grants for training.

One key risk of not addressing the challenges faced by SMEs is that retrofitting and refurbishment may not be properly effected in line with the carbon reduction agenda. This issue is particularly pertinent given that the vast majority of housing stock is in the private sector. SMEs are also at risk of losing out in the short to medium term, as a result of procurement processes that are expected to place increasing emphasis on requirements such as demonstrating an environmental/sustainability policy.

### 2.2.4 Skill shortages and gaps

As the sector emerges from the recession there are likely to be severe skills shortages due to the current lack of investment into training and development. Respondents in general believe that a culture of ongoing training and skills development is lacking, across the whole of the sector. Over the longer-term, training needs to become more flexible as it is, generally speaking, currently not considered fit for purpose. Training solutions are likely to be geared towards companies rather than individuals.

“There is a mismatch between what is being taught at university and what is needed in the real world.”

Director, new homes construction company (England)

The ability of the SME workforce, particularly in relation to retrofitting buildings, installing new technologies, and providing advice to consumers has been questioned within existing research. According to research carried out in 2009<sup>27</sup>, one in three firms reported skills gaps in relation to:

- Installation of new technology
- Engineering
- Higher level skills – adapting to new technology
- Development of new business models

Respondents also raised longer-term concerns that new entrants to the industry lack core skills such as business enterprise and communication, as well as fundamental English, Maths and ICT skills. With more computerised diagnostics systems anticipated within the industry in the future, the need for a solid base in ICT is becoming increasingly important.

In 2009 the Gibson Review highlighted insufficient numbers of skilled construction engineers – particularly those with skills in design, planning and project management.<sup>28</sup> This was echoed by respondents to this research, with representatives from the architecture, civil engineering and domestic housing sectors clearly stating that the biggest gaps in skills relate to project management and planning, with the ability to recognise quality and spot errors regarded as most crucial. At senior level in particular, this is an essential requirement.<sup>29</sup>

<sup>25</sup> <http://www.skanska.com/en/About-Skanska/Our-green-initiative/We-talk-and-walk-Green/>

<sup>27</sup> Aldersgate Group (2009), Mind The Gap: Skills for the Transition to a Low Carbon Economy

<sup>28</sup> Gibson Review of Productivity and Skills in Engineering Construction, 2009

<sup>29</sup> BERR (2008), Innovation in Construction Services

Construction sites are now cleaner and more efficient compared with twenty years ago, with increased focus on 'just in time' processes. According to London participants, skills in logistics and facilities management among site managers and supervisors are going to be increasingly important in order to maintain this approach.

A key concern is that there is an existing skills gap in site management; in many cases the abolishment of the 'clerk of work' role on sites is believed to have resulted in poor adherence to quality procedures and standards. This issue is expected to get worse in the short-term if this skills gap is not addressed.

“*Fabric can only deliver a certain percentage of low/zero carbon – skills in professional services such as design, planning and architecture are needed.*”

*Focus group participant, Wales*

“*It's about how you control the people that work under you on a site. Good management and management knowledge is important.*”

*Focus group participant, Scotland*

Respondents also identified significant gaps in skills required for air tightness and thermal bridging, both of which require different skills for designers and on-site staff and a practical understanding of both concepts is needed. No training course is currently believed to be on offer and it is unclear at present how this will be addressed, and how long this might take.

Several focus groups described how new legislative requirements will place increasing emphasis on the design phase in construction – leading to the need for designers and consultants who are well versed in sustainable materials and technologies. It was commented that in other countries, such as Switzerland, there has to be a person on the design team to sign off the low carbon aspects of a design. This was considered as a possible future way forward for the construction industry in all nations, however it is extremely unlikely that responsibility for the low or zero carbon elements in their entirety would ever be the remit of just one member of a team.

The emergence of the renewables sector is expected to create a need for specialist skills, in planning and design in particular. The role of the Domestic Energy Assessor will require specialist knowledge to undertake adequate energy assessments, and provide consumers with technical advice on all types of housing stock/ technologies related to 'eco-refurbishment'.<sup>30</sup> Additional capacity to ensure competence in insulation so that standards continue to be met will be needed to respond to the high level of demand expected for cavity wall and loft insulation. The UK Government is rolling out new competent worker schemes in insulation and re-roofing in order to help address this.

An initiative developed by ConstructionSkills, the Zero Carbon Hub and NHBC is identifying key issues, potential impacts on the home building sector and how they can be addressed – primarily through the Consultation on Home Building Skills – an Action Plan to 2020. The findings from this research are being developed into an online hub which will be accessible to all those involved in house building, to identify what training is required and where it can be found. The Energy Efficiency Partnership for Homes, a network of over 500 public, private and voluntary sector organisation members collaborate to drive the development of standards and best practice for energy efficiency, carried out a strategic review of training and skills identification. A UK-wide initiative developed by ConstructionSkills, the Zero Carbon Hub and NHBC is identifying key issues, potential impacts on the home building sector and how they can be addressed – primarily through the Consultation on Home Building Skills – an Action Plan to 2020.

Better understanding and prioritisation of low carbon initiatives is required among designers and clients, as well as senior facilities and buildings managers, and mechanical engineers. Research suggests that specialist training centres will be created to directly tackle the shortage of skills, such as iNet for Sustainable Construction.<sup>31</sup>

A programme of retrofitting would provide the construction sector with an opportunity to create new jobs and invest in upskilling. A more strategic approach to skills supply is needed to target the delivery of skills to sectors (including construction) as being important to the low carbon transition.<sup>32</sup>

Behavioural and attitudinal change is a clear issue within the construction industry regarding climate change issues; existing research paints the picture of an industry unlikely to choose to seek new training, or to embrace new technologies and working practices unless legally required to do so. Innovation is typically underpinned by the need to become more efficient, for example.

Participants in Wales described how the principles associated with 'place-making' are becoming increasingly important in construction. This involves an understanding and appreciation of client-side concerns and usage plans through much closer consultation, to ensure that buildings are fit for their intended purpose. These need to be incorporated into the design as well as the construction phase.

There will continue to be niche markets for specialist technologies. Participants in Scotland described high end one-off houses as examples of a niche market interested in micro-generation products - driven by an 'eco-urge'. As echoed by some participants in London - niche markets will require the continuing supply of specialist skills, including heritage and conservation skills.

The majority of participants felt that the future of new builds will witness a de-skilling within traditional craft trades. This will be attributed in particular to the steep rise in off-site manufacture and pre-fabricated buildings and pods.

Manufacturers are taking an active role in the installation and maintenance process, potentially negating the need for specialist subcontractors as part of new build projects. The potential implication for the industry in the medium-term is that manufacturers will continue to use their own teams only for repair and maintenance, which would reduce the spread of key skills needed to deliver this, among the rest of the industry.

<sup>30</sup> DECC (2009), Heat and energy saving strategy consultation; and, Foresight Group (2008), Powering Our Lives: Sustainable Energy Management and the Built Environment – Final Project Report

<sup>31</sup> BIS & DECC (2009), The UK Low Carbon Industrial Strategy

<sup>32</sup> Environmental Audit Committee (2009): Green Jobs and Skills, Second Report of Session 2008-09

These gaps need to be plugged now so that the industry can progress, and it was felt by some participants in London that there is a role for ConstructionSkills in providing the support to address these issues.

The changes for the industry are expected to be a driver for additional quality marks and regulation. Contractors will be expected to provide overall assessments that will test and demonstrate building suitability – this has not been a significant part of their remit in the past and these needs will have to be addressed with appropriate upskilling.

“ *To have low energy buildings you need high quality construction.* ”

Low carbon Consultant

The Construction Skills Certification Scheme (CSCS) card is the industry's largest scheme and, at present, covers 220 occupations including trades, technical, supervisory and management.

CSCS cards list the holder's qualifications and are valid for either three or five years. It also shows they have health and safety awareness as all cardholders have to pass the appropriate CITB-ConstructionSkills Health and Safety Test.

Many contractors and clients now demand proof of competence, before allowing workers onto their sites, which is provided by a CSCS card or equivalent.

There are mixed views on the value of certifying or 'badging' workforce competence, skills and quality. A number of focus groups participants commented that the CSCS card scheme is not always used or relied upon within the industry to 'evidence' competence – however this is not a universally held view.

For some participants in Wales and Scotland certification is considered to be an extremely important option and in need of attention in the short-term. The challenge is that there are so many types around and Local Authorities may not know which to go for. It was argued that certification needs to be appropriate for purpose and not a bureaucratic process for industry, as is generally felt to be the case at present.

In London, one participant highlighted that competence requirements will differ from one occupation to the next, but that employers would generally opt to take someone on requiring the least amount of training time and investment in order to ensure the right competence level is in place for the job.

## 2.2.5 Opportunities

“ *The renewables sector will continue to grow - despite the recession.* ”

Renewable energy association

The world's largest offshore wind farm near the Kent coast was opened in September 2010; this will result in up to 341 turbines being installed over a four-year period. Feedback from the industry strongly stated that the UK Government needs to maintain and where possible, increase investment into renewables to facilitate this type of development.

There are clear opportunities emerging within the renewables sector, particularly the construction of new nuclear, tidal and wind power plants. In Wales, incentives from the Welsh Assembly Government are anticipated that will support the development of renewables technologies. Energy prices are continuing to increase<sup>33</sup> which is likely to be a further catalyst for change.

In Scotland there are many prime locations for development of wind technologies. There is huge scope for growth in the off-shore wind sector in all nations, but wave and tidal are still fledgling industries in England. Respondents expect to see the emergence of large energy plants such as wind and hydro technologies in Wales in 5 years' time.

There is also scope to develop the residential new build and refurbishment sectors to better standards in England, Scotland and Wales due to the focus on achieving low and zero carbon targets. The Wales Strategic Energy Performance Investment Programme, known as ARBED, will facilitate investment into the energy performance of Welsh homes over the next decade and is the largest programme of its type underway in the UK. A social housing programme is expected to be driven by Local Authorities across the UK.

The cavity and loft insulation market is expected to be buoyant until at least 2015; in Wales there is also capacity for civil engineering development due to a new build nuclear power station on Anglesey, which is currently due to start in 2013. The Energy Island programme, which project leaders believe has the potential to inject £2.3bn into the economy of North Wales over 15 years, will also provide significant scope for development.

Existing building stock poses the greatest challenge to the industry as this requires new regulations and fiscal measures, as well as research & development and investment for new technologies.<sup>34</sup> The extent of the challenge in relation to achieving emission reduction in the residential sector has not yet been fully identified.<sup>35</sup>

However the challenges can be outweighed by the opportunities – it has been forecast that providing retrofit installation and advice services to the domestic sector could create up to 65,000 jobs in the UK over the next 40 years.<sup>36</sup>

<sup>33</sup> The Government predicted that the impact of climate change and energy policies could result in price rises of up to 18% for gas and 33% for electricity for the consumer (August 2010)

<sup>34</sup> Government Office for Science (2008), Foresight Group: Powering Our Lives – Sustainable Management and the Built Environment

<sup>35</sup> ConstructionSkills response to WAG Climate Change Strategy consultation

<sup>36</sup> Department for Business, Innovation and Skills & Department of Energy and Climate Change (2010), Meeting the Low Carbon Skills Challenge: A Consultation on Equipping People with the Skills to take Advantage of Opportunities in the Low Carbon and Resource Efficient Economy

Refurbishment and retrofitting will therefore offer a clear market opportunity in the medium and longer-term future, due to the sheer volume of existing properties. Refurbishment of buildings is expected to become increasingly focused on minimising energy consumption and incorporating sustainable and renewable forms of energy. These will need to meet relevant legislative drivers primarily through planning policy and building regulations.

Existing building management will be a critical area of focus for meeting carbon reduction targets. Commercial refurbishments are likely to be dependant to a certain extent on leases. Work is most likely to take place when businesses have moved out and modifications are required to meet the demands of new clients. As highlighted by participants at the focus group in Wales, the attitudes of landlords to long term energy efficiency savings versus short term costs will impact on the extent and nature of works required in the short to medium-term.

Respondents in Scotland questioned whether there is really an incentive to invest in new technologies in the existing commercial sector, in the short to medium-term. One way around this could be for building rates to be linked to carbon emissions rather than square footage. The higher rated property would be attractive then not only because of lower rates, but also knowledge of lower heating bills. The difficulty would be what to do with the low-rated stock that is left over, which would effectively be de-valued. Scotland participants described how the large companies that own these portfolios are looking at this issue seriously at the moment to consider which should be upgraded and which would not be worth investing in, in the short-term future.

Respondents have identified a number of external barriers to retrofitting. Firstly - who would pay for external insulation in multi-residential dwellings, and would it be realistic to expect buy-in for a heating system to cover the whole building? Secondly - in older properties and those of special interest, there may be important heritage and building performance considerations that challenge the standard approach to upgrade works.

“ *At the end of the day it is about what the client will pay for. The role of the contractor is to show the sustainable opportunities to the client to enable them to make a decision.* ”

Focus group participant, Scotland

It will be a long drawn out process to persuade large numbers of consumers to adopt renewable energy and to date across the UK consumers have been slow to take up energy efficiency measures.<sup>37</sup>

The need to reduce waste and achieve cost savings through more efficient waste management also presents a market opportunity for the sector. Recycling of concrete and tarmac is already taking place, and other materials may be re-engineered.

Initiatives are starting to gain momentum – for example a Knowledge Transfer Partnership has been developed between Laing O’Rourke and the Institute of Innovation to develop new solutions for the construction industry, which includes Construction Waste Management.<sup>38</sup> Similarly the Wates Group’s Target Zero programme aims to eliminate non-hazardous waste going to landfill from its construction projects by 2010.<sup>38</sup>

The Scottish Environment Protection Agency, Scottish Enterprise, Highlands and Islands Enterprise and the Scottish Funding Council have launched the Environmental and Clean Technologies Action Plan. New ways of managing waste that will emerge through this initiative are expected to result in substantial job creation and company expansion.<sup>40</sup>

However despite such progress, there is still some clarity required in relation to a permanent solution for managing and minimising waste in the short, medium or longer-term. Lack of clear links between policy and delivery are cited as a particular problem, for example it is clearly important to recycle and re-use but not so clear how can this be achieved. Participants in London suggested that recycling experts – not considered to be in short supply – ought to be leveraged to guide the industry in this respect.

One focus group discussed how Wales is the only area of the UK where organisations do not have clear processes and procedures in place for depositing hazardous waste safely. There are also different policies depending on which local authorities are involved – West and South Wales can be totally different for instance, so there is an issue around standardisation.

Other opportunities for the sector lie within the structure of the industry itself. The impact of the recession may result in greater numbers of collaborations, mergers and partnerships – as organisations draw together to share costs, profits and spread the risks. Collaborations with universities and research institutes could result in the identification of new products, materials or working practices, enabling scope for growth in the sector as costs of new technologies start to come down over the longer-term.

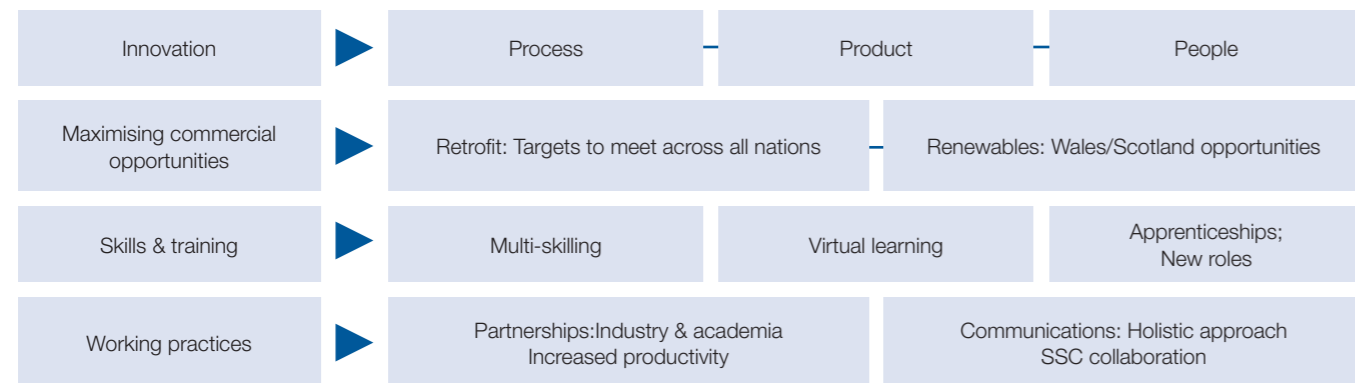
<sup>37</sup> Foresight Group (2008), Powering Our Lives: Sustainable Energy Management and the Built Environment – Final Project Report; and, Renewables Advisory Board (2008), 2020 Vision: How the UK can meet its target of 15% renewable energy

<sup>38</sup> [http://www.in2.swansea.ac.uk/laing\\_o\\_rourke.html](http://www.in2.swansea.ac.uk/laing_o_rourke.html)

<sup>39</sup> [www.wates.co.uk](http://www.wates.co.uk)

<sup>40</sup> Scottish Government (2009), Economic Recovery Plan: Update

## 2.3 Responses



### 2.3.1 Innovation

“An office block in five years will use less energy because it will have thicker walls, be better insulated and have better quality double-glazing. Your laptop will be a photovoltaic; your mobile phone will be a photovoltaic...”

Focus group participant, Wales

The general message from respondents is that innovation in its broadest sense<sup>41</sup> within the construction industry means new ways of thinking, new ways of working and questioning the status quo. It is apparent that innovation will be needed across all areas of the construction industry on an ongoing basis in order to ensure that businesses can save money, work more efficiently, remain competitive, and hold on to their market share.

Respondents broadly agree that the construction sector will maintain a focus on innovation; however due to the impact of the recession, it may be difficult to gain investment and support to take new products and processes to market in the short-term. However encouraging innovation, and commercialisation of research and development has been established as a priority by the Scottish Construction Forum.<sup>42</sup> The Welsh Assembly Government is aiming to maximise support from programmes emerging from the Carbon Trust, such as the Partnership for Renewables,<sup>43</sup> which offers scope for innovative development.

Some concerns emerged that adherence to legislation and established principles are more important than innovation, not least from an insurance and risk management perspective – however there is general agreement that the industry needs to innovate in order to make the most of market opportunities, meet the requirements of the carbon reduction agenda and create more affordable technologies.

<sup>41</sup> It should also be noted that the term can mean different things to different sub-sectors and across SMEs compared with larger organisations

<sup>42</sup> Scottish Construction Forum (2007), Construction Industry Plan 2007-2012: Achieving Construction Innovation and Excellence in Scotland

<sup>43</sup> WAG (2009), Climate Change Strategy – Programme of action consultation

“There will be several boom and bust cycles between now and 2050. However that does not mean that the industry cannot innovate.”

PhD student (environmental/low carbon research)

Feedback from the sector divides innovation into three broad categories – process, product and people. However it should be noted that there is some overlap between ‘process’ and ‘product’ and therefore they are predominantly discussed together within this section. Innovation depends largely on what the client is prepared to accept and trust, and with every building essentially a prototype – there needs to be certainty that everything will fit together.

Respondents expect process innovations to enable the industry to work more smartly and more efficiently. Process changes are likely within civil engineering as there is little scope to innovate in relation to some of the materials, which will remain broadly the same (concrete, steel and tarmac). However this does not mean that there will be no product innovation – products are also being developed so that they will be of lower embedded carbon.

There is potential to develop techniques for wave energy in lagoons in North West Wales but the cost of installation is high and is a barrier.

Participants in Scotland referred to an increasing focus on automation and robotic assistance, which will be tightly controlled in a factory to minimise waste. In addition, there will be an increase in the use of recycled materials in construction over the short to medium-term.

Some changes to working practices outside of the traditional elements of construction are anticipated - notably driver awareness, how materials are transported, appropriate loads and driving speeds.

Participants in Wales described how some new technologies could - potentially - be expanded more quickly by implementing on a wider scale. Biomass boilers have been integrated into social housing as a priority, and participants questioned whether it would have been better to put in a central system across the whole area and let the market choose.

Several focus groups commented that new technologies (such as solar panels and ground source heat pumps) are about turning buildings from absorbers of energy to generators of energy. One argument was that these technologies are still in an ‘emergence’ phase and that in five years’ time, there will be improved integration within new builds rather than the current situation where for the most part environmental technologies are simply ‘added-on’ to standard building designs. The counterpoint to this argument is that it is not so much the technology that is under-developed – but more the market.

Timber frame systems also represent an emerging opportunity to meet some of the new construction standards. In Wales however, the opportunity is not yet there to fully exploit this market. According to participants, there are insufficient house builders to ensure continuous manufacturing and distribution. Improvements would be needed in terms of communication and collaboration across the supply chain to help stimulate this market.

Resurgence is likely in traditional materials such as wood for window frames, owing to improved timber engineering technologies to remove imperfections, improve durability and extend the lifespan of the product.

In London, nuclear energy was discussed as an 'inevitable' carbon-zero energy resource - with some discussion around the long term possibility of mini power stations to serve small areas. An example was given of a similar scheme in the USA.

One participant in London commented on the huge potential difference that simple 'component innovation' can make:

“The flick from building a potential world destroyer nuclear power stations to developing cost effective and safe nuclear power stations might be down to innovation within one part of the system. It's similar to tower blocks - it was the invention of the lift that made tower blocks happen.”

Focus group participant, London

Behavioural change i.e. people innovation - is critical for the sector. The consumer needs to understand how to use innovative products and realise the benefits of new and innovative processes and working practices – particularly if costs are higher as a result.

Similarly those working in the sector need to commit to developing a clear understanding of the new technologies and how to use them. For example it is unclear whether the PassivHaus concept will work effectively across different climates. PassivHaus<sup>44</sup> dwellings typically achieve an energy saving of 90% compared to existing housing<sup>45</sup>. However, developed in Scandinavia<sup>46</sup> where cold, dry winters are typical, how will this transfer to cold but wet climates in England, Wales and Scotland? The quality of workmanship to achieve, for example, air tightness will be vital to make such concepts work effectively in all nations; a behavioural commitment from the industry workers to achieving these standards underpins this.

In addition to products and processes, innovation is needed in how to engage effectively with people, as well as how to engage with training. If smaller units of learning are accredited in a nationally recognisable way – employers will need to be innovative and specific about the skills they need.

There is scope to capitalise on developments in other countries, for instance in relation to sustainability and the eco-house. Scotland in particular is expected to align some standards with those developed in Scandinavia. Over the longer-term there will be a clearer understanding of the renewable energies that will best serve the needs of the market.

### 2.3.2 Maximising commercial opportunities

“The generation of renewable energy is a huge commercial opportunity”

Managing Director, home-building company (Scotland)

Although some concerns about wind energy were expressed in a small number of focus groups - predominantly as turbines are currently maintained by foreign organisations and there is a lack of expertise to be able to maintain them following the 5-year guarantee period - many respondents highlighted wind technologies as a commercial opportunity, especially for Wales and Scotland.

With 25% of Europe's wind potential and vast renewable reserves, Scotland can be an international leader in this sector. The Scottish Government has set out a blueprint to create at least 16,000 renewable energy jobs over the next decade.

Areas have been identified for further off-shore wind development in Wales, Scotland and England. Scotland, which already has a large wind farm in Europe (just outside Glasgow), has secured planning consent for more wind turbines on the coast. Another wind programme is being developed off the coast of East Anglia.

Respondents broadly agree that developments in wind and tidal energy will definitely grow – but to maximise the commercial market opportunities the ongoing challenge will be to maintain investment. Consumers need to buy-in to the longer-term benefits and where they cannot perceive it to be sufficiently beneficial, will not invest. For example the PassivHaus system is based on a design principle involving air-tightness to conserve energy. This has been practised in Wales, however it is considered unlikely that consumers will invest (c.£10k) to get this kind of standard in the short to medium-term, partly as the UK climate is not cold enough to make that a necessity and therefore consumers will find it difficult to perceive enough of a benefit to make it worthwhile.

The consumer attitude will remain a major barrier to be overcome – over the longer-term: “cost will always come before a sense of social responsibility.”<sup>47</sup> It is also important for the sector to tailor the offer for the consumer:

“Homes need to be 'liveable'. Category 5 homes have windows that cannot be opened. Who would want that?”

Representative from the Federation of Master Builders

<sup>44</sup> The term 'PassivHaus' refers to a specific construction standard for buildings which use efficient components and a whole house ventilation system to achieve exceptionally low running costs and have excellent comfort conditions in both winter and summer. These principles can be applied not only to the residential sector but also to commercial, industrial and public buildings.

<sup>45</sup> [www.passivhaus.org.uk/](http://www.passivhaus.org.uk/)

<sup>46</sup> The concept having originated from collaborations between German and Scandinavian researchers

<sup>47</sup> Managing Director, domestic and commercial construction company (Scotland)

There are opportunities in Wales for further marine energy development, given that Wales has over 1,200km of coastline and is rich in fast-flowing rivers and mountains. According to the Welsh Assembly Government, the initial inspirational target for 2025 should be to capture around 10% of wave and tidal stream energy that exist in the waters off the coast of Wales<sup>48</sup>. One participant commented that marine energy development would need stronger political backing for it to be perceived as a viable and cost-effective alternative energy source.

Costs will remain a key driver for the industry when considering how to action commercial opportunities. To develop wind and tidal technologies respondents state that financial support is a must, to facilitate ongoing development.

Some concerns were raised that the market within Wales is too small to stimulate substantial Research and Development and that, as such, new technology businesses are unlikely to expand and build capacity in the nation. However the rurality of Wales - and Scotland - including the high number of properties dependent on oil/LPG, is considered to present more of an opportunity for new energy than a challenge. There is less enthusiasm for geothermal energy due to practicality and cost issues.

In the north of Scotland, biomass fuel burning is being pushed, using wood-chip oil burners in particular. The local sourcing of the fuel is a key contributor and it was acknowledged that this might not be a good option further afield due to the need to transport the fuel for burning. In small community clusters/hamlets, there might also be opportunities for community-scale heating projects as an alternative to expensive calor-gas heating.

Water energy was also discussed and whether re-using 'grey water' would be a valuable opportunity for the future. However some questions were raised about how much energy would in fact be saved by implementing a grey water system, and whether this would be a worthwhile investment.

The focus on retrofit offers opportunities for all nations. Respondents in Scotland expect a faster response in relation to domestic housing compared with commercial properties.

Feed in tariffs will give the consumer an incentive to install solar thermal and PV – there is a strong need to sell this message in order for the sector to capitalise on the market opportunities. This would also create scope over the medium-term in relation to insulation options, as consumer interest and awareness of reducing carbon emissions and improving energy efficiency grows. Over the longer-term, there will be increased demand for low and zero carbon domestic homes, and solar and geothermal technologies.

### 2.3.3 Skills and training

In spite of a commitment to support skills development demonstrated by the majority of organisations in the construction sector, investment into skills and training is expected to remain at the bottom of the agenda for the majority of the sector in the short-term, resulting in limited development of staff. Public sector cuts are widely anticipated by the industry and is expected that these will impact upon training budgets, further undermining the scope for investment into upskilling.

<sup>48</sup> <http://wales.gov.uk/topics/environmentcountryside/energy/renewable/marine/?lang=en>

“ *The construction industry is seen as the safety valve of the economy and that it can be turned off when times are hard and turned on in periods of growth. But what about all the lost skills?* ”

*Focus group participant, Midlands*

“ *Persuading companies to invest in training at the moment is not practical even when they recognise the benefits.* ”

*Focus group participant, Wales*

Participants at the London and Midlands focus groups raised the point that apprenticeships are a sound option when there is the security of a two-year order book - but the current economic climate means taking action to prevent skills decay and not build capacity.

However addressing skills shortages through recruitment of apprentices is expected to pick up in the medium-term in Scotland in particular – there is a strong historical commitment to apprenticeships, which has not diminished even though the economic climate is currently forcing many organisations to temporarily halt employment of these trainees.

<sup>49</sup> Scotland offers a four-year Apprenticeship and feedback from interviewees in Scotland indicated greater concern over declining numbers of apprentices rather than the content/structure of the training programme itself

“ *They (apprentices) are the lifeblood of the sector.* ”

*Managing Director, domestic and commercial construction company (Scotland)*

Apprenticeships may need to adapt to meet needs of new technologies - the relevance of the traditional three-year Apprenticeship<sup>49</sup> was called into question within focus groups in England. The general perception is that this should focus more on core units plus 'bolt-on' modules in specialist areas that can be flexible and adaptable in line with priorities and future change. Additional modules should be easy to learn – with a cultural shift needed towards lifelong learning and continuous development.

In the short-term, a modular 'bite-sized' approach to learning is expected to result in England and Wales after the introduction of the Qualifications and Credit Framework (QCF). In Scotland the Scottish Credit and Qualifications Framework (SCQF) is utilised and therefore the QCF model does not apply. QCF can also respond to employer demands for more flexibility regarding 'bolt-on' training modules. The industry would like to see mandatory courses in key areas – such as air tightness and thermal bridging - to be introduced and subsidised by Governments in all nations. However funding and budget cuts pose a strong risk to colleges and there is the potential threat of reduction or withdrawal of some construction courses. Inevitably this would impact on the speed with which this agenda can be taken forward.



Over the medium to longer-term, therefore, more and more learning opportunities will be undertaken through virtual platforms. Industry representatives believe that this has to happen, as organisations will find it difficult to invest the time and money into long training courses that will take them away from the day-to-day business operations.

“ *There needs to be flexible bolt-on training that can be delivered in small bite-size chunks and not via 6-week courses. Time is money.* ”

**Regional Managing Director,  
commercial construction  
company (England)**

“ *Top up credits would be the preference. This would be flexible and adaptable.* ”

**Skills and training manager,  
home-building company (Scotland)**

New skills will begin to develop over the longer-term. Expertise will be needed for repair and maintenance of existing stock and increasingly skills will be needed in response to the shift towards off-site manufacturing and modular housing. The growth of marine technologies will necessitate underwater construction, which in turn requires training.

Over the next 3 to 5 years a focus on developing accreditation and training for the improvement of buildings is anticipated. A number of units have already been developed to demonstrate competence relating to energy efficiency.

On-site skills will be focused more on assembly and running/maintaining automated processes in the short to medium-term. It is likely that specialists will be increasingly used to ensure that new builds meet relevant low and zero carbon requirements. This will also have a knock-on effect on the skills needs of buyers and estimators, who will need to be better informed about what they are purchasing and what the options are for development.

The emergence of the energy consultant to advise and guide industry in response to changing legislation was discussed at several of the focus groups, and was echoed by a number of respondents taking part in telephone interviews. One employer in Wales commented that they have taken on environmental co-ordinators in the business as a result of legislation driving the business in that direction. Another commented that architectural practices are now able to register as ‘experts in sustainable design’, leading to a significant rise in the number of consultants.

The industry expects to see more multi-skilling in the medium-term – for example the job role of a carpenter will become more basic but may need to extend across other disciplines such as floor and wall insulation. In particular multi-skilling will be experienced among the operative workforce in the retrofit market. Common disciplines such as plastering, rendering and tiling are likely to combine. Plumbers and electricians will react to skills needed in relation to low carbon.

However a potential barrier to multi-skilling is that knowledge among construction sector specialists, such as plumbers, may be out of date - leading to uncertainty about how to work to the requirements of new legislation. Processes are likely to involve more external consultancies.

Participants in several focus groups commented that further research would be needed in the short-term, to identify specifically what gaps exist for training purposes. The Renewable Energy Route Map for Wales highlighted the potential for Wales to take forward the opportunity of being at the forefront of marine energy developments – but also noted that skills needs were to be identified.<sup>50</sup> Work is underway to respond to these questions – for example through the Delivering Low Carbon Skills Pilot project being led by the Built Environment Sector Skills Council Group.<sup>51</sup> A UK-wide initiative developed by ConstructionSkills, the Zero Carbon Hub and NHBC is identifying key issues, potential impacts on the home building sector and how they can be addressed – primarily through the Consultation on Home Building Skills – an Action Plan to 2020.

In the short-term, training needs to be better contextualised with the carbon reduction agenda, for example knowledge and understanding relating to using codes. There also needs to be a clearer understanding of ‘cause and effect’, i.e. why things are done the way they are as part of the construction process.

There is general agreement among respondents that the publicly funded social housing sector is going to be at the forefront of the low and zero carbon agenda in the short to medium-term, in response to fuel poverty and social responsibility to tenants. This will have a knock on effect of driving the skills needed to service these new technologies.

In Wales, there is considered to be scope to improve existing workforce skills to meet the requirements of current public sector refurbishment programmes and to reduce the reliance on skills brought in from outside Wales or overseas. According to some participants further investment needs to go into research and development within Wales to stay on the leading edge of change.

Some participants in Scotland felt that training should be prioritised for managers and designers, and that specialist sub-contractors could be brought in to meet bespoke construction needs on site. This view was challenged on the basis that this could reduce flexibility where such specialists are based further afield and in the Highlands and Islands.

As the fixed costs of training are high, there needs to be innovative approaches to its delivery. Incentives, such as the provision of tax breaks might better enable employers to release the workforce for training in the short to medium-term, although this appears unlikely due to public sector funding cuts. Technical understanding should be combined with practical ability to allow cross-fertilisation and increased transferability of skills.

<sup>50</sup> WAG (2008), Renewable Energy Route Map for Wales: consultation on a way forward to a leaner, greener and cleaner Wales  
<sup>51</sup> <http://www.sustainablebuildingportal.co.uk/pages/Training%20&%20Skills/FOUR-SECTOR-SKILL-COUNCILS>

Participants in Scotland discussed the value of the 'Micro Certification Scheme (MCS), which has similarities with the Gas Safe Register. Many participants felt this is critical, and that the scheme has served to help overcome real issues and ineffective installations - potentially saving lives - in particular schemes such as this are vital within emerging and growth sectors such as renewables. There was some concern that the cost of the scheme is going to be prohibitive to smaller employers in particular, and that a case needs to be made to the Scottish Government to obtain funding to cover it and provide the training that is needed among SMEs and across the supply chain.

There are concerns that the Further Education sector will not be able to respond with suitable training provision unless there is an evident demand for particular skills.

A participant in the Scotland focus group described the need to justify the expenditure for equipment to aid training in colleges, on the basis that companies are going to want to come in and use it. The issue is that there is currently no real business from it - therefore the catalyst for change is lacking.

A key concern from participants in Wales is that certain concepts considered extremely important for the future of the industry (e.g. micro-renewables) need to be taught at level 3, and these are likely to be missed by many new recruits who tend to enter the industry after level 2. This problem is likely to be exacerbated by the fact that smaller companies do not necessarily have the time, resources and skills to then manage and follow through the training process.

#### 2.3.4 Working practices

Organisations in the construction sector will need to diversify in order to provide a broader range of services - which a number of large companies have already successfully done. The mass retrofit concept encouraged by the Innovation and Growth Team will be a catalyst for SMEs to enable them to remain competitive, and thus, survive the impact of the recession.

It is anticipated that over the longer-term, the industry will develop leaner and more efficient processes - to 'achieve more from less' and improve productivity. This will be particularly important as the customer base is likely to be impacted by public sector funding cuts, and budgets will come under pressure. These changes are likely to include a more structured approach towards bidding for work, to enable organisations to respond to the increasingly stringent procurement requirements and processes.

*"We are heading towards increasing regulations and quality/competence schemes to improve the productivity of the sector."*

*Representative of the Federation of Master Builders*

Over the longer term, the structure of the construction industry could change; cross-sector collaborations - such as technology companies working with systems manufacturers - and potential merger and acquisition activity are likely to play a role in this. In the short-term the industry expects greater scope for partnership working:

*"Contractors would prefer a small piece of the pie than no pie at all."*

*CEO, housing company (Wales)*

In the longer-term there is the potential that a smaller number of larger companies will dominate the sector as there is a significant concern that many SMEs - particularly those in rural locations within Wales and Scotland - are at risk of being 'squeezed out' due to the impact of the recession. For example one respondent in Scotland noted that the Scottish Government will consider appointing one contractor to manage regional 'hubs'.

To aid training and awareness to support smaller businesses in particular, it was suggested in Scotland that contractors could invite sub-contractors to become inducted into their own standards on-site.

The majority of focus groups cited poor communications and lack of joined up working as a barrier to change within the construction industry. In both Scotland and London, participants highlighted that Sector Skills Councils should continue to work more closely together to provide a collective voice - particularly where there are emerging overlaps such as traditional construction alongside new technologies for building services. The Built Environment Skills Alliance (BESA) is one good example of this.

More collaborative working and 'joined up' thinking between industry and academia is likely to lead to a more holistic approach towards the sector as a whole, rather than viewing each sub-sector independently.

Respondents believe that the industry will, over time, become more receptive towards the sharing of concepts and ideas in a manner that captures good ideas and shares best practice, without divulging commercial sensitivities. This may take the form of communication forums, to enable wider discussion through virtual means.

Respondents agree that far more collaboration is needed between industry sub-sectors and universities to ensure that those leaving courses are suitably qualified, equipped and knowledgeable. This requires more open communication between industry and academia, to ensure that research is up to date and training responsive to the current needs of the industry.

Participants in London described lessons that can be learned from abroad - notably that university students in construction and engineering disciplines are required to undertake a yearly placement in industry - with the last placement containing a research element. Architecture courses currently offer this level of experience, but it is currently lacking in construction management and civil engineering.

There is a general feeling across the industry that there needs to be more partnership working and supply-chain integration to encourage shared responsibility and improved process compatibility. Interaction between R&D Institutes and construction companies is likely to enable the ongoing evolution of working practices.

*"The enlightened companies see information sharing as a great opportunity."*

*Representative of the East Midlands Centre for constructing the Built Environment*

## 3. Conclusions and recommendations

In the Midlands, there was substantial discussion on the appropriateness of information sharing and dissemination of best practices relating to innovation. On the one hand, the business need for competitive advantage advocates protecting innovative methods and approaches. On the other hand, sharing of best practices and performance league tables relating to carbon reduction might stimulate healthy competition and innovation. There was acceptance in general that, whether shared or not - innovative approaches are required by all business in the sector if only to meet the demands of new legislation.

Participants in Wales felt that industry should look not only at traditional sources of skills development – but towards manufacturers to assist with training, or at least manufacturers liaising more closely with further education to ensure skills that are taught remain relevant. This view was echoed in Scotland, with the argument that manufacturers and industry should work more closely together to develop short training courses for the industry on how to install and use equipment and technologies, rather than extensive training courses that run much longer and are more cost and time intensive.

The industry also needs support and guidance to be able to gain buy-in from clients and agents to the long term benefits of sustainable materials and reductions in energy bills. There are concerns that construction clients in the private sector are not sufficiently engaged with carbon efficiency valuations on building developments. This includes the benefits of long term cost savings that can be gained from investing increased capital at the outset on more sustainable materials and technologies.

### Conclusions

Whilst it is clear that the construction sector will face a number of difficult challenges in the short-term, largely due to the impact of the recession and announced spending cuts – there are also a number of key opportunities for the long-term growth and development of the sector. Many of these opportunities will be driven by the emergence of the renewables sector, and legislative and policy targets in relation to low and zero carbon.

However as the sector as a whole potentially faces severe skills shortages, and SMEs - which dominate the industry - focus on surviving the economic downturn, there are likely to be a number of obstacles hindering longer-term development.

Unless investment and widespread industry engagement can be secured, progress in relation to capitalising upon the opportunities offered through the renewables sector, and other forms of innovative change could be slow to come into effect.

There are significant concerns among respondents about the industry's capacity to respond to increasingly more stringent requirements in order to a) survive the recession and b) remain competitive – particularly if the approach needed towards skills and training differs across sub-sectors.

This is also partly dependent on securing the buy-in from the customer base, and this will require a significant cultural and attitudinal shift, particularly where the costs are considered to be a barrier for the consumer. Achieving this cultural change is therefore expected to be a long process, although there is the potential that momentum would increase if customers could see a clearly defined benefit that would make the investment worth their while in the short-term, rather than the long-term – or if the costs of investment were lower.

### Recommendations

For the economic downturn to become a catalyst for innovative and positive change for the sector, and for opportunities to be fully maximised, the following recommendations should be taken into consideration:

#### Short-term:

- A clear definition of legislative targets and what this will require of all organisations, across all sub-sectors and nations is required to enable an appropriate response to meeting those targets. In particular, clarity is needed as soon as possible in relation to the definition of low and zero carbon.
- There is a need for ongoing lobbying of Governments in all nations to encourage better engagement with the issues and opportunities for the construction sector, and to encourage more 'joined up' thinking between Governments and industry. In particular, barriers in relation to procurement should be flagged up for consideration. Furthermore it is vital to secure investment to facilitate the development of the renewables sub-sector, which offers a substantial opportunity to encourage and enable growth in the short, medium and longer-term. Some commitment to investment has been noted through the Comprehensive Spending Review – for example the Green Investment Bank, to be supported by £1bn of funding.
- It may be necessary to undertake additional research into the specific skills and training needs of the changing construction industry - in particular to identify where there are specific skills needs for different sectors.

**Medium-term:**

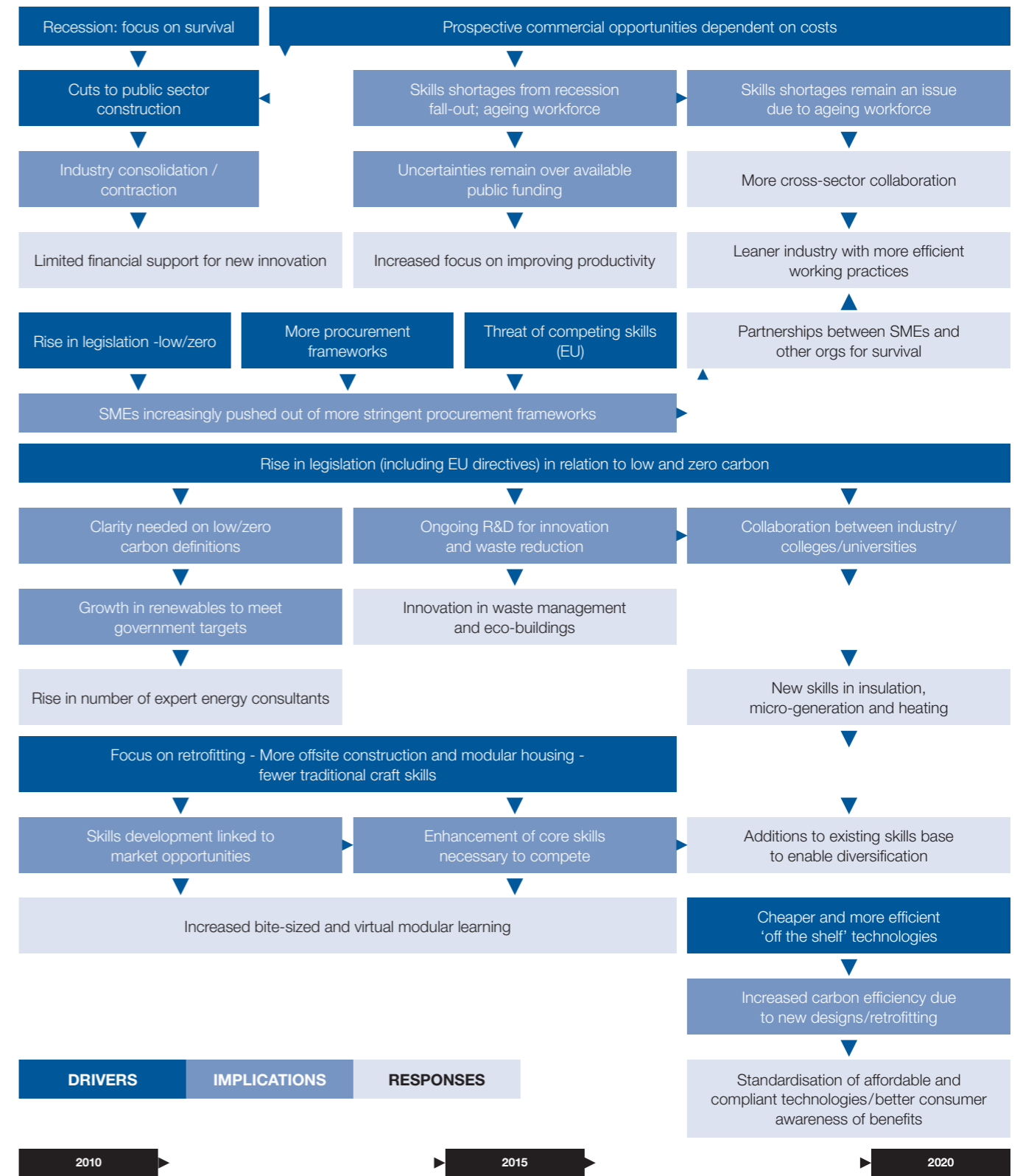
- Governments in all nations should consider the provision of subsidised or mandatory training in key areas – notably to plug current and emerging skills gaps. Financial support such as grants, tax breaks or some other form of incentive is likely to be necessary to enable the majority of organisations to address essential training and skills needs.
- Increased collaboration between universities/ colleges and industry is needed – to a) support the development of innovation and b) ensure that training is developed specifically in alignment with industry needs.
- Similarly, greater collaboration between Sector Skills Councils will enable the sector to ‘speak with one voice’ and act as an enabler to support communication between industry and academia.

**Long-term:**

- Knowledge sharing within the sector will be essential to support survival in the short-term and growth & development in the longer-term. A form of ‘information hub’ would enable effective acquisition of key data, and the means to disseminate best practice across the industry. This will also facilitate a more holistic approach and collaboration between industry, Sector Skills Councils, academia and policy makers.
- A review of competence standards is likely to be needed, in response to the emergence of new or enhanced skills and job roles in the sector.
- There is a clear need for industry and Governments in all nations to educate and communicate with the consumer – to increase awareness and knowledge in relation to the ‘green’ agenda, overcome barriers and optimise market opportunities for retrofit.

The table on the following page summarises the anticipated key drivers, impacts and responses and maps these across a timeline of the next ten years.

**Table 4: Timeline of anticipated key drivers, impacts and responses within the UK construction industry (2010-2020)**



# Appendix 1: Literature Review

## **Future Skills Research: Industry & Policy Literature Review**

The tables below provide a summary of recent INDUSTRY and POLICY issues relating to the climate change/sustainability agenda and its impact on the construction industry. There are three tables: UK-wide, Scotland and Wales. (Note that England-based findings are typically reported within 'UK-wide' publications and therefore this section is titled 'UK' rather than 'England'. Where information specific to Wales and Scotland was identified within UK wide publications, this has been extracted and reported on within the relevant section of this document).

The summaries provide industry and policy considerations under six main areas of interest for ConstructionSkills:

### **1. Innovation**

e.g. product, process, sector, business, innovation off-site, lean manufacturing, intelligent buildings and materials

### **2. Renewables**

e.g. large scale, nuclear, new build, retrofitting

### **3. Zero Carbon**

e.g. new build projects, both residential and non-residential

### **4. Low Carbon**

e.g. refurbishing existing housing stock, reducing carbon emissions, energy assessment

### **5. Change**

e.g. design, procurement, industry strategy, performance management and productivity, social/behaviour change

### **6. Environment**

e.g. climate change, waste, pollution

THEME	RESEARCH FINDINGS
Innovation	<ul style="list-style-type: none"> <li>• Although innovation has not been a key aspect of the construction industry in previous years, it is suggested that this should be improved by ‘greater internationalism, greater competition, and greater integration in the supply chain’.<sup>52</sup></li> <li>• It is necessary to keep in mind that the definition of ‘innovation’ for the construction industry will depend on whether it is being considered from sector, business or project level. ‘It can mean a new product or process for one organisation, and mean small steps towards change for another... The challenge and meaning of innovation for a small specialist sub-contractor will almost certainly be very different from that of a multinational construction contractor’<sup>53</sup></li> <li>• Eco-towns, Zero Carbon Homes, and Carbon Challenge: Government initiatives such as these will set minimum procurement standards, with the goal of giving the UK construction industry the confidence to invest in bringing innovative low carbon products to market<sup>54</sup></li> <li>• The UK’s Technology Strategy Board’s Low Impact Buildings Innovation Platform is also supporting innovative sustainable buildings through research and development, demonstration and design competition<sup>55</sup></li> <li>• However, the essential skills required to support the growth of innovative construction products and techniques, and to work with modern methods of construction, need to be identified and developed<sup>56</sup></li> <li>• There is likely to be an increase in requirement for Innovative Methods of Construction , with a subsequent increase in training needs, reduction in demand for some trades on-site but increase of others in factories (e.g. creation of pre-fabrication), and more computer aided design. The use of new materials may also have an impact of industry requirements, in terms of training and development, and increased specialism in off-site activities.<sup>57</sup></li> </ul>

<sup>52</sup> 2020 Vision: The Future of UK Construction: Executive Summary

<sup>53</sup> Salford Centre for Research and Innovation (2008), An Innovation Platform for Construction: NWUA Pilot Project to Develop Innovation Platforms in Non-science Research Disciplines

<sup>54</sup> BIS (2009), Towards a Low Carbon Economy – economic analysis and evidence for a low carbon industrial strategy

<sup>55</sup> Ibid.

<sup>56</sup> CLG (2008), Innovative Construction Products and Techniques; and, NESTA (2007), Hidden Innovation: How innovation happens in six ‘low innovation’ sectors

<sup>57</sup> 2020 Vision: The Future of UK Construction: Executive Summary

THEME	RESEARCH FINDINGS
Innovation	<ul style="list-style-type: none"> <li>• The supply chain can be reluctant to make use of innovative products which require investment in low carbon skills/equipment. Unless demand for innovative products is nurtured, training products and services will not be used and knowledge/skills will not develop.<sup>58</sup></li> <li>• An increase in collaboration between industry and universities may provide the construction sector with more impetus to embrace innovative products, techniques and working practices. Long-term partnerships may provide support to businesses in encouraging ‘incremental innovation’, rather than expecting a major step-change in practice. Participation in academic research projects may also offer the opportunity to increase the capacity of construction companies for applying and exploiting new ideas (i.e. by getting involved, over time, in more challenging research activities)<sup>59</sup></li> <li>• Nano-enhanced products are likely to have a significant impact on the construction sector (and could meet needs of sustainability agenda) – e.g. self-compacting concrete, glass coatings, and high-performance insulation materials. However, these products are currently very costly, and any innovative products will need to meet Building Regulations/ equivalent levels of safety to traditional products in order to become competitive<sup>60</sup></li> <li>• Technologies using solar, biomass and geothermal processes are also likely to have an important role to play in the future economy and these may need to be considered by the sector going forward<sup>61</sup></li> <li>• Innovative activity would be better measured through extent of use of modern methods of construction (rather than patents on new inventions by construction companies) – i.e. focus on/encourage spread of innovation through the sector and associated cost savings, rather than the small proportion of the sector registering patents (approx. 1% of firms). Innovative solutions/working practices towards large scale projects (e.g. Heathrow Terminal 5) can be widely influential on the rest of the sector<sup>62</sup></li> </ul>

<sup>58</sup> Foresight Group, 2008, Powering Our Lives: Sustainable Energy Management and the Built Environment – Final Project Report; and, BIS (2009), Towards a Low Carbon Economy – economic analysis and evidence for a low carbon industrial strategy; and, BIS (2008), Strategy for Sustainable Construction

<sup>59</sup> Salford Centre for Research and Innovation (2008), An Innovation Platform for Construction: NWUA Pilot Project to Develop Innovation Platforms in Non-science Research Disciplines

<sup>60</sup> BIS, Nanotechnologies and the Construction Sector, <http://interactive.bis.gov.uk/nano/sections/nanotechnologies-and-the-construction-sector/>

<sup>61</sup> House of Commons Energy and Climate Change Committee (2010), Low carbon technologies in a green economy: fourth report of session 2009-10

<sup>62</sup> NESTA (2007), Hidden Innovation: How innovation happens in six ‘low innovation’ sectors

THEME	RESEARCH FINDINGS
<b>Innovation</b>	<ul style="list-style-type: none"> <li>• Need to continue to exploit advances in other sectors for the benefit of the construction industry (e.g. use of ICT project management tools, implementing off-site manufacturing processes); as well as encourage more collaborative working between specialists to bring about more integrated working methods, particularly on larger projects<sup>63</sup></li> <li>• One innovative method of construction is off-site manufacture. Benefits: quicker build time for house, increased energy efficiency and less disruption onsite during construction. Disadvantages include: cheaper to use traditional methods due to the cost of converting to innovative methods and uncertainty of reaction of customers and mortgage lenders.<sup>64</sup></li> </ul>
<b>Renewables</b>	<ul style="list-style-type: none"> <li>• EU Renewable Energy Directive – requires the UK to achieve 15% of energy use from renewable sources by 2020<sup>65</sup></li> <li>• Proposed construction of new nuclear power stations and tidal/wind energy infrastructure – requirement for industry to apply existing skills and knowledge to new types of project (e.g. new nuclear generation plants potentially to start coming online by 2017)<sup>66</sup></li> <li>• UK Government target to obtain 30% of electricity from renewables by 2020<sup>67</sup></li> <li>• Need to transform public behaviour and perceptions: difficulties in persuading large numbers of companies/householders to take up renewable energy, when they have been slow to embrace energy efficiency measures despite economic advantages<sup>68</sup></li> <li>• Over the next 25 years, there is potential that 10,000 – 15,000 new jobs will be required across the UK to support a new nuclear build programme (through the construction, operation and maintenance of plants)<sup>69</sup></li> <li>• Introduction of a Renewable Heat Incentive across the UK planned for April 2011 – a fixed payment to be offered to property owners generating heat<sup>70</sup></li> </ul>

THEME	RESEARCH FINDINGS
<b>Zero Carbon</b>	<ul style="list-style-type: none"> <li>• In current UK construction legislation and practice, it has been identified that ‘the specific amounts of carbon used to make and maintain a building are ignored’ (along with the interrelationship between ‘embodied’ and ‘operational’ buildings use). There has been a subsequent call for a common metric to be used (‘Carbon Profiling’) to establish the ‘whole life’ carbon of a building - i.e. all emissions generated from development through to the use and maintenance of a building - particularly when calculating the overall benefits of retrofitting<sup>71</sup></li> <li>• Public sector non-domestic buildings to be zero carbon from 2018, and other non-domestic buildings from 2019 (plus increased levels of energy efficiency through Building Regulations and Code for Sustainable Homes)<sup>72</sup></li> <li>• Few companies in the non-domestic sector are able to deliver zero-carbon properties. The social pressures for energy efficiency in the non-domestic sector are currently having little impact on the building industry. Therefore, there is a subsequent need to radically change the sector’s attitude and approach<sup>73</sup></li> </ul>
<b>Low Carbon</b>	<ul style="list-style-type: none"> <li>• The UK Government’s Low Carbon Transition Plan has placed the focus on: ‘1) cutting emissions, 2) maintaining secure energy supplies, 3) maximising economic opportunities, and 4) protecting the most vulnerable’<sup>74</sup></li> <li>• For homes, the Transition Plan includes – smart meters in every home by 2020; £3.2 billion of support to help homes become more energy efficient; clean energy ‘cash back’ schemes; competition for 15 towns/villages to pioneer green innovation; community-based pilot to help deliver energy savings to low income areas<sup>75</sup></li> </ul>

<sup>63</sup> NESTA (2007), Hidden Innovation: How innovation happens in six ‘low innovation’ sectors

<sup>64</sup> NESTA (2006), The Innovation Gap - Why Policy Needs to Reflect the Reality of Innovation in the UK

<sup>65</sup> See: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF>

<sup>66</sup> BIS (2009), Towards a Low Carbon Economy – economic analysis and evidence for a low carbon industrial strategy

<sup>67</sup> HM Government (2009), The UK Low Carbon Transition Plan: National strategy for climate and energy

<sup>68</sup> Foresight Group (2008), Powering Our Lives: Sustainable Energy Management and the Built Environment – Final Project Report; and, Renewables Advisory Board

(2008), 2020 Vision: How the UK can meet its target of 15% renewable energy

<sup>69</sup> BIS (2009), Towards a Low Carbon Economy – economic analysis and evidence for a low carbon industrial strategy

<sup>70</sup> Renewable Heat Incentive, <http://www.rhincenive.co.uk/RHI/>

<sup>71</sup> RICS (2010), Redefining Zero: Carbon Profiling as a Solution to Whole Life Carbon Emission Measurement in Buildings

<sup>72</sup> BIS (2008), Strategy for Sustainable Construction

<sup>73</sup> Government Office for Science (2008), Foresight Group: Powering Our Lives – Sustainable Management and the Built Environment

<sup>74</sup> HM Government (2009), The UK Low Carbon Transition Plan: National strategy for climate and energy

<sup>75</sup> Ibid.

THEME	RESEARCH FINDINGS
Low Carbon	<ul style="list-style-type: none"> <li>• In terms of cutting emissions, new rules came into effect on 1st April 2010 that will legally require large non-energy intensive organisations ‘to closely monitor and report their emissions from energy use in preparation for carbon trading’.<sup>76</sup> The results of this reporting will then be used to rank large organisations according to reduction in energy use and improvements in energy efficiency. From 2011, some will need to purchase ‘allowances’ for every tonne of CO2 emitted. The construction industry is likely to feel the impact of this by being required by clients to incorporate energy efficiency into construction project design and development, especially where these large organisations require increasingly energy efficient buildings.</li> <li>• Existing building stock poses the greatest challenge to the industry –i.e. retrofitting. It requires new regulations and fiscal measures, but also research and development for new technologies, investment, and willingness on the part of construction industry to embrace the changes. Social motivation to upgrade public and private stock is also essential. Any potential regulatory, financial, inspection and monitoring arrangements will have a significant impact on how this process is approached by the industry<sup>77</sup></li> <li>• However there are opportunities – it has been forecast that providing retrofit installation and advice services to the domestic sector could create up to 65,000 jobs in the UK over the next 40 years.<sup>78</sup></li> <li>• The Government’s Household Energy Management strategy sets out the following aims: by 2011, 6 million homes to receive cavity wall and loft insulation; by 2015, all cavity walls and lofts insulated where practical; by 2020, eco-upgrades to 7 million homes; all homes to receive a smart meter by the end of 2020.<sup>79</sup></li> <li>• The recession has cut emissions by 11% in the EU traded sector. Therefore the target should represent the situation and provide an incentive for action. For this reason the target should be 30% reduction by 2020.<sup>80</sup></li> <li>• In order to transform the UK housing stock to meet low-carbon standards there needs to be new services provided by the SME construction industry. This will potentially add between £3.5 billion and £6.5 billion to the existing market for housing RMI (£23.9 billion)<sup>81</sup></li> </ul>

<sup>76</sup> Construction News (April 1st, 2010), New carbon reduction commitment rules come into force today

<sup>77</sup> Government Office for Science (2008), Foresight Group: Powering Our Lives – Sustainable Management and the Built Environment

<sup>78</sup> Department for Business, Innovation and Skills & Department of Energy and Climate Change (2010), Meeting the Low Carbon Skills Challenge: A Consultation on Equipping People with the Skills to take Advantage of Opportunities in the Low Carbon and Resource Efficient Economy

<sup>79</sup> Ibid.

<sup>80</sup> Chris Huhne, Dr Norbert Röttgen and Jean-Louis Borloo (2010) Joint EU Climate Change article, [http://decc.gov.uk/en/content/cms/news/EU\\_CC\\_article/EU\\_CC\\_article.aspx](http://decc.gov.uk/en/content/cms/news/EU_CC_article/EU_CC_article.aspx)

<sup>81</sup> FMB (2008) Transforming UK’s Existing Housing Stock

THEME	RESEARCH FINDINGS
Low Carbon	<ul style="list-style-type: none"> <li>• Whilst support is targeted at the right technologies, funding is at the minimum level required and consideration may need to be given to increase funding.<sup>82</sup></li> <li>• Federation of Master Builders (FMB) recommends: 5% VAT rate on housing refurbishment across the UK as soon as possible<sup>83</sup></li> <li>• In terms of the Energy Performance Certificate, National Home Energy Rating (NHER) recommends: 1) Key improvements from the Energy Performance Certificate (EPC) should be included on estate agent marketing; 2) A ‘scrappage’ scheme for heating systems; 3) A surcharge on Stamp Duty which is refundable for energy inefficiency; 4) Home improvers should have support from Domestic Energy Assessors; 5) Skills paths for assessors<sup>84</sup></li> <li>• Companies in construction have three goals: 1) to de-carbonise their own business and promoting this practice through their supply chain; 2) to provide buildings that emit less carbon; 3) to provide the infrastructure to enable the supply clean energy and sustainable practices in other areas of the economy<sup>85</sup></li> <li>• In order to attract the £1 billion of investment recommended by this report there needs to be some spending commitments by the government (for example infrastructure competition used to attract turbine manufacturers)</li> <li>• <b>UK Low Carbon Transition Plan as it relates to construction:</b> <ul style="list-style-type: none"> <li>- <b>Residential:</b> Increased energy efficiency in all homes to reduce heating emissions by 29% by 2020 (from 2008 levels) and all new homes to be zero carbon from 2016.</li> <li>- <b>Non-Domestic Buildings:</b> Increase in efficiency to reduce emissions by 13% by 2020 (from 2008 levels) and all new public sector buildings to be zero carbon from 2018, and private sector buildings from 2019.</li> <li>- <b>Infrastructure:</b> A larger, more flexible, smarter grid, new nuclear power stations to provide additional 16GW of power between 2018 and 2025 and major programme of wind power and marine energy to increase electricity from renewable sources to around 30% by 2020.<sup>86</sup></li> </ul> </li> </ul>

<sup>82</sup> Committee on Climate Change (2010) Building a Low Carbon Economy – The UK’s Innovation Challenge

<sup>83</sup> FMB (2008) Transforming UK’s Existing Housing Stock

<sup>84</sup> NHER (2009) Energy Performance Certificates- Seizing the Opportunity

<sup>85</sup> HM Government (2010) Low Carbon Construction Innovation & Growth Team: Emerging Findings

<sup>86</sup> HM Government (2010) Low Carbon Construction Innovation & Growth Team: Emerging Findings



THEME	RESEARCH FINDINGS
Change	<ul style="list-style-type: none"> <li>Companies need to be able to continuously change to remain competitive – ‘success depends on responding successfully to constant change rather than copying ‘best practice’ from others’; this also means maintaining a balance between focusing on capabilities required for the present, and those that will be needed in the future. ‘Developing organisations where change is a fundamental part of the culture is pivotal to identifying and co-creating positive futures’.<sup>87</sup></li> <li>‘Construction firms operate in a state of continuous adjustment between a regionally-based model and specialist divisions. Each has its particular operations and staffing issues. Firms need to operate unique versions of the two business models concurrently to make themselves adaptive to market changes. They are then less constrained by long-term plans and more able to respond opportunistically to emergent markets.’<sup>88</sup></li> </ul> <p><b>Impact of the recession:<sup>89</sup></b></p> <ul style="list-style-type: none"> <li>Private sector hit the hardest (commercial, industrial and private housing). Public sector projects (particularly non-housing) doing better, due to initiatives such as Building Schools for the Future, and the Olympic Park</li> <li>Massive loss of employment across the industry, expected to peak at 400,000 (15% decline) in 2011. The impact of this likely to continue for many years to come - need to recover the large swathe of skills lost.</li> <li>Average growth in construction output of 1.7% per year between 2010-2014 is forecast. It is likely, however, that the private sector will see an increase, whilst public sector construction will face cuts in public spending.</li> <li>Tackling labour shortages: Government looking at viability of more offsite construction/prefabrication, mobile communications, robotics etc. to reduce the need for labour on construction sites</li> <li>Engineering construction a priority sector for increased funding (for training at levels 2 and 3) identified in latest skills strategy – ensuring the industry has skills required to emerge from recession</li> </ul>

<sup>87</sup> Universities of Loughborough, Reading and Salford (2009), The Big Ideas for a changing world: Creating pathways for a competitive future – a fresh perspective on company competitiveness in the UK construction sector

<sup>88</sup> Ibid.

<sup>89</sup> ConstructionSkills Network Blueprint 2010 – 2014; and, Foresight Group, 2008, Powering Our Lives: Sustainable Energy Management and the Built Environment – Final Project Report; and, BIS (2009), Skills for growth: The national skills strategy

THEME	RESEARCH FINDINGS
Change	<p><b>Change already taking place in the construction industry:</b></p> <ul style="list-style-type: none"> <li>Activities and initiatives construction companies are already putting into place in order to support the sustainability and low carbon agendas include: <ul style="list-style-type: none"> <li>Knowledge Transfer Partnership (KTP) between Laing O’Rourke and the Institute of Innovation – to develop new solutions for the construction industry, such as Construction Waste Management<sup>90</sup></li> <li>The Wates Group’s Target Zero programme aims to eliminate non-hazardous waste going to landfill from its construction projects by 2010<sup>91</sup></li> <li>Skanska’s Green Initiative includes the publication of a book on green building solutions (‘Green Thinking’), as well as implementing this expertise on major construction projects worldwide, and participating in Green Building Councils across Europe<sup>92</sup></li> </ul> </li> </ul>
Environment	<ul style="list-style-type: none"> <li>Carbon Reduction Commitment beginning in 2010 – large commercial and public sector organisations to cut carbon emissions by 1.1 million tonnes of carbon per year (this will affect the working practices of large construction organisations, but also influence greater demand for low/zero carbon buildings)<sup>93</sup></li> <li>Through the Climate Change Act 2008, the Government committed to reducing emissions by 60% by 2050 (from 1990 baseline), and at least 26% by 2020<sup>94</sup></li> <li>See notes above in ‘Low Carbon’ re: reducing the emissions of existing buildings. The main challenge facing industry is to put practices into place that will enable extensive installation of new technologies in existing stock. This is supported by government policies: minimum standards of work carried out on existing buildings; financial incentives to encourage innovation; energy efficiency requirements added to existing Building Regulations<sup>95</sup></li> </ul>

<sup>90</sup> [http://www.in2.swansea.ac.uk/laing\\_o\\_rourke.html](http://www.in2.swansea.ac.uk/laing_o_rourke.html)

<sup>91</sup> [www.wates.co.uk](http://www.wates.co.uk)

<sup>92</sup> <http://www.skanska.com/en/About-Skanska/Our-green-initiative/We-talk-and-walk-Green/>

<sup>93</sup> BIS (2008), Strategy for Sustainable Construction

<sup>94</sup> Ibid.

<sup>95</sup> BIS (2008), Strategy for Sustainable Construction

THEME	RESEARCH FINDINGS
Environment	<ul style="list-style-type: none"> <li>• By 2012, a 50% reduction in construction waste going to landfill (from 2008 levels), agreed by the Strategic Forum for Construction (with further reductions hoped for beyond 2012, if an integrated approach to waste management can be developed across the supply chain) – directly impacting, again, on construction working practices<sup>96</sup></li> <li>• ‘We cannot under-estimate the scale of this challenge. It will mean a fundamental shift in the way we conduct ourselves professionally. Engineers, architects and surveyors will have to learn how to account for carbon using principles normally only properly understood by accountants and economists. Principles like discount rates which are now only used when talking about a financial cost – it’s an area that the majority working in our sector haven’t had to understand before.’<sup>97</sup></li> </ul>

<sup>96</sup> Ibid.

<sup>97</sup> Atkins Global: Atkins calls for new industrial revolution to secure low carbon future: [http://www.atkinsglobal.com/media\\_centre/press\\_releases/Atkins\\_calls\\_for\\_new\\_industrial\\_revolution\\_secure\\_low\\_carbon\\_future.aspx](http://www.atkinsglobal.com/media_centre/press_releases/Atkins_calls_for_new_industrial_revolution_secure_low_carbon_future.aspx)

## Scotland

THEME	RESEARCH FINDINGS
Innovation	<ul style="list-style-type: none"> <li>• As the Scottish economy directs investment towards meeting emission reduction targets, current jobs will need to be upgraded and new jobs and economic activities created in those sectors where there is an opportunity to develop and gain competitive advantage.<sup>98</sup></li> <li>• Encouraging innovation, and commercialisation of research and development has been established as a priority by the Scottish Construction Forum<sup>99</sup></li> <li>• A Combined Heat and Power plant (CHP) or district heating scheme increases the efficiency of energy capture to over 80%, compared to only 15-22 percent for plants producing only electricity. However, in order to be successful careful consideration is needed to install this at the same time as the construction of houses, offices or other industrial units as the user of the heat needs to be within close radius (Scottish Government 2007).<sup>100</sup></li> <li>• Heat is a significant draw on energy resources, but innovation can be used to solve this. For example the use of biomass for combined heat and power. This has more benefits than burning coal to produce electricity as it is a more direct use of an energy resource.<sup>101</sup></li> </ul>
Renewables	<ul style="list-style-type: none"> <li>• With 25% of Europe’s wind potential and vast renewable reserves, Scotland can be an international leader in this sector. The Scottish Government has set out a blueprint to create at least 16,000 renewable energy jobs over the next decade.<sup>102</sup></li> <li>• The Renewable Heat Action Plan for Scotland sets out the Government target of 11% of heat to come from renewable sources by 2020. An initial focus on industrial, commercial and public sectors, will be followed by a strong emphasis on improving standards of existing housing stock (some 50% of Scotland’s heat use in the domestic sector) - e.g. retrofitting micro-renewables<sup>103</sup></li> </ul>

<sup>98</sup> Scottish Government (2009), Conserve & Save: Consultation on the Energy Efficiency Action Plan for Scotland

<sup>99</sup> Scottish Construction Forum (2007), Construction Industry Plan 2007-2012: Achieving Construction Innovation and Excellence in Scotland

<sup>100</sup> SPICe (2007) Waste Management in Scotland- Towards Zero Waste, <http://www.scottish.parliament.uk/business/research/briefings-07/SB07-59.pdf>

<sup>101</sup> SPICe (2007) Energy- Subject Profile, <http://www.scottish.parliament.uk/business/research/briefings-07/SB07-35.pdf>

<sup>102</sup> Scottish Government (2007), The Government Economic Strategy; and, Scottish Government (2009), Economic Recovery Plan: Update

<sup>103</sup> Scottish Government (2009), Renewable Heat Action Plan for Scotland: a plan for the promotion of the use of heat from renewable sources

THEME	RESEARCH FINDINGS
Renewables	<ul style="list-style-type: none"> <li>Achieving the above targets will also have a significant impact on Scotland's capability to achieve targets set out in Climate Change (Scotland) Act (see 'Environment' below). The Scottish Government is confident that they can be met, if the UK-wide Renewable Heat Incentive is introduced, and if changes in waste policy are implemented (discourage landfill for commercial/industrial waste, and encourage recycling, reusing etc.)<sup>104</sup></li> <li>Current work towards achieving these targets creates a significant opportunity for occupations likely to be involved in the creation, installation and maintenance of products and services – e.g. designers, specifiers, building services engineers and planners<sup>105</sup></li> </ul>
Zero Carbon	<ul style="list-style-type: none"> <li>Target of total zero carbon buildings by 2030 – with phased zero net carbon emissions for space heating, hot water, lighting and ventilation by 2016-2017<sup>106</sup></li> <li>New house building projections of around 24,500 per year – opportunity to build high levels of energy performance for the future now. Further research required into the energy performance of new build and existing stock, and identification of any issues among those designed to be zero or low carbon; subsequent need to make training in new technologies a priority for the construction sector<sup>107</sup></li> <li>Future potential/consideration of building regulations to take account of energy efficiency standards for new builds (e.g. appliances that are built-in to a development); and ensuring that minimum standards are maintained through adherence to the regulations by owners of existing stock looking to do work on buildings<sup>108</sup></li> </ul>
Low Carbon	<ul style="list-style-type: none"> <li>Schemes for Approved Certifiers of Construction to be encouraged, so that suitably qualified and experienced tradesmen can certify that installations comply with building regulations<sup>109</sup></li> <li>Introduction of 'very low carbon' standards in 2013<sup>110</sup> - but staged increases in energy standards between 2010 and 2013, with the introduction of the Scottish Building Standards 2010 - 30% reduction in carbon emissions beyond current standards<sup>111</sup></li> </ul>

<sup>104</sup> Ibid.

<sup>105</sup> Ibid.

<sup>106</sup> Sullivan (2007), A Low Carbon Building Standards Strategy For Scotland

<sup>107</sup> Ibid.

<sup>108</sup> Ibid.

<sup>109</sup> Sullivan (2007), A Low Carbon Building Standards Strategy For Scotland

<sup>110</sup> Ibid.

<sup>111</sup> Scottish Building Standards Agency: [www.sbsa.gov.uk](http://www.sbsa.gov.uk)

THEME	RESEARCH FINDINGS
Low Carbon	<ul style="list-style-type: none"> <li>Around 7,000 SMEs in Scottish construction sector – although they are aware of energy efficiency agenda, they need support in identifying benefits to business of new technologies etc., and the impact on the sector. Need to identify gaps between strategic targets and industry base line, and practical steps to be taken in supporting the sector to achieve targets<sup>112</sup></li> <li>There must be a maximum target amount for net Scottish emissions account for each year between 201 and 2050. Also, the amount of net Scottish emissions for the year 2050 must be, at minimum 80% less than the baseline.<sup>113</sup></li> <li>'The location and volume of the renewable energy capacity identified in this study to be necessary to provide 40% of Scotland's 2020 demand for electricity would require network reinforcement at the levels recognised in numerous studies'<sup>114</sup></li> </ul>
Change	<ul style="list-style-type: none"> <li>Between 2010-2014, a projected annual increase in output of 2.8% (well above UK average) – attributed to expenditure programme on public housing repair and maintenance works. R&amp;M sector is labour intensive, so employment also forecast to increase over this period, by around 9%. New work output is also expected to grow (private housing especially)<sup>115</sup></li> <li>Severe pressures on Government spending – lower budgets for public sector projects in health, education, housing and infrastructure (public non-housing output forecast to decrease by an annual rate of 8.3% to 2014)<sup>116</sup></li> <li>Cost benefit analyses are required to identify: 1) impact on construction sector/new builds of energy standards and sustainability measures in 2010 building regulations; 2) the incentives for building to higher level of energy performance; 3) measures taken to improve energy efficiency of existing stock; 4) adoption of new building technologies and techniques (this analysis requires particular focus on development projects and potential impact on construction practices)<sup>117</sup></li> </ul>

<sup>112</sup> Consultation on the Energy Efficiency Action Plan for Scotland: ConstructionSkills response

<sup>113</sup> OPSI (2009) Climate Change (Scotland) Act

<sup>114</sup> SPICe (2007) Energy - Subject Profile

<sup>115</sup> ConstructionSkills Network Blueprint 2010 – 2014

<sup>116</sup> ConstructionSkills Network Blueprint 2010 – 2014; and, Foresight Group, 2008, Powering Our Lives: Sustainable Energy Management and the Built Environment – Final Project Report; and, BIS (2009), Skills for growth: The national skills strategy

<sup>117</sup> Sullivan (2007), A Low Carbon Building Standards Strategy For Scotland

THEME	RESEARCH FINDINGS
Environment	<ul style="list-style-type: none"> <li>• The Climate Change (Scotland) Act 2009 sets a target to reduce emissions by 80% by 2050, and at least 42% by 2020<sup>118</sup></li> <li>• The Scottish Environment Protection Agency, Scottish Enterprise, Highlands and Islands Enterprise and the Scottish Funding Council have launched the Environmental and Clean Technologies Action Plan. Environmental and clean technologies have the potential to support tens of thousands of new Scottish jobs, through a major expansion in the number of companies developing state-of-the-art ways to tackle pollution, manage waste and reduce carbon.<sup>119</sup></li> <li>• ‘Planet’ a key theme in the Scottish Construction Forum’s Industry Action Plan; regarded as a key driver for change for the industry, affecting planning, design, procurement and working practices. This includes increasing understanding and recognition of sustainability, and developing good practice/industry leadership on environmental and sustainability issues.<sup>120</sup></li> <li>• Two key targets in waste reduction for Scotland- maximum of 5% waste being landfilled by 2025; and, 70% of municipal waste to be recycled by 2025<sup>121</sup></li> <li>• ‘Strategic Environmental Assessment (SEA) is a systematic process for predicting, assessing, reporting, mitigating, and monitoring the environmental effects of certain proposed plans and programmes with significant environmental effects.’<sup>122</sup></li> <li>• The Business Waste Framework (Scottish Executive 2007) sets out key aims for the sector, including reducing the amount of business waste by at least 200,000 tonnes a year. The Executive and SEPA undertook to publish bi-annual progress reports on these aims.<sup>123</sup></li> </ul>

<sup>118</sup> [www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact](http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/climatechangeact)

<sup>119</sup> Scottish Government (2009), Economic Recovery Plan: Update

<sup>120</sup> Scottish Construction Forum (2007), Construction Industry Plan 2007-2012: Achieving Construction Innovation and Excellence in Scotland

<sup>121</sup> Scottish Government (2009), Zero Waste Plan

<sup>122</sup> SPICe Briefing (2007) Environment- Subject Profile, <http://www.scottish.parliament.uk/business/research/briefings-07/SB07-27.pdf>

<sup>123</sup> SPICe (2007), Waste Management in Scotland - Towards Zero Waste

## Wales

THEME	RESEARCH FINDINGS
Innovation	<ul style="list-style-type: none"> <li>• Prioritisation of technology and innovation, the commercialisation of new sustainable technologies, energy services and low carbon products – all require development of the skills base within these specialist areas, and the offer of integrated packages of support to businesses<sup>124</sup></li> <li>• Development of new products and processes will provide new commercial opportunities to the construction sector in Wales. Therefore, there is a need for construction companies to be able to exploit these opportunities by engaging with the manufacture and installation of innovative/leading edge technologies<sup>125</sup></li> <li>• Due to the scale/timing of new business opportunities, there are some doubts as to whether indigenous companies have access to adequate guidance and support, or the capacity, to exploit these opportunities to the full (i.e. large number of SMEs – difficult to accelerate growth and development, whilst at the same time maintaining income levels)<sup>126</sup></li> </ul>
Renewables	<ul style="list-style-type: none"> <li>• Welsh Assembly Government (WAG) currently looking to maximise support from programmes emerging from the Carbon Trust, such as Partnership for Renewables<sup>127</sup> (supporting the public sector to manage onsite renewable energy projects) – subsequent potential for construction companies to engage with these projects.</li> <li>• Furthermore, the Flexible Support for Business Environment and Sustainability initiative will provide companies with the opportunity to access advice and support regarding ‘sustainable, cost effective business practices’<sup>128</sup></li> <li>• Wales has ‘exceptional renewable energy resources’: several large on- and off-shore windfarms are currently under construction – including consent begin granted for the development of the second largest offshore windfarm in the world at Gwent y Mor<sup>129</sup></li> <li>• The Renewable Energy Route Map for Wales also highlights the potential for Wales to take forward the opportunity of being at the forefront of marine energy developments – but construction skills needs to be identified<sup>130</sup></li> </ul>

<sup>124</sup> WAG (2009), Capturing the Potential: A Green Jobs Strategy for Wales

<sup>125</sup> WAG (2007), Building Companies, Building Skills

<sup>126</sup> Ibid.

<sup>127</sup> WAG (2009), Climate Change Strategy – Programme of action consultation

<sup>128</sup> HM Government (2009), The UK Low Carbon Transition Plan: National strategy for climate and energy

<sup>129</sup> Ibid.

<sup>130</sup> WAG (2008), Renewable Energy Route Map for Wales: consultation on a way forward to a leaner, greener and cleaner Wales

THEME	RESEARCH FINDINGS
Zero Carbon	<ul style="list-style-type: none"> <li>• A programme of support to improving domestic energy efficiency standards will be introduced (e.g. installation of new technologies and creation of community-level energy generation projects)<sup>131</sup></li> <li>• WAG's proposed legislation/building regulations for improving the efficiency of new housing stock, and the cost implications of these regulations for the construction industry, are of concern to the sector – particularly during a recession. Upskilling workers in sustainability and 'green building' techniques will be costly, but there is also a need to establish the extent/type of skills need<sup>132</sup></li> </ul>
Low Carbon	<ul style="list-style-type: none"> <li>• The key challenges for emission reduction in the residential sector have not yet been fully identified<sup>133</sup></li> <li>• Large number of solid wall homes in Wales, with rural properties often dependent on oil or LPG for fuel: 'tackling this backlog of hard-to-heat homes will create jobs, encourage skills, improve local areas, and directly reduce fuel poverty'<sup>134</sup></li> <li>• Building technologies identified as one of the largest emerging low carbon industries in Wales – WAG to focus on these industries where there could be quick development of the relevant skills base and strong supply chain<sup>135</sup></li> <li>• WAG aim to generate up to twice as much renewable electricity per year by 2025 (compared to present day) and by 2050 – at the latest – have almost all energy needs met by renewable electricity (e.g. through wind and marine sources)<sup>136</sup></li> <li>• To promote the optimum use of offshore wind around the coast of Wales in order to deliver a further 15 kWh/d/p of capacity by 2015/16, to test the appropriateness and cost effectiveness of steps to exploit the tidal range of the Severn estuary, to capture at least 10% (8 kWh/d/p) of the potential tidal stream and wave energy off the Welsh coastline by 2025, to have 4.5 kWh/d/p of installed onshore wind generation capacity by 2015/2017, to support small scale hydro and geothermal schemes where they are environmentally acceptable in order to generate at least 1 kWh/d/p and to deliver by 2020 up to 6 kWh/d/p in Wales of electricity from biomass – 50% indigenous/50% imported – and a heat potential of 2-2.5 kWh/d/p in Wales<sup>137</sup></li> </ul>

<sup>131</sup> Ibid.

<sup>132</sup> ConstructionSkills response to WAG Climate Change Strategy consultation

<sup>133</sup> Ibid.

<sup>134</sup> WAG (2010), A Low Carbon Revolution: The Welsh Assembly Government Energy Policy Statement

<sup>135</sup> WAG (2009), Capturing the Potential: A Green Jobs Strategy for Wales

<sup>136</sup> WAG (2010), A Low Carbon Revolution: The Welsh Assembly Government Energy Policy Statement

<sup>137</sup> WAG (2010) A Low Carbon Revolution: The Welsh Assembly Government Energy Policy Statement

THEME	RESEARCH FINDINGS
Change	<ul style="list-style-type: none"> <li>• WAG aim: 'A step change in the energy efficiency performance of all housing stock in Wales'. This is to be achieved through delivery of:<sup>138</sup> <ul style="list-style-type: none"> <li>- <b>Energy Efficiency:</b> Revised Home Energy Efficiency Scheme (improving over 3000 homes per year); information and support to local action groups/communities;</li> <li>- <b>Funding:</b> Arbed – Wales Strategic Energy Performance Investment Programme – stimulating investment of £350m into energy performance of domestic stock; including £30m investment from WAG to secure private sector funding for whole house assessments and improvements for over 10,000 homes; plus use of EU funding for energy efficiency;</li> <li>- <b>Building Regulations:</b> increasing standards to zero carbon; changes in public sector procurement (see below)</li> <li>- <b>Reform:</b> seek for energy tariffs to encourage reduction in energy consumption; roll-out of installation programme for smart meters.</li> </ul> </li> <li>• Public sector construction: Changes in the way the Welsh Assembly procures built environment services – treating construction projects as programmes rather than stand alone purchases. Therefore, creation of a procurement framework for planning purposes, and enabling supply chain to flourish; also opportunities for integrating social clauses within public sector construction contracts (e.g. opportunities for long-term unemployed)<sup>139</sup></li> <li>• All developments procured, or financially supported by, WAG will be required to achieve a minimum of Level 3 of the Code for Sustainable Homes; non-residential homes to achieve excellent 'BREEAM' status (BRE Environmental Assessment Method); a minimum of recycled materials to be used in all new buildings. These changes in public sector procurement practices will require construction managers to adapt – as well as changes in construction methods to support the sustainability agenda<sup>140</sup>.</li> </ul>

<sup>138</sup> Ibid.

<sup>139</sup> WAG (2007), Building Companies, Building Skills

<sup>140</sup> WAG (2009), Climate Change Strategy – Programme of action consultation

# Appendix 2: Bibliography

THEME	RESEARCH FINDINGS
Change	<ul style="list-style-type: none"> <li>Levels of repair and maintenance works expected to hold well due to the National Housing Quality Standard, and new projects for private housing sector and infrastructure will provide increases in output for Wales (annual growth forecast of construction output 2.5% between 2010 and 2014)<sup>141</sup></li> <li>A step-change in the energy efficiency performance of all housing stock in Wales and a significant proportion of our energy to be generated locally or domestically<sup>142</sup></li> </ul>
Environment	<ul style="list-style-type: none"> <li>The National Housing Strategy sets out the need to reduce the carbon footprint of housing stock in Wales, and tackling climate change through: improving energy performance of existing homes and during the construction of new homes, and also ensuring the design and location of new housing considers environmental issues<sup>143</sup></li> </ul>

- Department for Business, Innovation and Skills (BIS) (2008), Strategy for Sustainable Construction
- BIS (2009), Changing to Compete: Review of Productivity and Skills in UK Engineering Construction
- BIS (2009), Towards a Low Carbon Economy – economic analysis and evidence for a low carbon industrial strategy
- BIS, Nanotechnologies and the Construction Sector
- BIS (2009), Skills for growth: The national skills strategy
- BIS & Department of Energy and Climate Change (2010), Meeting the Low Carbon Skills Challenge: A Consultation on Equipping People with the Skills to take Advantage of Opportunities in the Low Carbon and Resource Efficient Economy
- British Wind Energy Association (BWEA) (2009), Marine Renewable Energy - State of the industry report
- BWEA (2010): The Industry View on the Marine Energy Action Plan
- BWEA, UK Offshore Wind: Charting the Right Course
- BWEA, UK Offshore Wind: Staying on Track
- Department for Communities and Local Government (CLG) (2008), The Code for Sustainable Homes - Setting the standard in sustainability for new homes
- CLG (2008), Innovative Construction Products and Techniques
- Committee on Climate Change (2010), Building a Low Carbon Economy – The UK's Innovation Challenge
- Construction News (April 1st, 2010)
- Construction Sector Training and Employment Strategy (Greater Nottingham) 2008
- ConstructionSkills response to WAG Climate Change Strategy consultation
- ConstructionSkills, Skills Needs Analysis for Construction
- ConstructionSkills Network, Blueprint for UK Construction Skills 2010 to 2014
- Consultation on the Energy Efficiency Action Plan for Scotland: ConstructionSkills response
- Department of Energy and Climate Change (2009), Heat and energy saving strategy consultation: A summary of the online consultation submissions received in response to the consultation
- Federation of Master Builders (FMB) (2008), Transforming UK's Existing Housing Stock
- Government Office for Science; Foresight Group (2008), Powering Our Lives: Sustainable Energy Management and the Built Environment – Final Project Report
- HM Government (2009), The UK Low Carbon Transition Plan: National strategy for climate and energy
- HM Government (2010), Low Carbon Construction Innovation & Growth Team: Emerging Findings
- House of Commons Environmental Audit Committee (2009), Green Jobs and Skills Second Report of Session 2008-09
- House of Commons Energy and Climate Change Committee (2010), Low carbon technologies in a green economy: fourth report of session 2009-10
- Chris Huhne, Dr Norbert Röttgen and Jean-Louis Borloo (2010), Joint EU Climate Change article, [http://decc.gov.uk/en/content/cms/news/EU\\_CC\\_article/EU\\_CC\\_article.aspx](http://decc.gov.uk/en/content/cms/news/EU_CC_article/EU_CC_article.aspx)
- National Home Energy Rating (NHER) (2009), Energy Performance Certificates - Seizing the Opportunity

<sup>141</sup> ConstructionSkills Network Blueprint 2010 – 2014

<sup>142</sup> WAG (2010): A Low Carbon Revolution –The Welsh Assembly Government Energy Policy Statement

<sup>143</sup> WAG (2009), Climate Change Strategy – Programme of action consultation

- NESTA (2006), The Innovation Gap - Why Policy Needs to Reflect the Reality of Innovation in the UK
- NESTA (2007), Hidden Innovation: How innovation happens in six 'low innovation' sectors
- OPSI (2009), Climate Change (Scotland) Act
- Renewables Advisory Board (2008), 2020 Vision: How the UK can meet its target of 15% renewable energy
- RenewableUK, The Next Steps for Marine Energy
- Royal Institution of Chartered Surveyors (RICS) (2010), Redefining Zero: Carbon Profiling as a Solution to Whole Life Carbon Emission Measurement in Buildings
- Salford Centre for Research and Innovation (2008), An Innovation Platform for Construction: NWUA Pilot Project to Develop Innovation Platforms in Non-science Research Disciplines
- Scottish Building Standards Agency
- Scottish Construction Forum (2007), Construction Industry Plan 2007-2012: Achieving Construction Innovation and Excellence in Scotland
- Scottish Government (2007), The Government Economic Strategy
- Scottish Government (2009), Economic Recovery Plan: Update
- Scottish Government (2009), Renewables Action Plan
- Scottish Government (2009), Renewable Heat Action Plan for Scotland: a plan for the promotion of the use of heat from renewable sources
- Scottish Government (2009), Conserve & Save: Consultation on the Energy Efficiency Action Plan for Scotland
- Scottish Government (2009), Zero Waste Plan
- Skills for Scotland: A Lifelong Learning Strategy
- SPICe (2007), Waste Management in Scotland- Towards Zero Waste
- SPICe (2007), Energy- Subject Profile
- SPICe Briefing (2007), Environment - Subject Profile
- Sullivan (2007), A Low Carbon Building Standards Strategy For Scotland
- Universities of Loughborough, Reading and Salford (2009), The Big Ideas for a changing world: Creating pathways for a competitive future – a fresh perspective on company competitiveness in the UK construction sector
- WAG (2007), Building Companies, Building Skills
- WAG (2008), Renewable Energy Route Map for Wales: consultation on a way forward to a leaner, greener and cleaner Wales
- WAG (2009), Capturing the Potential: A Green Jobs Strategy for Wales
- WAG (2009), Climate Change Strategy – Programme of action consultation
- WAG (2010), A Low Carbon Revolution: The Welsh Assembly Government Energy Policy Statement