Skills Needs Analysis of the Construction and Built Environment Sector in Wales

Theme: Onsite and offsite construction in Wales

June 2013

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1. The aim of the Built Environment Sustainability Training (BEST) programme is to develop and pilot strategic training to support individuals working in the built environment and sustainable energy sector, enabling the delivery of the Welsh Government's aspirations towards sustainable development.

Evidence Base

2. In 2011, Pye Tait Consulting conducted a review of Skills Provision for the Built Environment in Wales[1], with the aim of providing CITB and the Welsh Government with a 'case for change' and a suitable proposal for skills provision that satisfies this change.

3. CITB has, in addition, been undertaking a major programme of work as part of Build Up Skills UK, an alliance of UK Sector Skills Councils comprising Asset Skills, CITB, Energy & Utility Skills and SummitSkills. Working in collaboration these organisations carried out a UK-wide assessment of the National Status Quo[2] which in turn informed the development of a strategic future skills Road-map[3] to ensure that employers in the built environment sector in the UK have the skilled workforce (specifically craft and technical 'blue collar'[4] workers) required to meet EU 2020 energy efficiency targets.

4. As well as drawing upon these key programmes of recent research – this SNA for onsite and offsite construction has been informed by a range of other desk-based sources and a full bibliography is presented in Appendix 1.

Construction in Wales

5. Construction remains an important sector that makes a vital contribution to social and economic activity within Wales and the UK as a whole, underpinning growth and ambition. However, it has suffered as a result of the recession, particularly in respect of jobs and training.

[1] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change.
[2] Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.
[3] Pye Tait Consulting (2012) Build Up Skills UK - 2020 Skills Roadmap and Action Plan.
[4] Typically referring to workers that are based on some form of site and carry out physical or manual work – for example bricklayers, plasterers, roofers etc.

6. Looking ahead - short term prospects are weak, with a further contraction of 5% in output expected in 2013 before a weak return to growth in 2014. Over the next five years to 2017, the Welsh construction industry is expected to see overall output rise at an average rate of 2.7% per year. The main driver of performance over the forecast period is the planned new nuclear power plant at Wylfa in Anglesey[5].

7. The 2010 Spending Review resulted in an unprecedented real terms reduction of over 40% in the Welsh capital budget over the period to 2014-15. The next decade is likely to see a continued real terms reduction in the Welsh Government's annual capital budget which will mean £2-4bn less capital available than in the previous decade.

8. Headline statistics from the 2011 Census report 111,000 people employed in construction in Wales[6].

9. Construction employment is expected to decline at an average rate of 1.5% per year between 2013 and 2017, as strong growth in output terms is expected to take place later rather than sooner. Total construction sector employment is forecast to contract to 92,910 individuals by 2017 although in the intervening period there is estimated to be annual recruitment requirement (ARR) of 2,950 individuals[7].

10. EU Skills estimates employment totals in Wales of approximately 6,000 in electricity, 500 in gas (upstream) and 5,800 in gas (downstream) industries[8].

11. ProSkills reports total employment in the wood and wood product (excluding furniture) manufacturing sector in Wales to consist of 9,000 individuals across 1,050 workplaces[9].

The workforce

12. The vast majority of employers in the Welsh construction sector are small, with approximately 93% employing less than 10 people. Less than 1% of employers are large (employing more than 250 people) although these firms carry out a disproportionate share of the work by value.

13. An estimated 35,700 people in the sector work on a self-employed basis, although this is less widespread among professional occupations where self-employment is most common among architects and surveyors[10].

[5] Experian: 2013-2017 Construction Skills Network Wales Labour Market Intelligence.
[6] ONS (December 2012) Statistical Bulletin: 2011 Census – Key statistics for Wales, March 2011.
[7] Experian: 2013-2017 Construction Skills Network Wales Labour Market Intelligence.
[8] EU Skills (2010) Sector Skills Agreement – Wales.
[9] ProSkills (2011) Labour Market Intelligence – Process Manufacturing.
[10] ONS (2012) Labour Force Survey Four quarter average Summer 2011 to Spring 2012 inclusive.

14. The majority (76%) of employers surveyed as part of the 2011 Skills Provision in Wales research reported having provided access to at least some form of training for their workforce over the preceding two years. Although on the whole, the majority (55%) of surveyed employers reported not having taken steps to train staff in respect of low carbon skills.

Demand for, and value of, sustainability skills in the Built Environment in Wales

15. The uncertain economic situation means that in the short-term survival is the biggest driver for the construction sector as a whole, particularly for small and medium sized enterprises (SMEs). CITB's Sector Skills Assessment for Wales pointed out that the wider sustainability agenda has the potential to create a significant number of 'green jobs' following the economic downturn but will also require up-skilling at all levels.

16. Specialist skills, from design through to the installation of new types of products and materials, will be needed to meet the high specification and low energy requirements of new buildings and infrastructure in the future. At the same time, offsite manufacturing and prefabrication has the potential to substantially increase as the industry moves from recession to recovery.

17. 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.

18. The development of new products and processes will provide new commercial opportunities to the construction sector in Wales. 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.[11]

19. Over the medium term, low and zero carbon targets together with substantial growth of the renewables sector that is anticipated for Wales, are expected to drive the development of new skills, but the risk of skills shortages and gaps could remain significant unless action is taken to address this.

[11] Welsh Government (2007) Building Companies, Building Skills.

Gap analysis in training provision

20. The general consensus from focus groups participants was that provision adequately serves traditional and core aspects of construction. There were some concerns around hard to fill vacancies for certain trades which are likely to be derived from the overall structure of qualifications within these areas. However, constraints on physical resources and expertise mean that employer demand for training in new and specialist areas is, currently, largely unmet. Furthermore, focus group participants were sceptical that new skills and advanced techniques will be easily delivered under current provision despite some providers already attempting to move into this area.

21. Analysis of data provided by Ofqual on built environment-related vocational qualifications in Wales[12], substantiates evidence from the Skills Provision in Wales research that gaps exist in provision relating to the following priority skills/occupational areas in Wales:

- Earth Moving Equipment;
- Heavy plant materials (because of the size of the equipment and the space required);
- Heritage (including specialist skills needed to retrofit historic/listed buildings);
- Interior wall insulation (the Arbed programme for regeneration in Wales has led to increased demand for these skills);
- Prefabrication, timber framing and pods;
- Scaffolding;
- Steeplejacking;
- Street Works.

22. Focus group attendees pointed out that training and development in these skill areas requires facilities, equipment and space not available to any of the individual colleges or other providers and that the only available facilities for such training are some distance from Welsh employers, in England.

23. Participants also stressed that the priority skills list does not address any potential future needs of the industry in high technology areas such as carbon reduction materials and techniques. While the teaching of such knowledge and skills is entirely possible within the physical resources of existing provision, it would require additional specialised staff supported by access to on-going research and development[13].

[12] Cf. Matrix of Built Environment Skills Provision in Wales (separate Excel-based annex).

[13] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change.

24. Research into the National Status Quo (2012) identified a belief among providers that Awarding Organisations unwilling to collaborate with them can block the development of relevant provision – particularly in the more rural areas of Wales and indeed Northern Ireland. Stakeholders noted that training is not widely available in Wales to up-skill the workforce for the needs of the Energy Island in Anglesey. There is a concern that employers in Wales, especially SMEs, would not be able to benefit from up-skilling and that instead businesses would send their teams over from England (for example Bristol and Birmingham) to capitalise on the opportunities.

25. The Skills Provision in Wales research identified that approximately four fifths of surveyed employers were in favour of change to construction skills provision in Wales, with only one fifth preferring a no change scenario. These findings were substantiated by focus group participants who were strongly of the opinion that, for Wales to remain competitive in terms of its construction skills base, training provision needs to be better equipped not only in terms of both physical space and plant but in terms of the knowledge and skills of the teaching resources.

Recommendations

26. Recommendations are set out in section 7.2.

Priority Areas for Action

27. Priority Areas for Action are set out in section 8.

2. Introduction

2.1 Overview of the BEST programme

The aim of the Built Environment Sustainability Training (BEST) programme is to develop and pilot strategic training to support individuals working in the built environment and sustainable energy sector, enabling the delivery of the Welsh Government's aspirations towards sustainable development.

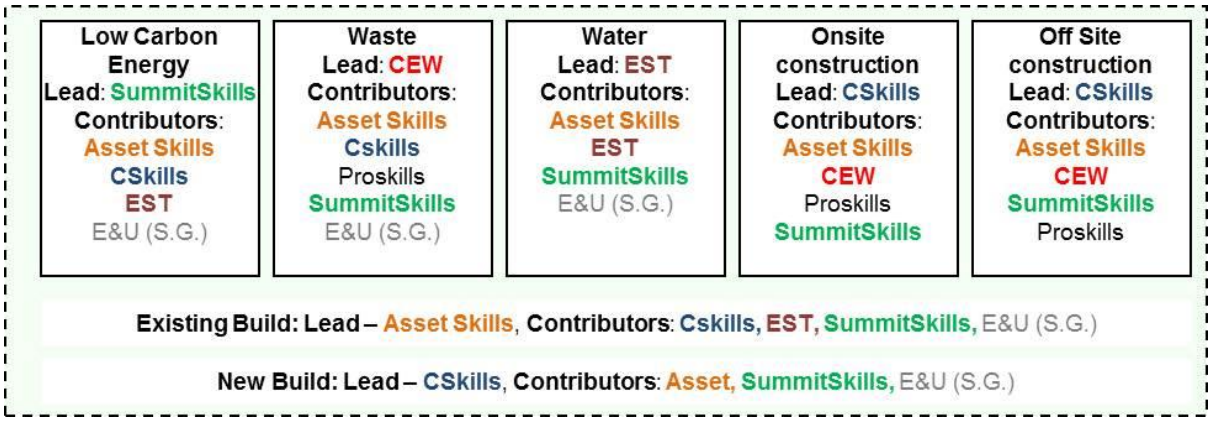
Currently, substantial change is occurring in this sector that will be accelerated as demands increase to reduce the energy usage and environmental impact of our buildings. These necessary changes can only be realised through Wales utilising a skilled and knowledgeable workforce and this programme is largely focussed on enabling the transition of existing employees from level 2 through to attainment of qualifications at levels 3, 4 & 5.

BEST benefits from nearly £4.5M of European Social Fund (ESF) grant funding from the Welsh European Funding Office (WEFO) which will be matched with approximately £3.4M from the Sponsors and training providers.

To achieve the above objectives/targets, BEST will unite a range of key stakeholders with responsibilities for the skills of the energy, waste, water and built environment sectors with the objective of creating a 10-year strategy and training delivery roadmap. That roadmap will stimulate and empower businesses, employees and training providers in Wales through the provision of new (procured) training courses funded through BEST.

Cardiff University's Welsh School of Architecture is the Lead Sponsor and will work alongside the following Joint Sponsors: Asset Skills, Constructing Excellence Wales, CITB, the Energy Saving Trust, Proskills, and SummitSkills. The joint sponsors and key themes for the programme are set out in Figure 1, below.

Figure 1: Joint sponsors and theme involvement



2.2 Scope of this Skills Needs Analysis (SNA)

This Skills Needs Analysis (SNA) has been developed by CITB and covers the combined themes of 'Onsite and Offsite' and 'New Build' construction in Wales.

Onsite and Offsite construction covers all construction activity within the Construction and Built Environment sector that takes place either onsite or in factory premises (offsite). New Build construction involves all activity which involves new work rather than retrofit (repair or maintenance) of existing buildings. The SNA will draw upon professions represented by CITB, ProSkills, SummitSkills, AssetSkills and EU-Skills. Appendix B contains the proposed industry sectors defined by Standard Industrial Classification (SIC) codes which will be deemed in-scope for the Skills Needs Analysis.

2.3 Evidence base

In 2011, Pye Tait Consulting conducted a review of Skills Provision for the Built Environment in Wales[14], with the aim of providing CITB and the Welsh Government with a 'case for change' and a suitable proposal for skills provision that satisfies this change. The study involved a detailed literature review, 420 interviews with employers, 100 interviews with employees and three focus groups involving a mix of built environment sector stakeholders.

CITB has, in addition, been undertaking a major programme of work as part of Build Up Skills UK, an alliance of UK Sector Skills Councils comprising Asset Skills, CITB, Energy & Utility Skills and SummitSkills. Working in collaboration these organisations carried out a UK-wide assessment of the National Status Quo[15] which in turn informed the development of a strategic future skills Road-

[14] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change.
[15] Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.

map[16] to ensure that employers in the built environment sector in the UK have the skilled workforce (specifically craft and technical 'blue collar'[17] workers) required to meet EU 2020 energy efficiency targets.

As well as drawing upon these key programmes of recent research – this SNA for onsite and offsite construction has been informed by a range of other desk-based sources and a full bibliography is presented in Appendix 1.

2.4 Overview of the construction sector in Wales

Construction remains an important sector that makes a vital contribution to social and economic activity within Wales and the UK as a whole, underpinning growth and ambition. However, it has suffered as a result of the recession, particularly in respect of jobs and training. Whilst contractors have strived to retain skilled staff and preserve capacity for the upturn through reduced working hours or under-employment, this means significant excess capacity must be made up before growth increases employment.

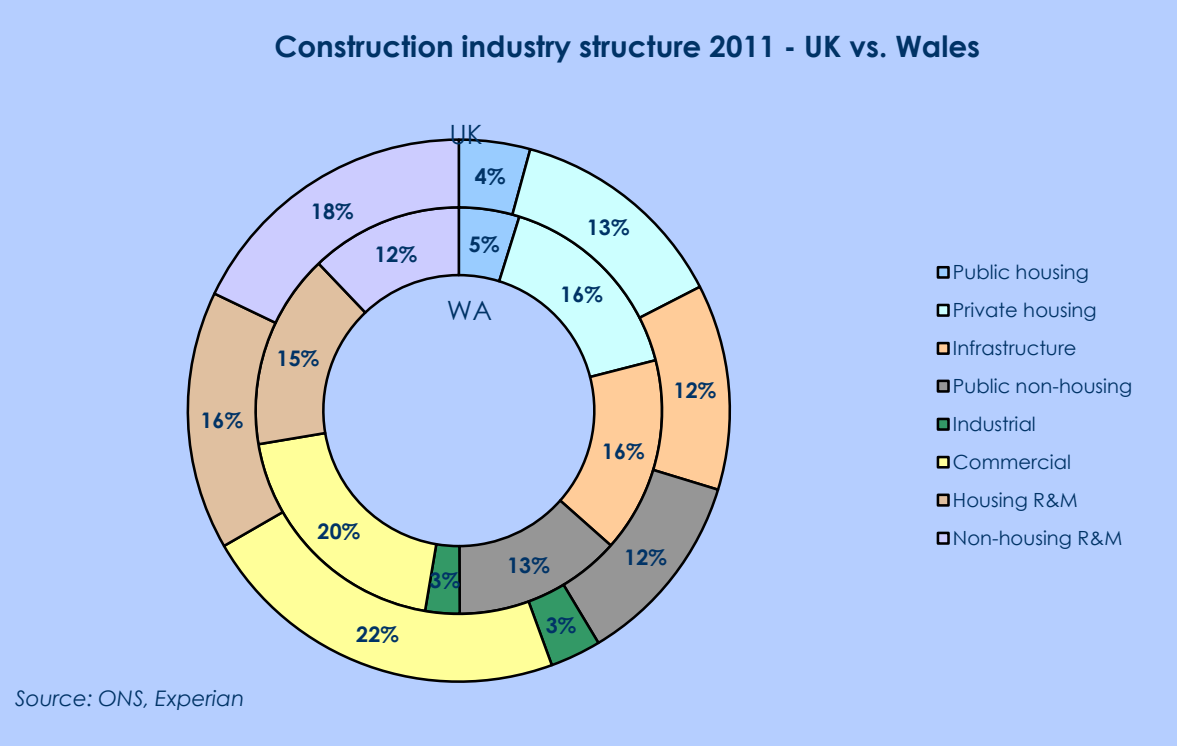
At the same time, the built environment workforce needs to be trained in the holistic understanding of the implications of their actions in the delivery of low carbon, sustainable buildings. Specialist skills for commissioning buildings are required to ensure energy efficiency can be maintained and the importance of longer involvement in construction projects beyond the typical commission period is required for all professionals. Core knowledge and understanding of specific products is essential, as are skills in innovation, entrepreneurship and business development[18].

Skills for new build in particular must ensure that improving the theoretical performance of buildings during design is delivered in reality. Indeed reducing the baseline of energy and water usage should be common across all the skill sets in the built environment[19].

An overview of the construction industry structure in Wales is presented in Figure 2, below. In comparison with the UK, Wales operates a large share of public housing, private housing and other new infrastructure developments. Repair and Maintenance (R&M) accounts for a smaller share of the sector than is the case for the UK as a whole.

[16] Pye Tait Consulting (2012) Build Up Skills UK - 2020 Skills Roadmap and Action Plan.
[17] Typically referring to workers that are based on some form of site and carry out physical or manual work – for example bricklayers, plasterers, roofers etc.
[18] CITB (2010) Sector Skills Assessment for the Construction Sector – Wales report.
[19] CITB (2010) Sector Skills Assessment for the Construction Sector – Wales report.

Figure 2: Construction industry structure 2011 – UK vs. Wales



The Office for National Statistics (ONS) reports 14,835 enterprises operating in built environment-related Standard Industrial Classification (SIC) codes in Wales in 2012[20]. A breakdown of total enterprises by SIC code is presented in Appendix 2.

2.5 Building stock in Wales

The characteristics of the building stock in Wales have changed dramatically over the last 50 years. Typical post-war properties, with coal fires and outdoor sanitation are clearly out of date, but a large proportion of the housing stock that will be inhabited in 2050 already exists.

There are approximately 1.35 million domestic dwellings in Wales – an increase of 6% since 2000-2001[21]. Table 1, below, shows the current dwelling estimates in comparison to the other UK nations, illustrating ownership among the private and public sectors.

[20] SIC codes in scope of the Built Environment were defined in conjunction with BEST prior to the commencement of this work.
[21] Welsh Government (December 2012) Statistical First Release – New House Building in Wales (July to September 2012).

Table 1: UK domestic building stock by nation and tenure[22]

Nation	Private sector		Social sector				Total
	Owner occupied	Private rented	Local authority	Housing executive	Registered social landlord	Housing association	
Wales	945,003	182,269	88,723	N/A	133,640	N/A	1,349,635
England	14,860,000	3,706,000	1,801,000	N/A	N/A	2,018,000	22,385,000
Northern Ireland	469,100	125,400	N/A	85,900	N/A	24,800	705,200
Scotland	1,465,000	242,000	374,000	N/A	N/A	276,000	2,357,000
TOTAL	**17,739,103**	**4,255,669**	**2,263,723**	**85,900**	**133,640**	**2,318,800**	**26,796,835**

Source: Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.

Older building stock constitutes a wide variation of building fabrics and designs and provides specific challenges in terms of efficient energy usage. The size of this problem is highlighted in Table 2, which shows the number of pre-1919 dwellings and their prevalence in the UK regions – the highest proportion of this older property stock exists in Wales and is represented by 34% of all dwellings.

Table 2 Proportion of pre-1919 dwellings per nation[23]

Region	Number of pre-1919 dwellings	Proportion of pre-1919 dwellings of the total number
Wales	459,000	34.0%
England	4,865,000	27.7%
Northern Ireland	87,700	12.4%
Scotland	455,000	19.3%

Source: Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.

The Holmans Report 'Housing Need and Demand in Wales 2006 to 2026', published in 2010, estimated that 284,000 additional homes are required in Wales between 2006 and 2026[24].

There were 1,493 dwellings started during July to September 2012. This figure is up by 5 per cent on the same quarter of 2011 but down by 1% on July to September 2010. There were 1,231

[22] Data for England, Scotland and Wales are from 2010; data for Northern Ireland from 2011. Sources: English Housing Survey; Scottish House Condition Survey; Northern Ireland Housing Market Review; and Welsh Government Dwelling Stock Estimates. Please note not all data are available for every category.
[23] Data for England and Scotland is from 2010; data for Wales is from 2012; data for Northern Ireland is from 2011.
[24] Welsh Government (December 2012) Statistical First Release – New House Building in Wales (July to September 2012).

completions during the July to September quarter 2012 which is an increase of 9 per cent on the same quarter of 2011 but, as with starts, this was still down (by 5 per cent) on the number of completions seen in this quarter in 2010.

The number of dwellings completed across Wales has generally declined since 2007-08, mainly as a consequence of the drop in the number of new dwellings started during recent years, although there was a slight increase during 2011-12. This increase has carried through into the first half of 2012-13, with completions higher than in the first half of the previous two years[25] .

[25] Welsh Government (December 2012) Statistical First Release – New House Building in Wales (July to September 2012).

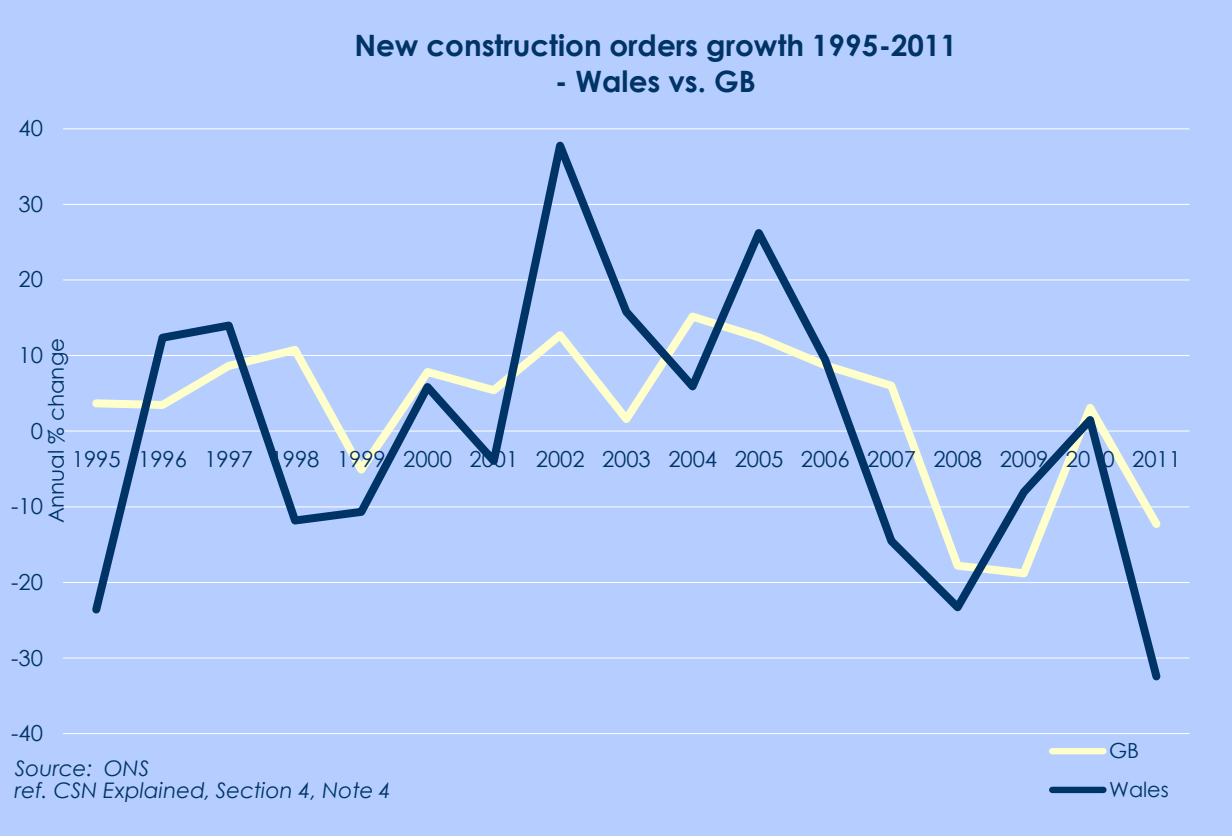
3. Current performance of the sector in Wales

3.1 Economic performance

Gross Value Added (GVA) in the Welsh construction sector totalled £43.9bn in 2009 prices in 2011, a 0.5% decline on 2010[26]. This compares poorly with UK GVA growth of 1.1% in the same period and means that Wales' construction sector share of total UK construction GVA fell from 3.6% to 3.4%.

Construction output in Wales returned to growth in 2010 and saw a further year of growth in 2011 before returning to contraction in 2012 with an estimated decline of 13%. Output is expected to have fallen across the board in 2012, with the exception of industrial construction, although that sector is recovering from a particularly low base (Figure 3).

Figure 3: New construction order growth 1995-2011 (Wales vs GB)



[26] Experian: 2013-2017 Construction Skills Network Wales Labour Market Intelligence.

Both the public and private new housing sectors saw good growth in 2010, of 13% and 17% respectively, taking the former to a new historic high, but the remainder of the new work sectors experienced declining levels of activity, with the industrial construction sector particularly weak (-21%).

Particularly relevant to the onsite construction theme – the main engine of growth in 2011 was the repair and maintenance (R&M) sectors, which recovered most of the ground lost in a poor 2010. The volatility of R&M may be due to the increasing use of framework agreements for large social housing renovation projects and therefore the fact that rising levels of work may be undertaken by large contractors based outside Wales[27].

Looking ahead - short term prospects are weak, with a further contraction of 5% expected in 2013 before a weak return to growth in 2014. Over the next five years to 2017, the Welsh construction industry is expected to see overall output rise at an average rate of 2.7% per year. The main driver of performance over the forecast period is the planned new nuclear power plant at Wylfa in Anglesey[28].

By way of comparison – data from the UKCES Working Futures 2010-2020 report, predicts Gross Value Added (GVA) for the construction sector in Wales at 2.2%, compared with 2.4% for the UK as a whole. For the primary sector (including utilities) the figure is lower, at 0.8% for Wales, compared with 0.5% for the UK as a whole[29].

3.1.1New infrastructure priorities in Wales

The 2010 Spending Review resulted in an unprecedented real terms reduction of over 40% in the Welsh capital budget over the period to 2014-15. The next decade is likely to see a continued real terms reduction in the Welsh Government's annual capital budget which will mean £2-4bn less capital available than in the previous decade.

The Welsh Government's high level infrastructure investment priorities are as follows:

1. Improving transport links, particularly East-West transport links in both North and South Wales;

2. Improving telecommunications networks and assuring all parts of Wales have access to adequate broadband facilities for their economic needs;

3. Supporting the development of the energy industry in Wales – including Wylfa and the Energy Island programme, on and offshore wind, and the Severn barrage);

[27] Experian: 2013-2017 Construction Skills Network Wales Labour Market Intelligence.
[28] Experian: 2013-2017 Construction Skills Network Wales Labour Market Intelligence.
[29] UKCES (2012) Working Futures 2010-2020 – Report for Wales.

4. Investing in housing – including increasing the supply of social housing and improving existing housing stock;

5. Delivering more efficient and economical public services;

6. Improving the quality of the educational estate, particularly schools;

7. Developing existing Enterprise Zones[30].

In line with these priorities the Welsh Government has announced £44m of new infrastructure investment for 2012-13, providing an additional:

- £2,7m for M4 junction improvements;
- £3m for NEST and £2m for arbed benefiting an extra 1000 homes;
- £6m to expand the successful Welsh Housing Partnership, levering in an investment of £30m in total to deliver 280 family homes for intermediate rent;
- £5m to double the size of the recylcable empty homes fund, contributing to our target of bringing 5,000 empty homes back into use during this Assembly term;
- £4m to accelerate essential flood protection schemes, reducing the impact of flood and coastal erosion on our communities;
- £6.8m to accelerate major hospital projects at Ysbyty Glan Clwyd and Llandough;
- £500k to deliver premises for domestic abuse 'One Stop Shops' in Pembrokeshire, Swansea and Gwynedd;
- £5m to support schools projects in in Lampeter, Denbighshire, Abercynon and Penarth;
- £3m for the new Cardiff City Centre post-16 campus;
- £3.5m to support essential infrastructure work for the Northern Gateway site in the Deeside Enterprise Zone;
- £2.5m to boost the Welsh Economic Growth Fund[31].

The Housing Strategic Capital Programme aims to provide a coherent and transparent investment approach to housing capital and asset investment in line with the Programme for Government, providing sustainable and high quality new housing and a suitable standard of existing housing which enables people access to a safe and secure home and maximises their chances of attainment and success in life.

The Investment Plan for housing is split into two key objectives to:

[30] Welsh Government (2012) Wales Infrastructure and Investment Plan – for growth and jobs.
[31] Welsh Government (2012) Wales Infrastructure and Investment Plan – for growth and jobs.

- Increase the supply of good quality new affordable housing in Wales supported through the social housing grant programme – Welsh Government commissioned research estimates that an additional 5,100 non market homes per year are required to meet anticipated need and there is a current backlog of unmet housing need of approximately 9,500 households;

- Refurbish and improve existing housing stock – supported through achieving the Welsh Housing Quality standard for social housing.

The Welsh Government will continue to increase the stock of social housing in Wales through:

- Achieving 7,500 new affordable homes over the term of this Government;

- Direct capital investment through the Social Housing Grant Programme, with support of £60m in 2012/13, £48m in 2013/14 and £48m in 2014/2014 and also seek to increase the amount of Social Housing Grant by making the case for additional funding for housing[32].

3.2 Employment

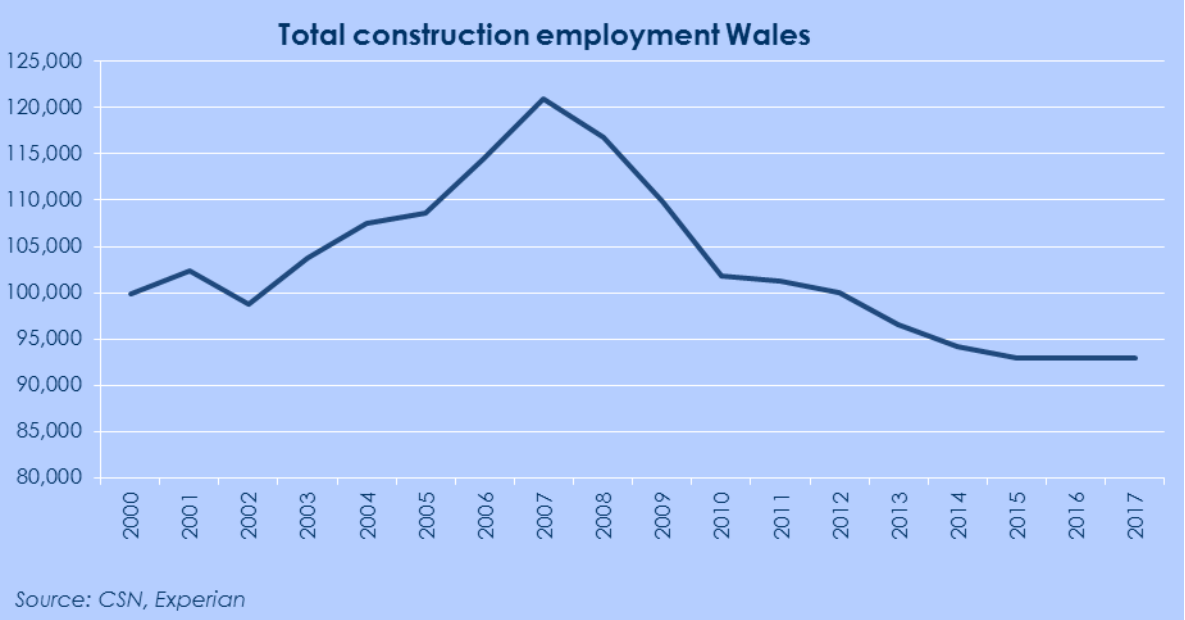
3.2.1 Core construction sector employment

Headline statistics from the 2011 Census report 111,000 people employed in construction in Wales[33].

According to Labour Market Intelligence published by Experian/CITB in 2013 (excluding certain industry sectors that fall within EU Skills' and ProSkills' footprints) – this figure was reported at 101,220 individuals as at 2011[34]. According to the same data source - construction employment is expected to decline at an average rate of 1.5% per year between 2013 and 2017, as strong growth in output terms is expected to take place later rather than sooner. Total construction sector employment is forecast to contract to 92,910 individuals by 2017 although in the intervening period there is estimated to be annual recruitment requirement (ARR) of 2,950 individuals[35].

[32] Welsh Government (2012) Wales Infrastructure and Investment Plan – for growth and jobs.
[33] ONS (December 2012) Statistical Bulletin: 2011 Census – Key statistics for Wales, March 2011.
[34] Experian: 2013-2017 Construction Skills Network Wales Labour Market Intelligence.
[35] Experian: 2013-2017 Construction Skills Network Wales Labour Market Intelligence.

Figure 4: Total construction employment forecast Wales 2000-2017



The largest construction-specific occupation in Wales in 2011 was wood trades and interior fit-out, which took a 13% share of total construction employment, followed by plumbing and heating ventilation and air conditioning (HVAC) trades with an 8% share[36].

By way of comparison with the latest LMI data produced by Experian/CITB - the UKCES Working Futures 2010-2020 report (published October 2012) provides a forecast for employment growth in the Welsh construction at 1.4% by 2020, compared with 1.1% for the UK as a whole[37].

3.2.2 Electricity, gas and water sector employment

EU Skills estimates employment totals in Wales of approximately 6,000 in electricity, 500 in gas (upstream) and 5,800 in gas (downstream) industries. Employment has remained fairly static over the last 20 years, although some restructuring of the sector has occurred due to down-sizing, following the privatisation and deregulation of many aspects of the electricity and gas industries. The occupations that have declined in numbers during this period have been typically related to admin/secretarial, skilled technical and low/non-skilled occupations[38].

By way of comparison – the UKCES Working Futures 2010-2020 report provides a forecast for employment growth in the Welsh primary sector and utilities at 0.7% by 2020, compared with 0.3% for the UK as a whole[39].

[36] Experian: 2013-2017 Construction Skills Network Wales Labour Market Intelligence.
[37] UKCES (2012) Working Futures 2010-2020 – Report for Wales
[38] EU Skills (2010) Sector Skills Agreement – Wales.
[39] UKCES (2012) Working Futures 2010-2020 – Report for Wales

3.2.3 Wood product manufacturing sector employment

ProSkills reports total employment in the wood and wood product (excluding furniture) manufacturing sector in Wales to consist of 9,000 individuals across 1,050 workplaces[40].

3.3 Environmental performance

3.3.1 Environmental commitment for the built environment

As with many other UK sectors - the built environment is attempting to meet and adjust to a number of different change factors at the same time. These include: economic impacts, the move towards energy conservation and sustainable buildings [41], constraints on natural resources, an ageing building stock, changes in national demographics as they affect the workforce, and much else.

Recent research undertaken by the Renewable Energy Association (REA)[42] suggests that the UK renewables sector offers significant potential for growth, with turnover expected to reach £24 billion by 2020. Stakeholders in regions and nations such as Wales confirmed there is predicted a significant rise in demand for external solid wall insulation over the next ten years[43].

The UK has committed to achieving 15% of its energy from renewable sources in 2020[44], broken down as follows:

- Approximately 30% of electricity demand, including 2% from small-scale sources;
- 12% of heat demand;
- 10% of transport demand[45].

Wales aims to double its renewable electricity by 2025, with 4GW from marine energy[46].

3.3.2 Actions being taken to improve environmental performance across the built environment

The Welsh Government recognises the need for a "whole system transition to low carbon energy".

[40] ProSkills (2011) Labour Market Intelligence – Process Manufacturing.
[41] The term sustainable buildings incorporates all aspects of creating a building that is environmentally responsible and resource-efficient throughout its lifecycle from siting to design, construction, use of materials and technologies, operation, maintenance, renovation, and demolition.
[42] Renewable Energy Association (2012) Renewable Energy: Made in Britain.
[43] Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.
[44] In comparison to 1.3% in 2005 and 2.9% in 2009.
[45] Department of Energy and Climate Change (DECC) (2009) National Renewable Energy Action Plan.
[46] Department of Energy and Climate Change (2011) UK Renewable Energy Roadmap.

The Renewable Energy Route Map for Wales in 2008 outlined plans to move Wales towards self-sufficiency in renewable electricity. A range of new energy developments including a 299MW biomass power plant in Holyhead and a 4.5GW offshore wind zone to complement its Energy Island activities. Furthermore Wales' Low Carbon Research Institute in 2010 secured £19 million from the Welsh European Funding Office, a contribution to a £34 million programme to enable Wales and its industry partners to lead the way in research to cut carbon emissions, as part of the European Research Development Fund's Convergence, Regional Competitiveness, Employment programmes and the ESF programme[47].

The authority to set building regulations for Wales was transferred to Welsh Ministers from December 2011. The policy of the Welsh Government is to embed changes to the building regulations that will support the achievement of zero carbon new build. In addition, a commitment to improving the planning system is expected to simplify processes by April 2013 – to coincide with the launch of Wales' Single Environment Body.

The Code for Sustainable Homes (the Code) was implemented in the UK May 2008 and measures the sustainability of a new home against categories of sustainable design (energy/CO^2, water, materials, surface water runoff, waste, pollution, health and well-being, management and ecology). It rates the 'whole home' as a complete package. The mandatory aspect of the Code was suspended, along with Home Information Packs in May 2010[48].

At the time of writing, The Code remains the entirely voluntary national standard for the sustainable design and construction of new homes (applicable in England, Wales and Northern Ireland). It is intended to help promote higher standards of sustainable design above current Building Regulations minima. In Wales all new residential buildings promoted or supported by Welsh Government or its sponsored bodies must meet Level 3 of The Code[49].

Of the new homes built in England, Wales and Northern Ireland[50] from April 2007 – 31 December 2011 using the Code for Sustainable Homes:

- 98,865 design stage certificates and 52,486 post-construction certificates were issued up to 31 December 2011. The vast majority of dwellings with energy performance certification were built for the public sector;

[47] Welsh Government (2012) Energy Wales: A Low Carbon Transition.
[48] Home Information Packs (HIPs) were introduced under Part 5 of the Housing Act 2004. There is separate legislation for Scotland that requires anyone selling a property to provide a Home Report. The pack comprised a set of documents including an Energy Performance Certificate, local authority searches, title documents and guarantees. The Localism Act. 2011 formally repealed the HIP legislation on 15 January 2012.
[49] Welsh Government (2012), http://wales.gov.uk/topics/sustainabledevelopment/design/standards/;jsessionid=5E6FDD7F4979F37820820AA3A87ECB40?lang=en.
[50] The Code for Sustainable Homes became operational in England in April 2007. From May 2008 in Wales, a minimum of Code Level 3 is required for all new housing promoted or supported by the Welsh Assembly Government or their sponsored bodies and from 2nd June 2008, Code Level 3 is required for all new self-contained social housing in Northern Ireland. The Code does not apply in Scotland.

- 45,555 dwellings were awarded 3-star post-construction ratings;
- 128 dwellings were awarded 6-star ratings;
- 78% of design stage certificates and 87% of post-construction certificates were issued Code level 3;
- In England, the 2010 Quarter 4 average energy efficiency rating of new homes increased from 80.2 in 2009 Quarter 4 to 81.7. In Wales, the increase was from 79.3 to 80.6[51].

For new non-domestic buildings in England, Wales and Northern Ireland Non-Domestic Energy Performance Certificates (NDEPC) and Recommendation Reports must be issued for all non-domestic buildings on completion, and when being sold or rented. This is applicable to all buildings with a floor area of >2500m^2.

The Welsh Government has also pledged investment of up to £45 million in Phase 2 of its energy saving programme – Arbed[52] - over the next three years. The Arbed programme and its implications for workforce skills is discussed further in section 5.1.4.

3.4 Equality and diversity issues

The proportion of Black and Minority Ethnic (BME) groups employed within the construction sector in Wales has remained static between 2011 and 2012 (2% of the workforce versus a slightly higher proportion of 5% in the UK as a whole). For both women and BME's, the representation amongst professional and office-based roles is higher than that for manual workers and highlights the challenge in terms of increasing the participation of these groups in manual and site-based roles[53].

Overall the EU Skills sector workforce has the same ethnicity makeup as Welsh workforce as a whole with 98% classifying themselves as white/British/Welsh. This proportion is slightly lower in the more urban South-East Wales region and slightly higher in the remaining three regions. There are growing signs that many employers are beginning to recognise the benefits of employing non-white workers, especially in activities requiring direct, particularly face-to-face contact with their customers[54].

[51] Code for sustainable homes and energy performance of buildings, data to end December 2011.
[52] Meaning "Save".
[53] ONS (2012) Labour Force Survey Four quarter average Summer 2011 to Spring 2012 inclusive.
[54] EU Skills (2010) Sector Skills Agreement – Wales.

4. The workforce

4.1 Current working patterns

The vast majority of employers in the Welsh construction sector are small, with approximately 93% employing less than 10 people. Less than 1% of employers are large (employing more than 250 people) although these firms carry out a disproportionate share of the work by value.

An estimated 35,700 people in the sector work on a self-employed basis, although this is less widespread among professional occupations where self-employment is most common among architects and surveyors[55].

Evidence from CITB' 2012 workforce mobility study highlights that, on average, construction industry workers in Wales commute similar distances to work to other regions in the UK. According to that report, 91% of workers travel more than 10 miles and 80% of workers travel in excess of 20 miles to their main place of work[56].

The majority (76%) of employers surveyed as part of the 2011 Skills Provision in Wales research reported having provided access to at least some form of training for their workforce over the preceding two years, although just under a quarter have not provided any training. Instances of training are higher among the professional occupations (Table 3).

Table 3: Whether provided access to training in last 2 years

	Overall	Buildings	Civil Eng.	Specialist trades	Architectural & Eng.	Other professional
Yes	**75.6%**	71.7%	89.4%	72.1%	80.4%	88.2%
No	**24.2%**	28.3%	10.6%	27.4%	19.6%	11.8%
Don't know	**0.2%**	-	-	0.5%	-	-

Source: Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales
Base: 418 respondents.

Among those employers who provided access to training, 10% delivered all training 'in-house' and without use of external provision – particularly the case within specialist construction trades. Architectural, engineering and other professionals reported leaning more towards external provision for training fulfilment[57].

[55] ONS (2012) Labour Force Survey Four quarter average Summer 2011 to Spring 2012 inclusive.
[56] CITB (2012) Workforce Mobility and Skills in the Construction Sector in the UK and Republic of Ireland.
[57] CITB (2010) Sector Skills Assessment for the Construction Sector – Wales report.

Two thirds of surveyed employers expected their training budgets to remain the same in the subsequent 12 months, with 16% anticipating a fall in their budget and 13% anticipating a rise.

On the whole, the majority of surveyed employers reported not having taken steps to train staff in respect of low carbon skills. This is especially the case within specialist trades as opposed to architectural, engineering and other professionals whom have made greater inroads into training within in this area (Table 4).

Table 4: Whether training provided in low carbon skills

	Overall	Buildings	Civil Eng.	Specialist trades	Architectural & Eng.	Other professional
Yes	**40.4%**	40.6%	45.7%	34.5%	52.0%	58.8%
No	**54.8%**	54.7%	50.0%	60.4%	46.0%	29.4%
Don't know	**4.8%**	4.7%	4.3%	5.1%	2.0%	11.8%

Source: Source: Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales
Base: 416 respondents.

4.2 Workforce characteristics

4.2.1 Core construction sector workforce characteristics

The age profile of the construction industry in Wales, for both professionals and contractors alike, matches that of many other UK industries. It is mature, ageing and has undergone significant change over the past 10 years. Coupled with a long-standing tendency towards early retirement and difficulties recruiting teaching staff – it is important to ensure there remains capacity within existing training provision to cope with the necessary recruitment of new trainees over the coming years, as well who will train the trainers of the future. Figure 5 shows the age profile of the construction workforce in Wales.

Figure 5: Age profile of construction workforce Wales 2012

For professional, managerial and manual occupations, the workforce has generally been distinguished by a decline in the share of the younger groups in total employment and a rise in those aged 45 and over. Indeed professional trades such as architecture, mechanical and civil engineering could lose 33% of their manpower due to retirement in Wales – which compares with 18% for the UK as a whole.

Despite efforts to encourage younger people to consider construction as a desirable career choice at every level (for example via CITB' Positive Image campaign within schools), the industry has an age profile that is biased towards the 35-54 age groups.

The under-representation of women remains a priority for the construction sector in Wales as it does in the UK. Currently, women account for 11% of employment in the sector, compared with 13% for the UK as a whole. In Wales, nine in ten women employed in construction work in non-manual off-site roles[58].

[58] ONS (2012) Labour Force Survey Four quarter average Summer 2011 to Spring 2012 inclusive.

4.2.2 Electricity, gas and water sector workforce characteristics

Electricity, gas (upstream) and water are highly regulated industries, which require, by law, a fully competent technical workforce. Within the waste management industry the activities are generally lower skilled, requiring physical exertions, often within a hazardous workplace.

Around 76% of all employees in the EU Skills sector workforce are male; the figure is even higher within the electricity and waste management industries. This compares to 54% of the Welsh workforce as a whole. Within the workforce, there still exists some strong gender stereotypes in terms of the jobs that males and females tend to undertake. For example, nearly 70% of admin/ secretarial jobs are filled by women, as are over half of sales/ customer service jobs.

The age profile of the energy and utilities sector workforce varies quite considerably by industry and region, although all have, on average, a relatively older workforce than the Welsh average. The most interesting point however, is the proportion of 16-24 year-olds who are employed in the gas (upstream) industry in South East Wales. A significant contributory factor to this would seem to be the high proportion of "back office" staff employed by this industry in this region. This is an occupational group which does tend to be younger on average than those employed in the "technical" or managerial occupations. 54% of the gas (upstream) workforce in Wales is employed in these occupations, compared to 41% across the UK[59].

4.2.3 Wood product manufacturing workforce characteristics

The Proskills sector in Wales has a workforce that is slightly older on average than the workforce across Wales as a whole. Whilst this is due in part to the need for more mature workers in some areas of the sector, there is still a need to attract younger people to the industries and to implement succession planning systems. Further work will need to be done with schools, colleges, Job Centre Plus and Careers Wales staff to continue to raise the profile of the sector and to promote the opportunities available for young people, as well as to those who are looking to change careers or who are currently unemployed[60].

4.3 The jobs people do

The professional occupations set out in Table 5 have been identified through research into the National Status Quo as being particularly intrinsic to the low carbon and energy efficiency agenda within the built environment arena. These roles are not currently clearly defined within the Standard Occupational Classification (SOC) system and, due to their relatively recent emergence there is no reliable labour market information currently available.

[59] EU Skills (2010) Sector Skills Agreement – Wales.
[60] Proskills (2010) Sector Skills Assessment for the Process and Manufacturing Sector – Wales.

Table 5: Emerging construction occupations in Wales

Energy Conservation Officer
Energy Manager
Energy Assessor
Thermal Insulation Engineer
Renewable Energy Installer
Eco-Designer

Table 6, below, sets out the range of occupations and total employment levels core to the construction sector in Wales.

Table 6: Core construction occupations in Wales

Occupations	Total employment in Wales 2011
Senior, executive, and business process managers	3,590
Construction managers	5,250
Non-construction professional, technical, IT, and other office-based staff	7,530
Wood trades and interior fit-out	13,240
Bricklayers	4,460
Building envelope specialists	4,500
Painters and decorators	6,460
Plasterers and dry liners	1,720
Roofers	1,040
Floorers	1,340
Glaziers	2,350
Specialist building operatives nec*	3,520
Scaffolders	490
Plant operatives	1,710
Plant mechanics/fitters	1,550
Steel erectors/structural	2,460
Labourers nec*	5,800
Electrical trades and installation	5,650
Plumbing and HVAC trades	8,370
Logistics	1,250
Civil engineering operatives nec*	2,430
Non–construction operatives	3,350
Civil engineers	3,180
Other construction professionals and technical staff	7,120
Architects	1,020

Surveyors	1,840
TOTAL	**101,220**

Source: Experian: 2012-2016 CITB Network Wales Labour Market Intelligence.

Table 7, below, sets out the range of occupations core to the manufacture of wood and wood products (excluding furniture) as part of process manufacturing in Wales.

Table 7: Wood-based occupations within process manufacturing in Wales

Yard staff	Wood machinist
Accountant/credit controller	Research and development/technical manager
Driver	Designer/CADCAM Product engineer
IT Support	Sawyer including timber conversion and treatment
Loader	Maintenance manager
Production supervisor	Estimator/surveyor
Plant operative	Team leader
Tool room technician	Site installer
Labourer	Finance manager Internal
Production manager	External sales person
Semi-skilled operative	Purchasing manager
Yard manager	Customer service advisor
Sales manager	Health and safety manager
Contracts manager	Transport clerk Assembly expert
CNC Programmer	Plant operative e.g. Paint line operative
Quality assurance manager	Buyer
CNC Operatives	

Source: ProSkills (2011) Labour Market Intelligence – Process Manufacturing

5. Demand for, and value of, sustainability skills in the Built Environment in Wales

5.1 Principles of sustainability, short, medium and longer term drivers in Wales

5.1.1 Principles and importance of sustainability for the built environment in Wales

The concept of 'sustainability' – most commonly associated with harnessing economic, social and environmental gains – is necessarily wide-ranging and open to interpretation, meaning that there is no one universally accepted definition. Understanding the types of skills and knowledge required for a sustainable built environment sector in Wales requires an understanding of the principles that underpin sustainability in terms of the development, construction, management and maintenance of buildings.

According to good practice guidance produced by the Cross Sector Group on Sustainable Design and Construction – sustainable development is key to tackling the linked challenges of climate change, resource use, economic prosperity and social well-being[61]. Sustainable design and construction takes account of the resources used in construction, and of the environmental, social and economic impacts of the construction process itself and of how buildings are designed and used. While consideration of energy and carbon impacts is an important element, sustainable design and construction goes further than this. In summary, sustainable design and construction seeks to:

- Minimise the use of resources (including energy and water);
- Ensure sustainable sourcing of materials;
- Minimise waste;
- Ensure the built environment is resilient to the impact of climate change;
- Protect and enhance biodiversity and green infrastructure; and
- Provide buildings and spaces that are pleasant and healthy for occupiers and users[62].

Sustainability is central to the Welsh Government's policies, strategies and programmes of activities. With respect to buildings promoted or supported by the Welsh Government or Sponsored Bodies (SBs), Sustainable Building Standards require that the following conditions are met:

- For residential development, a minimum Code for Sustainable Homes level 3;
- For non-residential development, with some exceptions for smaller buildings, Building

[61] Cross Sector Group (2012) *Good Practice Guidance: Sustainable Design and Construction.*

[62] Cross Sector Group (2012) *Good Practice Guidance: Sustainable Design and Construction.*

Research Establishment Environmental Assessment Method (BREEAM) excellent or an equivalent quality assured scheme; and

- In all **new** buildings at least 10% of the total value of materials used should be recycled or reused materials or products.

For extensions, alterations or refurbishment, the above are not required, but an energy efficient solution is required[63].

In addition, Cadw is committed to implementing a programme of action outlined in the Historic Environment Strategic Statement including conservation of a range of iconic Welsh cultural heritage sites, promoting sustainable techniques and traditional skills, as well as achieving improved physical and intellectual access for the public[64].

The drive to reduce embodied carbon and improve the energy performance of new and existing buildings is a key aspect of the sustainability agenda for the built environment sector. This is principally driven by European legislation and, from 2015, the Welsh Government intends to introduce changes to Part L of the Building Regulations as a step towards meeting that requirement. Through a commitment to achieving 40% onsite improvement in carbon emissions for new housing, the Welsh Government believes this will lead to longer term social and economic benefits, contribute to reducing Wales' CO^2 emissions and enhance the wellbeing of people and communities[65].

The following key benefits and outcomes for sustainability skills and training were set out by the Welsh Government in their 2009 Green Jobs Strategy :

- Business advisors in the public and private sector have the skills to diagnose and help businesses that need to change or adapt to a lower carbon economy;
- Businesses are able to hire a suitably qualified and/or experienced workforce to help them respond in a timely fashion to demand for more sustainable/lower carbon products and services;
- Businesses know where to find suitable training courses or learning resources to train and improve the knowledge or understanding of their existing workforce;
- Employees understand the drivers for a more sustainable economy and are able to apply that knowledge to their job;
- People find it easy to get additional skills to improve their employability[66].

[63] http://wales.gov.uk/topics/sustainabledevelopment/design/standards/;jsessionid=8A306C81EBB4349ECB8DA7D01356AC33?lang=en

[64] CADW (2011) *Conservation principles for the sustainable management of the historic environment in Wales.*

[65] Welsh Government (2012) *One Wales, One Planet – The Sustainable Development Annual Report 2011-12.*

[66] Welsh Government (2009) Capturing the Potential – A Green Jobs Strategy for Wales.

5.1.2 Short term drivers for sustainability skills (2013-2013)

A number of drivers have been identified that are expected to prompt changes for the construction sector likely to impact on skills and training, productivity, innovation, and the overall structure of the industry.

The uncertain economic situation means that, in the short-term, survival is the biggest driver for the construction sector as a whole, particularly for small and medium sized enterprises (SMEs) – which comprise the majority of the sector in Wales. 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. Having said that, CITB's Sector Skills Assessment for Wales pointed out that the wider sustainability agenda has the potential to create a significant number of 'green jobs' following the economic downturn but will also require up-skilling at all levels.

Specialist skills, from design through to the installation of new types of products and materials are increasingly needed to meet the high specification and low energy requirements of new buildings and infrastructure. At the same time, Modern Methods of Construction (MMC) and offsite manufacturing have the potential to increase as the industry moves from recession to recovery. *[See section 5.2.1 MMC for further detail]*

New ways of working will not always require new skills or create jobs but will often be in addition to an amalgam of existing workers' skill sets – with an anticipated expansion of multi-skilling[67].

The need for knowledge and skills relating to sustainability is also having a significant influence on construction clients' procurement requirements. This influence is set to grow in Wales, due to the Welsh Government's legislative and policy targets, the emergence of the renewables sector and the rising cost of traditional energy. There are likely to be significant business opportunities for carbon conscious SME contractors in Wales, whereas businesses slow to acquire low carbon knowledge and skills may find it much harder to win work in the coming years[68].

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 focus group participants further investment needs to go into research and development within Wales to stay on the leading edge of change.

Just under half of employers surveyed as part of the 'Skills Provision in Wales' research in 2010 felt that low carbon issues are currently very/fairly important to their organisation's success (Table 8). Positive views exist mainly among the professional sub-sectors such as architectural and engineering

[67] CITB (2010) Sector Skills Assessment for the Construction Sector – Wales report.

[68] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change.

employers, whereas those involved in specialised construction appeared to be the least concerned about the impact of the low carbon agenda at the time the research was carried out[69].

Table 8: Importance of low carbon issues to business success

Importance of Low Carbon issues	Overall	Buildings	Civil Eng.	Specialised	Architectural & Eng.	Other professional
Very important	**21.5%**	19.6%	17.0%	20.3%	32.0%	29.4%
Fairly important	**23.4%**	27.1%	34.0%	19.3%	24.0%	17.6%
Neither important nor unimportant	**12.7%**	15.0%	6.4%	12.2%	8.0%	35.3%
Not very important	**15.6%**	11.2%	10.6%	21.3%	10.0%	5.9%
Not at all important	**11.0%**	9.3%	17.0%	10.7%	12.0%	5.9%
Don't know/too early to say	**15.8%**	17.8%	14.9%	16.2%	14.0%	5.9%

Source: Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales
Base: 418 respondents

Employers were also asked to rate the skills implications relating to specific industry changes on a scale of 1 to 5, with 1 being 'no impact' and 5 being 'significant impact'. The average rating of just under 3 out of 5 indicates a cautious acceptance by employers that skills needs will be affected by the changes (Table 9)[70].

Table 9: Skills implications of specific forecast industry changes – employer ratings

Industry changes	Average rating
Low and Zero Carbon legislation	2.4
Waste management	2.9
Recycling	2.9
Installation of renewable technologies	2.8
Use of low carbon products/techniques	2.8

Source: Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales
Base: 369 responses from 391 respondents

[69] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change.

[70] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change.

Despite the opportunities presented by the sustainability agenda – CITB's Sector Skills Assessment for Wales points out that recruitment difficulties (reported as 'hard-to-fill vacancies') are still a problem with specialist trade occupations in particular. Within professional services, hard-to-fill vacancies are most prominent among engineers[71] (Table 10).

Table 10: Main occupations where hard to fill vacancies are encountered (UK)

Category	Occupation	% employers reporting HTFVs
Specialist trade	Carpenters/joiners	19%
Specialist trade	Floorers	18%
Specialist trade	General operatives	17%
Specialist trade	Plant/machine operators	15%
Specialist trade	Painters/decorators	14%
Professional	Civil engineers	13%
Professional	Mechanical engineers	11%
Professional	Other engineers	12%
Professional	Architectural technologists	10%
Specialist trade	Electricians	10%

Source: CITB (2010) *Sector Skills Assessment for the Construction Sector – Wales report.*

The most commonly reported causes of hard-to-fill vacancies are set out in Table 11, below. Issues relating to motivation and attitude appear to be more prevalent in Wales than the UK as a whole, followed by applicants lacking required skills and desired levels of work experience[72].

Table 11: Causes of hard to fill vacancies for skilled staff

Cause	Wales	UK
Applicants lack desired motivation/attitude	84%	74%
Applicants lack required skills	69%	84%
Applicants lack desired work experience	37%	68%
Not enough people trained in the construction sector in recent years	36%	81%
Applicants lack desired qualifications	34%	51%
Low numbers of applicants generally	33%	53%
Competition from other employers	2%	39%

Source: CITB (2010) *Sector Skills Assessment for the Construction Sector – Wales report.*

[71] CITB (2010) *Sector Skills Assessment for the Construction Sector – Wales report.*

[72] CITB (2010) *Sector Skills Assessment for the Construction Sector – Wales report.*

5.1.3 Medium term drivers for sustainability skills (2015-2017)

Over the short and medium term, the future of house building within the UK as a whole is likely to be largely driven by the combination of government policy on sustainability, legacy of the economic downturn and the rapid evolution of innovative technologies.

The development of new products and processes will provide new commercial opportunities for the construction sector in Wales. 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.[73]

Over the medium term, low and zero carbon targets together with substantial growth of the renewables sector that is anticipated for Wales, are expected to drive the development of new skills, but the risk of skills shortages and gaps could remain significant unless action is taken to address this.

When economic recovery takes hold, there are likely to be severe skills shortages due to the current lack of investment into training and development, which will be exacerbated by the issues of an ageing workforce. The pressures of the economic climate are off-putting to potential new entrants into the sector and there is the risk of a diminishing skills base available to replace those that will be lost as part of the current workforce moves towards retirement.

5.1.4 Longer term drivers for sustainability skills (2018-2020)

Construction sector labour market intelligence published by the UK Commission for Employment and Skills (UKCES) points out that the share of total construction employment, and hence skills demand, in the higher occupational groups (managers, directors and senior officials; professional occupations; and associate professional and technical occupations) is expected to increase by 25.6 per cent for the UK between 2010 and 2020. This is attributed to key drivers of change affecting the sector, most notably legislation and policy change (particularly relating to environmental and low carbon), product and process innovation – all of which are as relevant to Wales as the UK as a whole. The interplay of the various key drivers means that there is a degree of uncertainty over future skills demand, which may be problematic in encouraging employers to invest in skills development[74].

In the longer term, general awareness of the sustainability agenda is expected to increase, energy efficiency technologies will become more mainstream and the costs associated with production and installation are likely to reduce in consequence. There will be more opportunities for the industry, for example through retrofit, although maximisation of these opportunities will depend on improvements to productivity, increased collaboration with academia, Welsh Government support and establishment of knowledge and skills relating to innovative technologies and modern, efficient,

[73] Welsh Government (2007) Building Companies, Building Skills.
[74] UKCES (2012) *Sector Skills Insights – Construction; Evidence Report 50.*

working processes[75].

House building is likely to be driven by a more complicated profile of forces including demographic shifts, policy evolutions and climate change. The structure of the industry is likely to become more diverse, with more specialist firms working with sustainability, zero carbon dioxide and innovative technologies[76].

'PassivHaus' refers to a specific construction standard for buildings which requires the workforce to have an understanding of efficient components and how a whole house ventilation system can achieve exceptionally low running costs and excellent comfort conditions in both winter and summer. 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 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.

A key 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 (such as wind and marine sources)[77].

5.2 Skills needs for Modern Methods Construction and Building Information Modelling

5.2.1 Skills needs for Modern Methods of Construction (MMC)

For a building system to be considered truly sustainable from an environmental perspective, the whole lifecycle from cradle to grave must be taken into account including embodied energy of the raw materials, transport costs, production and construction emissions and the energy consumed during use and at the end of its life[78].

As environmental and sustainability legislation becomes more stringent, the built environment is likely to see more widespread use of technological and process innovation, which could in turn lead to greater internationalisation, greater competition and greater integration with the supply chain[79].

Modern Methods of Construction (MMC) require the integration of design, manufacturing,

[75] Pye Tait Consulting (2010) Understanding Future Change in Construction (Wales Summary).
[76] Goodier, C.I. and Pan, W. 'Briefing: Future trends in UK housebuilding' in *Municipal Engineer,* Volume 165, Issue ME2, June 2012.
[77] Welsh Government (2010) A Low Carbon Revolution: The Welsh Assembly Government Energy Policy Statement.
[78] Sanna, F; Hairstans, R et al (2012) *Structural optimisation of timber offsite modern methods of construction.* World Conference on Timber Engineering
[79] CITB (2010) *Sector Skills Assessment for the Construction Sector – Wales report.*

construction and onward maintenance, implying a need for cross-disciplinary education for design teams. This will include a need for more design technicians trained in Computer-Aided Design (CAD) working offsite[80].

Figure 6, below, illustrates the integration of design, manufacturing and construction, which is dependent upon people, process and technological functions.

Source: Goulding, J., Rahimian, F et al 'Strategic priorities for shaping the future research agenda' in *Architectoni.ca,* 2012, pp.62-73

'Process' functions require skills and knowledge relating to: procurement, supply chain management, whole life costing, health and safety, design management, lean construction, sustainability, tolerance and quality.

'People' functions require skills and knowledge relating to: communication, project management, client engagement, leadership, perception and integration[81].

The Experian/SAMI Consulting report '2020 Vision – The Future of UK Construction' highlighted a number of skills implications resulting from approaches to MMC. Whilst UK-wide in terms of its remit – the findings may be considered as important and relevant to Wales as the rest of the UK.

Depending on the level and extent of completion of finishes offsite, there might be a substantial reduction of bricklayers, plasterers, tilers, electricians, plumbers etc. that work onsite. Initially many of these trades will still be required in the offsite factories, but eventually, possibly rapidly, the level of skill needed will be reduced by the advantages of factory conditions and methods, in particular by having one skilled operator supervising a number of less skilled operators. Ultimately there appears

[80] CITB (2010) *Sector Skills Assessment for the Construction Sector – Wales report.*
[81] McCarney, M. and Gibb, A. (2012) *Interface Management from an Offsite Construction Perspective*

to be the potential for even greater levels of automation, especially if large-scale production can be achieved through utilisation of processes and equipment developed in industries such as motor manufacturing.

Any increase in MMC will lead to greater specialism in offsite activities, coupled with a narrowing of skills where possible, to make the most of manufacturing methods. Work and training for most of the labour in a "construction factory" may involve supervising machines rather than operating them. However, generalists and specialists with construction experience will still be needed for supervision of less skilled labour in the factories, and technicians will be required to provide the parameters for setting up the machines.

Growth in the use of onsite MMC in the more innovative scenarios will lead to a need for highly trained generalists, capable of assembling complex components. However there is likely to be a counter balance between the generalists, probably employed by the main contractor or subcontractors, and a growing number of highly specialised employees/agents of manufacturing organisations who will come onsite with their products and install them.

Demand for multi-skilling in the more innovative scenarios will arise from the need to install more complex pieces of equipment, requiring the skills of different trades. In addition, more complex logistics would be greatly simplified with more multi-skilled staff. Apart from the need for certification under regulations for particular tasks (gas and electricity in particular), the main components of multi-skilling will be on-going safety training, and a greater comprehension of the consequences of not following installation instructions on specialised and often large and expensive components. This is in addition to the need to understand the implications of components being imprecisely fitted. This will apply in R&M and on new-build[82].

Table 12, below, sets out how traditional onsite trades are likely to be affected in different ways as a result of migration to offsite construction – relevant as much to Wales as the UK as a whole.

Table 12: Impact of offsite manufacture on traditional onsite trades

Significantly affected	Same type of work but under different conditions	Not affected
Carpenters (more work) Masons (less work)	Electrical; Plumbing; Insulation; Plasterboard work; External door and wall insulation.	Roofers; Internal plasterers; Painters and decorators
Rationale:		

[82] Experian/SAMI Consulting (2008) 2020 Vision – The Future of UK Construction.

The tasks required in constructing a traditionally built house are more or less divided equally between masonry workers and carpenters. Offsite manufacturing makes more use of timber-frame technologies, therefore relying more heavily on the work of the carpenters.	The difference in the nature of the tasks is derived from the difference between fixing to concrete and fixing to timber.	Trades that are expected to remain onsite.

Source: Dublin Institute of Technology (2008) *Changing training needs arising from the adoption of offsite construction techniques.*

In a survey of 222 built environment sector organisations in Wales, reported by CREW in 2011, the following procurement skills were deemed by respondents to be most important (in order from most to least):

- Procurement and selection;
- Sourcing;
- Materials use and qualification of impact;
- Impact and use minimisation;
- Management systems[83].

Offsite construction manufacture is one approach that can contribute to MMC and sustainability. Gains can be experienced from enhanced performance and efficiency of components and units; significant waste reduction; reduced site traffic and operative travel; and reduced site waste. Indeed research for WRAP has shown that offsite construction can reduce onsite waste by up to 90%[84].

In an offsite factory setting, with skilled supervisors overseeing lower skilled operators, traditional craft and specialist construction skills are expected to reduce.

Site supervisors and site labour will require:

- a greater understanding of general building issues such as tolerances, air/water tightness and the interaction between components.
- the ability to read, understand and follow instructions on new materials and components (for example, types of insulation);
- an understanding of the cost of damage to large components;
- the ability to use tools for testing complex installations and identifying faults at an early stage;

[83] CREW (2011) *Low carbon skills requirements for the regeneration and built environment professional services sector in Wales.*

[84] Davis Langdon (2011) *Cost Model: Offsite Manufacturing*

- an understanding of modern terminology[85].

During the BRE's evaluation of the Code for Sustainable Homes Pilot Programme in 2011, it became evident that the use of MMC presented its own challenges to the onsite management staff (Site Agent). The use of this type of construction resulted in the need for a specific skill to coordinate trades and activities to a far greater level of detail than would normally be the case, specifically conflicts between trades needing to be in the same space at the same time[86].

5.2.2 Skills needs for Building Information Modelling (BIM)

Building Information Modelling describes the process of designing a building collaboratively using one coherent system of computer models rather than as separate sets of drawings[87]. In June 2011 the UK government published its BIM strategy announcing its intention to require collaborative 3D BIM (with all project and asset information, documentation and data being electronic) on its projects by 2016[88].

In Wales a BIM Hub was formed in July 2012 to provide support for the Welsh construction industry[89]. BIM was discussed at a recent CITB (Feb 2013) meeting where it was agreed that there is a lack of understanding generally regarding BIM including client gaps in knowledge, as well as a focus on building rather than the wider construction sector including infrastructure. Build Up Skills UK research supported the finding that here is a need for additional knowledge based training in BIM within Wales.

Managing building information using a building information model can lead to substantial cost savings, from design and construction through to maintenance. The model saves time and waste on site, and extra coordination checks are largely unnecessary; the information generated from the model will lead to fewer errors on site caused by inaccurate and uncoordinated information[90].

5.3 Higher level skills

5.3.1 Sustainability skills - professional

Even before work begins on site there will be an increased demand for low carbon design-related skills to ensure that new buildings are designed for maximum energy efficiency, prior to technology being installed. Design and planning considerations relating to the type of material used or aspects of structure can yield cost-effective and appropriate low carbon solutions[91].

[85] CITB (2010) *Sector Skills Assessment for the Construction Sector – Wales report.*
[86] BRE (2011) Delivering Low Carbon Skills in Wales – Low Carbon New Build Learning Project.
[87] http://www.wspgroup.com/en/wsp-group-bim/BIM-home-wsp/what-is-bim/
[88] http://www.bimtaskgroup.org/
[89] http://www.bimtaskgroup.org/bim-regional-hub-wales/
[90] http://www.thenbs.com/topics/bim/articles/bimInConstruction.asp
[91] CITB (2010) Sector Skills Assessment for the Construction Sector – Wales report.

Research carried out to inform the 2011 BRE report 'Delivering Low Carbon Skills Wales – Low Carbon New Build Learning Project' included a workshop with built environment sector stakeholders to discuss skills issues associated with low carbon building projects in Wales. These were found to include the following higher level areas:

- Generally better knowledge is needed rather than skills with respect to low carbon building;
- Skills around quality requirements and checking could be better across the board;
- Architects' skills for low carbon residential developments;
- Standard Assessment Procedure (SAP) Assessors do not always have knowledge outside of the assessment and may not be able to help with practical achievement;
- Building Control functions need better understanding of the Code for Sustainable Homes (CSH) and skills required;
- Site agents need to adopt a different approach to the traditional;

Designers need to be fully knowledgeable around how to create buildable standard details that meet the requirements of the code (these details ultimately need to be shared with the trades).

The research identified opportunities for improvement by bringing the code assessor on board at an earlier stage to simplify design and build; the CSH and SAP assessor could potentially be the same person; creation of details into a format that can be easily understood on site; more site-based time for trainee architects; and a low carbon coordinator on site from day 1[92].

Technical knowledge and skills, including surveying, are essential to ensuring robust retrofit solutions are found for existing buildings of different ages and conditions through effective identification and solution prescription. In parallel, management skills development is critical to ensuring retrofit projects are planned and delivered in a cost and time efficient way[93].

The National Status Quo research (2012) established from employers and industry stakeholders that the following professional occupations and associated skills/knowledge needs need to be urgently addressed in order for the UK to meet the requirements of the EU 2020 energy efficiency targets[94]:

- Energy Advisor/Assessor (wide-ranging skills and knowledge needs)
- Architects (low carbon design skills; whole life costing)
- Planners (understanding of energy efficiency targets)
- Civil engineers (understanding of low carbon materials and installation processes; knowledge of energy efficiency targets)
- Surveyors (understanding of energy efficiency targets and impacts of energy efficiency

[92] BRE (2011) Delivering Low Carbon Skills Wales – Low Carbon New Build Learning Project.
[93] BRE (2011) Delivering Low Carbon Skills Wales – Retrofit Learning Project.
[94] To reduce energy consumption by 20%; to reduce greenhouse gas emissions by 20%; to meet 20% of energy needs through renewable resources.

measures – or lack of them)

- Site supervisors (understanding of the processes and quality standard of completed work needed to meet low carbon requirements).

Research carried out to inform the 2011 BRE report 'Delivering Low Carbon Skills Wales – Retrofit Learning Project' included interviews with Sector Skills Councils to explore intermediate skills issues. For those working at a professional level, it is likely that additional skills will be required to plan, assess and inspect building requirements; design and commission solutions; and inspect finished work. This was felt to be especially relevant to energy advisors and assessors, site managers and others responsible for the oversight and checking of work standards, as well as micro-generation commissioners/inspectors.

In 2011 the Construction Industry Council undertook a consultation[95] with construction industry employers, professional institutions and education and training providers to establish whether Advanced Technical and Higher Apprenticeships were the best way to deliver the higher level skills required by the industry. All of the key stakeholder groups indicated that they were interested in developing both Advanced Technical (level 3) and Higher Apprenticeships (level 4+) for a variety of professional, managerial and technical occupations.

Some Technical and Higher Level apprenticeship frameworks have been developed for use in Wales for example Construction Technical and Professional non-statutory (Wales) [96] which includes a level 3 Apprenticeship in Technical and Professional and level 6 Higher Apprenticeship. Apprenticeship numbers are discussed more fully in section 6.1.2 of this report. LLWR data suggests that although the frameworks exist there is not currently training provision for the frameworks mentioned available in Wales.

5.3.2 Sustainability - managerial

In 2011, IFF Research carried out Management and Supervisory Skills Research on behalf of CITB. The study was UK-wide in its remit and achieved 64 employer survey responses from Wales among a total of 1,450 UK-wide responses in total. As this is the only study of its kind within the construction sector, the key findings, particularly with respect to low carbon skills, are considered relevant to this report

Between 2007 and 2011 the research identified an increase in the proportion of employers with skill gaps relating to green/low carbon, sustainability and environmental issues. Understanding the implications and increased importance of low carbon and green issues was the skills area where

[95] Construction Industry Council Consultation on Technical Apprenticeships and Higher Apprenticeships in England and Wales (2011)
[96] Construction Technical and Professional non statutory Wales (2013) http://www.afo.sscalliance.org/frameworkslibrary/index.cfm?id=FR02002

most employers reported any managerial skills gap (45% of respondents), and there has been an increase in employers reporting gaps for being able to manage the delivery of sustainable practices in the company's work (from 21% in 2007 to 37% in 2011)[97].

A full set of the reported managerial skills gaps (on a prompted basis) are presented in Table 13, below:

Table 13: Proportion of employers with specific managerial skills gaps (prompted)

Skills gap	% survey respondents 2011 (2007)
Understanding the implications and increased importance of green issues	45% (n/a)
Keeping up to date with environmental legislation	43% (37%)
The IT skills of senior staff themselves	43% (40%)
Identifying potential new markets or clients	39% (27%)
Risk management	38% (33%)
Legal understanding of contracts	38% (38%)
Managing the delivery of sustainable practices in the company's work	37% (21%)
Keeping up to date with Health and Safety legislation	35% (36%)
Winning new business and general selling skills	34% (28%)
Developing and creating a clear strategy and vision for the business	34% (27%)
Managing their time effectively and prioritisation of tasks	33% (32%)
Identifying the IT needs of the organisation	33%(28%)
Maximising the productivity of staff	33% (33%)
Keeping up to date with the latest innovations, products or techniques	32% (26%)
Identifying the training needs of staff, and developing their skills	32% (30%)
Ensuring projects run to cost and managing project finances	31% (27%)
Team building and getting staff to share the same goals	30% (29%)
Writing a business plan	29% (25%)
Estimating the cost of a project accurately	28% (25%)
Understanding and implementing Corporate Social Responsibility	28% (20%)
Financial understanding	28% (28%)
Communicating effectively	27% (23%)
Managing client expectations and maintaining high customer satisfaction	26% (27%)
Ensuring project work is carried out safely	26% (26%)
Effective delegation	26% (26%)
Managing suppliers or sub-contractors effectively	23% (25%)
Capability to ensure offsite products are integrated on-site	14% (n/a)

Source: IFF Research (2011) Management and Supervisory Skills Research.

Despite green issues and environmental legislation representing the most commonly occurring skills

[97] IFF Research (2011) Management and Supervisory Skills Research.

gaps – employers participating in the study rated these skills as being of lower importance than around half of all others[98].

5.3.3 Surveying skills

Surveying skills were found by the BRE study to be lacking, with respect to building integrity, realistic calculation of energy savings and general knowledge of the performance of walls. This finding is corroborated by other studies that have identified a significant lack of understanding around levels of enabling works required to facilitate external solid wall insulation. This was evidenced during discussions with surveyors from a number of organisations carrying out works under Arbed; they indicated that the basic surveying courses (ONC/D and HNC/D Building Surveying) that were undertaken within the last 12 years did not cover these knowledge areas.

There also appears to be little knowledge among surveyors on the issues of applying solid wall insulation externally to typical 'Welsh Terraced Housing' constructed of random stone or brick. It is imperative that the surveyor is capable of undertaking a risk assessment of the particular characteristics of the wall/building to be insulated and what is the most appropriate material selection to ensure the wall performance is enhanced and not compromised. In addition there is evidence of a lack of understanding by the clients on what to request in tenders and the qualitative assessment of the work undertaken[99].

5.3.4 Intermediate skills

Intermediate skills are defined as those required of traditional building crafts and trades. Meeting the demands of the sustainability agenda in new build construction will mean working with new technology and being familiar with the subtle adaptations that are required. For example ensuring airtightness or minimising cold bridging are two techniques that are used to improve energy efficiency, and for both of these it is attention to detail rather than the underlying skills that can potentially influence the overall energy performance of the building[100].

Research into the National Status Quo (2012) identified the skills and knowledge needed by the blue collar built environment workforce (including new build construction) in order for the UK to meet the EU 2020 targets. These skills and knowledge needs are equally applicable to Wales and relevant to the built environment sustainability agenda (Table 14).

[98] IFF Research (2011) Management and Supervisory Skills Research.
[99] BRE (2011) Delivering Low Carbon Skills Wales – Retrofit Learning Project.
[100] CITB (2010) Sector Skills Assessment for the Construction Sector – Wales report.

Table 14: Skills and knowledge needs for the blue collar built environment workforce (including onsite and offsite construction)

Technical skills needs	Technical knowledge needs
▪ Installation of solar thermal and photovoltaic (PV) ▪ Installation of energy recovery/efficient cooling/shallow geothermal systems ▪ Installation of biomass, combined heat and power & wind turbines ▪ Installation of ground and air source heat pumps ▪ Installation of solid wall and cavity wall insulation, and building fabrics they are suitable for ▪ Installation of switches and thermostats ▪ Ability to use geotechnical measurement equipment and carbon assessment tools ▪ Ability to work with more precise tolerances and a greater degree of technical accuracy ▪ Skills in Building Information Modelling (BIM)[101] ▪ Ability to install different energy efficiency systems having identified which best suits the needs of a range of buildings (age and fabric)	▪ Legislation and targets relating to energy efficiency (as it continues to emerge) and what this means for the built environment sector; awareness of energy consumption ▪ Awareness of building regulations and how they will continue to evolve over time ▪ Understanding of the principles of heat loss, heat gain and moisture movement ▪ Understanding of and skills in relation to offsite manufacturing ▪ Understanding air quality, air tightness and ventilation requirements of buildings (including the implications of "getting it wrong" in relation to air tightness in particular) ▪ Knowledge of the range of energy efficiency measures, and their suitability for different building fabrics and ages, including pre-1919 and hard to treat buildings ▪ The so-called 'hierarchy' of energy efficiency measures, i.e. the sequence in which issues in buildings must be addressed to ensure maximum energy efficiency ▪ Knowledge of a range of different types of insulation treatments and their suitability for various buildings including thermal insulation ▪ Understanding of building physics and how different energy efficiency measures will impact on other installations (current and future) within a building, and the structural implications (for example air tightness) of implementing changes ▪ Knowledge of different types of low carbon materials – including the design lifecycle ▪ Quality assurance specifically in relation to energy efficiency
Other skills and knowledge needs	
▪ Communication and sales skills – notably the ability to explain financial mechanisms such as the Green Deal and to translate technical jargon ▪ Administrative skills ▪ Understanding of occupational remits/impacts e.g. an electrician installing solar panels on a roof and how this might affect the infrastructure – elements of multi-skilling possibly needed; also need to consider impact/contribution of water and waste management, and recyclable materials ▪ Leadership and management skills ▪ STEM (science, technology, engineering and mathematics) skills.	

[101] Defined by the Royal Institute of British Architects (RIBA) as: *digital representation of physical and functional characteristics of a facility creating a shared knowledge resource for information about it forming a reliable basis for decisions during its life cycle, from earliest conception to demolition.*

Research carried out to inform the 2011 BRE report 'Delivering Low Carbon Skills Wales – Low Carbon New Build Learning Project' identified the following intermediate skills issues associated with core construction trades:

- Understanding of sustainability issues;
- Understanding of specific requirements of legislation;
- Understanding of the planning stage around orientation effects;
- Implications of the effect of one technology or solution on other areas of design and build;
- Understanding of how people will live in their houses and therefore how to design for that.

Specific skills issues around sustainability were found to include:

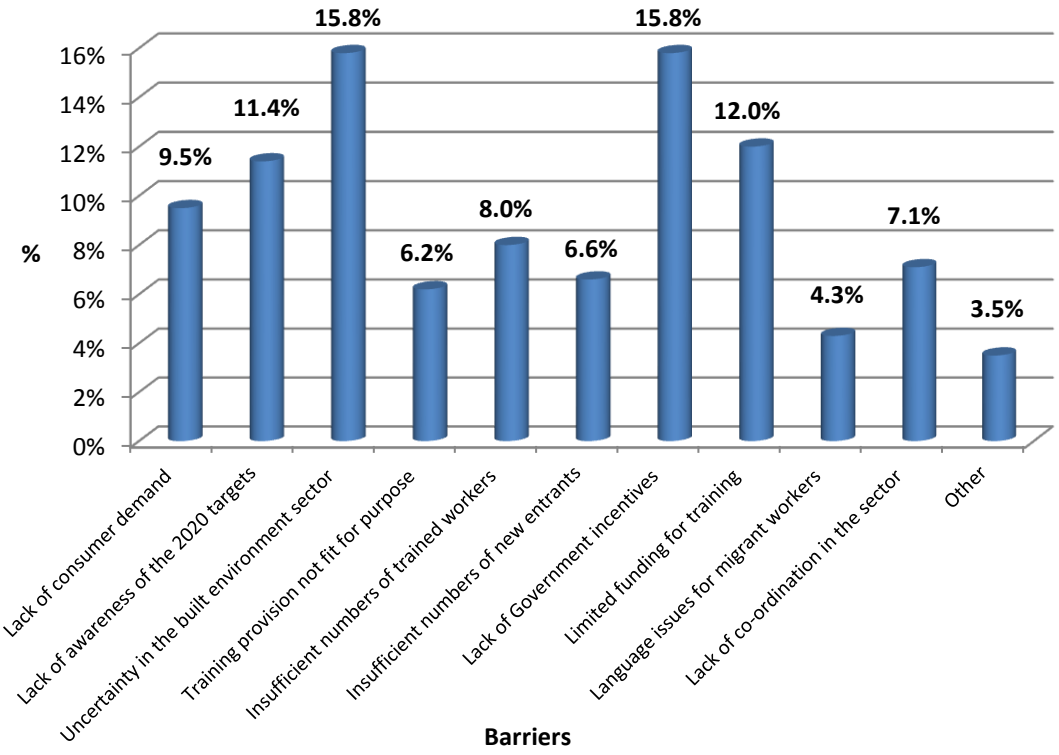
- Air-tightness requirements;
- Benefits of particular micro-renewable technologies and how to install and integrate them with other elements;
- Quality requirements to meet the code, and;
- How each trade affects adherence to the code.

In addition, small builders struggle to cope with cost and time for training, don't have the capacity to bring in experts and local specialists can be rare. Opportunities for improvement, as identified by the Status Quo research, might include sustainability education for trades; more knowledge-sharing from completed schemes; creating champions within businesses; creation of knowledge around fabric first solutions; and creating standard details for achieving the desired levels[102].

Employers' perceptions of the barriers to the UK's achievement of the EU 2020 targets are set out in Figure 7, below. Uncertainty within the sector and lack of Government incentives are the most prominent barriers.

[102] BRE (2011) Delivering Low Carbon Skills Wales – Low Carbon New Build Learning Project.

Figure 7 Barriers faced by the UK in relation to meeting the 2020 energy efficiency targets (employer perspectives)



Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.
Base 314 employer survey respondents.

6. Gap analysis and supply-side analysis

6.1 Current skills provision Wales

The qualifications Regulator in Wales is the Department for Children, Education, Lifelong Learning and Skills (DCELLS), an executive body of the Welsh Government. Accredited qualifications are subsequently listed on the Database of Approved Qualifications in Wales (DAQW)[103]. In Wales there is a separate Credit and Qualifications Framework (CQFW). The CQFW recognises both full and partial completion of qualifications by learners as well as training activities that fall outside of regulatory and funding arrangements[104].

The remainder of this section is informed by work undertaken to produce a Matrix of Built Environment Skills Provision in Wales – delivered as a separate Excel-based annex to this report. The matrix includes:

- Programmes of study (courses) offered Higher Education (HE) institutions, including statistics on student starts, completions and destinations in 2010-2011 (provided by the Higher Education Statistics Authority);
- Vocational qualifications by Learning Aim title, including the number of certificates issued in 2011 and the first three quarters of 2012 (provided by Ofqual);
- Further Education and private training providers in Wales delivering built environment courses, including the number of certificates issue in 2010-2011(provided by the Lifelong Learning Wales Record);
- Built environment sector Apprenticeships offered in Wales, including total starts in 2010-2011).

6.1.1 Higher Education Provision

According to data from the Higher Education Statistics Authority (HESA) - seven out of the eleven HE institutions within Wales offer courses relating to the six principal areas of construction and the built environment[105]. These institutions are: Cardiff University; Cardiff Metropolitan University; University of Glamorgan; Glyndŵr University; University of Wales, Newport; Swansea University; and Swansea Metropolitan University.

[103] http://www.daqw.org.uk/

[104] http://wales.gov.uk/topics/educationandskills/qualificationsinwales/creditqualificationsframework/?lang=en

[105] This research used Principal Subject Area Codes as defined by HESA and agreed by ConstructionSkills - including: H2 Civil Engineering; K1 Architecture; K2 Building; K3 Landscape design; K4 Planning (urban, rural and regional); K9 Others in architecture, building and planning.

During the academic year 2010-11, there were 130 built environment sector courses offered at Welsh HE institutions. A breakdown by principal subject area and region is presented in Table 15. Civil Engineering courses account for the largest share, followed by Building and Planning respectively. There is an absence of core HE provision for the built environment in mid-Wales.

Table 15: Number of HE courses by principal subject area and region of Wales (2010-2011)

Principal subject of study	Region	No. courses
(H2) Civil engineering	N	2
	M	0
	SE	28
	SW	14
(H2) Civil Engineering Total		**44**
(K1) Architecture	N	1
	M	0
	SE	20
	SW	0
(K1)Architecture Total		**21**
(K2) Building	N	5
	M	0
	SE	20
	SW	5
(K2)Building Total		**30**
(K3) Landscape design	N	0
	M	0
	SE	0
	SW	0
(K3) Landscape Design Total		**0**
(K4) Planning (urban, rural & regional)	N	4
	M	0
	SE	18
	SW	0
(K4) Planning (urban, rural & regional) Total		**22**
(K9) Others in architecture, building & planning	N	4
	M	0
	SE	9
	SW	0
(K9) Others in architecture, building & planning Total		**13**
Total built environment courses in Wales		**130**

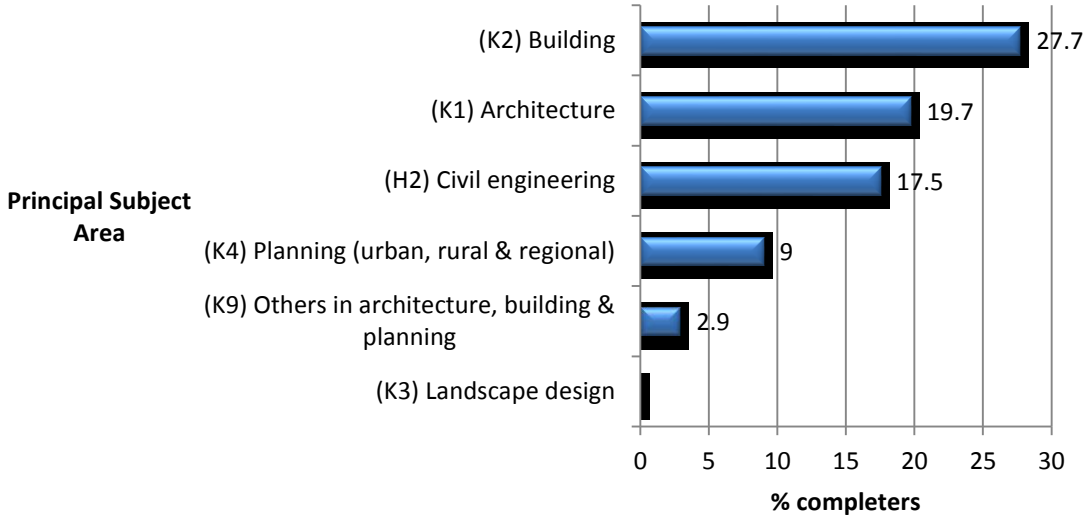
A total of 1,912 enrolments were reported across these principal subject areas in 2010-2011.The vast majority of enrolments were located in South East Wales (1,571), followed by South West Wales (229) and then North Wales (112). The total number of enrolments by principal subject area is set out in Table 16, below, with Civil Engineering and Architecture proving the most popular selections.

Table 16: Number of HE enrolments by principal subject area in Wales (2010-2011)

Principal subject of study	No. enrolments
(H2) Civil engineering	685
(K1) Architecture	243
(K2) Building	401
(K3) Landscape design	0
(K4) Planning (urban, rural & regional)	339
(K9) Others in architecture, building & planning	244
Total built environment enrolments in Wales	**1912**

Of some 1,607 students completing built environment-related courses, only 283 were reported to have entered the industries of their principal subject areas within a time-frame of six months – the remainder enter other industries[106] (Figure 8).

Figure 8: Percentage of built environment HE completers entering corresponding built environment SIC Codes within first six months



[106] Based on SIC codes of industry entrance as reported by HESA.

6.1.2 Vocational qualifications and Apprenticeships

Based on data supplied by Ofqual, there are currently 1,323 unique Learning Aim reference numbers relating to built environment sector vocational qualifications and a total of 14,491 certificates were issued in 2011.The top five qualifications based on total numbers of certificates issued in the first three quarters of 2012 are set out in Table 17.

Table 17: Top five built environment vocational qualifications based on certs issued 2010-11

Title	Level	Awarding Organisation	No. certificates issued Q1-Q3 2012
City & Guilds Level 3 Award In Requirements for Electrical Installation BS7671:June 2008 (2011) (QCF)	3	City and Guilds of London Institute	755
Cskills Awards Level 1 Diploma in Carpentry and Joinery (QCF)	1	Cskills Awards	655
City & Guilds Level 2 Certificate in Basic Plumbing Studies	2	City and Guilds of London Institute	543
City & Guilds Level 1 Introductory Certificate in Basic Construction Skills	1	City and Guilds of London Institute	537
City & Guilds Level 1 Certificate in Basic Construction Skills	1	City and Guilds of London Institute	457

Source: Ofqual

A total of 52 training providers were reported to offer built environment vocational qualifications in 2010-11 according to the Lifelong Learning Wales Record (LLWR). The five training providers with the highest reported numbers of learner starts are set out in Table 18, below, and extend across north, south east and south west Wales. The statistics are consistent with the current gender imbalance of the built environment sector workforce, being extremely male-dominated.

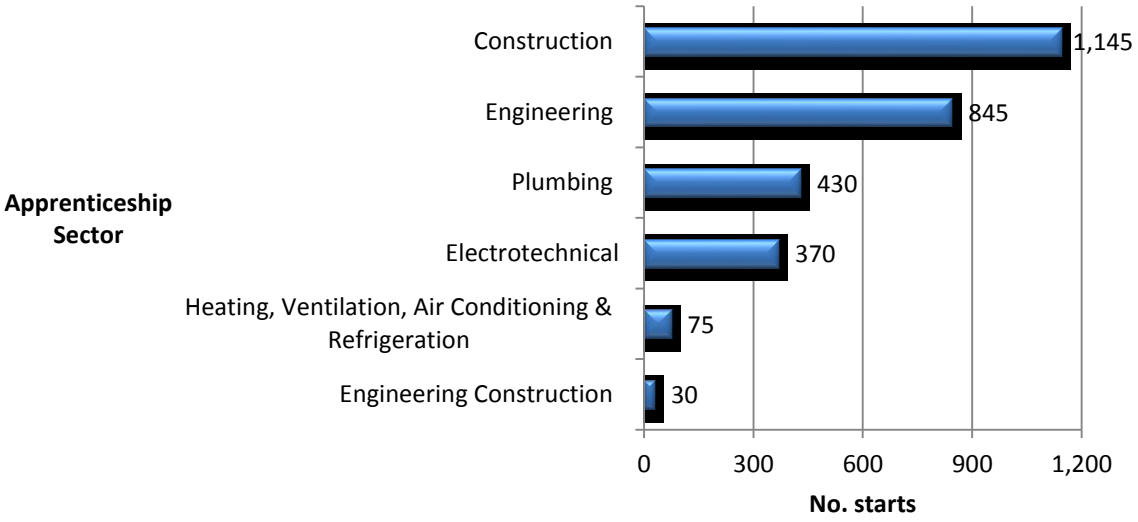
Table 18: Top five training providers based on number built environment learner starts 2010-11

Training provider	No. starts 2010-11	No. in learning 2010-11	Males in learning 2010-11	Females in learning 2010-11
Coleg Llandrillo	1,235	1,525	1,480	45
Coleg Gwent	880	1,045	1,015	30
Yale College	840	1,095	1,070	25
Neath Port Talbot College	735	860	830	30
Barry College	730	885	835	50

Source: LLWR

According to the LLWR, there were 2,895 Apprenticeship starts within built environment sector frameworks in 2010-11. The breakdown of starts by Apprenticeship sector is set out below, with Construction and Engineering Apprenticeships attracting the highest levels of interest.

Figure 9: Number of built environment sector Apprenticeship starts in 2010-11



Source: LLWR

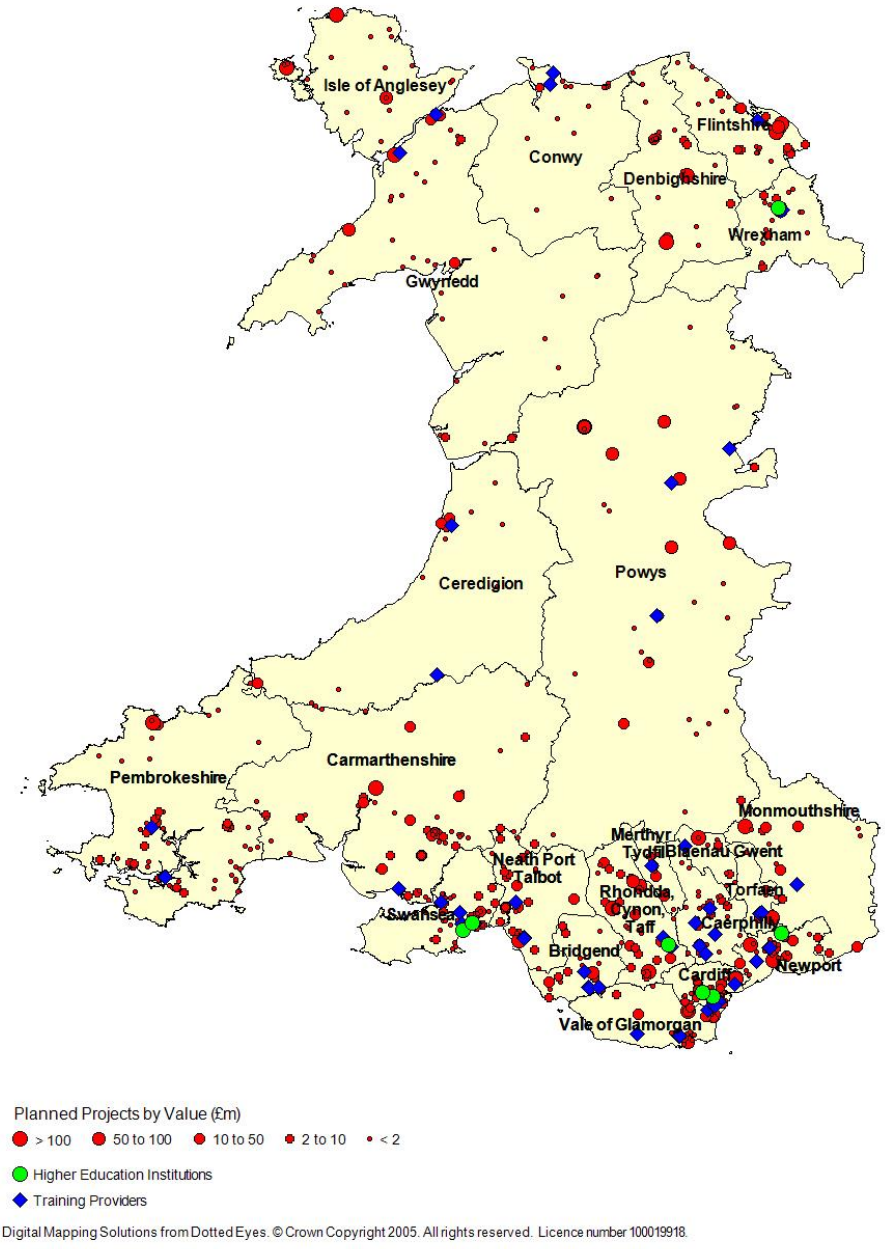
Some Technical and Higher Level apprenticeship frameworks have been developed for use in Wales for example Construction Technical and Professional non-statutory (Wales) [107] which includes a level 3 Apprenticeship in Technical and Professional and level 6 Higher Apprenticeship. LLWR data suggests that although the frameworks exist there is not currently training provision for the frameworks mentioned available in Wales.

6.1.3 Location of provision

Figure 10 shows the location of planned construction activity by size over the period 2013-2020. This data is overlain with the location of training providers and HE institutions. It is clear that training provision appears concentrated in the south and north of Wales with limited provision located in the West and central areas. Whilst provision broadly aligns with planned project data there needs to be consideration to ensure any new provision is accessible to those in mid and North Wales.

[107] Construction Technical and Professional non statutory Wales (2013) http://www.afo.sscalliance.org/frameworkslibrary/index.cfm?id=FR02002

Figure 10: Planned Construction projects in Wales by value



6.2 Gap analysis

6.2.1 Perceptions around built environment skills provision in Wales

Findings from the Skills Provision in Wales (2011) research revealed a little over 80% of employers are either 'very' or 'fairly' satisfied with existing training provision and providers also regard their provision as meeting the needs of the construction industry in Wales.

Whilst these findings present a generally positive picture - this is based on employers' past and current demands for training and does not necessarily take into account how training needs will evolve in response to emerging and future drivers of change.

The general consensus from focus groups participants was that provision adequately serves traditional and core aspects of construction. There were some concerns around hard to fill vacancies for certain trades which are likely to be derived from the overall structure of qualifications within these areas. However, constraints on physical resources and expertise mean that employer demand for training in new and specialist areas is, currently, largely unmet. Furthermore, focus group participants were sceptical that new skills and advanced techniques will be easily delivered under current provision despite some providers already attempting to move into this area.

Analysis of data provided by Ofqual on built environment-related vocational qualifications in Wales[108], substantiates evidence from the Skills Provision in Wales research that gaps exist in provision relating to the following priority skills/occupational areas in Wales:

- Earth Moving Equipment;
- Heavy plant materials (because of the size of the equipment and the space required);
- Heritage (including specialist skills needed to retrofit historic/listed buildings);
- Interior wall insulation (the Arbed programme for regeneration in Wales has led to increased demand for these skills);
- Prefabrication, timber framing and pods;
- Scaffolding;
- Steeplejacking;
- Street Works.

Focus group attendees pointed out that training and development in these skill areas requires facilities, equipment and space not available to any of the individual colleges or other providers and that the only available facilities for such training are some distance from Welsh employers, in England.

[108] Cf. Matrix of Built Environment Skills Provision in Wales (separate Excel-based annex).

Participants also stressed that the priority skills list does not address any potential future needs of the industry in high technology areas such as carbon reduction materials and techniques. While the teaching of such knowledge and skills is entirely possible within the physical resources of existing provision, it would require additional specialised staff supported by access to on-going research and development[109].

Research into the National Status Quo (2012) identified a belief among providers that Awarding Organisations unwilling to collaborate with them can block the development of relevant provision – particularly in the more rural areas of Wales and indeed Northern Ireland. Stakeholders noted that training is not widely available in Wales to up-skill the workforce for the needs of the Energy Island in Anglesey. There is a concern that employers in Wales, especially SMEs, would not be able to benefit from up-skilling and that instead businesses would send their teams over from England (for example Bristol and Birmingham) to capitalise on the opportunities.

The Status Quo research established that the majority of employers working across the built environment do not perceive a need for brand new qualifications to be developed from scratch in order to deliver skills and knowledge needed to meet the EU 2020 targets. The general consensus among respondents was that existing qualifications can, for the most part, be refined and expanded without the need to create a large suite of brand new qualifications.

Where new qualifications are developed, stakeholders argued for a greater number of accredited qualifications based on National Occupational Standards (NOS), as opposed to non-accredited, shorter courses. Concern was expressed about the emergence on unregulated short courses which could result in poorly trained workers leading, ultimately, to poor quality work. In particular there is deemed to be a need for more qualifications at Level 3, as Levels 1 and 2 are not always considered sufficient by employers.

Respondents to the Status Quo research also suggested that the quality of provision and knowledge/expertise of tutors can be inconsistent UK-wide, and a clear need has been identified for 'train the trainer' provision. Furthermore it is anticipated that additional Continuing Professional Development (CPD) will need to be on offer for tutors to enable them to maintain up-to-date awareness of new technologies as they develop[110].

6.2.2 A case for enhanced construction skills provision in Wales

The Skills Provision in Wales research identified that approximately four fifths of surveyed employers

[109] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change.

[110] Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.

were in favour of change to construction skills provision in Wales, with only one fifth preferring a no change scenario. These findings were substantiated by focus group participants who were strongly of the opinion that, for Wales to remain competitive in terms of its construction skills base, training provision needs to be better equipped not only in terms of both physical space and plant but in terms of the knowledge and skills of the teaching resources.

Change is considered essential to meeting future needs (albeit in five to ten years) for advanced knowledge and skills in such areas as[111]:

- Advanced construction materials;
- New building systems;
- The use of insulation materials;
- The installation of energy recycling systems;
- Building and installation of waste heat recovery;
- Advanced glazing systems (integration into existing building);
- Techniques for upgrading the energy efficiency of existing buildings;
- Building and maintenance of deep bore and ground heating systems;
- The building of green roofs;
- The integration of solar and wind power systems into and alongside new and existing buildings, and many more.

6.2.3 'Delivering Low Carbon Skills in Wales' programme

Delivering Low Carbon Skills (DLCS) in Wales is a cross-sector programme managed by the Built Environment Sector Skills Council Group (BESSCG) in Wales, which consists of Asset Skills, ConstructionSkills, Energy and Utility Skills, and SummitSkills. DLCS is a programme of research and training which seeks to enhance the evidence base for low carbon skills and support the development in skills and capacity of the further education (FE) sector in Wales. A key component of this programme was the delivery of a set of pilot training courses which were commissioned and, since summer 2011, have been delivered by training providers across Wales. These pilots aimed to develop the capacity of the training providers to deliver low carbon training for the built environment workforce, up-skill the built environment workforce in Wales, and test employer demand for up-skilling their workforce with low carbon skills.

As part of their evaluation of the programme in 2011, GHK reported that employers will invest significantly in training if they recognise it is closely related to a new or rapidly developing market (for example, external wall insulation or home energy advice). There are skills gaps in these areas

[111] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change, views of industry stakeholders and providers.

which are emerging as result of government initiatives. On the supply side, some training providers illustrated a flexible approach to their business planning processes and a willingness to bid for funding if they could make a business case. Key factors which influenced these decisions were a consideration of what providers offer already, the tendering process, and the price.

There is evidence that the FE sector has benefitted from the programme, including through the up-skilling of staff from the Train the Trainer programmes and the increased skills and experience of staff who have delivered the pilots. Most training providers believe these factors will improve their mainstream provision. As a result of the developments in the FE sector and growing demand from more 'forward looking' employers, the DLCS programme has stimulated activity which will lead to some of the gaps in the FE market being filled. Looking to the future, it is likely that several elements of the DLCS programme are likely to be sustained. This will be achieved either by providers continuing to offer the pilots on a commercial basis, or by delivering certain aspects of particular pilots as part of their mainstream provision[112].

6.2.4 Sector Priority Fund (SPF) Pilot Programme

Following on from DLCS programme in Wales 2 well attended employer and stakeholder events were held in May 2012 to develop ideas for SPF bids in Wales. CITB are currently bidding for two projects under the SPF pilot programme which will pilot strategic project activity. The two projects are detailed.

Green Project, which builds on the pilot DLCS programme undertaken during 2011 and 2012.

The objective is to develop the capacity of companies so that they are better able to compete in the green economy and create sustainability and growth for their business and prepare for opportunities arising from schemes such as Arbed, Green Deal and ECO.

The project aims to work with approximately 600 participants and 250 companies and will ensure that employers, training providers and industry stakeholders have the skills and knowledge required to meet the challenges that the will be created as the low carbon agenda moves forward, it will:

- prepare and inform the industry in readiness for changes to construction methods, green deal, legislative changes and building regulations;
- introduce new training at Level 2 and Level 3 in Internal Wall Insulation and Understanding Sustainable Energy Efficiency and training to meet the requirements of PAS 2030 to become a Green Deal Installer, all of which will be required as a result of Green Deal and energy efficiency;
- build capacity within CITB and the heritage sector;
- research future skills gaps with a particular emphasis around Energy Island;
- evaluate the outcomes.

Apprentices and Qualifications for the Construction Industry project, which will pilot training and development qualifications to ensure that the Welsh construction workforce are equipped to take

[112] GHK (2012) Evaluation of the Delivering Low Carbon Skills in Wales Programme – Final Report.

forward employment opportunities which are currently forecast.

The project aims to work with approximately 500 participants and 220 companies and will work with industry specialists, colleges and training providers to:

- develop existing provision so that it will enable a greater variety of Higher Apprenticeships to be made available for learners and industry;
- develop new qualifications identified by industry for the Repair and Maintenance of buildings, to bridge the gap to assist trade trained personnel to undertake professional progression, and new short courses which employers require to undertake their business;
- facilitate a network of civil engineering training providers and stakeholders whose aim is to ensure that the Welsh Civil Engineering Workforce has the necessary skills and training to bid for and win contracts as they become available;
- introduce training provision which is not currently available in Wales in dry lining;
- Allow apprentices to undertake one of the additional 6 units available through the updated SASW;
- evaluate the outcomes.

7. Conclusions and recommendations

7.1 Conclusions

Construction in Wales – a fragile economic recovery

Construction remains an important sector that makes a vital contribution to social and economic activity within Wales and the UK as a whole, underpinning growth and ambition. However, it has suffered as a result of the recession, particularly in respect of jobs and training. Whilst contractors have strived to retain skilled staff and preserve capacity for the upturn through reduced working hours or under-employment, this means significant excess capacity must be made up before growth increases employment.

At the same time, the built environment workforce needs to be trained in the holistic understanding of the implications of their actions in the delivery of low carbon, sustainable buildings. Specialist skills for commissioning buildings are required to ensure energy efficiency can be maintained and the importance of longer involvement in construction projects beyond the typical commission period is required for all professionals. Core knowledge and understanding of specific products is essential, as are skills in innovation, entrepreneurship and business development[113].

Looking ahead - short term prospects are weak, with a further contraction of 5% in output expected in 2013 before a weak return to growth in 2014. Over the next five years to 2017, the Welsh construction industry is expected to see overall output rise at an average rate of 2.7% per year. The main driver of performance over the forecast period is the planned new nuclear power plant at Wylfa in Anglesey[114].

Relevant report sections: 2.4

The need to respond effectively to drivers of change

The most influential drivers for change affecting employers are legislation and the need to maximise commercial opportunities in the interests of survival.

As with many other UK sectors - the built environment is attempting to meet and adjust to a number of different change factors at the same time. These include: economic impacts, the move towards energy conservation and sustainable buildings, constraints on natural resources, an ageing building stock, changes in national demographics as they affect the workforce, and much else.

[113] CITB (2010) Sector Skills Assessment for the Construction Sector – Wales report.
[114] Experian: 2013-2017 Construction Skills Network Wales Labour Market Intelligence.

The UK has committed to achieving 15% of its energy from renewable sources in 2020[115], broken down as follows:

- Approximately 30% of electricity demand, including 2% from small-scale sources;
- 12% of heat demand;
- 10% of transport demand[116].

Wales aims to double its renewable electricity by 2025, with 4GW from marine energy[117].

The highest proportion of pre-1919 dwellings stock exists in Wales and is represented by nearly 30% of all dwellings.

Knowledgeable industry stakeholders, including the providers, are of the opinion that, while current education and training provision is adequate, there will - at some point in the recovery - be a need for different, specialised skills.

Because these skills relate directly to Government priorities (be that those emerging from the UK Government or Welsh Government) – specifically the need for carbon reduction, use of sustainable materials and responsible procurement – these stakeholders believe that education and training in skills to achieve such priorities should begin to be taught and developed as soon as possible.

Relevant report sections: 2.5; 3.3

Demand for, and value of, sustainability skills in the Built Environment in Wales

ConstructionSkills' Sector Skills Assessment for Wales pointed out that the low carbon agenda has the potential to create a significant number of 'green jobs' post-recession but will also require up-skilling at all levels.

Specialist skills, from design through to the installation of new types of products and materials, will be needed to meet the high specification and low energy requirements of new buildings and infrastructure in the future. At the same time, offsite manufacturing and prefabrication has the potential to substantially increase as the industry moves from recession to recovery.

New ways of working will not always require new skills or create jobs but will often be in addition to an amalgam of existing workers' skill sets – with an anticipated expansion of multi-skilling .

In Wales, there is considered to be scope to improve existing workforce skills to meet the

[115] In comparison to 1.3% in 2005 and 2.9% in 2009.
[116] Department of Energy and Climate Change (DECC) (2009) National Renewable Energy Action Plan.
[117] Department of Energy and Climate Change (2011) UK Renewable Energy Roadmap.

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.

The development of new products and processes will provide new commercial opportunities to the construction sector in Wales. 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.[118]

As a result of Modern methods of construction (MMC) and offsite production methods – skills on-site are likely to be less traditionally trade-oriented and more multi-faceted, including a better understanding of the composition and purpose of assemblies and how they can be moved and lifted.

MMC will result in the need for site supervisors and site labour with an understanding of modern terminology, the ability to read, understand and follow instructions on new materials and components (for example, types of insulation), an understanding of the cost of damage to large components, and the ability to use tools for testing complex installations and identifying faults at an early stage.

Relevant report sections: 5.1; 5.2; 5.3

Gap analysis

Findings from the Skills Provision in Wales (2011) research revealed a little over 80% of employers are either 'very' or 'fairly' satisfied with existing training provision and providers also regard their provision as meeting the needs of the construction industry in Wales.

Whilst these findings present a generally positive picture - this is based on employers' past and current demands for training and does not necessarily take into account how training needs will evolve in response to emerging and future drivers of change.

The general consensus from focus groups participants was that provision adequately serves traditional and core aspects of construction. There were some concerns around hard to fill vacancies for certain trades which are likely to be derived from the overall structure of qualifications within these areas. However, constraints on physical resources and expertise mean that employer demand for training in new and specialist areas is, currently, largely unmet. Furthermore, focus group participants were sceptical that new skills and advanced techniques will be easily delivered under current provision despite some providers already attempting to move into this area.

[118] Welsh Government (2007) Building Companies, Building Skills.

Analysis of data provided by Ofqual on built environment-related vocational qualifications in Wales[119], substantiates evidence from the Skills Provision in Wales research that gaps exist in provision relating to the following priority skills/occupational areas in Wales:

- Earth Moving Equipment;
- Heavy plant materials (because of the size of the equipment and the space required);
- Heritage (including specialist skills needed to retrofit historic/listed buildings);
- Interior wall insulation (the Arbed programme for regeneration in Wales has led to increased demand for these skills);
- Prefabrication, timber framing and pods;
- Scaffolding;
- Steeplejacking;
- Street Works.

Focus group attendees pointed out that training and development in these skill areas requires facilities, equipment and space not available to any of the individual colleges or other providers and that the only available facilities for such training are some distance from Welsh employers, in England.

Participants also stressed that the priority skills list does not address any potential future needs of the industry in high technology areas such as carbon reduction materials and techniques. While the teaching of such knowledge and skills is entirely possible within the physical resources of existing provision, it would require additional specialised staff supported by access to on-going research and development[120].

The Status Quo research established that the majority of employers working across the built environment do not perceive a need for brand new qualifications to be developed from scratch in order to deliver skills and knowledge needed to meet the EU 2020 targets. The general consensus among respondents was that existing qualifications can, for the most part, be refined and expanded without the need to create a large suite of brand new qualifications.

Respondents to the Status Quo research also suggested that the quality of provision and knowledge/expertise of tutors can be inconsistent UK-wide, and a clear need has been identified for 'train the trainer' provision. Furthermore it is anticipated that additional Continuing Professional Development (CPD) will need to be on offer for tutors to enable them to maintain up-to-date awareness of new technologies as they develop[121].

[119] Cf. Matrix of Built Environment Skills Provision in Wales (separate Excel-based annex).
[120] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change.
[121] Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.

The Skills Provision in Wales research identified that approximately four fifths of surveyed employers were in favour of change to construction skills provision in Wales, with only one fifth preferring a no change scenario. These findings were substantiated by focus group participants who were strongly of the opinion that, for Wales to remain competitive in terms of its construction skills base, training provision needs to be better equipped not only in terms of both physical space and plant but in terms of the knowledge and skills of the teaching resources.

The key areas considered essential to meeting future needs are highlighted in section 8 Priority Areas for Wales.

Relevant report sections: 6.1; 6.2

7.2 Recommendations

The drivers of change affecting the built environment sector across the UK as whole present significant business opportunities. It is essential that Wales capitalises on these opportunities in order to remain competitive in an increasingly global market and to ensure Wales is positioned at the forefront of the sustainability agenda rather than lagging behind other UK and European nations.

The strategic recommendations set out within this section should be considered in conjunction with those included within the SNAs developed by other project sponsors.

The recommendations are intended to:

1. Help steer the on-going work of the BEST Programme; and
2. Underpin the 'priority areas for action' (presented in the subsequent section and covering specific industry skills and knowledge needs to be addressed through training)

Consideration will need to be given to the prioritisation of these recommendations and assignment of roles and responsibilities, as appropriate.

1. **Work not only with existing partners but also other key stakeholders now and in the future in order to develop and deliver a well-informed and cohesive skills and training strategy document for the built environment sector in Wales**

   It will be important for BEST to draw on evidence from existing partners as well other stakeholders and programmes of activity that are currently underway or planned for the future. This will be in order to:

   - harness synergies as part of parallel activity;
   - minimise duplication of activity, for example identification of training and qualifications/units that have already been developed or are currently in development – a notable example being the recommendation for development of a national centre of excellence for construction training in Wales as an outcome of the 2011 Skills Provision in Wales research;
   - identify lessons learned from other programmes (for example via evaluation reports of programmes such as Arbed);
   - consider how skills developed through short term programmes can be maintained and retained in Wales; and
   - ensure funding is being spent in the most effective way.

   In taking forward evidence from the various Skills Needs Analyses, it will be important that the

strategy document:

- distinguishes between 1) technical skills needs; and 2) knowledge requirements (i.e. that may be offered through CPD training);
- distinguishes between 1) pan-sector skills and knowledge needs; and 2) needs that are unique and specific to certain sub-sectors;
- gives consideration to training that will be attractive to young people in the interests of preserving workforce capacity in the future;
- prioritises actions for the future;
- assigns timescales, roles and responsibilities to enable a coordinated and manageable delivery plan to be devised.

2. **Harness appropriate sources of funding to support the development and delivery of sustainability training for the built environment sector in Wales**

   Ensure that funding pledged from project sponsors and training providers is harnessed. Continue to monitor the use of funding and ensure arrangements are in place to ensure financial sustainability of programme outcomes (specifically new training and qualifications) once funding arrangements have been fulfilled.

3. **Develop appropriate new training courses based on an understanding of the extent of mismatch between demand versus current supply of sustainability training for the built environment sector in Wales**

   Consideration should be given not only to the number of courses currently available in priority need areas – but also geographical coverage. Whilst transport links between South East and South West Wales are relatively straightforward via major road and rail links – the 2011 Skills Provision in Wales research highlighted the need to ensure training is also accessible to employers in mid and North Wales.

4. **Ensure that training and qualifications are developed at the appropriate levels**

   It is understood that a key focus of the BEST programme is professional and higher level skills – deliberately distinguishing its work from the 'blue collar' remit of Build Up Skills UK. Having said that, BEST is targeted to deliver specific numbers of participants on to training courses at level 2, 3, 4 and above, thereby representing intermediate, advanced and higher level skills. It will therefore be important to ensure an appropriate balance is struck between achieving the target numbers of participants at each level, whilst ensuring enough places are created at appropriate levels to meet the needs of professional services working in the built environment sector.

5. Ensure that training delivered by BEST is responsive to drivers of rapid industry change

Technological and process innovation point to a need for new modules and units to be speedily developed to ensure the built environment sector in Wales doesn't lag behind other nations. It will also be important to avoid the risk of new training courses becoming quickly outdated following roll-out.

Equally important will be development of 'train the trainer' provision so that tutors are kept up to date with the latest industry developments and are sufficiently equipped to pass on this knowledge.

6. Ensure that training delivered by BEST is sufficiently flexible and accessible to built environment sector employers

Developing flexible and accessible training means giving consideration to the following:

- Ensuring the format and content of training provision is designed with the needs of micro and small employers in mind – taking into account factors such as cost and time needed to complete units and modules;
- Offering knowledge units and CPD training, i.e. not just technical skills in isolation;
- Ensuring geographical accessibility, i.e. minimising travel requirements so that employers in certain areas of Wales are not put off attending training;
- Locating training provision close to major current and planned development projects in Wales in order to tap into potential training demand from the supply chain;

Consideration should also be given to addressing identified skills needs through existing and planned Apprenticeship frameworks.

7. Raise awareness of sustainability training provision, including stimulating demand from industry and seeking to embed cultural and behavioural change

Arrangements should be put in place to raise industry awareness and engagement with the importance and value of training provision that addresses the sustainability agenda. This could be achieved by: working with partners to host information events and workshops; national marketing and promotional campaigns including use of social media such as Twitter; and publishing information resources such as a clear and accessible online training directory endorsed by partners and industry representative organisations.

8. Ensure that future training provision is subject to on-going monitoring

Monitoring systems should be put in place (including assignment of roles and responsibilities) to ensure the supply of training remains aligned to demand and that providers are equipped to meet the needs of industry from a delivery perspective, taking into account infrastructure, access to equipment (for example through links with industry) as well as tutorial expertise.

9. Continue to evaluate the impact of the BEST programme

The impact of the BEST programme should be assessed independently at key intervals to ensure progress continues to meet intended objectives and that internal processes remain fit for purpose.

Section 8 sets out clear priority areas for action in Wales and it hoped that BEST funding will be used to target these areas directly.

8. Priority areas for action in Wales

8.1 Introduction

Going forward, it will be essential that built environment training provision in Wales responds to the priority skills and knowledge needs of the sector in Wales. This will ensure the professional as well as traditional (craft/trade) workforce are suitably equipped to maximise the economic and business potential of the low carbon agenda and renewable technologies.

This section sets out the priority training needs emerging from several pieces of recent research relevant to the sector in Wales, most notably 'Skills Provision for the Built Environment in Wales' (2011) and 'Analysis of the National Status Quo' (2012).

8.2 Priority areas for action

The general consensus among participants of recent research[122] is that existing qualifications can, for the most part, be refined and expanded without the need to create a large suite of brand new qualifications.

The following professional occupations and associated skills/knowledge needs must be urgently addressed in order for Wales (and indeed the wider UK) to meet the requirements of the EU 2020 energy efficiency targets[123]:

- Energy Advisor/Assessor (wide-ranging skills and knowledge needs)
- Architects (low carbon design skills; whole life costing)
- Planners (understanding of energy efficiency targets)
- Civil engineers (understanding of low carbon materials and installation processes; knowledge of energy efficiency targets)
- Surveyors (understanding of energy efficiency targets and impacts of energy efficiency measures – or lack of them)
- Site supervisors (understanding of the processes and quality standard of completed work needed to meet low carbon requirements)[124].

Change such as improvements or enhancements to training provision in Wales is considered

[122] Most notably 'Skills Provision for the Built Environment in Wales' (2011) and 'Analysis of the National Status Quo' (2012).
[123] To reduce energy consumption by 20%; to reduce greenhouse gas emissions by 20%; to meet 20% of energy needs through renewable resources.
[124] Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.

essential to meeting future needs for advanced knowledge and skills in such areas as:

- Advanced construction materials;
- New building systems;
- The use of insulation materials;
- The installation of energy recycling systems;
- Building and installation of waste heat recovery;
- Advanced glazing systems (integration into existing building);
- Techniques for upgrading the energy efficiency of existing buildings;
- Building and maintenance of deep bore and ground heating systems;
- The building of green roofs;
- The integration of solar and wind power systems into and alongside new and existing buildings, and many more[125].

The following key skills and knowledge areas need to be addressed via development or enhancement of qualifications aimed at the blue collar (traditional craft and trade) built environment workforce:

- Understanding the principles of heat loss
- Understanding air quality, air tightness and ventilation requirements within buildings
- Knowledge of the range of energy efficiency measures, and their suitability for different building fabrics and ages, including pre-1919 stock and hard to treat buildings
- The so-called 'hierarchy' of energy efficiency measures, i.e. the sequence in which issues in buildings must be addressed in order to ensure maximum energy efficiency
- Installation of ground and air source heat pumps
- Installation of solar thermal and solar PV
- Installation of energy recovery, energy efficient cooling and shallow geothermal systems
- Installation of biomass, combined heat and power and wind turbines[126].

Further specialist units in the following areas will be required to be added to existing qualifications in order to meet the 2020 targets:

- Energy consumption
- The 2020 targets and what they mean for the building sector
- Legislation relating to energy efficiency (as it continues to emerge) and what this means for the building sector

[125] Pye Tait Consulting (2011) Skills Provision for the Construction Sector in Wales - Research to inform Transformational Change.
[126] Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.

- Quality assurance specifically in relation to energy efficiency materials, measures and procedures
- Energy saving behaviours – information to educate consumers
- Training on 'selling' the energy efficiency agenda to consumers to stimulate demand for energy saving measures[127].

In addition, training should be developed in Wales that addresses the following current knowledge and skills issues – specifically in relation to sustainability:

- Understanding of sustainability issues;
- Understanding of specific requirements of legislation;
- Understanding of the planning stage around orientation effects;
- Implications of the effect of one technology or solution on other areas of design and build;
- Understanding of how people will live in their houses and therefore how to design for that.
- Air-tightness requirements;
- Benefits of particular micro-renewable technologies and how to install and integrate them with other elements;
- Quality requirements to meet the code, and;
- How each trade affects adherence to the code[128].

[127] Pye Tait Consulting (2012) Build Up Skills UK - Analysis of the National Status Quo.
[128] BRE (2011) Delivering Low Carbon Skills Wales – Low Carbon New Build Learning Project.

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Appendix 2. UK SIC codes and descriptions identified as being within scope of this research

The tables below present the Standard Industrial Classification (SIC) codes and descriptions identified as being within scope of this research.

Cluster Code	Cluster Description
A	Development and construction of buildings
B	Electrical, plumbing and other construction installation activities
C	Building completion and finishing
D	Other built environment activities

SIC2007	SIC (2007) Description	Lead SSC	Cluster Code
16.10	Sawmilling and planing of wood	Proskills UK	A
16.21	Manufacture of veneer sheets and wood-based panels	Proskills UK	A
16.22	Manufacture of assembled parquet floors	Proskills UK	A
16.23	Manufacture of other builders' carpentry and joinery	Proskills UK	A
16.29	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	Proskills UK	A
35.11	Production of electricity	EU Skills	D
35.12	Transmission of electricity	EU Skills	D
35.13	Distribution of electricity	EU Skills	D
35.14	Trade of electricity	EU Skills	D
35.21	Manufacture of gas	EU Skills	D
35.22	Distribution of gaseous fuels through mains	EU Skills	D
35.23	Trade of gas through mains	EU Skills	D
41.1	Development of building projects	CITB	A
41.2	Construction of residential and non-residential buildings	CITB	A
42.11	Construction of roads and motorways	CITB	D
42.12	Construction of railways and underground railways	CITB	D
42.13	Construction of bridges and tunnels	CITB	D
42.21	Construction of utility projects for fluids	CITB	D

42.22	Construction of utility projects for electricity and telecommunications	CITB	D
42.91	Construction of water projects	CITB	D
42.99	Construction of other civil engineering projects n.e.c	CITB	D
43.11	Demolition	CITB	D
43.12	Site preparation	CITB	D
43.13	Test drilling and boring	CITB	D
43.21	Electrical Installation	SummitSkills	B
43.22	Plumbing, heating and air conditioning	SummitSkills	B
43.29	Other construction installation	CITB	B
43.31	Plastering	CITB	C
43.32	Joinery installation	CITB	C
43.33	Floor and wall covering	CITB	C
43.34	Painting and glazing	CITB	C
43.39	Other building completion and finishing	CITB	C
43.91	Roofing activities	CITB	C
43.99	Other specialised construction n.e.c	CITB	C
71.11	Architectural activities	CITB	D
71.12	Engineering activities and related technical consultancy	CITB	D
74.9	Other professional, scientific and technical activities n.e.c	CITB	D

Appendix 3. Built Environment Enterprises in Wales by Sub-sector

The table below presents the total number of built environment enterprises in Wales, as reported by the Office for National Statistics (ONS) in 2012 and broken down using 4-digit Standard Industrial Classification (SIC) codes.

SIC 2007 code	SIC (2007) Description	Total no. enterprises in Wales
1610	Sawmilling and planing of wood	45
1621	Manufacture of veneer sheets and wood-based panels	10
1622	Manufacture of assembled parquet floors	0
1623	Manufacture of other builders' carpentry and joinery	245
1629	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting	60
3511	Production of electricity	60
3512	Transmission of electricity	0
3513	Distribution of electricity	0
3514	Trade of electricity	5
3521	Manufacture of gas	0
3522	Distribution of gaseous fuels through mains	5
3523	Trade of gas through mains	0
4110	Development of building projects	945
4120	Construction of residential and non-residential buildings	1980
4211	Construction of roads and motorways	110
4212	Construction of railways and underground railways	10
4213	Construction of bridges and tunnels	0
4221	Construction of utility projects for fluids	15
4222	Construction of utility projects for electricity and telecommunications	15
4291	Construction of water projects	10
4299	Construction of other civil engineering projects n.e.c	950
4311	Demolition	25
4312	Site preparation	95
4313	Test drilling and boring	15
4321	Electrical Installation	1530
4322	Plumbing, heating and air conditioning	1220
4329	Other construction installation	305

4331	Plastering	165
4332	Joinery installation	820
4333	Floor and wall covering	245
4334	Painting and glazing	485
4339	Other building completion and finishing	655
4391	Roofing activities	265
4399	Other specialised construction n.e.c	990
7111	Architectural activities	365
7112	Engineering activities and related technical consultancy	1755
7490	Other professional, scientific and technical activities n.e.c	985
		14385

Source: ONS - UK Business Activity, Size and Location Guide 2012. Table B3.4.