

Baselining and research into the construction sector in Scotland

Final report to Scottish Enterprise

March 2012

SQW

1: Introduction and methodology

- 1.1 In November 2011, SQW was commissioned by Scottish Enterprise (SE) to undertake Baselining and Research into the Construction Sector in Scotland. Construction Scotland was also part of the client group for this research. This report sets out our findings, which aim to provide an evidence base that will inform the development of a new strategy for the sector in 2012.
- 1.2 The research took place at an important time for the construction sector, and a time of unusual change and uncertainty at all levels in the wider economy. The previous Scottish Construction Industry Plan was developed in 2007. Economic upheaval in the global economy has since affected all sectors and in particular construction, usually seen as barometer as it reflects confidence and capacity to invest across the corporate and domestic consumer spheres. There have been major political changes in Scotland with the new SNP Government coming to power in 2007 and more recently with the election of the new UK Government in 2010.
- 1.3 There has also been a major policy focus on developing a low carbon economy and reducing carbon emissions from all parts of the economy. Since the built environment is estimated to produce around 40% of carbon emissions, these policy developments clearly have added significance for the construction sector.

Study aims

- 1.4 The brief set out four elements of research for this study:
- Economic analysis, Scottish industry mapping and performance – including an updated mapping of the sector, a review of historical growth and performance and an economic evaluation of the sector and sub-sectors
 - Global trends, key drivers and growth projections – including a review of main trends, future trends and trends most relevant to Scotland; and growth projections for key markets and geographies
 - Benchmarking and learning from other regions - identifying top global performers; and a review of the characteristics of the top performers
 - Outline research into specific opportunities – including a review of the organisations involved in developing these opportunities; examples of current innovation activity in these areas; and suggestions for areas for SE intervention
- 1.5 Some of these study aims have been easier to address than others. Where evidence has not been available we provide an explanation in the relevant sections of the report. Overall the aim has been to provide a characterisation of the sector, looking at the main trends, issues and opportunities for growth in the future.

Defining the sector

- 1.6 Construction industry outputs range from minor improvements to major capital projects – infrastructure, commercial, residential. They are produced from a wide range of raw, finished and semi-finished materials; they utilise design, professional and technical planning, managerial and craft skills.
- 1.7 The sector is unusually difficult to bound with different statistical definitions used in the various national datasets. As a result we have not been able to work with a single consistent definition through the report, but have followed practice elsewhere in using the following three groupings, each based on the Standard Industrial Classification (SIC) codes:
- For the economic performance of the sector, we have used the SIC codes for the core construction sectors (SIC41-43) and an apportionment of activity in other SIC codes where a significant amount of activity is dependent on the construction sector
 - In other sections of the report, where we look at employment and skills issues, the definition is based on Construction Skills SIC definition which is SIC 41-43, SIC 71.1 (architects) and SIC 74.902 (quantity surveyors)
 - For other indicators including much of the ONS data, a narrower definition is used including only the core construction sectors.

Methodology

- 1.8 There were three main elements of research within the study:
- Desk-based review of relevant publications, datasets and academic research;
 - Consultations with 14 key industry stakeholders to discuss recent trends, strengths and weaknesses and opportunities and threats for the sector in the future;
 - A survey of businesses from different parts of the sector to discuss the main issues facing the sector from an individual business perspective. We spoke to 29 businesses as part of the study (with a further 20 others approached).

Report structure

- 1.9 The report is structured as follows:
- Section 2 – Policy and strategic context
 - Section 3 – Industry representation
 - Section 4 – Economic performance of the sector
 - Section 5 – Recent trends in the sector
 - Section 6 – Industry mapping
 - Section 7 – Key issues facing the sector

- Section 8 – Future growth prospects
- Section 9 – UK benchmarking
- Section 10 – Global benchmarking
- Section 11 – Market opportunities
- Section 12 – Conclusions
- Annex A – SIC code supply chain analysis
- Annex B – Consultee list

2: Policy and strategic context

Summary

2.1 The strategies and initiatives highlighted in this section reinforce:

- The importance of the construction sector to the wider Scottish economy, in particular how it can play a role in helping a return to economic growth and recovery
- The need for the sector to adapt to the challenges and opportunities of the low carbon economy. However, as we found in our consultations with industry there perhaps remains a gap between ambitious policy targets and actually delivering solutions to meet the low carbon challenge
- The issue of public sector procurement for construction projects which has become all the more important as the industry has become more dependent on public sector led contracts.

Strategic context

2.2 There are a range of strategies and policies relevant to the construction sector in Scotland. Some of these are relevant to the overall positioning and growth of the sector, others are focused on the opportunities in terms of addressing the low carbon agenda. A summary of the thrust of the main strategies, as this relates to construction, is provided in the table below.

Table 2-1: Policy and strategy context

Policy/ strategy document	Relevance to Scotland's construction sector
<i>Scottish strategy/ policy</i>	
Scottish Construction Industry Plan – Scottish Construction Forum (2007)	<p>Much of what this strategy aimed to do remain valid five year on such as: ensuring continuous improvement in the performance of the Scottish construction industry; helping to increase productivity, sustainability, quality and pride in this important industry; supporting a construction industry that produces best 'whole life value' in our built environment; and improving the image of the industry.</p> <p>Although sustainability is covered under the Planet theme, the need for the sector to address the low carbon agenda has clearly moved on significantly in the last four years.</p>
Climate Change (Scotland) Act 2009	<p>The legislation introduced the statutory target for Scottish Ministers to ensure Scotland's net emissions reduce by at least 80% by 2050 lower than the 1990 baseline. An interim target was set also set that net Scottish emissions account for the year 2020 is at least 42% lower than the baseline". This is to be known as the 'Interim Target'.</p> <p>This interim target of at least 42% emissions reduction by 2020 is higher than the UK government stated aim of curbing greenhouse gas emissions by 34% by 2020, as included in the UK Climate Change Act 2008</p>
Government Economic Strategy – Scottish Government (2011)	<p>Under its strategic priority of Infrastructure Development and Place, the strategy sets out the Government's focus on continuing investment in major capital projects such as the Forth Replacement Crossing and South Glasgow Hospital.</p> <p>It also highlights the plans for the Scottish Futures Trust with its £2.5 billion programme of NPD investment. Another important aspect of the planned</p>

Policy/ strategy document	Relevance to Scotland's construction sector
	<p>infrastructure investment is around the plans for leveraging new investment through initiatives such as TIF, the National Housing Trust and JESSICA.</p> <p>The strategy also makes the important point that improving physical infrastructure brings immediate benefits to the economy by supporting the construction sector and its supply chains.</p> <p>There is an overview of the planned investments in a range of areas including transport, energy and urban regeneration. In terms of housing, the strategy states the Government will be working with local authorities, housing association and private developers to fund new housing including through the National Housing Trust. It also mentions the provision of support for the transition to a low carbon economy by introducing the Warm Homes Fund supported from the Scottish Futures Fund (SFF) to deliver energy efficiency</p>
<p>Low Carbon Economic Strategy – Scottish Government (2010)</p>	<p>The strategy has an objective around 'moving towards a low carbon built environment - reducing carbon emission, through all phases of the building process, from design to construction, through operation and maintenance, within the new and existing building stock'.</p> <p>It states the Government's ambition is that all new buildings in Scotland will be zero carbon by 2017, where practicable. The desire is to exploit and integrate low carbon building technologies into the design and construction process (covering the development, commercialisation, testing, demonstration and market innovative new building technologies and materials, and integrating these into the design process).</p> <p>However it also acknowledges that the market opportunity for retrofitting the existing building stock is also huge. The strategy states that there is potential for growth in the high demand for retrofit technologies utilising new technology and new construction ideas e.g. new material development and smart sensors. It is suggested that there are over 500 Scottish companies (many in the construction industry) that can address the UK market opportunity which is expected to be £21bn by 2014/15.</p>
<p>Infrastructure Investment Plan – Scottish Government (2011)</p>	<p>This outlines £60bn infrastructure spending programme over the next 20 years (on more than 50 capital projects). The Plan identifies the following areas for which this spend is to be allocated over the long term: transport; digital; energy and renewables; water; waste; health; education; and housing. Total capital investment is £2.8bn in 2011/12 and is expected to rise to £3.5bn in 2014/15; this represents an increase of 25% by 2014/15.</p> <p>The announcement of this pipeline of public sector investment is likely to at least provide some level of assurance of future construction demand in Scotland. <i>Further discussion of the pipeline other public sector projects is discussed in a later section on funding and investment</i></p>
<p>Climate Change Adaptation Framework, Built Environment Action Plan – Scottish Government (2009)</p>	<p>Highlights the climate change threats to infrastructure and the built environment in terms of water, wind and heat. Sets out opportunities for the construction sector which include:</p> <ul style="list-style-type: none"> • Innovative design of new buildings and retrofitting of existing ones to make them more resilient to climate change. • Also including in new developments climate change adaptation measures including habitat networks and the inclusion of sustainable urban drainage systems (SUDS), cooling and ventilation requirements. • It is suggested that Scotland is likely to be more able to cope with the potential effects of climate change than some other parts of the UK because it has adapted buildings and policies over many decades to cope with higher rainfall and more frequent storms.
<p>Energy Efficiency Action Plan – Scottish Government (2010)</p>	<p>Sets out the framework for the Scottish Government's comprehensive approach to energy efficiency and micro-generation. Within it, the Plan highlights a commitment to reducing the energy usage in the built environment and various actions including the changes to building standards, developing sustainability labelling system within building regulations, targeting support towards dwellings with the lowest EPC ratings and undertaking a mapping study of the existing non-domestic stock.</p>
<p><i>Recent UK strategy/ policy</i></p>	
<p>Government Construction</p>	<p>This emphasises the need to improve coordination and leadership in terms of</p>

Policy/ strategy document	Relevance to Scotland's construction sector
Strategy – Cabinet Office, UK Government (2011)	<p>procuring and delivering construction projects and calls for a new relationship between Government and the industry.</p> <p>It also pledges that Government rolling two year forward programme of infrastructure and construction projects where public funding has been agreed.</p> <p>Also acknowledged is the need to ensure that Government commissioning teams are consistently equipped with the necessary high level of skills appropriate to specific projects and programmes.</p> <p>There are a range of initiatives highlighted for Government to support the construction sector including standardising procurement forms, improving procurement models and ensuring value for money but not at the expense of without sacrifice of whole life value.</p>
Low Carbon Construction Action Plan – BIS, UK Government (2011)	<p>Actions being taken forward by the UK Government include: working with industry to identify what is required stimulate investment in low carbon and growth; reforming approaches to public procurement; encouraging the supply chain to work collaboratively; and helping to support innovation and best practice through the Better Public Building Awards.</p> <p>The Action Plan also states the need to make the most of export opportunities and exploiting its work on zero carbon new homes, on retrofitting and on major projects like the Olympics.</p> <p>Also emphasised is the need for a new level of cooperation between Government and industry. The Plan pledges to establish a new joint Government and industry board, the Green Construction Board, to ensure that the action plan is implemented.</p>

Source: Various

Other key developments

- 2.3 During our consultations, other key policy developments/ initiatives were highlighted as having a major influence on the development of the construction sector in Scotland. These are summarised below.
- 2.4 The **Scottish Futures Trust (SFT)** was created in September 2008 as an independent company, wholly-owned by the Scottish Government to oversee public infrastructure investment across Scotland. This new organisation and model will have important influence on the way in which public sector construction contracts are tendered over the coming years. The aim of this body was to help ensure better value for taxpayers' money in the delivery of vital public infrastructure projects. SFT is involved across all phases of the infrastructure investment cycle, from initial option investigation to asset disposal. SFT is also the delivery lead on the Hub partnership which is bringing together public bodies such as local authorities, NHS boards and the private sector to deliver around £1 billion of community infrastructure. More discussion about procurement models and the Hub initiative is included in a later section on funding and investment.
- 2.5 Another key development primarily in relation to the construction of new buildings has **changes to building standards** introduced by the Scottish Government in 2010 but with further changes to be made in 2013 and 2016. Building standards cover a range of issues including structural and fire safety, accessibility, resistance to noise and damp, but also conservation of energy. In 2007, the Scottish Government commissioned the Sullivan Report to make recommendations on measures to improve the energy performance of houses and buildings in Scotland, thereby reducing carbon dioxide emissions and contributing to the Scottish Government's ambitious climate change targets. The main recommendation of the

Sullivan Report¹ was in relation to new building was for net zero carbon buildings (i.e. space and water heating, lighting and ventilation) by 2016/2017 with two intermediate changes in 2010 and 2013.

- The 2010 change in energy standards for non-domestic buildings should deliver carbon dioxide savings of 50% more than 2007 standards - for domestic buildings should deliver carbon dioxide savings of 30% more than 2007 standards.
- The 2013 change in energy standards for non-domestic buildings should deliver carbon dioxide savings of 75% more than 2007 standards - for domestic buildings should deliver carbon dioxide savings of 60% more than 2007 standards.

2.6 The report stated an overall ambition for total-life zero carbon buildings by 2030. The report recommended that consideration be given to developing practical performance standards for existing buildings (aligned with the energy performance certificates). According to the Government, 90% of the recommendations are either completed or in progress. The low carbon stage for new buildings was achieved with the introduction of the 2010 building regulation energy standards in October 2010².

2.7 Although there are already some initiatives led by the Scottish Government and others to encourage the introduction of energy efficiency measures, the UK Government will soon be launching the **Green Deal**. This new initiative, expected to start in the autumn of 2012, aims to facilitate the retro fitting of energy saving measures to millions of homes across the UK. As part of the scheme, the Government is establishing a framework to enable private firms to offer consumers energy efficiency improvements to their homes, community spaces and businesses at no upfront cost. These are likely to include energy efficient boiler replacements, cavity wall insulation, double glazing and loft insulation. Customers will be able to choose from 23 different technologies, which include cavity wall insulation and draught-proofing; the Green Deal may also cover the costs of solar water heating, wood-burning stoves and biomass boilers. Payments for implementing the measures will then be repaid through a charge in instalments on energy bills, linked to the property. .

2.8 According to the UK Government the scheme will provide opportunities for skilled and unskilled labour, from assessment to installation, manufacturing to supply. Discussions with stakeholders suggested that it will mainly be the larger operators (who have had the time and resources to prepare for the introduction) that will benefit directly from the implementation of the Green Deal. However, if the initiative has the desired effect on increasing demand for energy efficiency measures, then it is likely to provide new opportunities for all sizes of businesses. .

¹ Scottish Government (2007), A Low Carbon Building Standards Strategy For Scotland - report of a panel appointed by Scottish Ministers, chaired by Lynne Sullivan

² Scottish Government (2011), Progress Report on the Low Carbon Building Standards Strategy for Scotland

3: Industry representation

Construction Scotland

- 3.1 Construction Scotland came into being as the leadership organisation for construction in Scotland in April 2011. This new organisation has assumed the roles of the Scottish Construction Forum and been established as the voice for the industry in its engagement with Scottish Government Ministers, key stakeholder groups and the wider industry. Its objectives include: gathering and representing industry views to Government, encouraging employer leadership, promoting innovation; and developing and monitoring a strategy for the sector. Essentially, the organisation seeks to be an umbrella organisation that pulls together all sub-sectors within the industry to create one unified voice.

Other industry bodies

- 3.2 The main organisations representing the different parts of the sector are summarised in the table below with some more active/ relevant to Scotland than others (e.g. some are UK organisations and whilst they may not have a Scottish office may have a Scottish committee or designated representative).
- 3.3 Each organisation has its own membership and many of these organisations carry out their own research on the issues affecting their particular part of the construction sector. The range of occupations covered by the following organisations emphasises a number of issues which should be considered in the context of this research and the upcoming strategy development of a new strategy for the construction sector in Scotland.
- 3.4 As cited in section 1, there are challenges around which occupations and sub-sectors should be included in a sector definition and to what extent those sub-sectors actually see themselves as part of the construction sector. The range of occupations and complexity of industry representation makes it particularly challenging to develop a strategic approach within the sector. In some cases there are even numerous organisations representing one sub-sector. But it is evident from the list that a coordinated approach across these interests and organisations could have a very strong influence on future Government policy.

Table 3-1: Industry organisations in Scotland (listed alphabetically)

Name of organisation	Scottish office?	Summary	Website
Chartered Institute of Building (CIOB)	Glasgow	With over 46,000 members the CIOB is the international voice of the building professional, representing an unequalled body of knowledge concerning the management of the total building process	www.ciob.org.uk
Chartered Institute of Building Services Engineers	No	It received its Royal Charter in 1976 and is the professional body that exists to: 'support the Science, Art and Practice of building services engineering, by providing our members and the public with first class information and education services and promoting the spirit of fellowship which guides our work.	www.cibse.org

Name of organisation	Scottish office?	Summary	Website
Chartered Institute of Plumbing and Heating Engineering (CIPHE)	Monifieth	Founded in 1906, the Chartered Institute of Plumbing and Heating Engineering (CIPHE) is the professional body for the UK plumbing and heating industry. It has a membership of around 10,000 including approximately 260 manufacturers and distributors	www.ciphe.org.uk
Civil Engineers Contractors Association (CECA)	Stirling	The Civil Engineering Contractors Association is the representative body for companies who work day-to-day to maintain and upgrade the country's vital transport and utility infrastructure. CECA (Scotland) Ltd represents over 100 civil engineering contractors ranging in size from small rural contractors to large multinationals. CECA maintains strong links within the Scottish Parliament, particularly its Transport, Infrastructure and Enterprise Ministers	www.ceca.co.uk
Confederation of Roofing Contractors (CORC)	No	Organisation established in 1985	www.corc.co.uk
Contract Flooring Association (CFA)	No	Formed in 1974 by the amalgamation of three small flooring associations: The Floor Covering Contractors Association, whose members specialised primarily in smooth floor coverings: the Association of Flooring Contractors (hardwood flooring) and the Carpet Planners Association	www.cfa.org.uk
Council Of Regulation Gas Installers (CORGI)	No	Confederation for the Registration of Gas Installers was set up in 1970, given the task of ensuring that gas work is carried out safely	www.corgiservices.com
Federation of Environmental Trade Associations (FETA)	No	FETA is the recognised UK body representing the interests of over 400 manufacturers, suppliers, installers and contractors within the heating, ventilating, building controls, refrigeration & air conditioning industry to policy makers and the wider public	www.feta.co.uk
Federation of Master Builders (FMB)	Edinburgh	The FMB is the UK's largest trade association in the building sector, with national offices in England, Northern Ireland, Scotland and Wales, supported by additional regional offices	www.fmb.org.uk
Glass and Glazing Federation	Grangemouth	The main representative organisation for companies involved in all aspects of the manufacture of flat glass and products and services for all types of glazing, in commercial and domestic sectors	www.ggf.org.uk
Homes for Scotland	Edinburgh	Homes for Scotland is the voice of the Scottish home building industry. Its membership of 160 home building and associate member companies provides 95% of all new homes built for sale in Scotland each year	www.homesforscotland.com
Institute of Civil Engineers (ICE)	Glasgow	ICE Scotland represents over 8000 civil engineers living and working in Scotland. It promotes civil engineering and the interests of civil engineers.	www.ice.org.uk
National Federation of Roofing Contractors (NFRC)	No	The National Federation of Roofing Contractors Limited (NFRC) is the UK's largest roofing trade association, representing over 70% of the roofing industry by value. With a history spanning almost 120 years, NFRC has established itself as the voice of	www.nfrc.co.uk

Name of organisation	Scottish office?	Summary	Website
		the roofing industry.	
National House-Building Council (NHBC)	Edinburgh	NHBC (National House-Building Council) is the leading warranty and insurance provider and standards setter for UK house-building for new and newly converted homes.	www.nhbc.co.uk
Royal Incorporation of Architects in Scotland (RIAS)	Edinburgh	RIAS was founded in 1916 as the professional body for all chartered architects in Scotland and is the foremost architectural institute in the country dealing with architecture and the built environment	www.rias.org.uk
Royal Institute of Chartered Surveyors (RICS Scotland)	Edinburgh	With around 100,000 qualified members and over 50,000 students and trainees in some 140 countries, RICS provides the world's leading professional qualification in land, property, construction and the associated environmental issues	www.rics.org
Scottish and Northern Ireland Plumbing Employers Federation (SNIPEF)	Edinburgh	Before SNIPEF was established in 1923 there were local associations of Master plumbers in various parts of the country. The oldest of which is the Glasgow and West of Scotland Association, founded in 1856. Today, there are 11 Local Associations which cover all areas of Scotland and Northern Ireland	www.snipef.org
Scottish Building Federation (SBF)	Edinburgh	SBF has served the construction industry and in particular our member companies since 1895. It comprises 16 Regional Associations and promotes the interests of the construction industry to a diverse range of stakeholders, representing around 700 companies from across Scotland	www.scottish-building.co.uk
Scottish Decorators Association	Stirling	The Scottish Decorators' Federation is the national trade association for all types of firms involved in the decorating industry in Scotland	www.scottishdecorators.co.uk
Scottish Federation of Housing Associations (SFHA)	Glasgow	The purpose of the SFHA is to be the national voice and advocate of Scotland's Housing Associations and Co-Operatives	www.sfha.co.uk
SELECT	Midlothian	Scotland's trade association for the electrical industry was founded in 1900, as an independent and autonomous association representing the interests of Members, driving up industry standards, ensuring that work carried out by Member companies is of the highest quality and training the electricians of the future	www.select.org.uk/

Source: Various websites

3.5 Details of the main organisations involved in skills development and innovation in the sector are highlighted later in the report.

4: Economic performance of the sector

- 4.1 The starting point for reviewing the economic performance of the sector was an analysis of the official data produced by the Scottish Government. This was customised by Government statisticians for the study, producing data which could be analysed for the period 2006 to 2009. We also look at how the sector has performed since 2009 using other national data-sets (ONS and Construction Skills).

Summary of economic performance

- 4.2 The main points we draw from this analysis are that:
- The overall number of employees (i.e. individuals that are employed) in the Scottish construction sector and supply chain decreased from 171,000 in 2006 to 168,000 in 2009 (but with a significant dip between 2008 and 2009).
 - Total employment (i.e. taking into account people with more than one job) in the Scottish construction sector and supply chain decreased from 203,800 in 2008 to 184,400 in 2009 (no employment data available for 2006 and 2007).
 - Based on ONS estimates in 2009, there were also 59,000 self-employed in the construction sector.
 - Looking at other ONS data on employment since 2009, it would appear that employment in the sector decreased by a further 9% but that self-employment increased over those two years by 12%, from 59,000 to 66,000.
 - According to ONS, the overall number of jobs in the construction sector in 2011 was estimated to be 236,000 (i.e. 170,000 employee jobs and 66,000 self-employed).
 - The economic performance in terms of sales and GVA in the construction sector and supply chain increased marginally over the three year period from 2006 to 2009. However, there was a significant drop from 2008 to 2009, when sales and GVA both fell by approaching £3 billion. The employment trends data point to a similar fall in sales and GVA in the sector and supply chain between 2009 and 2011.

Methodology for producing the statistics

- 4.3 Every year the Government produces its Scottish Annual Business Statistics³ publication which provides details on the economic and financial performance of different sectors as defined by SIC (Standard Industry Classification) codes. This requires detailed analysis of the UK Interdepartmental Business Register (basically the Government's database of all companies in the UK). As a result, this detailed analysis is always a year behind the basic figures on employment and business numbers, which are available for example through ONS

³ <http://www.scotland.gov.uk/Topics/Statistics/Browse/Business/SABS>

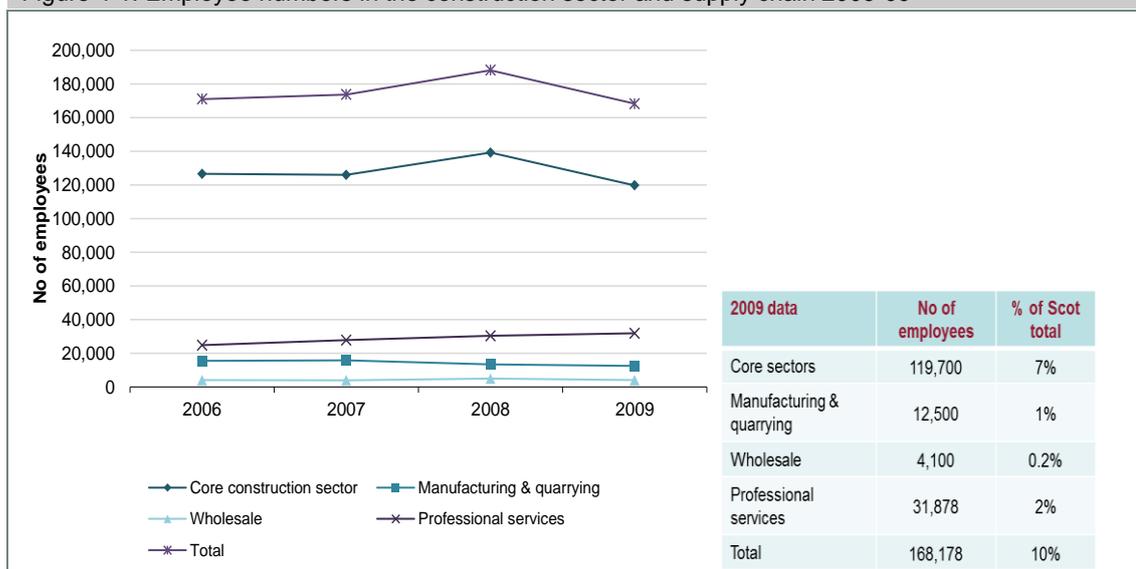
or NOMIS. Therefore the first issue to flag up here is that the analysis can only include data up to 2009 (as is the case with all sectors). Another factor to bear in mind when looking at the figures in this section of the report is that two slightly different methods have been used to compile the statistics⁴.

- 4.4 In order to produce an estimate of the performance of not only the main construction sector (as defined by SIC 41 to 43) but also its immediate supply chain, an *apportionment*⁵ of supporting SIC codes have been included in the analysis. This for example includes a group of companies involved in quarrying, logging and manufacturing materials used in the construction process. There is also a group for businesses involved in the wholesale of construction products and finally a group that includes the range of professional services involved in construction projects.

Employees and employment

- 4.5 The analysis shows that over the four year period, the number of employees in the core construction sectors decreased from nearly 127,000 to 119,000 in 2009. However, between 2008 and 2009, there was a drop of around 20,000 employees. In terms of the three supply chain groups, the data shows that: the number of employees in professional services increased slightly during this period from 25,000 to 32,000; the figures for manufacturing and quarrying decreased from 15,000 to 12,000; and the wholesale employee figure remained broadly the same.
- 4.6 The overall number of employees in the Scottish construction sector and supply chain decreased from 171,000 in 2006 to 168,000 in 2009 (but again with a significant dip between 2008 and 2009). These figures do not take account of self-employment in the sector.

Figure 4-1: Employee numbers in the construction sector and supply chain 2006-09



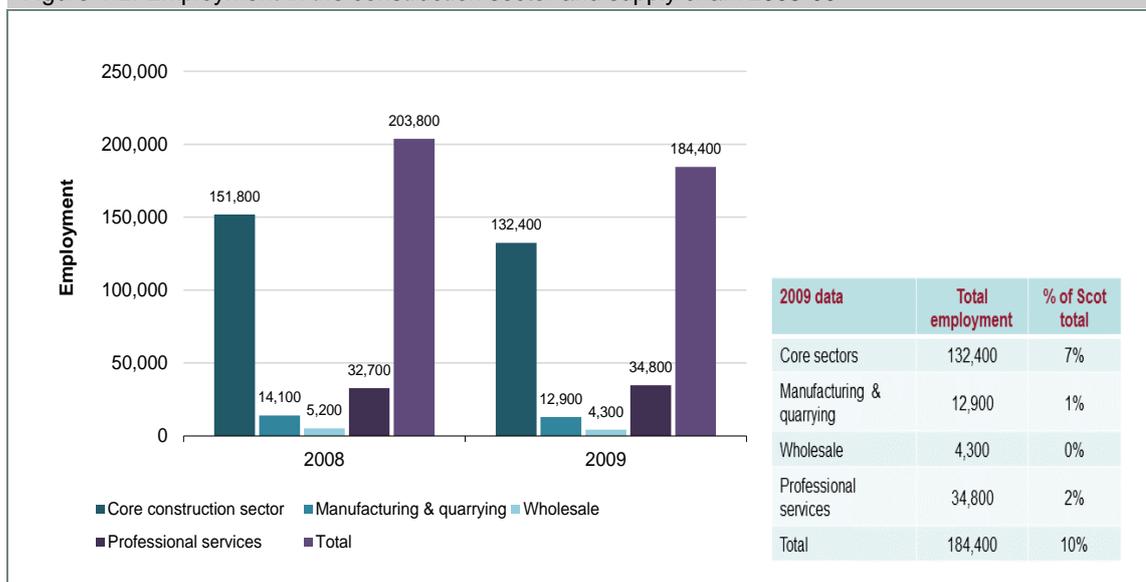
Source: Scottish Government and SQW

⁴ The data for 2006 and 2007 is based on SIC 2003 whilst 2008 and 2009 figures are based on SIC 2007 data. Strictly speaking the two data sets are not directly comparable but at the Scotland level, there is likely to be minimal differences between the two data-sets

⁵ See Annex A for more detail on the process of apportionment – tables relating to all graphs are also provided

- 4.7 For 2008 and 2009, the Scottish Government figures also show total employment levels which counts all jobs in the sector rather than individuals employed in construction. Some people working in the sector may have more than one job (i.e. two part-time jobs) and so as would be expected the total employment figure is higher. Between 2008 and 2009, employment in the core sectors dropped from 152,000 to 132,000 and including the wider supply chain estimates, overall employment decreased from 204,000 to 184,000 (Figure 4-2). Once again, we would highlight that these figures do not include self-employment.
- 4.8 It is important to highlight the difference in employee and employment numbers – for example in 2009, there were 168,000 employees but 184,000 employee jobs (i.e. the total employment figure). This is an important distinction to make especially when considering other employment estimates for the sector.

Figure 4-2: Employment in the construction sector and supply chain 2008-09

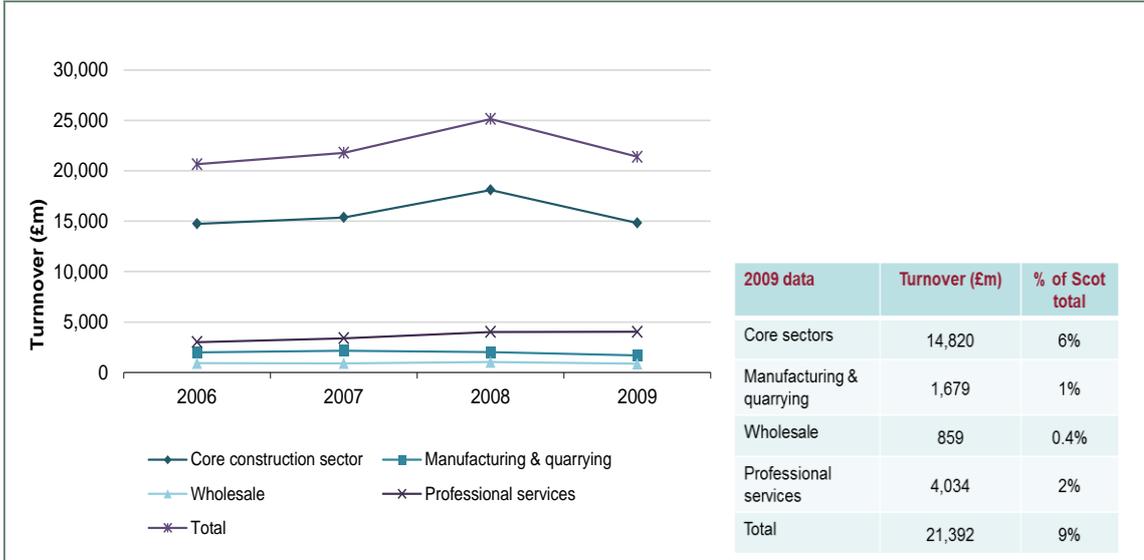


Source: Scottish Government and SQW

Turnover

- 4.9 There has been a net increase in sales generated by firms in the sector and supply chain. Overall the figure has increased from £20.6 billion in 2006 to £21.4 billion in 2009 billion in 2009. However, once again the decrease in total sales is notable between 2008 and 2009 when it decreased from £25.1 billion down to £21.4 billion, a drop of nearly £4 billion.

Figure 4-3: Turnover in the construction sector and supply chain 2006-09

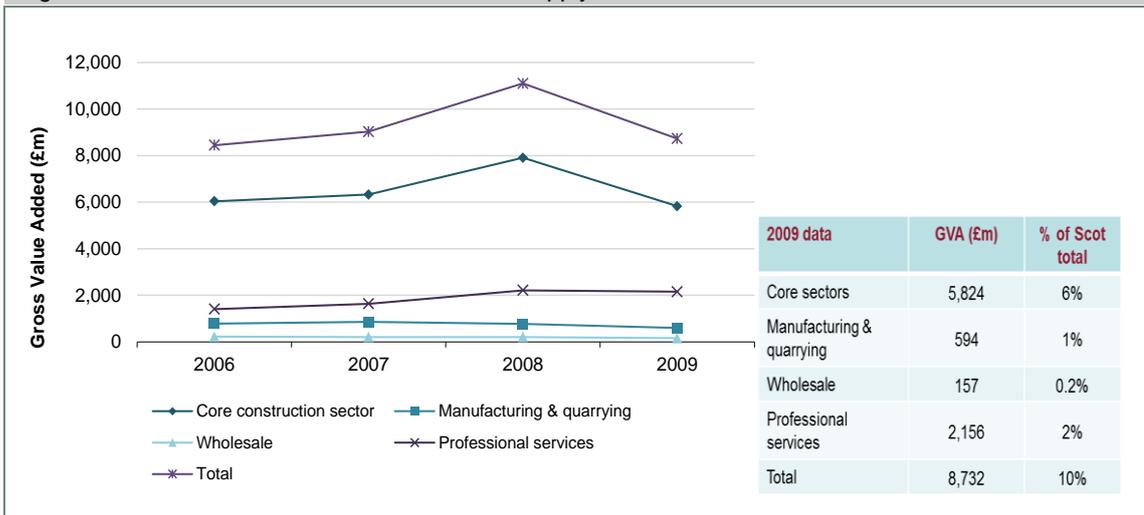


Source: Scottish Government and SQW

Gross Value Added (GVA)

- 4.10 GVA is the main measurement of economic impact. Although total volume of sales is an interesting indicator, it includes some double-counting. Overall, GVA in the core construction sectors has changed from just over £6 billion in 2006 down to £5.8 billion in 2009. Including the supply chain, the figure increased marginally from £8.4 billion to £8.7 billion. However, once again there was a dramatic drop in GVA between 2008 and 2009. For the core sectors, this decreased from £7.9 billion to £5.8 billion. Including the wider supply chain, GVA decreased from £11.1 billion to £8.7 billion.

Figure 4-4: GVA in the construction sector and supply chain 2006-09



Source: Scottish Government and SQW

- 4.11 Table 4-1 shows GVA per employee for each of the sub-sectors in the core construction sector and the three groupings in the supply chain. Two of the three main sub-sectors (construction of buildings and civil engineering) have higher levels of productivity than the average for all sectors. Activities selected from professional services also have higher than average productivity levels.

Table 4-1: GVA per employee

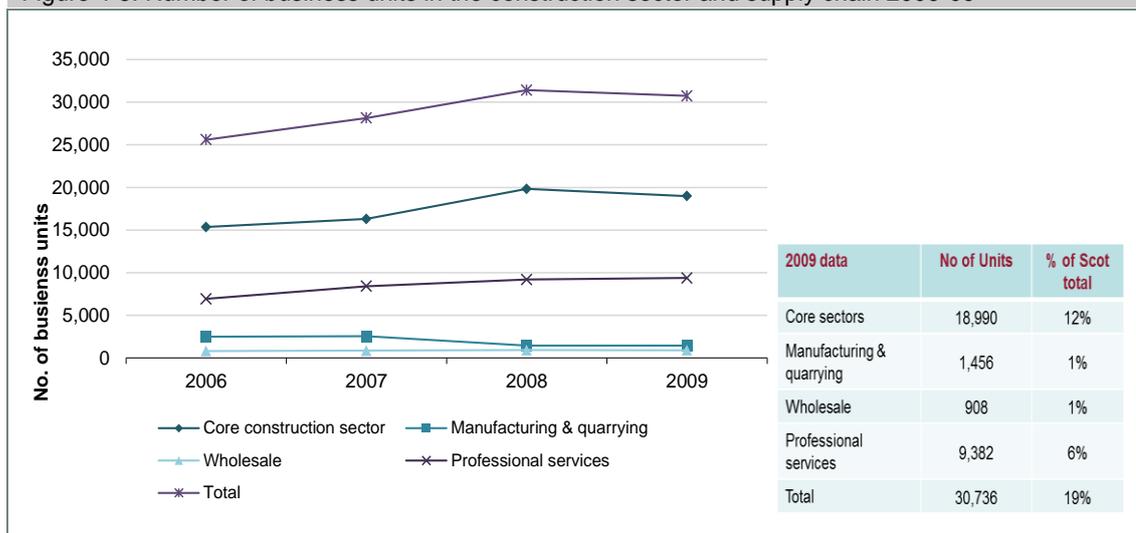
	GVA per employee
Construction of Buildings (SIC 41)	£56,857
Civil Engineering (SIC 42)	£71,196
Specialised Construction Activities (SIC 43)	£39,220
Core construction sector (41-43)	£48,658
Manufacturing & quarrying ⁶	£47,544
Wholesale	£38,366
Professional services	£67,640
Construction + supply chain total	£51,922
All sectors	£54,087

Source: Scottish Government and SQW

Business units

- 4.12 The number of business units covers all registered business locations for firms involved in construction (note: this is different from the number of actual businesses). In the analysis it was not deemed appropriate to apportion this number for the construction supply chain⁷. The graph below shows that for the core sectors, the number of business units has increased from over 15,000 in 2006 to nearly 19,000 in 2009. There was a drop of about 1,000 business units between 2008 and 2009 but not nearly the same decrease as highlighted for the previous economic indicator. The number of business units *involved to some extent* in the supply chain has increased from just over 10,000 to nearly 12,000 in the same time period.

Figure 4-5: Number of business units in the construction sector and supply chain 2006-09



Source: Scottish Government and SQW

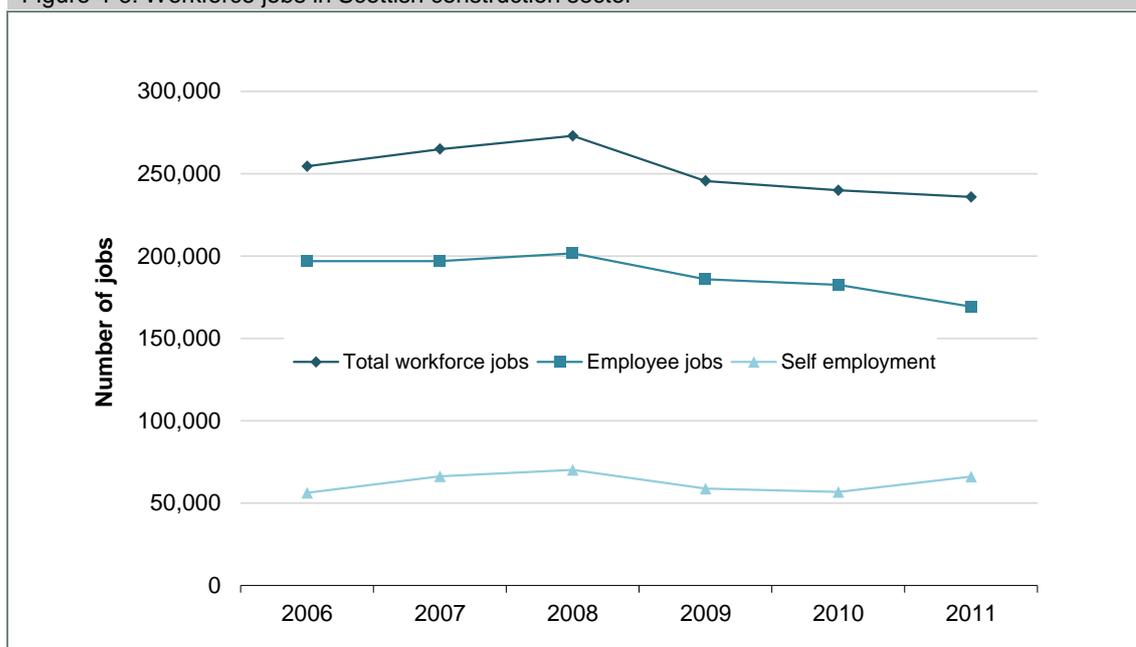
⁶ Note: these groupings only relate to certain selected activities in the construction supply chain. For manufacturing as a whole the GVA per employee figure would be a lot higher – see Annex A for explanation

⁷ Businesses have been identified as being part of the supply chain but that is not to say all their activity relates to the construction sector – for this reason the number of businesses (or units) have not been apportioned

Performance of the sector since 2009

- 4.13 Although the Scottish Government data on the sector and supply chain does not currently exist beyond 2009, it is useful to consider some other data on employment to identify how the figures (on employment, turnover and GVA terms) may have changed and also to take into account levels of self-employment which are not covered by the Scottish Government statistics.
- 4.14 ONS produces estimates of workforce jobs which includes employee jobs and self-employment. The figures on employee jobs for 2008 and 2009 are broadly the same as the Scottish Government data for those two years where comparisons can be made. The ONS estimates show significant numbers of self-employed working in the construction sector. This figure is difficult to identify due to a higher proportion of informal employment compared to other sectors⁸. Between 2009 and 2011, although the number of employees in the sector has decreased by a further 9% to around 170,000, the estimate for self-employment has increased over those two years by 12% up from 59,000 to 66,000 as shown in Figure 4-6. The overall number of *jobs* in the construction sector in 2011 was estimated to be 236,000.

Figure 4-6: Workforce jobs in Scottish construction sector⁹



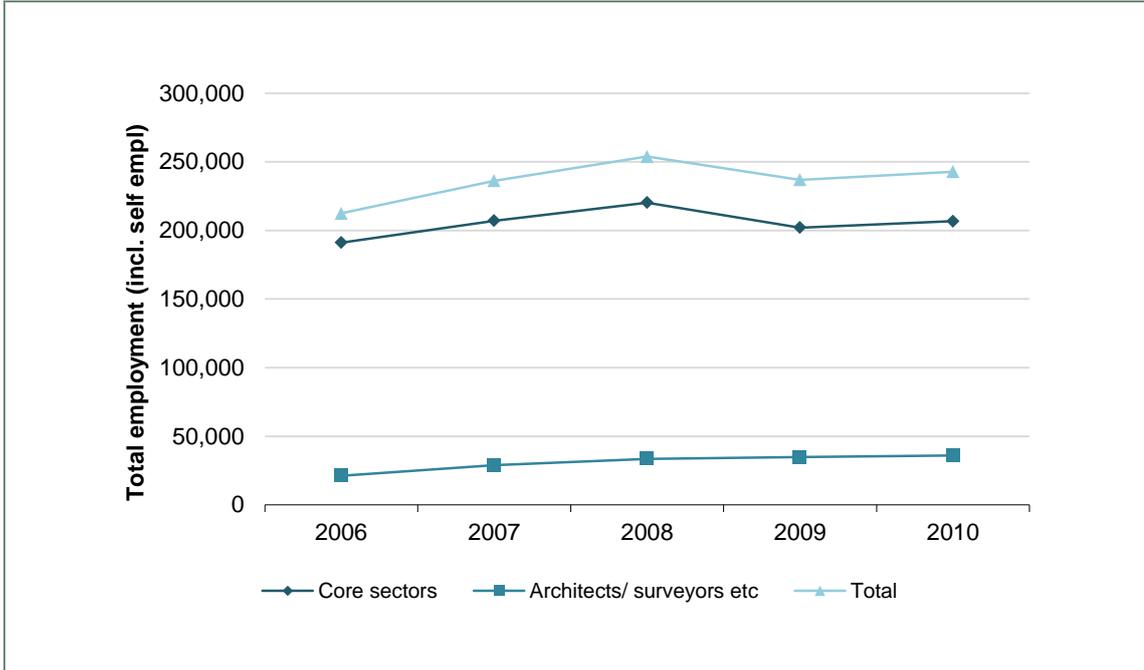
Source: NOMIS Workforce Jobs (using 4 quarter averages)

- 4.15 Another source of data on employment in the sector is Construction Skills Scotland. In Figure 4-7 we set out their employment estimates for the sector over the last six years which also take into account self-employment. The latest available employment data for 2010, shows the total employment in the sector (including architects and surveyors) was nearly 243,000, marginally higher than the 240,000 estimated by ONS for 2010 as shown in Figure 4-6.

⁸ Jewel, C (2006), Informal employment: a threat or an opportunity for the UK construction sector?

⁹ The SIC codes used here are SIC 41-43 (core sectors), SIC 71.1 (architectural/ engineering) and SIC 74.902 (quantity surveying)

Figure 4-7: Construction Skills Scotland employment estimates



Source: Construction Skills Scotland

4.16 As well as looking at changes in employment since 2009, it is also interesting to look at the changes in the business base. According to the IDBR, the number of construction businesses decreased from 26,560 in 2009 to 25,735 in 2011, a reduction of 3%. There has been a bigger drop in the number of firms involved in the construction of buildings (down 15%) and civil engineering firms (down 11%). The number of architectural and engineering firms has increased by 6% during this period¹⁰.

Figure 4-8: Change in business numbers 2009-2011



Source: IDBR 2009-2011

¹⁰ It should be noted that this relates to the broader category of SIC 71 because it is not possible to access data solely for SIC 71.1

5: Recent trends in the sector

- 5.1 In this section we review recent headline trends within the Scottish construction sector over the last four to five years. These dataset reinforce the scale of change and turbulence that has been experienced during this period.

Summary of recent trends

- 5.2 The purpose of this section has been to demonstrate the scale of change experienced by the sector over the last four years. A number of headline messages emerge from the data:
- According to ONS construction output data, sales relating to private sector housing decreased from £2.5 billion down to just over £1.4 billion in 2010 (-43%). All output relating to new work has decreased by 11% over the four years with a particular large drop between 2008 and 2009
 - Output relating to repair and maintenance increased by 30% over the last four years mainly through increases in housing and infrastructure R&M. For all construction output, a 1% increase was recorded over the four years but in with a significant dip in 2009
 - Trend data on the number of insolvencies, housing supply and planning applications all demonstrate how demand and activity in the sector has fallen over the last four years.

Change in construction output and orders

- 5.3 A key source of data on the construction sector in Scotland is the Office for National Statistics which provides data on orders and output¹¹. In terms of new work, there has been an 11% reduction in annual output over the last four years (but significant fluctuation year or year, for example a drop of 19% between 2008 and 2009). This is shown in Table 5-1. Over the four year period, there has been a significant increase in public housing output but also a large drop in private housing activity. In 2006, this was worth £2.5 billion but by 2010 this has decreased to just over £1.4 billion.

Table 5-1: Construction output in Scotland 2006-2010 – output relating to new work (£m)

	New housing		Infrastructure	Other new work excl. infrastructure			All new work
	Public	Private	Infrastructure	Public	Private industrial	Private commercial	
2006	292	2,528	852	927	467	2,777	7,842
2007	343	2,274	975	861	405	3,130	7,988

¹¹ This data covers all types of construction (commercial and domestic buildings, all types of infrastructure and civil engineering projects), demolition, site preparation, all forms of construction installation, painting, glazing, roofing and scaffolding activities.

	New housing		Infrastructure	Other new work excl. infrastructure			All new work
2008	416	1,991	1,525	844	370	2,883	8,030
2009	481	1,521	1,407	908	271	1,889	6,479
2010	647	1,437	1,505	1,225	474	1,726	7,016
% change	122%	-43%	77%	32%	2%	-38%	-11%

Source: Construction Statistics Branch, Office for National Statistics

- 5.4 Output relating to repair and maintenance (R&M) increased by 30% over the last four years (Table 5-2) which has mainly come from increases in housing and infrastructure R&M¹². Taking all construction output together, there has been a 1% increase over the four years but again we highlight the significant dip in output in 2009.

Table 5-2: Construction output in Scotland 2006-2010 – output relating to repair & maintenance (£m) and all work

	Housing	Other work		Infrastructure	All repair and maintenance	All work – new work + repair & maintenance
		Public	Private			
2006	1,502	588	952	0	3,042	10,884
2007	1,538	552	993	0	3,084	11,072
2008	1,614	633	1,010	0	3,257	11,287
2009	1,623	621	845	0	3,089	9,568
2010	1,783	573	828	774	3,958	10,974
% change	19%	-3%	-13%	-	30%	1%

Source: Construction Statistics Branch, Office for National Statistics

- 5.5 The data on the number of new construction orders also shows the dramatic decline in private sector work. Between 2006 and 2010, the number of orders in relation to private housing halved, private industrial decreased by 23%

Table 5-3: Number of new construction orders in Scotland 2006-10

	New housing			Other new work				All other new work	All new work
	Public	Private	All new housing	Infra-structure	Public	Private industrial	Private commercial		
2006	326	1,588	1,914	552	1,146	441	3,101	5,239	7,153
2007	391	1,638	2,029	785	1,067	398	2,658	4,907	6,936
2008	433	1,196	1,629	1,224	1,048	333	1,661	4,266	5,895
2009	390	714	1,104	775	1,160	226	1,011	3,173	4,277
2010	522	807	1,329	920	1,414	337	990	3,661	4,990

¹² Prior to 2010, infrastructure repair and maintenance was included in 'other work'

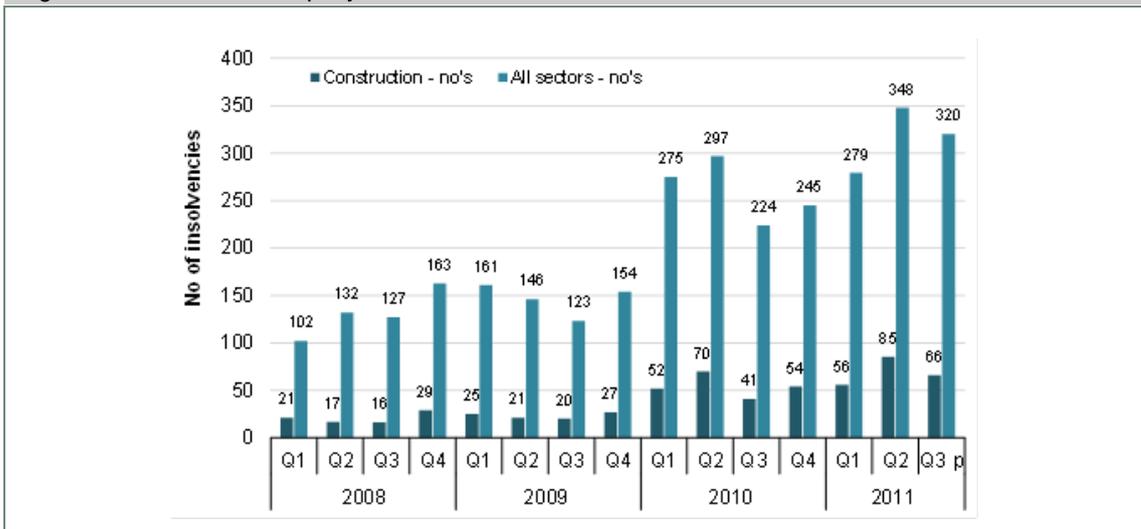
	New housing			Other new work					
% change	60%	-49%	-31%	67%	23%	-23%	-68%	-30%	-30%

Source: Construction Statistics Branch, Office for National Statistics

Insolvencies

- 5.6 Many businesses in the sector have failed during the economic downturn and recession. These include Rok, R&D Construction, Applecross, Thomas Mitchell Homes, Elphinstone Estates and most recently civil engineering firm WJ Harte. The closure of some firms had a considerable impact on their area: for example, Rok was particularly important to the Highland economy whilst R&D Construction was based in Dumfries, where 200 jobs were lost when it closed in 2011.
- 5.7 According to the official statistics on insolvencies in the sector, the number has indeed increased over the last three years. In 2008, there were 83 company insolvencies (most of which were compulsory liquidations as opposed to creditors' voluntary liquidations) in the sector. This increased to 93 insolvencies in 2009 and then jumped up to 217 during 2010.

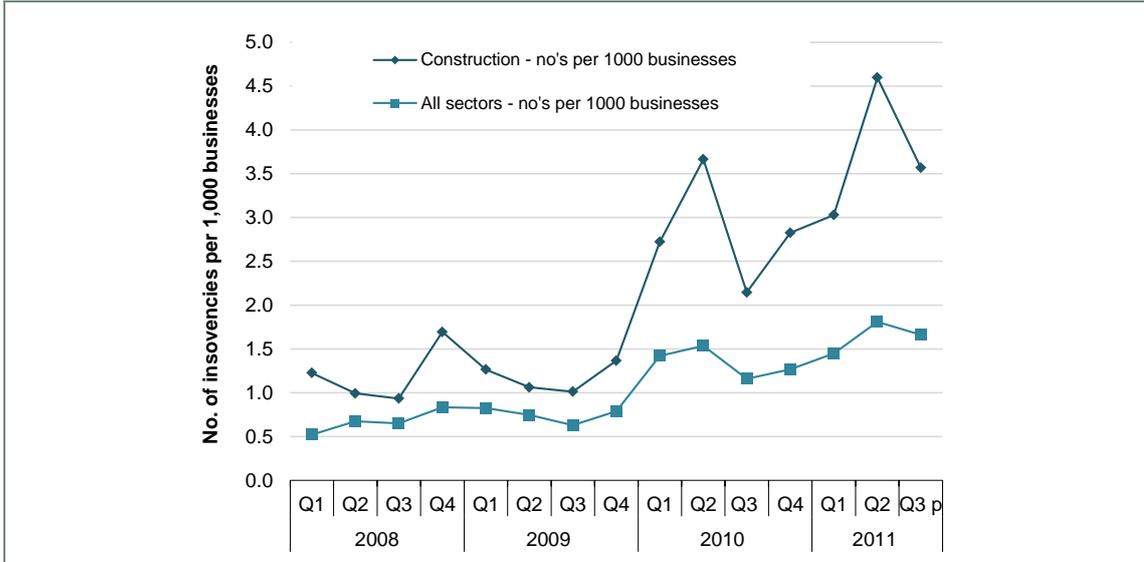
Figure 5-1: Number of company insolvencies in construction sector



Source: Insolvency Service, Department for Business Innovation and Skills (BIS)

- 5.8 As noted earlier, the construction industry is particularly sensitive to economic conditions and the number of insolvencies as a proportion of all construction businesses is higher than the average. As shown below, construction insolvencies per 1,000 businesses increased much more steeply towards the end of 2011 than insolvencies across all sectors. We have already seen that the estimated number of self-employed in the construction sector increased during 2011, undoubtedly due in part to people being made redundant and deciding to set up on their own.

Figure 5-2: Number of insolvencies per 1,000 businesses

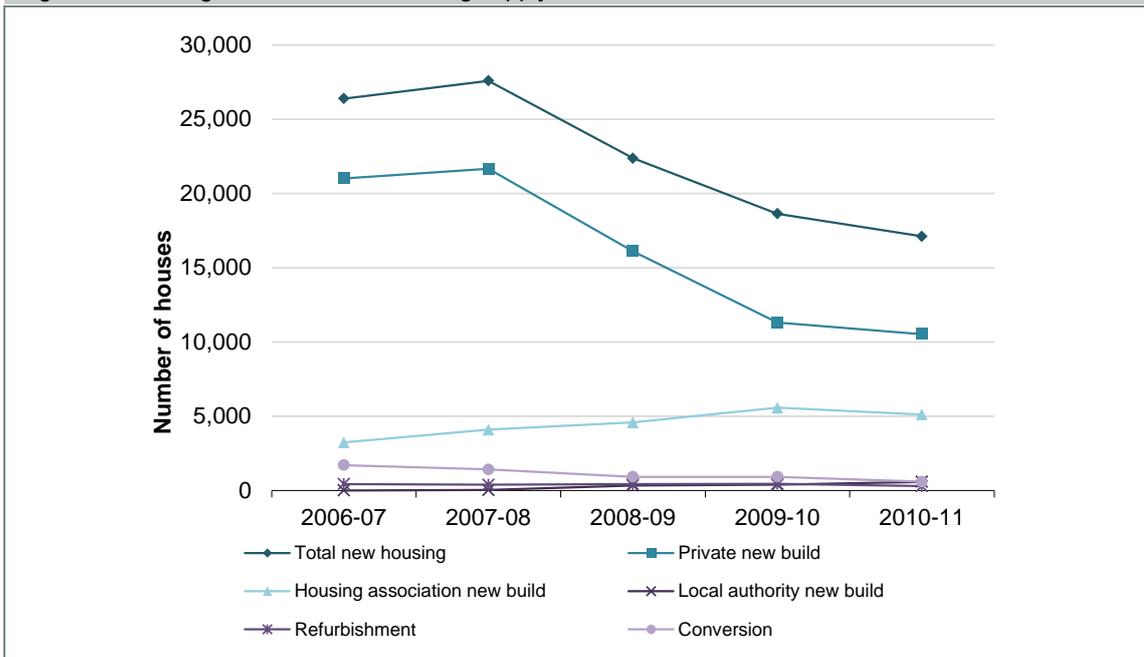


Source: Insolvency Service, Department for Business Innovation and Skills (BIS)

Housing supply

- 5.9 The recent drop in private housing can be seen clearly in terms of housing supply data provided by the Scottish Government (Figure 5-3). This data shows that in 2007-08 the private sector completed nearly 22,000 houses. Last year this figure had more than halved, to 10,500 houses. Housing association new builds have consistently been around the 5,000 mark in the last three to four years.
- 5.10 Between 2006/07 and 2010/11, there was a reduction of 35% in the total number of houses being built from 26,000 in 2006/07 down to 17,000 in 2010/11. This drop is in line with the change in England during the same period.

Figure 5-3: Changes in Scotland's housing supply 2006/07 to 2010/11

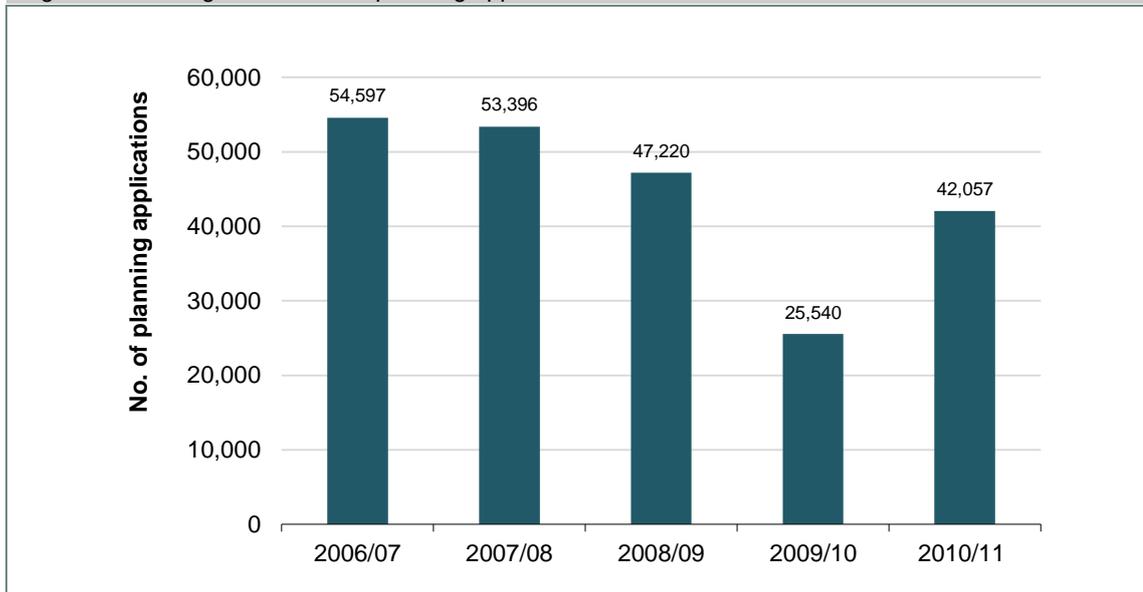


Source: Housing Supply Statistics, Scottish Government

Planning applications

- 5.11 The change in the number of planning applications in Scotland also highlights the decrease in construction related activity. In 2006/07, there were nearly 55,000 planning applications submitted. In 2009/10, this had decreased by over 50%. Interestingly, the number bounced back in 2010/11 back up to 42,000 applications.

Figure 5-4: Change in number of planning applications



Source: Scottish Government

- 5.12 A breakdown of the main types of planning applications is provided below. The recovery was more for local than national projects, and much of it was attributable to households rather than business at any level. Nevertheless, it does show some upturn in confidence.

Table 5-4: Changes in planning applications

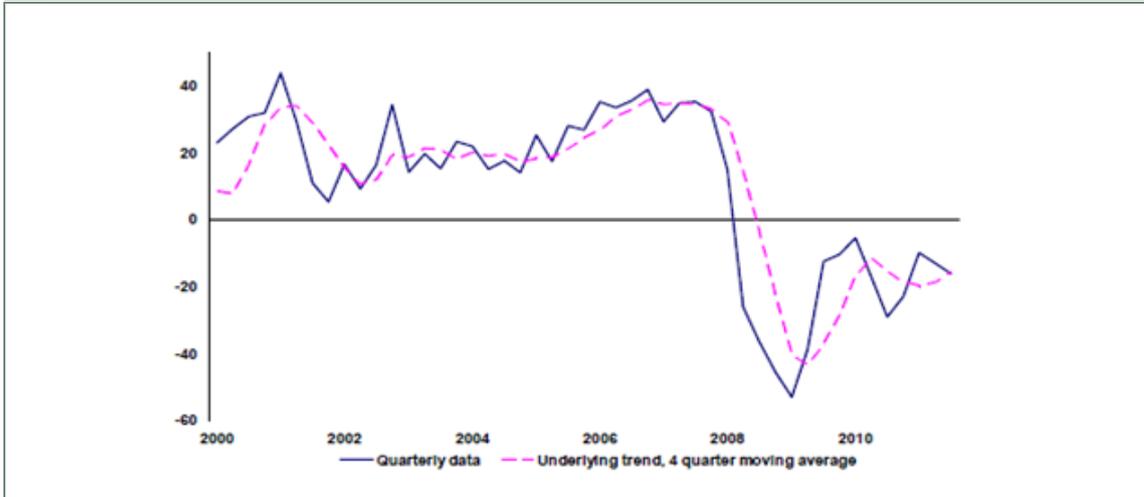
	2006/07	2007/08	2008/09	2009/10	2010/11
Householder developments	25707	24821	20941	11,220	18,195
Major housing	1014	1000	787	161	208
Local housing	9103	9085	8037	3,777	6,562
Business and industry major	451	527	467	100	99
Business and industry local	3876	3560	3055	1,752	2,676
Other developments major	479	551	524	134	149
Other development local	6107	6592	6340	3920	6060
Telecoms	646	479	354	127	349
Listed Buildings and Conservation Area Consents	3679	3624	3636	2078	3592
Advertisement applications	2740	2468	2349	1316	2075

Source: Scottish Government

Recent trends in industry feedback

- 5.13 Feedback from Scottish surveyors contributing to the RICS UK Construction Market Survey (third quarter of 2011) shows how overall levels of activity in Scotland have decreased in recent years. The graph highlights the balance between those stating that workloads have increased compared to those stating it has decreased over the last quarter.

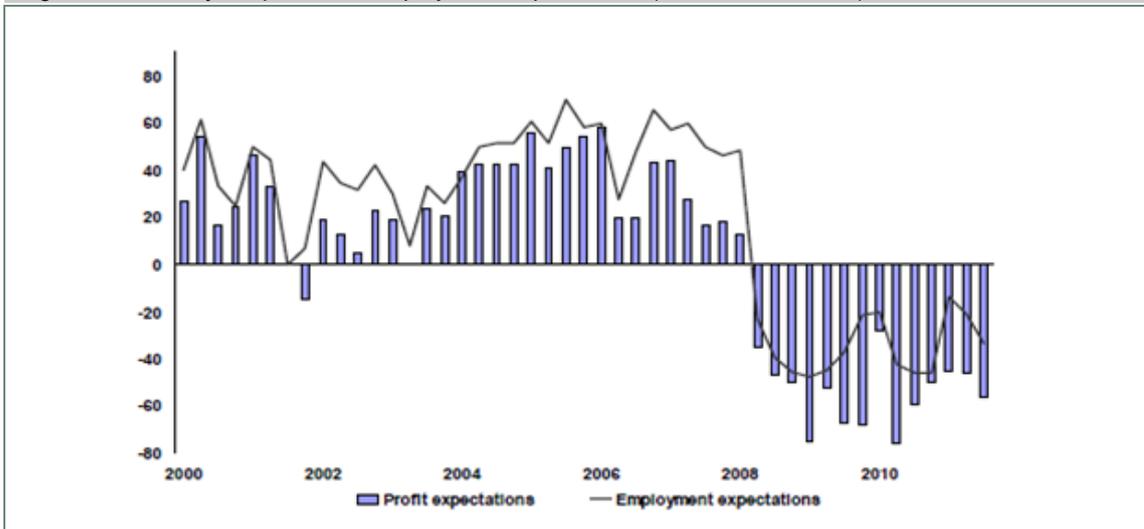
Figure 5-5: Changes in surveyors' construction related workloads - % Balance



Source: RICS Construction Market Survey Q3 2011

- 5.14 There is a similar pattern when looking at future expectations of survey respondents. When surveyors have been asked about profit and employment expectations over the last three years a significantly larger proportion has been negative about 12 month prospects.

Figure 5-6: Surveyors' profit and employment expectations (12 months forward) - % Balance

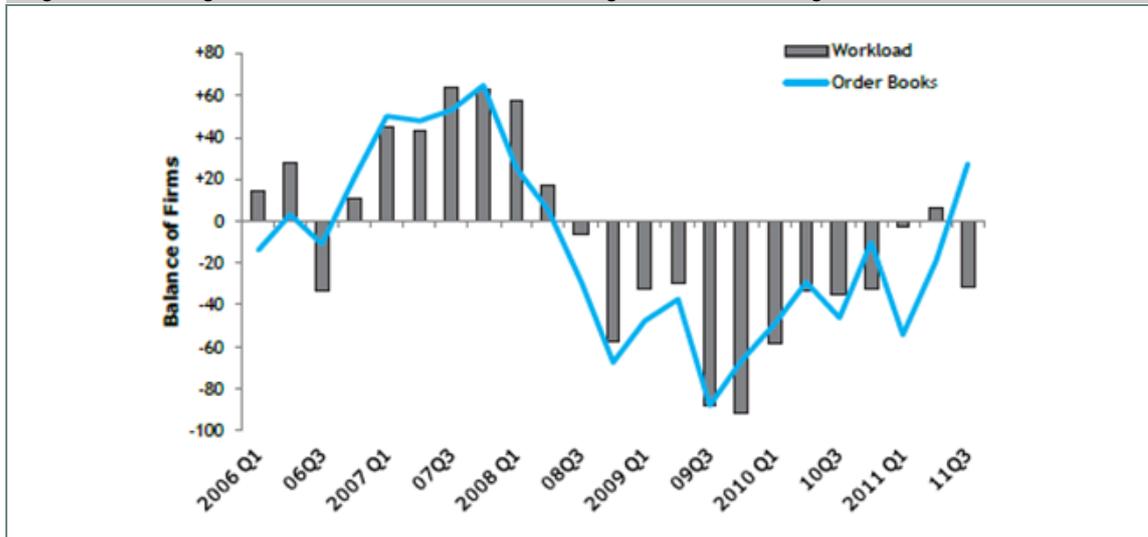


Source: RICS Construction Market Survey Q3 2011

- 5.15 According to CECA (Civil Engineers Contractors Association) member survey, the workload of its members appeared to making a recovery up to the second quarter of 2011, but in the last

quarter has taken another dip. However, feedback on order books would still seem to suggest some increase in orders when compared to the last couple of years¹³.

Figure 5-7: Change in workload and order books amongst Scottish civil engineers 2006-2011



Source: CECA: Scotland Workload Trends 2011

¹³ In discussing these figures with stakeholders, it was highlighted that the responses to this particular survey was quite small and so this should be borne in mind when looking at the results.

6: Industry mapping

Summary of industry mapping

- 6.1 The construction sector is dominated by micro-sized businesses. These account for 90% of the sector in Scotland. Businesses with less than five employees account for approaching 90% of firms involved in architectural activities. Civil engineering firms tend to be slightly larger.
- 6.2 In terms of overall construction employment numbers, the main concentrations are to be found in Glasgow, Aberdeen, Edinburgh and Aberdeenshire, together accounting for 42% of Scotland's workforce.
- 6.3 The construction sector is an important driver of the wider economy due to the impact that construction investment has on other sectors. Based on Scottish Government's Input Output data, construction has the 10th highest output multiplier out of 126 industry groups.

Profile of sector and sub-sectors

Profile of business base

- 6.4 The construction sector is dominated by micro-sized businesses. These account for 90% of the sector. Businesses with less than five employees account for approaching 90% of firms involved in architectural activities. Civil engineering firms in Scotland tend to be slightly larger.

Figure 6-1: Size of businesses (employment) in the construction sector



Source: IDBR 2011

- 6.5 Table 6-1 provides the numbers of firms in each employment size category.

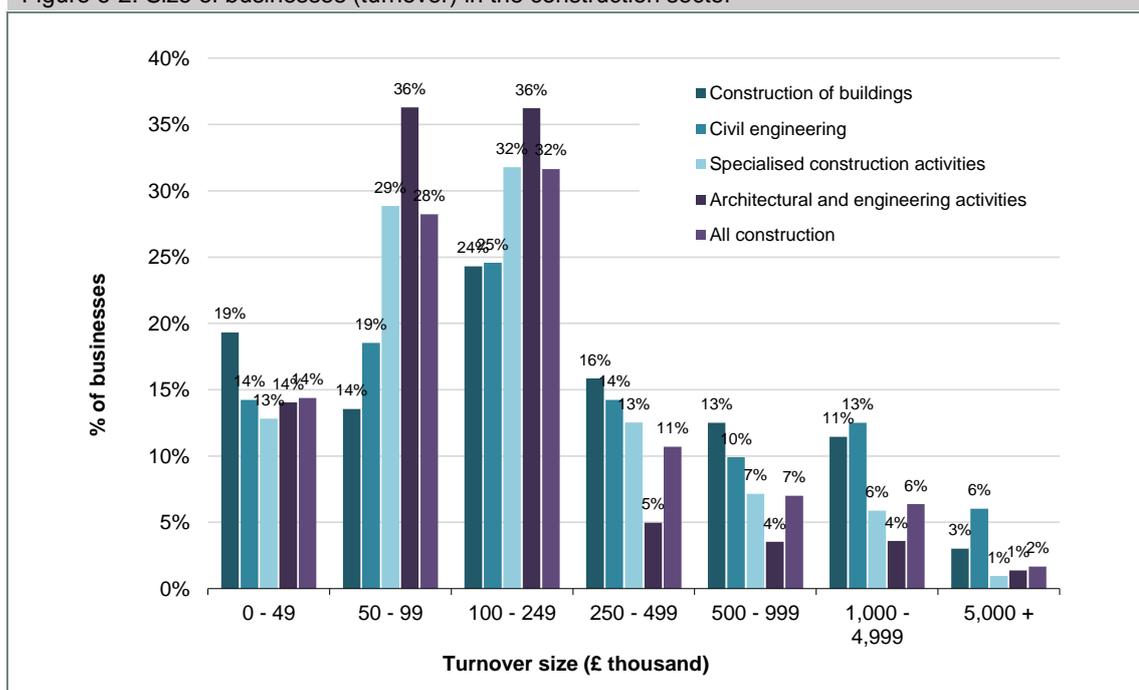
Table 6-1: Size of businesses (employment) in the construction sector

	0 - 4	5 - 9	10 - 19	20 - 49	50 - 99	100 - 249	250 - 499	500 - 999	1,000 +	Total
Construction of buildings	3,410	490	240	95	45	20	10	5	5	4,320
Civil engineering	760	160	120	70	25	15	5	5	0	1,160
Specialised construction activities	9,120	1,655	710	275	100	25	5	0	0	11,890
Architectural and engineering activities	7,420	465	260	130	45	30	5	5	5	8,365
All construction	20,710	2,770	1,330	570	215	90	25	15	10	25,735

Source: IDBR 2011

6.6 As would be expected from their size, civil engineering firms also tend to be more likely to generate sales of over £1 million. The most common turnover size for all types of construction firms is £100,000-250,000.

Figure 6-2: Size of businesses (turnover) in the construction sector



Source: IDBR 2011

Profile of employment by sub-sector

6.7 Using data from the ONS Business Register and Employment Survey (BRES)¹⁴ and the best-fit SIC codes used by Construction Skills to define the sector, the numbers employed in the different sub-sectors are as follows (table 6-2). These figures relate to individuals employed in the sector and do not take into account the self-employed.

¹⁴ This data is based on a survey approach, hence the numbers differ from those in the first section on economic performance (the Scottish Government analysis used employment data reported through the IDBR)

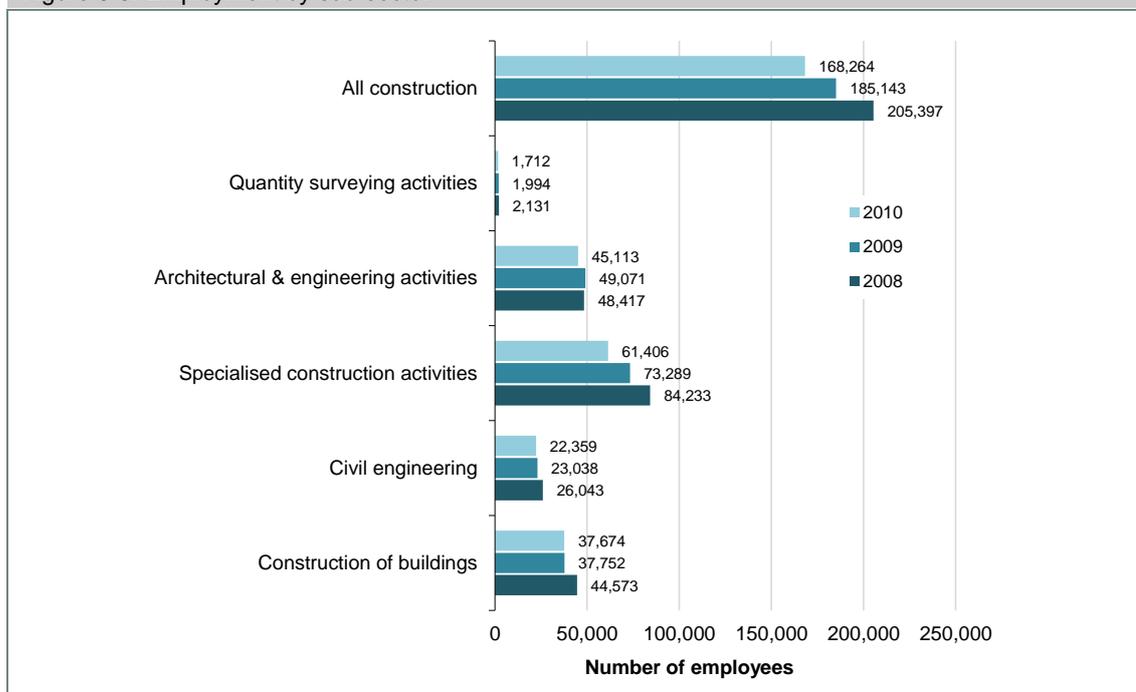
Table 6-2: Employment by sub-sector, 2010

Sub-sector	No of employees	%
Construction of buildings	37,674	22%
Civil engineering	22,359	13%
Specialised construction activities	61,406	36%
Architectural & engineering activities	45,113	27%
Quantity surveying activities	1,712	1%
All construction	168,264	100%

Source: BRES

6.8 Figure 6-3 shows how these employee numbers have changed in each sub-sector between 2008 and 2010.

Figure 6-3: Employment by sub-sector



Source: BRES 2008-2010

Geographic distribution by employment

6.9 In terms of overall employment numbers Glasgow, as would be expected, has the highest number of construction workers with nearly 24,000. The other main concentrations of employment are in Aberdeen, Edinburgh and Aberdeenshire. The high numbers of employees in the North East of Scotland reflects the number of engineering jobs supplying the oil and gas sector.

6.10 As a proportion of the local workforce, the largest construction workforces are to be found in Aberdeenshire (14%), Aberdeen (13%) and Midlothian (13%). In Scotland as a whole, construction employment accounts for 7% of the workforce.

Table 6-3: Construction employment in Scottish local authorities

Local authority	Employees	%	Local authority	Employees	%
Glasgow City	23,663	6%	Angus	2,728	8%
Aberdeen City	21,645	13%	Scottish Borders	2,690	7%
Edinburgh, City of	14,110	5%	Moray	2,333	7%
Aberdeenshire	11,913	14%	Argyll and Bute	2,253	6%
North Lanarkshire	10,585	9%	East Ayrshire	2,189	6%
South Lanarkshire	8,950	8%	South Ayrshire	2,148	5%
West Lothian	7,437	10%	East Lothian	2,028	8%
Fife	7,155	6%	East Dunbartonshire	1,725	8%
Highland	6,847	7%	West Dunbartonshire	1,633	5%
Renfrewshire	5,021	7%	East Renfrewshire	1,287	7%
Dundee City	4,594	6%	Shetland Islands	1,064	7%
Falkirk	4,572	8%	Clackmannanshire	895	7%
Perth and Kinross	4,104	7%	Orkney Islands	884	9%
Midlothian	3,145	13%	Inverclyde	874	3%
Dumfries and Galloway	3,108	6%	Eilean Siar	763	7%
Stirling	3,044	7%			
North Ayrshire	2,877	7%	Scotland	168,264	7%

Source: BRES 2010

Wider supply chain impact

- 6.11 The construction sector is an important driver of the wider economy owing to the impact that construction investment has on other sectors. Construction has the 10th highest output multiplier out of 126 industry groups.

Figure 6-4: Sectors with the highest multiplier effect

Industry group	Output multiplier	Rank	Employment multiplier	Rank	GVA multiplier	Rank
Forestry harvesting	2.21	1	2.69	11	2.87	3
Social work activities	2.10	2	1.83	51	2.17	20
Fertilisers	2.08	3	3.85	5	4.27	2
Electricity production & distribution	2.08	4	4.15	4	2.36	13
Gas distribution	2.08	5	4.20	3	2.83	4
Organic chemicals	2.06	6	6.29	2	2.52	11
Railway transport	2.03	7	2.29	20	2.54	10

Industry group	Output multiplier	Rank	Employment multiplier	Rank	GVA multiplier	Rank
Ancillary transport services	1.99	8	2.49	15	2.19	19
Coke, refined petroleum & nuclear fuel	1.99	9	13.41	1	7.40	1
Construction	1.94	10	2.19	24	2.14	22
Synthetic resins	1.94	11	2.25	22	2.06	24
Recreational services	1.91	12	2.24	23	2.20	18
Domestic appliances nec	1.88	13	1.73	62	2.73	6
Pulp, paper & paperboard	1.87	14	3.02	8	2.58	8
Industrial gases & dyes	1.86	15	2.16	27	1.99	26
Pesticides	1.85	16	1.83	52	1.90	37
Textile finishing	1.84	17	1.67	72	1.91	34
Oil & gas extraction	1.84	18	2.64	13	2.15	21
Textile weaving	1.84	19	1.86	46	1.99	27
Dairy products	1.83	20	2.66	12	2.83	5

Source: Scottish Government Input Output tables (2007 – latest available)

Main Scottish-based construction firms

- 6.12 The criteria for inclusion in the Scottish Business Insider Top 500 is that each company must have fully audited accounts, and either have a UK or international head office in Scotland, or 90% of their turnover must be generated in Scotland. Companies are ranked by a combination of turnover and profit.

Table 6-4: Top Scottish based construction firms

Rank	Company Name	Main location	Turnover (£m)	Profit (£m)	Employees
84	CCG (Holdings) Ltd	Glasgow	134.5	11.75	635
130	RJ McLeod (Contractors) Ltd	Glasgow	77.76	10.76	419
133	Cruden Investments Ltd	Edinburgh	131.7	3.94	607
135	Ogilvie Group Ltd	Stirling	205	2.5	600
147	BDW East Scotland Ltd	Balmedie	50	18.7	167
175	Barr Holdings Ltd	Paisley	170.61	1.34	742
194	Bovis Lend Lease (Scotland) Ltd	Glasgow	83.29	2.33	92
213	Dawn Group Ltd	Prestwick	75.06	2.1	149
214	CBC Construction & Property Group Ltd	Glasgow	62.57	2.6	253
218	Pihl UK Ltd	Aberdeen	74.69	1.96	104

Rank	Company Name	Main location	Turnover (£m)	Profit (£m)	Employees
220	Chap (Holdings) Ltd	Westhill	53.88	3.33	326
222	Muir Group plc	Inverkeithing	78.18	1.75	320
238	Muirfield (Contracts) Ltd	Dundee	55.22	2.28	324
256	Mactaggart & Mickel Group Ltd	Glasgow	40.28	3.88	207
279	Miller Group Ltd	Edinburgh	783	-72	1309
281	Ashleigh (Scotland) Ltd	Dumfries	54.39	1.42	270
299	Veitchi (Holdings) Ltd	Rutherglen	44.05	1.89	401
300	Stewart Milne Group Ltd	Westhill	275.78	-27.7	1056
301	Laing O'Rourke Scotland Ltd	Motherwell	262.33	-24.09	Not included
315	Malcolm Allan Housebuilders Ltd	Kintore	23.04	9.72	57
345	Cala Group Ltd	Edinburgh	144.46	-27.07	328
357	Bett Homes Ltd	Stirling	105.44	-7.19	324
402	J Smart & Co (Contractors) Plc	Edinburgh	21.02	3.98	268
427	Tulloch Homes Group Ltd	Inverness	62.69	-13.65	155
433	McTaggart Ltd	Dalry	27.92	1.16	202
437	Marshall Construction Ltd	Alloa	33.53	0.49	322
439	Mackenzie Construction Ltd	Glasgow	25.94	1.41	160
453	Tillicoultry Quarries Ltd	Kincardine on Forth	22	1.81	54

Source: Scottish Business Insider Top 500 2011

7: Key issues facing the Scottish construction sector

7.1 In this section we discuss the main issues facing the construction sector, as informed by our discussions with key stakeholder organisations and businesses.

Funding and investment

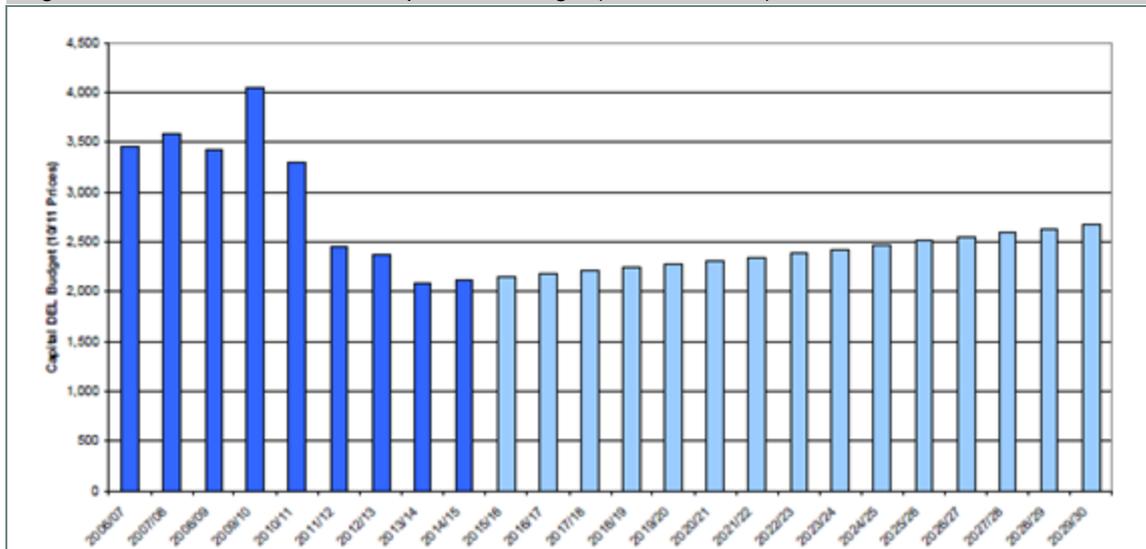
7.2 As highlighted in earlier sections, there has been a major decline since 2007/08 in the amount of private sector investment in new construction projects. This was reflected by consultees who saw it as the major issue that has affected the sector in the last few years and will continue to do so for the foreseeable future.

7.3 Many construction developments have stalled or been cancelled due to lack of finance which in some cases has been due to banks' reluctance to lend or because there is no longer demand. For example, in the case of housing developments the recession had the effect of 'turning the tap off at both ends' in that developers could no longer access corporate lending and home-buyers were finding it increasingly difficult to access mortgages.

7.4 However, the Scottish Government did try to soften the blow of the recession and decline in investment through its acceleration of capital projects in 2010. At a time when there was very little demand from retail or commercial sectors, this move was certainly welcomed by the industry. However, at that stage it was not envisaged that the downturn and lack of confidence across all parts of the economy would last so long.

7.5 The austerity measures introduced by the new UK Government have had an impact on Scottish Government budgets over the coming years and as a result will result in cutbacks in spending and fewer public sector construction projects. The scale of change in anticipated Scottish Government investment in capital projects is shown below.

Figure 7-1: Scottish Government Capital DEL Budget (2010-11 Prices)



Source: Scottish Government (2011), Infrastructure Investment Plan

7.6 Although there has been an expectation from the public sector that the private sector now needs to take the lead, the continuing economic uncertainties especially in light of recent turmoil in the Eurozone makes an imminent return to private sector growth more difficult. Businesses emphasise that without sufficient public sector funding the sector will really struggle. Some responses from a recent RICS member survey are included below:

- ‘Government cutbacks are taking their toll on the Scottish construction economy. Continuing economic weakness means that the private sector remains highly inactive. If the government continues with its current ‘austerity’ policy, then the infrastructure of the Scottish construction market is at risk of severe depletion’
- ‘The squeeze on public sector combined with low activity in the private sector due to bank lending/finance is the perfect storm. A double dip is already here’¹⁵.

Future public sector investment

7.7 Although the next few years will see lower levels, public sector investment will continue to be a significant contribution to output in the sector. In late 2011, the Scottish Government published its Infrastructure Investment Plan which sets out the main public sector projects in the coming years. This publication, although highlighting lower levels of capital investment, was welcomed by most of our consultees in that it provides an element of certainty to the industry about future projects and future demand.

7.8 Some of the major investments featured in the Infrastructure Investment Plan over the coming three years are set out below. The largest projects are the Forth Replacement Crossing, the Edinburgh Glasgow Rail Improvement programme and the new South Glasgow Hospital.

Table 7-1: Main Scottish Government capital projects 2012-2015

Theme	Project	Estimated budget
Transport	Forth Replacement Crossing	£1,400-1,600m
	Edinburgh Glasgow Rail Improvement	£1,100m
	Edinburgh Trams	£500m
	Aberdeen Western Peripheral Route and A90 Balmedie to Tippetty	£348-458m
	Borders Railway	£235-295m
Health	New South Glasgow Hospitals and Laboratory Facility	£842m
	NHS Dumfries and Galloway – Royal Infirmary (new build)	£230m
	NHS Lothian – Royal Hospital for Sick Children and Department of Clinical NeuroSciences	£225m
Education	Scotland's Schools for the Future School Building Programme - Capital	£550m
	Scotland's Schools for the Future School Building Programme - NPD	£700m

¹⁵ RICS UK Construction Market Survey Q3 2011

Theme	Project	Estimated budget
	Glasgow City Centre Colleges	£200m
	Inverness College	£52m
	Kilmarnock College	£50m
Culture	Dundee V&A Museum	£45m
Housing	Affordable Housing and National Housing Trust	£640
	Fuel Poverty and Energy Efficiency Programme	£196m
Sport	Commonwealth Games investment	£524m
Justice	HMP Grampian	£105m

Source: Scottish Government Infrastructure Investment Plan 2011

Public sector procurement

- 7.9 The issue of public sector procurement was a theme in the 2007 Scottish Construction Industry Plan. Our discussions with stakeholders and business suggested that although it has always been an important issue, it is now even more significant construction has become more dependent on public sector work in the last four to five years.
- 7.10 There have been recent changes in public sector procurement of capital projects. Following the recommendations of the McClelland Report¹⁶, the Scottish Government has attempted to standardise the procurement process through Public Contracts Scotland. The overarching aim is to help public sector organisations purchase goods and services more efficiently, while meeting the requirements of EU procurement legislation.
- 7.11 The change in Government in Scotland in 2007 also had an impact on public procurement as the SNP Government decided to replace the PPP/PFI model of procurement with a Non-Profit Distributing (NPD) model. However, many commentators have highlighted the similarities between the two models¹⁷ whereby a ‘special purpose vehicle’ is set up to carry out design, construction, and operation of new or refurbished infrastructure.
- 7.12 The commissioning of capital projects under the NPD model was to be the responsibility of a new organisation, the Scottish Futures Trust. However, although this organisation was created in 2008, it took some time before it was actually commissioning work, and according to industry stakeholders there was a hiatus period between previously commissioned PPP/PFI contracts and the new NPD contracts.
- 7.13 As part of the NPD model, the Scottish Government set up five regionally based ‘Hub companies’ which bring together public sector organisations and a private sector development partner. The three regional Hub companies set up to date involve the following private sector partners:

¹⁶ Scottish Executive (2006), Review of Public Procurement in Scotland Report & Recommendations

¹⁷ Hellowell and Pollock (2009), Non-Profit Distribution: The Scottish Approach to Private Finance in Public Services in ‘Social Policy & Society’ 8:3, 405–418

- Hub South East £300m programme – joint venture (JV) company formed in August 2010 with SPACE consortium (Galliford Try, Fulcrum and Davis Langdon)
 - Hub North £435m programme – JV formed in March 2011 with Alba Community Partnerships (Cyril Sweet Investment Ltd and Miller Corporate Holdings)
 - Hub East Central £500m programme – JV formed in November 2011 with Amber Blue (Robertson Group, Amber Infrastructure and FES).
- 7.14 Arrangements for Hub companies in the West and South West are still being finalised. In addition to the setting up of these Hub companies, another aspect of public procurement in Scotland (and indeed in other parts of Europe) has been an increasing tendency to set up commissioning frameworks, again in an attempt to ensure value for money for public sector agencies.
- 7.15 Feedback from stakeholders and businesses indicated that some of the developments highlighted above have presented significant challenges to the sector in particular for the smaller firms. Representatives from different sub-sectors indicated that winning work with the public sector is becoming increasingly difficult and expensive. RIAS recently produced a report on the issue and made a number of recommendations including:
- Remove unnecessary and unintended barriers to market being experienced by micro-organisations and SMEs in Scotland
 - Ensure proportionality in the procurement process
 - Encourage the use of suitably qualified in-house advisors and assessors
 - Review and amend the use of Pre-Qualification Questionnaires and change the focus from the quality of the procurement process towards quality of the outcomes¹⁸.
- 7.16 The RIAS report also highlights that construction is the most expensive procurement sector across Europe and that the UK has amongst the slowest procurement and highest costs. Stakeholders and businesses stated that whilst they understand the need for the public sector to make procurement processes more efficient, the changes have in effect made it more difficult for Scottish SMEs to win work, as larger contracts favouring larger firms. We understand that the Scottish Government is intending to introduce a Procurement Bill in 2012 that will ensure a slimmed down and more effective procurement process for SMEs tendering for public contracts.
- 7.17 The feedback from industry also suggested that declining availability of work has caused the market to become ‘cut-throat’ with very aggressive tendering processes and pressure of prices. It was highlighted that because of the state of the economy and the nature of public sector procurement, Scottish firms are coming under increasing pressure from the many English and Irish based firms that have entered the Scottish market in recent years.

¹⁸ RIAS (2011), Public Procurement in Scotland: Building a Better Future?

Skills and workforce capacity

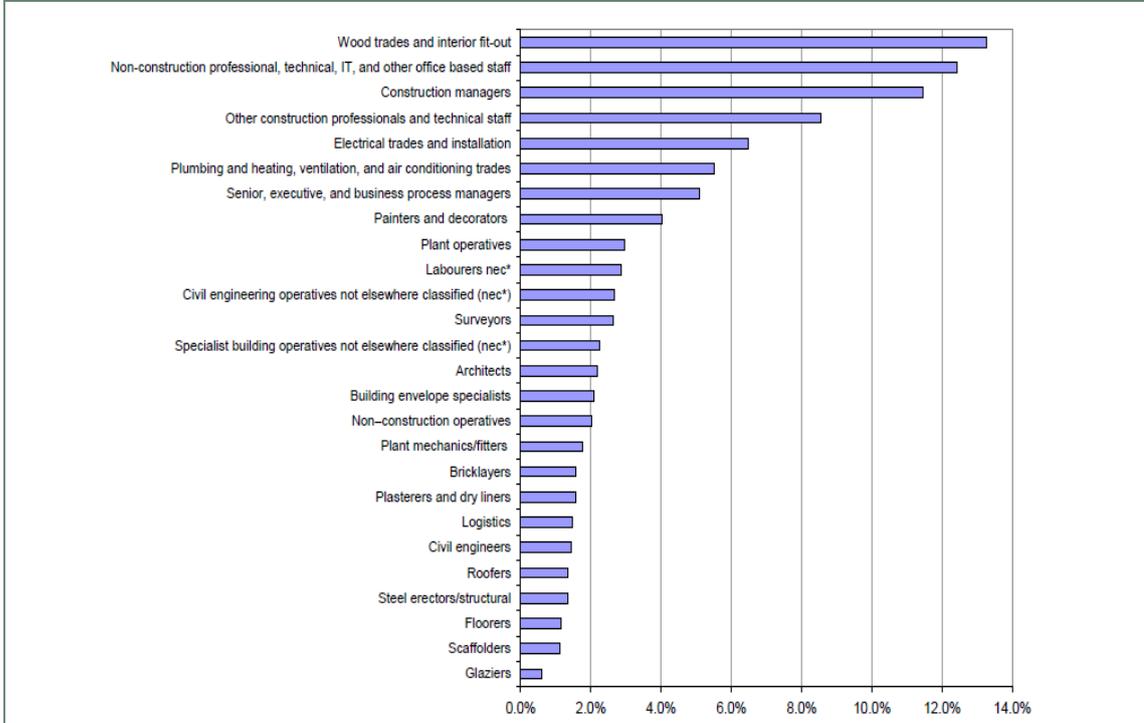
- 7.18 Skills and capacity is another important issue for the development of the sector. As highlighted earlier, there has been a significant decrease in the number of employees in the sector in Scotland. In our discussion with industry it was highlighted that pre-recession there were some issues around skills shortages and gaps (with an important contribution being made by migrant workers from Eastern Europe, some of whom are believed to have returned home following the downturn). However, in light of all the recent redundancies, there is now an over-supply of labour relative to the demand for construction projects.
- 7.19 Low demand has meant a lack of recruitment of young people as many companies cannot afford to run apprenticeships or graduate placements. The construction workforce is ageing (in part, it was suggested, as a result of the legacy left by the last recession) and there are beginning to be some concerns that when the industry does pick up again there will not be enough experienced labour available. Some consultees stated that this issue is made worse by many apprenticeship decisions being made to meet contractual requirements rather than being triggered by the quality of the candidate.
- 7.20 On the issue of capacity, those interviewed believed that there was still some degree of elasticity in the construction labour market i.e. people would come back to the sector if demand picked up. However, there was anecdotal feedback to suggest that many engineers, architects, skilled onsite managers trained in Scotland are increasingly looking at employment opportunities overseas (in, for example, Australia and the Middle East).
- 7.21 Several areas were emphasised where the effectiveness of construction skills development could be improved:
- apprenticeships - these need to be more coordinated across the industry rather than lots of local initiatives
 - apprenticeship completions - Scotland's apprenticeship statistics focus on 'new starts' rather than the number of completions
 - training investment - skill trainers need more investment in low carbon and renewables to be prepared for future opportunities
 - image - the sector needs to enhance its image to successfully attract new talent
 - professional development - all firms offer the required practical training to their staff (e.g. health and safety) but there is very little professional development training available
 - career advisory services - there is a lack of understanding about construction jobs in school career advisory services leading to poor quality advice.

Different skills and occupations in the sector

- 7.22 As we have already seen the construction sector is extremely diverse including civil engineers, labourers, construction managers, architects and surveyors. Research carried out by Construction Skills Scotland shows the breakdown of different occupations in the sector. The

highest number of jobs is in wood trades and interior fit-out, accounting for 14% of workers. This is higher than the UK average of 11%, and probably reflecting the greater use of timber frames in Scottish house building. Other main occupations include non-construction professionals and administrators (just over 12%) and construction managers (around 11%).

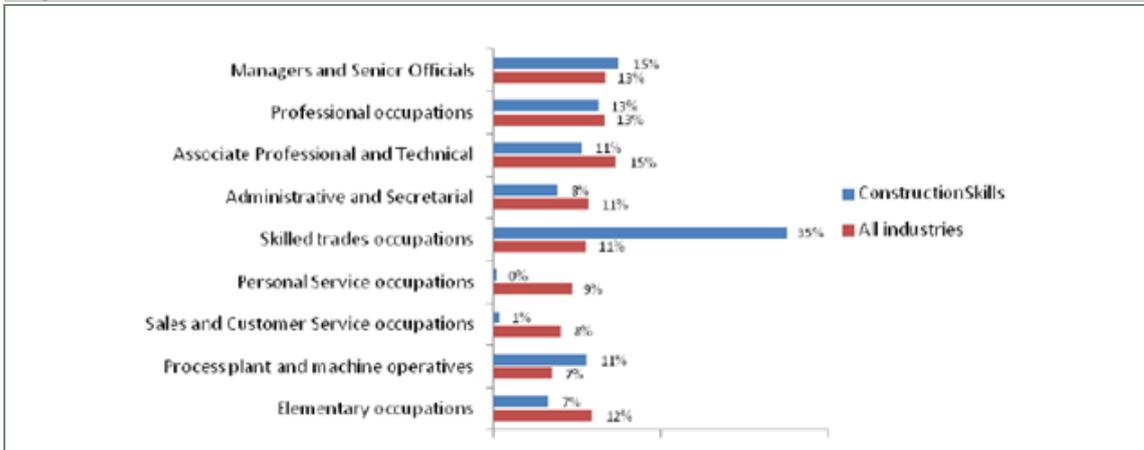
Figure 7-2: Breakdown of main occupations in Scotland's construction sector in 2009



Source: Construction Skills Scotland (2011)

7.23 It is also interesting to consider the types of jobs in the sector. As illustrated below, over a third of occupations are skilled trades, significantly higher than the average of 11% for all sectors. The sector is also over-represented in the proportion of managers and senior officials (15% against the average of 13%), due in part to the project based nature of the construction sector, and also in process, plant and machine operatives (12% compared to an average of 7%).

Figure 7-3: Main occupational classifications in the construction sector in 2009



Source: Construction Skills Scotland (2011)

Skills supply

- 7.24 Reflecting the importance of skilled trades to the construction sector, construction-related apprenticeships make up a sizeable proportion of the total number of Modern Apprenticeships funded each year. For the last two full years, these have accounted for around 3,000-4,000 out of a total of 21,000 Modern Apprenticeships. To some extent, these numbers depend on the availability of work for companies to take on an apprentice.

	2008-09		2009-10		2010-11		2011-12 (6 months)	
	No of starts	In training	No of starts	In training	No of starts	In training	No of starts	In training
Construction	2,366	7,644	2,231	6,698	2,056	5,801	1,499	5,938
Engineering	1,340	3,627	1,038	3,611	943	3,541	645	3,563
Engineering construction	111	294	80	271	111	318	20	300
Plumbing	535	1,775	331	679	301	1,156	221	1,058
All Modern Apprenticeships	10,579	26,614	20,216	33,733	21,561	32,253	11,405	33,758

Source: Alliance for Sector Skills Councils Scotland & Skills Development Scotland

- 7.25 Scotland's colleges and universities have a vital role in providing the training for the construction workforce. There are currently 36 colleges in Scotland training around 23,000 students in construction related courses. The top five in terms of numbers of students are Glasgow Metropolitan, Edinburgh Telford College and Cardonald College, South Lanarkshire College and Reid Kerr College. The top ten colleges are shown below

	2006-07	2007-08	2008-09	2009-10
Glasgow Metropolitan	1,836	2,031	2,056	1,869
Edinburgh's Telford College	1,551	1,501	1,617	1,755
Cardonald College	701	1,007	1,528	1,627
South Lanarkshire College	1,573	1,519	1,766	1,457
Reid Kerr College	683	611	518	1,280
Motherwell College	776	941	1,050	1,164
Dumfries and Galloway College	1,164	1,130	1,121	1,024
Forth Valley College	1,018	1,000	1,121	987
Inverness College	1,208	1,464	1,226	955
North Glasgow College	650	692	758	952
Total FE construction students (not all colleges listed here)	20,099	21,936	23,019	22,832

Source: Scottish Funding Council

- 7.26 In 2006/07, there were 4,311 full-time construction students in Scotland's colleges (21%). By 2009/10, this had increased marginally to 4,454 (but 19% of total students).
- 7.27 As highlighted by consultees, because of the limited employment opportunities now and in the foreseeable future, there is going to be more of a tendency for more full-time students doing construction related courses. A consideration for Government and skills agencies is where these students are going to move on to after completing their training.
- 7.28 In terms of HE students, there were 6,655 students doing architectural, building and planning degrees in 2010/11. Nearly a third of these were postgraduate students and overall three-quarters were full-time students. This is up marginally on the proportion of full-time students in 2006/07 when just over 70% were full-time students.

Table 7-4: Architecture, building and planning students in Scotland's HEIs

		Full-time	Part-time	Sub-total	Overall total by year
2010/11	Post graduate	1210	755	1965	6655
	Under graduate	3880	810	4690	
2009/10	Post graduate	1145	665	1810	7075
	Under graduate	4305	960	5265	
2008/09	Post graduate	1050	695	1745	7315
	Under graduate	4405	1165	5570	
2007/08	Post graduate	855	755	1610	6960
	Under graduate	4325	1025	5350	
2006/07	Post graduate	870	1130	2000	7245
	Under graduate	4285	960	5245	

Source: HESA – student statistics

- 7.29 The top universities in terms of architecture, building and planning students in 2010/11 were Glasgow Caledonian, Heriot Watt, Robert Gordon, Edinburgh Napier and University of Strathclyde.

Table 7-5: Architecture, building & planning at HEIs in Scotland – 2010/11

Institution	No. students
Glasgow Caledonian University	1050
Heriot-Watt University	895
Robert Gordon University	850
Edinburgh Napier University	605
University of Strathclyde	575
Edinburgh College of Art	570
The University of Dundee	525
Glasgow School of Art	525

Institution	No. students
The University of Edinburgh	450
University of the Highlands and Islands	230
University of Aberdeen	160
University of Glasgow	140
University of Stirling	65
University of Abertay Dundee	10
Total	6,655

Source: HESA – student statistics

7.30 In Table 7-6, below we have highlighted the other main organisations involved in supporting skills development in the sector.

Table 7-6: Skills support organisations

Organisation	Location	Summary	Website
Construction Skills Scotland	Inchinnan, Renfrewshire	The Sector Skills Council and Industry Training Board for the construction industry, working with industry, for industry to deliver a safe, professional and fully qualified UK construction workforce. It works with construction companies to help them improve skills, increase their competitive edge and respond to the many challenges employers face – from the low carbon agenda, through to reducing costs on-site and recruiting new workers to the sector.	www.cskills.org
Skills Development Scotland	Glasgow	Scotland's main skills agency. Its employer services range from funding for employee training and training plan development to PACE redundancy support. <i>In 2010-11, PACE support was provided to 2587 individuals at 57 construction sites. In the first 6 months of 2011-12, support was provided to 654 individuals at 38 sites.</i> SDS also supports individuals through training courses, search for jobs, help with Modern Apprenticeships and other training programme.	www.skillsdevelopmentscotland.co.uk
Scottish Building Apprenticeship & Training Council (SBATC)	Edinburgh	Scottish Building Apprenticeship & Training Council (SBATC) was founded in 1934. The main purpose of the organisation is to regulate and monitor the working conditions, wages, recruitment and training of apprenticeships within the Building Industry throughout Scotland. During 2010 SBATC indentured over 1,300 apprentices despite the current economic difficulties being sustained within Industry.	www.sbatc.co.uk

Source: Various websites

7.31 One of the key considerations for all these organisations is that the training they provide meets the demand from the industry. Skills requirements for the future include those in the areas of renewables, low carbon, energy efficiency, and Modern Methods of Construction.

Innovation

- 7.32 The feedback from consultations with stakeholders and businesses highlighted mixed views about the levels of innovation in the sector. Some saw the sector as very innovative and forward thinking, whereas others felt the levels of innovation were very poor. Businesses noted that in the past, time was the main barrier to developing innovation. However, it was felt that in the present climate, lack of funds was the main barrier to innovation. Three main trends were pinpointed in relation to innovation in the construction sector.
- 7.33 First, innovation is being driven by the low carbon agenda, and by the manufacturing construction subsector rather than the construction industry ‘core’. Secondly, lack of investment is stalling innovation in the construction industry. Construction projects are driven by cost meaning that innovation is always the first to be cut. Construction firms are not willing to spend a lot of money on R&D as it does not usually result in a quick return. Thirdly, there is not enough industry-wide knowledge on the financial assistance available for R&D. There are lots of innovation grants available but few construction firms are aware of these. The level of promotion and communication on these resources to the construction industry needs to be improved.
- 7.34 In Table 7-7 below, we list the main universities and research areas involved in supporting innovation in the Scottish construction sector.

Table 7-7: Overview of main HE organisations and research areas

University	Research area
University of Dundee	Civil engineering
	Architecture and the Built Environment
University of Edinburgh	Architecture and the Built Environment
University of Glasgow	Civil Engineering
Glasgow School of Art	Mackintosh School of Architecture
Glasgow Caledonian University	Architecture and the Built Environment
Heriot Watt University	Civil Engineering
	Architecture and the Built Environment
Edinburgh Napier	Civil Engineering
	Architecture and the Built Environment
	Timber Engineering
Robert Gordon University	Architecture and the Built Environment
University of Strathclyde	Electrical and Electronic Engineering
	Civil Engineering
	Architecture and the Built Environment

- 7.35 Examples of some of the universities’ research activities are presented below.

Table 7-8: Detailed examples of innovation activity

Organisation	Summary of activity
Edinburgh Napier University -Institute for Sustainable Construction	<p>ISC comprises of leading built environment applied research and knowledge transfer centres and has specialist expertise in developing and supporting innovative building technologies and product innovation. The institute has six centres:</p> <ul style="list-style-type: none"> • Building Performance Centre –one of the leading UK centres for applied research, knowledge transfer and consultancy for the built environment. Key functions of the Centre include: construction product research and development; development of technical standards, robust details and building regulations; building diagnosis and material performance; and sustainable construction. The Centre was winner of the Queen's Anniversary Prize 2009 for 'innovative housing construction for environmental benefit and quality of life'. • Centre for Geotechnics – the Centre undertakes research, consultancy, and CPD in relation to the following: 'landfill settlement'; 'distinct element modelling'; and 'mass loss / degradable soils' • Centre for Infrastructure Research – a multi-disciplinary research centre focussed on designing and managing the built environment for the future. The focus is on 'creating the future' through the design and management of the built environment. Work is undertaken in the following broad research themes: 'adaptability'; 'sustainability'; 'safety'; 'value'; 'construction and de-construction'. • Centre for Offsite Construction and Innovative Structures – the aim of the Centre is to deliver efficient offsite solutions and structural innovations. The Centre launched a new research project in June 2011, Structural Optimisation of Timber Offsite Modern Methods of construction – a Sustainable Approach. This is funded by the Engineering and Physical Sciences Research Council (EPSRC). The Centre is working with a range of partners including: Bre; CCG OSM; CSC; Harley Haddow; Kraft; Neil Sutherland Architects; NHBC; Oregon Timber Frame Engineering; Structural Engineers Registration; Scottish Government; Timber Solve; UK Timber Frame Association. • Centre for Sustainable Communities – this focuses on networking, innovation and creative partnerships in meeting the objectives of a sustainable development. One of the key products associated with the Centre includes the Smart Cities project. This creates an innovation network between cities and academic partners to develop and deliver better e-services to citizens and businesses in the North Sea Region. • Scottish Energy Centre – the Centre helps develop renewable energy systems and has a track record relating to sustainable design in construction. The Centre develops low and zero carbon technologies and provides commercial technical support services to the market; with specific strengths in the field of energy diagnostics and modelling and renewables integration. <p>ISC also has its own consultancy arm, RMP. This is an acoustic consultancy division which provides advice on sound insulation testing and architectural acoustic design, industrial noise reduction, environmental noise and vibration control, noise mapping and air tightness testing.</p> <p>It is the lead partner in the Low Carbon Building Technologies Gateway project. This targets Scottish micro, small and medium enterprises and provides solutions for low carbon housing for all housing built up to 2050 . The project is led by Edinburgh Napier University and funded jointly by Scottish Government (SPIRIT funding), Scottish Enterprise and European Regional Development Funding (ERDF). The project was started in June 2010</p> <p>ISC in collaboration with industry partners developed a new construction test facility in 2008, termed the Building Performance Assessment Centre (BPAC) – Hangar 17. This unique facility allows new construction products and systems to be evaluated in full scale test buildings.</p> <p>Another important area of activity is the Centre for Timber Engineering (CTE) which covers education, research and consultancy in the various constructional uses of timber. The Centre works with industry in several ways, including through commercial contracts and Government grants; notably via KTPs. Industry partners include James Callander & Son; and James Jones and Sons.</p>
Heriot-Watt University – School of Built Environment	<p>The School of Built Environment Heriot-Watt is one of the UK's leading institutions for multidisciplinary research and teaching in the built environment. It comprises of three main Institutes:</p> <ul style="list-style-type: none"> • Institute for Infrastructure & Environment – areas covered include water

Organisation	Summary of activity
	<p>management, railway engineering, cementitious materials, critical infrastructure, geo-mechanics and structural analysis</p> <ul style="list-style-type: none"> • Institute for Building & Urban Design – the Institute aims to be a world leader in architectural engineering, construction management and planning. It provides research and postgraduate training across a wide range of fields covering design in the built environment. Research areas include: Urban Energy (e.g. low carbon refurbishments for existing buildings in domestic and non-domestic sectors; challenges for new-build low-carbon buildings), Sustainable Materials; Construction Economics and Management; building and drainage; Centre for Environment and Human Settlements; and Planning and Urban Design. • Institute for Housing, Urban & Real Estate Research – the Institute is among the UK's top social and urban policy research centres with a quarter of its research outputs classed as 'world leading' in the UK Government's 2008 Research Assessment Exercise. The Institute brings together existing research groups within Heriot-Watt University's School of the Built Environment. Research themes includes: housing development, design and regeneration.
<p>Glasgow Caledonian University – Centre for Built Environment</p>	<p>The Centre for Built Environment (CBE) provides a central point of contact for companies operating within the Scottish Construction Industry, and matches these organisations to facilities and expertise available within the built environment faculties of Glasgow Caledonian University School of the Built and Natural Environment, University of Strathclyde Department of Architecture, and the Mackintosh School of Architecture, The Glasgow School of Art. Examples of innovation activity includes:</p> <ul style="list-style-type: none"> • Seminars, workshops, free lectures and networking events – these are organised by CBE on topics relating to all aspects of the construction industry/built environment • Knowledge and Technology Transfer in the Built Environment (KTTBE) Awards – CBE provided an award scheme for feasibility studies undertaken by academics and SMEs in the Scottish construction industry. This was partly funded by the Scottish Government SEEKIT programme • Applied Knowledge Exchange – Scottish Enterprise funds the University's knowledge transfer scheme allowing SMES to access up to 10 days of free academic expertise.

Source: University websites

BRE Scotland

7.36 BRE Scotland, as part of the BRE Group, also has a central role in supporting the construction sector. It is involved in a range of activities including consultancy, testing, certification, research and training. Under consultancy, it provides support in site efficiency, waste management and lean construction. In terms of testing, it can assess individual materials and products, building systems, engineering structures and whole buildings. Through BRE Ventures it promotes the successful exploitation of new ideas through bringing together innovators, networks and funding streams. The aim is to help companies bring innovation to market quickly.

BRE Innovation Park @ Ravenscraig

BRE is currently developing an Innovation Park on the site of the former steel works in Ravenscraig, North Lanarkshire. BRE has obtained a 2-acre plot of land on the site to develop an Innovation Park as part of the regeneration of the former Ravenscraig steel works site which is being transformed into a new town with 10,000 houses.

The Innovation Park at Ravenscraig will follow a 'ground-up' approach to sustainable planning and development. The site will feature porous road surfaces

and paving, 3-stage SUDS system, native planting and landscaping, street furniture and lighting, and a natural play area. Up to 12 demonstration buildings can be constructed which will showcase products and technologies which meet the future energy requirements for Scotland. A visitor centre will also be provided which will also operate as a community facility, engaging with local groups such as school children, young adults and FE colleges.

In 2011 the Park was allocated funding to develop four houses that will demonstrate up to 80 technologies that can improve energy efficiency and reduce carbon emissions. Edinburgh Napier University's Institute for Sustainable Construction is overseeing the scheme, with support from Scottish Enterprise and the Scottish Funding Council.

Source: BRE website

HE Collaboration activity

- 7.37 One of the main examples of HE collaboration to support the sector is the **CIC Start Online** project led by Glasgow Caledonian University in partnership with Edinburgh Napier University, Glasgow School of Art, Heriot Watt University, the Robert Gordon University, University of Edinburgh and University of Strathclyde. The project receives support from ERDF, the Scottish Government's SEEKIT programme and Scottish Enterprise.
- 7.38 As part of the project, there is a scheme for joint industry/academic feasibility studies and a competition for free academic consultancy. The website also provides information on expertise available at the participating universities and a database of design solutions for sustainable refurbishment. There are currently over 200 members list on the website with a range of architects, surveyors, engineering consultants, renewable technology installer and contractors.

KTP Partnerships

- 7.39 We conducted an online search of all the current and completed KTPs where the main knowledge/technology area involved in the Partnership related to the built environment. The results, presented in Table 7-9 below, show that there are five current KTPs and an equivalent number that have been completed recently. The total value of all 10 KTPs is just over £1 million.

Table 7-9: KTPs in built environment - current and completed

Academic partner	Company partner	Amount
CURRENT KTPs:		
The University of Edinburgh	Powerwall Space Frame Systems Limited	£244,568.00
Edinburgh Napier University	Icopal Limited	£73,056.00
Edinburgh Napier University	A Proctor Group Limited	£71,332.00
Heriot-Watt University	ARK Housing Association Limited	£68,827.00
Glasgow School of Art	Tenants First Housing Co-operative Limited	£115,722.00

Academic partner	Company partner	Amount
COMPLETED KTPS:		
University of Strathclyde	K J Tait Engineers	£81,696.00
University of Abertay, Dundee	Greenbelt Group Limited	£70,608.00
University of Abertay, Dundee	Ian Farmer Associates (1998) Limited	£79,178.00
Heriot Watt University	FES FM Limited	£120,090.00
Edinburgh Napier University	Action Scaffolding Contracts Limited	£76,218.00

Source: <http://www.ktponline.org.uk/>

Business R&D investment

7.40 Some of the data on business innovation would appear to indicate low levels of activity in the construction sector: for example the latest Scottish Government statistics on Business Enterprise R&D (BERD). In 2010, the construction sector is estimated to have invested £350,000 in formal R&D out of a total of £622 million. The issue here might be that construction firms are actually working with manufacturers in their supply chain to develop new products – as suggested by the feedback on innovation – in which case this investment would come under manufacturing. BERD expenditure for all sectors in Scotland was significantly lower than for the UK as a whole – in Scotland it was equivalent to 0.52% of GDP compared to 1.09% of GDP in the UK.

Table 7-10: Expenditure on R&D performed within businesses in Scotland by broad product groups (£'000s)

	2005	2006	2007	2008	2009	2010
Manufacturing:	472,442	419,236	480,872	430,792	457,060	415,010
Chemicals	196,964	149,856	166,446	163,347	174,049	158,449
Mechanical Engineering	26,471	23,670	28,907	19,897	28,027	26,424
Electrical machinery	111,520	101,915	118,778	117,015	111,329	106,019
Transport Equipment & Aerospace	7,428	5,541	10,926	5,625	16,171	7,929
Other manufacturing	130,059	138,254	155,814	124,908	127,485	116,189
Services	80,850	64,658	59,321	97,397	113,505	144,325
Other sectors:	23,002	23,034	43,972	50,342	76,430	63,012
Agriculture, hunting & forestry; Fishing	..	..	..	..	..	..
Extractive industries	20,740	21,077	33,330	35,544	53,900	36,684
Electricity, gas & water supply	..	..	..	..	..	..
Construction	1,235	361	522	..	1,027	350
Total	576,295	506,928	584,165	578,531	646,995	622,347

Source: ONS; Scottish Government Business Enterprise R&D 2010; .. denotes 'disclosive

Exporting

- 7.41 Another characteristic of the sector to consider in terms of future development is the level of exporting and firms' abilities or willingness to internationalise. As shown in Table 7-11, below, construction only contributes 2% of all of Scotland's exports (amounting to £1.2billion out of a total of £66.3 billion). However, it should be noted that the professional services linked to the construction sector (e.g. architects) would come under the heading of business services.

Table 7-11: Scottish exports by sector 2006-09¹⁹

	2006	2007	2008	2009	% of all exports
Financial Intermediation	9,290	12,215	11,445	11,195	17%
Wholesale, Retail & Repairs, Hotels & Restaurants	8,595	9,390	9,335	9,365	14%
Manufacture of Food Products and Beverages	5,565	5,850	6,045	6,950	10%
Business Services	5,310	5,920	6,000	6,525	10%
Manufacture of Coke, Refined Petroleum Products & Nuclear Fuel, Manufacture of Chemicals & Chemical Products	3,270	4,610	5,540	4,925	7%
<i>Manufacture of Distilled Potable Alcoholic Beverages (sub-set of F&D manufacturing)</i>	<i>2,850</i>	<i>3,220</i>	<i>3,445</i>	<i>3,945</i>	6%
Electrical and Instrument Engineering	3,780	3,465	3,350	3,205	5%
Land, Water & Air Transport & Auxiliary Transport Activities	3,095	2,905	2,885	3,140	5%
Electricity, Gas & Water Supply	2,320	2,045	1,470	2,960	4%
Mining, Quarrying & Extraction of Petroleum	1,325	1,850	2,035	2,775	4%
Manufacture of Transport Equipment	2,075	2,510	2,620	2,770	4%
Mechanical Engineering	1,620	1,865	2,125	2,200	3%
Manufacture of Metals and Metal Products	1,610	1,875	1,900	2,085	3%
Other Manufacturing Industries	1,815	1,905	1,905	1,895	3%
Manufacture of Paper, Print and Publishing	1,290	1,255	1,230	1,300	2%
Construction	1,335	1,710	1,670	1,245	2%
Total Rest of UK and International Exports	55,940	63,390	63,450	66,375	100%

Source: Scottish Government (2010), Global Connections Survey

- 7.42 Looking at the construction sector figures more closely, most (93%) of these 'exports' are sold to other parts of the UK. This reinforces the fact that very few products and services from the sector are exported overseas.

- 7.43 This issue of low exporting levels was discussed with stakeholders. It was suggested that it would be unlikely for a Scottish construction firm to become involved in other markets. So

¹⁹ We have only included the sectors above construction in the export tables – some other sectors such as real estate, agriculture and education are lower exporting sectors

much of construction requires local knowledge of planning, regulation and local suppliers. It was also stated, however, that there is more potential for the business and professional services element of the sector to export than is currently being realised. Specifically, consultees highlighted the potential opportunities based on renewables-related construction.

Table 7-12: Breakdown of exports – rest of UK and overseas (2009)

	Total International Exports (£million)		Total Rest of UK Exports (£million)		Total Exports (International plus Rest of UK) (£million)	
Financial Intermediation	940	8%	10260	92%	11195	100%
Wholesale, Retail & Repairs, Hotels & Restaurants	1395	15%	7970	85%	9365	100%
Manufacture of Food Products and Beverages	3615	52%	3340	48%	6950	100%
Business Services ²	2675	41%	3850	59%	6525	100%
Manufacture of Coke, Refined Petroleum Products & Nuclear Fuel, Manufacture of Chemicals & Chemical Products	2675	54%	2250	46%	4925	100%
<i>Manufacture of Distilled Potable Alcoholic Beverages (sub-set of F&D manufacturing)</i>	<i>3130</i>	<i>79%</i>	<i>815</i>	<i>21%</i>	<i>3945</i>	<i>100%</i>
Electrical and Instrument Engineering	2040	64%	1160	36%	3205	100%
Land, Water & Air Transport & Auxiliary Transport Activities	800	25%	2340	75%	3140	100%
Electricity, Gas & Water Supply	0	0%	2960	100%	2960	100%
Mining, Quarrying & Extraction of Petroleum	805	29%	1975	71%	2775	100%
Manufacture of Transport Equipment	1000	36%	1770	64%	2770	100%
Mechanical Engineering	1495	68%	710	32%	2200	100%
Manufacture of Metals and Metal Products	870	42%	1215	58%	2085	100%
Other Manufacturing Industries	815	43%	1075	57%	1895	100%
Manufacture of Paper, Print and Publishing	410	32%	890	68%	1300	100%
Construction	90	7%	1155	93%	1245	100%
Total International Exports	21140	32%	45235	68%	66375	100%

Source: Scottish Government (2010), Global Connections Survey

Summary of strengths and weaknesses

7.44 To complete this section, we summarise what stakeholders and businesses view as the strengths and weaknesses of the construction sector. Some of the issues were discussed above, but other feedback is also included.

7.45 The main **strengths** of the sector were as follows:

- The acceleration of capital expenditure and delay in Scottish public sector cuts helping to maintain activity during 2010 – this was seen as helpful in ‘softening the

blow'. The ability of the Scottish Government to make its own funding decisions was seen as a positive in relation to construction projects.

- Research excellence in Scotland's universities and work of BRE in innovation/skills areas. Also the fact that academics and industry are willing to collaborate – it was stated that this is easier to do in a smaller country through face-to-face networks involving key players.
- Work of skills agencies and FE in supporting skills development e.g. availability of Modern Apprenticeships for construction and related sectors. There is a strong tradition of developing graduates. More generally the skill set of the Scottish workforce was highlighted their being particular strengths in engineering.
- New legislation to address climate change and carbon emissions is believed to be driving innovation in the sector. Scotland is believed to be well placed to respond to zero carbon challenge compared to rest of UK (e.g. tradition of timber frame housing) and the significant investment in renewables infrastructure in Scotland is seen as a strength.

7.46 The main **weaknesses** of the sector were as follows:

- One of the main weaknesses identified by businesses and stakeholders was the low levels of private sector demand in the last few years following the recession. This has been particularly noticeable in the major decrease in house building. It was stated that there continue to be difficulties for construction firms in trying to access bank lending
- Public procurement practices and procedures were also said to be a weakness. The scaling up of contracts (with more administrative burden) has reportedly made it more difficult for Scottish SMEs to bid/ win work. There was also a general perception that in the last few years there has been increased competition from Irish/English based contractors
- Although there are some existing testing facilities such as BPAC, it was believed that Scotland needs to have a national testing centre with all relevant public, private and academic partners involved. The fact that many Scottish firms currently need to send products to England for testing is reportedly hindering the sector's ability to bring new products to market.
- The planning system was highlighted by some businesses as too bureaucratic and contributing to project delays resulting in additional costs – 'too much red tape'
- Some consultees also stated that the effects of the recession will mean that capacity is lost to the sector. For example, representatives of both the architects and surveyor sub-sectors highlighted examples of newly qualified graduates moving abroad or into other sectors to find work. Due to the current lack of work, insufficient numbers of apprenticeships are being supported. Certain sub-sectors are expected to have issues with an ageing workforce with a limited supply of new workers coming through.

- On the whole, most businesses stated that the economic conditions have made it more difficult to invest in training, skills and innovation (but this was contrasted by some larger companies that have seen increased competition as a driver for being more innovative, in order to survive).
- The general attitude of the sector was described as being ‘reactive’ – evolving in line with what the market and clients demand. It was stated that although the public sector has been forthcoming in terms of policy ambitions in terms of developing a low carbon economy. Guidance for the sector on how these policies will actually translate into solutions was said to be less clear.
- Some consultees also highlighted the fragmented nature of the sector as a weakness especially in terms of representation and lobbying. One consultee stated the ‘need for industry to be heard, not just represented’.

7.47 As part of discussion with businesses, we sought information and views on the **construction supply chain** in Scotland. Most of the consultees stated there were no specific issues with weaknesses or gaps in the supply chain, some in fact stated that there was an over-supply at the moment because of the decrease in workloads. For some of the larger firms, they have a centralised procurement system and use suppliers from across the UK. However, a small number of consultees were able to identify potential gaps:

- The first area was high quality construction manufacturing - they always need to source these products outside of Scotland. There are producers in Scotland but they don't produce these goods at a quality or competitive level. The main reason for this is that there has been a lack of investment over a long period of time and Scotland has falling far behind other areas.
- Another consultee pointed out that there was limited availability of suppliers for certain components required for low/zero carbon house-building. Some suppliers sourced from Germany or Scandinavia, and labour then had to be imported to fit those components.
- There were also general concerns about the long-term future of suppliers and the risk of a knock-on impact if one part of the supply chain is lost. It was acknowledged that the industry is relatively weak in supply chain management and that especially in the current climate there is a need for greater collaboration throughout the supply chain.

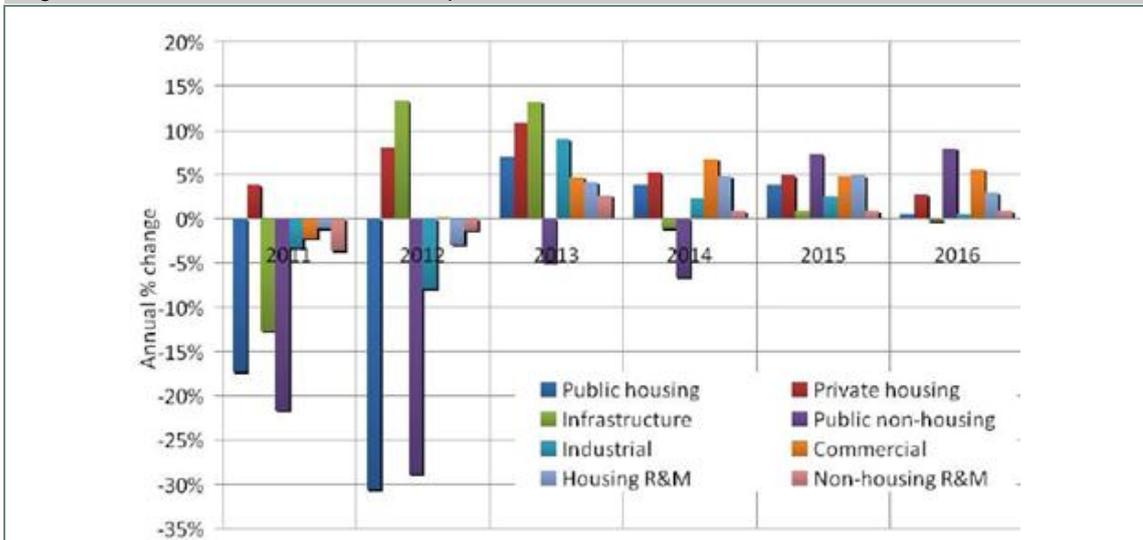
8: Future growth prospects

- 8.1 In this section we look ahead at the prospects for the Scottish construction sector using existing research but also reflecting on feedback from our own primary research.

Growth potential

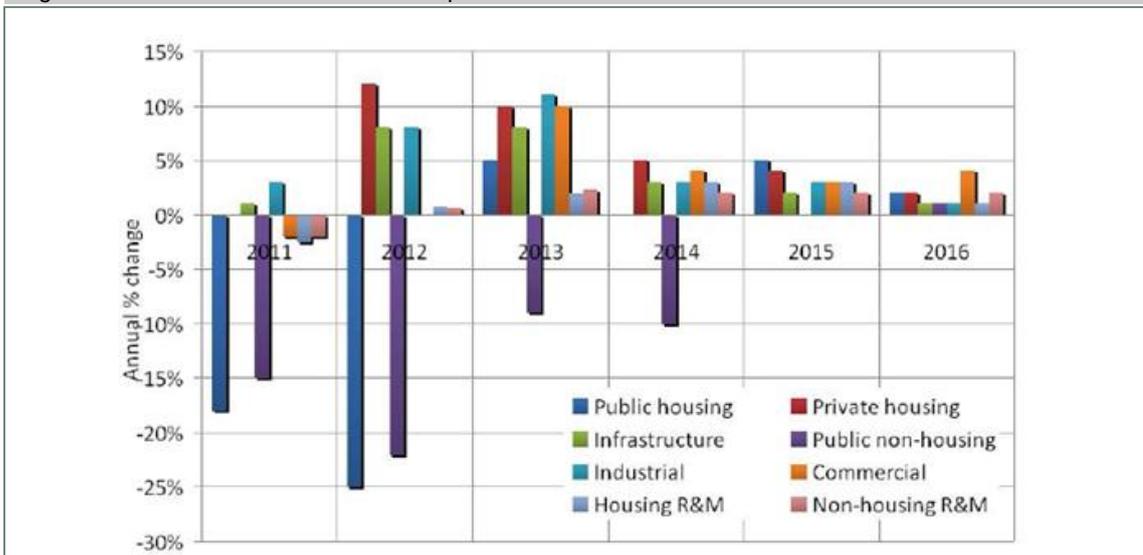
- 8.2 Construction Skills and Experian have produced projections for changes in output and employment in the Scottish construction sector and for the UK as a whole. Based on these projections, it is anticipated that output in infrastructure will increase at a greater rate in Scotland compared to the UK as a whole (especially during 2012 and 2013). However, output in the private housing sector is likely to be slower to return to the UK average.

Figure 8-1: Forecast for construction output in Scotland 2011-2016



Source: Construction Skills/ Experian

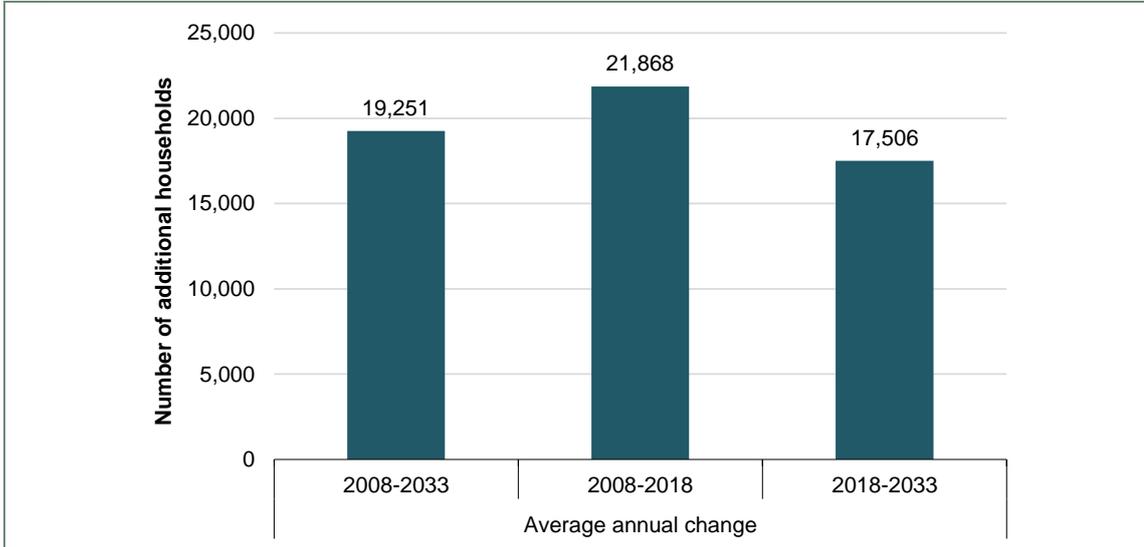
Figure 8-2: Forecast for construction output in UK 2011-2016



Source: Construction Skills/ Experian (2011)

8.3 Although the above forecasts would suggest a slower return to growth of new housing completions, it is worth considering the projected demand for additional housing based on demographic projections. Data from GROS suggests that over the next decade or so the number of households in Scotland will increase by approximately 22,000 each year (gross). This is 5,000 more than the number of homes built in 2010/11 (without taking demolitions into account).

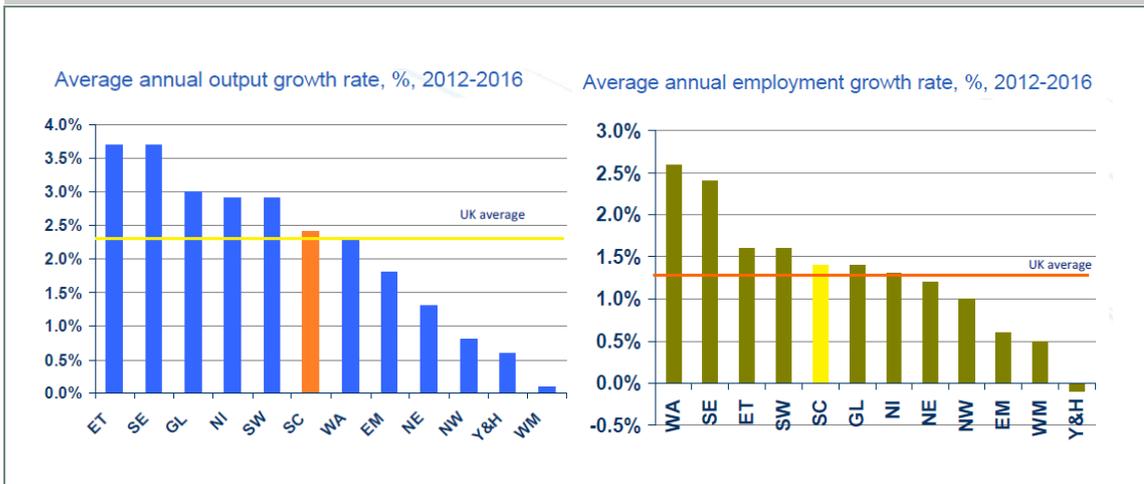
Figure 8-3: GROS household projections



Source: GROS

8.4 Between 2012 and 2016, Scotland's construction output is projected to grow at just under 2.5% annually which is slightly above the UK average. In terms of employment, Scotland's sector is projected to grow at just under 1.5%, again marginally above the UK average.

Figure 8-4: Regional comparisons of projected output growth rate and employment growth rate, 2012-2016

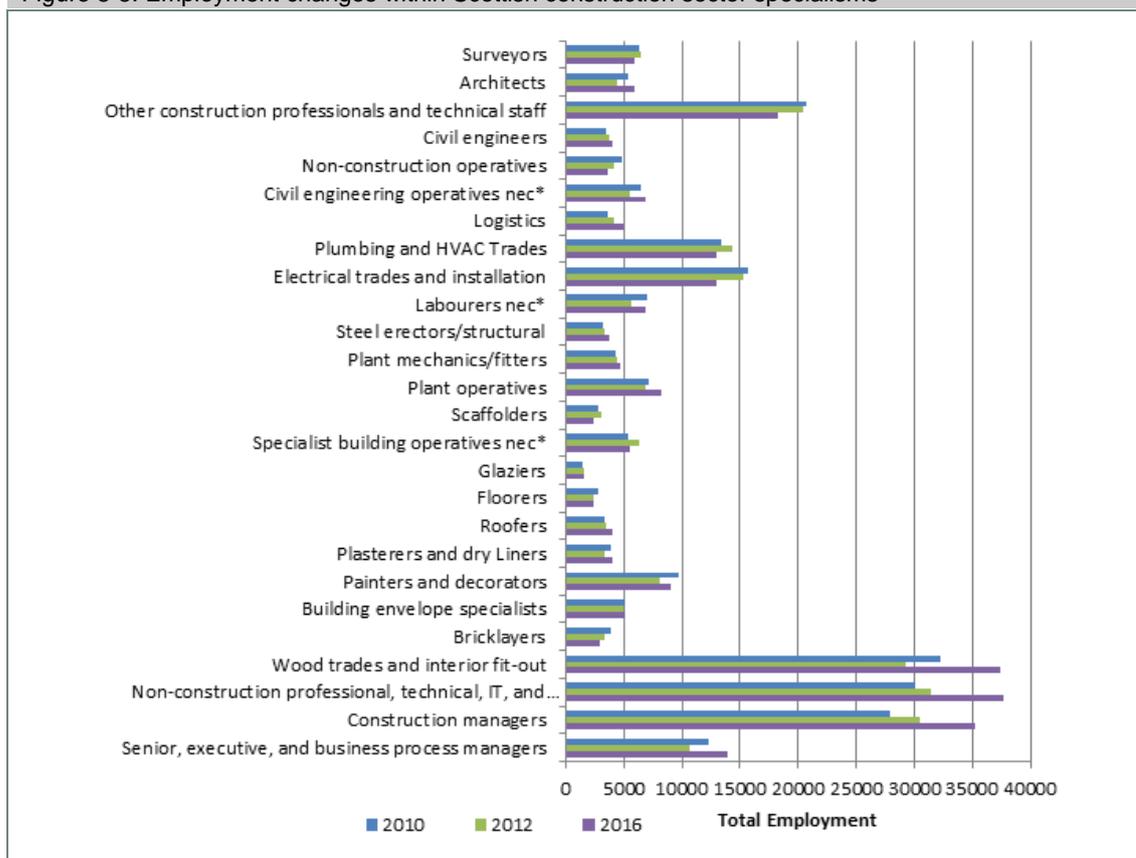


Source: Construction Skills/ Experian (2011)

Future demand for specific skills and occupations

8.5 In terms of future employment growth within the construction sector, architects (31%), wood trades and interior fit-out (28%) and civil engineering operatives (28%) are projected to have the highest growth rates among construction-specific trades and professions (Figure 8-5).

Figure 8-5: Employment changes within Scottish construction sector specialisms



Source: Construction Skills/ Experian (2011)

Opportunities and threats

8.6 Based on our discussions with industry stakeholders and businesses the following feedback was received in relation to the main **opportunities** for the construction sector:

- Scottish Government’s continuing commitment to large capital projects (V&A, Forth Replacement, Aberdeen WPR) and more SFT/NPD projects coming through such as Sick Kids Hospital Edinburgh, Glasgow Colleges
- It was also believed that there would be significant opportunities associated with building the infrastructure and facilities (e.g. athletes village) required for the Commonwealth Games
- Increasing demand for sustainable/ low carbon technologies was seen as a major opportunity for Scotland – particular opportunities in retro-fitting insulation into traditional housing stock (e.g. addressing energy efficiency in older buildings could make a major difference to CO2 emissions from the built environment)
- Increasing demand from the public sector for social/ affordable housing – with at least some housing being built in the short term (notably, 1,000 homes through NHT) in order to address continuing growth in population and a move towards smaller households
- Developing the supply chain in growth areas of R&M, energy efficiency, waste management and providing clearer guidance on standards and technologies that need

to be used. A particular need and opportunity was identified to develop the supply chain in Scotland for zero carbon housing (at present there is still a need to bring in overseas companies to fit components)

- Increasing the number of Scottish companies winning work in England. It was also stated that more could be done to help Scottish firms to internationalise and take leading edge innovation developed in Scotland overseas
- Ensuring the procurement process is efficient at the same time as ensuring smaller firms can access public sector contracts was seen as an opportunity, especially at a time when the sector remains dependent on public sector work
- More joined up working between the different sub-sectors and the different representative bodies was seen as very important in order to develop a single voice for the wider construction sector. This would then be beneficial for dealing with Government, promoting the sector as a career for young people and helping Scottish firms to tap into overseas markets. This area of opportunity came not only from current industry bodies but also individual businesses looking for a more strategic approach to developing the wider sector.

8.7 The main **threats** were believed to be:

- General concerns about double-dip recession. There is a risk that uncertainty in the Eurozone and further global economic shocks will dampen demand further in both the private and public sector. This would also impinge on mortgage lending and depress any potential housing demand revival
- Continuing decline in public sector investment (housing, schools, hospitals & some smaller infrastructure projects). The recent Scottish Government Infrastructure Investment Plan highlights the upcoming cuts to capital spend. The private sector is being expected to pick up the slack when public sector cuts kick-in – but will not be in any position to take the lead
- On-going economic uncertainties and low confidence levels e.g. Eurozone crisis – whilst there was perhaps some recovery in 2010, confidence fell again in 2011, raising doubts as to when the economy will actually get back on track
- Increasingly complex procurement procedures – difficulties for smaller firms. Framework/ Hub company approach tends to suit larger rather than smaller firms (although some big firms state that having fewer larger contracts to bid for makes it difficult for them too)
- Shortage of housing due to lack of private sector investment and availability of mortgages (supply and demand issues). For many house-builders there are concerns about the costs of implementing low carbon technologies into new housing (meeting new building regulations)
- Loss of skills in different sub-sectors – the realisation that a whole generation of school leavers will be lost to the sector which could have longer term implications.

Business perspective on growth prospects

- 8.8 Just under half of the interviewed businesses had experienced turnover decreases over the last three years due to market conditions, in particular due to aggressive tendering from competitors. About a fifth of businesses saw their turnover grow in the last three years. Reasons for growth were varied including natural growth, increased market share and public sector contacts. Most that were able to maintain turnover over the recession attributed this to the legacy of PFI contracts.
- 8.9 A small minority (8%) of the interviewed businesses forecast turnover decreases in the coming three years. Over a third of businesses expected their turnover to be maintained at its current level, while over half the interviewed businesses expected their turnover to increase (see Table 8-1) in the coming three years. The two main reasons for these positive growth forecasts were NDP projects coming on stream and increasing work in overseas markets.

Table 8-1: Turnover trends.... (% of businesses)

Turnover change	...over the last 3 years?	...over the next 3 years?
Decrease >30%	22%	0%
Decrease up to 30%	26%	8%
Roughly the same	26%	35%
Increase up to 30%	7%	39%
Increase >30%	15%	15%
Don't know	4%	3%

Source: SQW business interviews (2011) – base 27

Public sector role

- 8.10 All the interviewed businesses believed that there was a pivotal role for the public sector in supporting the construction sector over the coming years. In particular, **it was said to be vital for the Government to continue to invest in housing and infrastructure and maximise the availability of public funds to the construction sector** wherever possible.
- 8.11 Other areas, apart from capital investment, where the public sector could support the construction sector were:
- overseas promotion of Scottish construction firms
 - creating a stable legislative environment
 - Procurement practices were seen as an important area where the public sector could improve its relationship with the construction sector. It was felt **that a lot more could be done to get Scottish firms on the winning side of procurement**. Suggestions to improve procurement practices included:
 - a change of procurement scoring – not awarding contracts on price alone
 - having a one off PQQ that can be update annually rather than a new PQQ for every project

- thresholds for frameworks should be increased from the current level of £0.75m
- a more staggered approach to tendering rather than flooding the market over a short period
- making the system more accessible for small businesses with tiered contracts.

9: UK benchmarking

9.1 In this section we now look at the Scottish industry in a wider context, first in relation to the UK, then internationally.

Summary of UK benchmarking

9.2 The main points from this section are as follows:

- In 2011, the top 100 building contractors in the UK ,many of them active in Scotland, saw a drop in turnover of £0.5 billion, demonstrating the continuing economic challenges in the UK construction sector
- In terms of construction output, Scotland has the fourth highest levels out of the UK regions, behind only London, South East and South West
- Using ONS output data, Scotland's construction sector has one of the most productive workforces out of UK regions at around £67,000 GVA per employee, behind only London and the North East²⁰
- Scotland also differs from other UK regions in terms of the scale of growth in recent years and its size relative to the total workforce
- The projection for annual growth in the UK construction sector over the next four years is estimated to be around 2.3 or 2.4%. Construction Skills puts Scotland marginally higher than the UK average which would tie in with the fact that Scotland appears to have one of the better performing construction sectors in the UK.

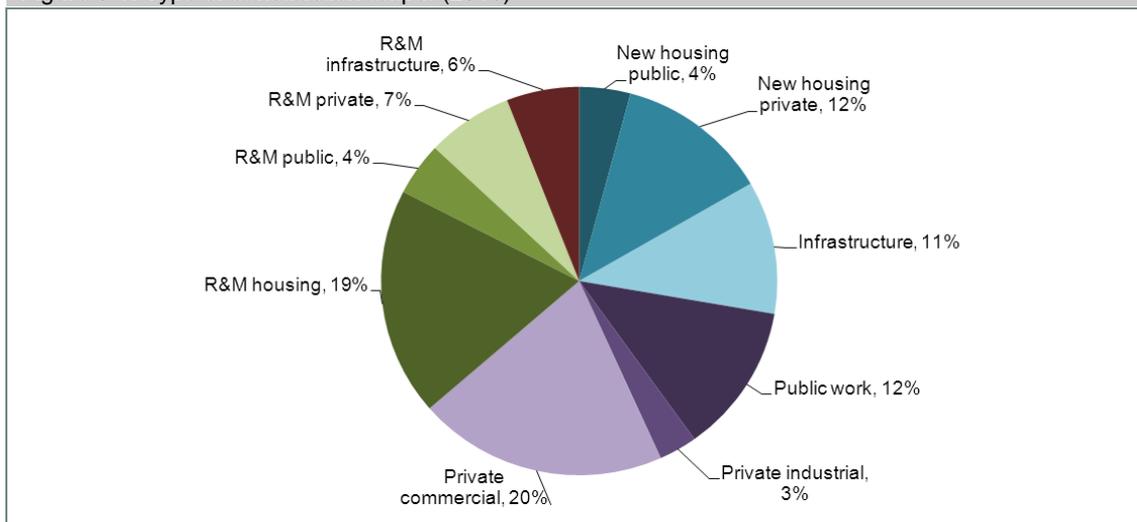
Overview of the UK construction industry

9.3 The UK construction industry consists of approximately 260,000 firms employing over 1.2 million people in a multitude of roles²¹. The UK construction sector contributed 8.3% of total GVA in 2008. The value of output in the industry was estimated at £114 billion in 2010 – new work account for 64% of this output and the remaining 36% was repair and maintenance (R&M). The output is further broken down by type in Figure 9-1.

²⁰ Productivity levels in the construction sector tend to be around or slightly above the all-industry average. For example, based on 2009 ABS data the average GVA per job in the construction sector was £42,000 in line with the average for all sectors. According to the Scottish Government ABS data for the same year GVA per employee in construction and engineering sectors was marginally higher than average

²¹ ONS Construction Statistics Branch - information relates to the number of private contractors' firms on the BERR's (now BIS) Builders' Address File

Figure 9-1: Type of construction output (2010)



Source: Construction Statistics Branch, Office for National Statistics

9.4 According to Global Construction 2020²² review the non-residential sector is a particularly high proportion of construction output in the UK, accounting for 46% of the total in 2010. Conversely, the residential and infrastructure sectors are smaller in the UK than they normally are in developed countries. Datamonitor²³ characterises the UK construction industry as fragmented. The industry is characterised by the presence of some large firms such as AMEC Plc. and Balfour Beatty Plc., however small scale companies also operate alongside these players. Datamonitor research suggests that there is only a ‘moderate’ level of new entrants to the industry in the UK.

9.5 In 2011 the total turnover of the top 100 biggest building contractors in the UK dropped half a billion to just under £64bn – though the profit and average margin increased, suggesting many firms are concentrating on staying in the black rather than simply chasing turnover. Table 9-1 shows the top ten UK construction companies whose turnover ranges from £10 billion to £1 billion. Rivalry is assessed as strong in the UK by the Datamonitor review. This is because the industry has experienced poor growth over recent years, and rivalry is intensified as players are forced to compete for a smaller pot.

Table 9-1: Top 10 UK Construction Companies 2011

Rank by turnover	Rank by profit	Company	Turnover (£m)	Pre-tax profit (£m)	Scottish operations?
1	1	Balfour Beatty	10541	187	Balfour Beatty Engineering Services HQ at Hillington Park, Glasgow
2	2	Carillion	5139	167.9	Carillion Civil Engineering based in Bishopbriggs
3	20	Laing O'Rourke	3320	25.9	Office at Eurocentral, North Lanarkshire
4	3	Babcock	2755.8	115.4	Office in Stirling
5	11	Morgan Sindall	2101.9	40.7	No physical presence in Scotland but involved in West of Scotland Hub programme

²² Global Construction 2020: A global forecast for the construction industry over the next decade to 2020 (2011), published by Global Construction Perspectives and Oxford Economics.

²³ United Kingdom construction and engineering trends (Datamonitor – August 2011)

Rank by turnover	Rank by profit	Company	Turnover (£m)	Pre-tax profit (£m)	Scottish operations?
6	9	Kier	2098.7	57.7	Office in Steps
7	6	Mitie	1891.4	86.8	Office in Rutherglen
8	8	Interserve	1872	64.1	Office in Livingston
9	13	Skanska	1267.3	38.7	Office in Holytown, North Lanarkshire
10	19	Galliford Try	1221.5	26.1	Represented by Morrison Construction which has offices in Edinburgh and other locations around the country

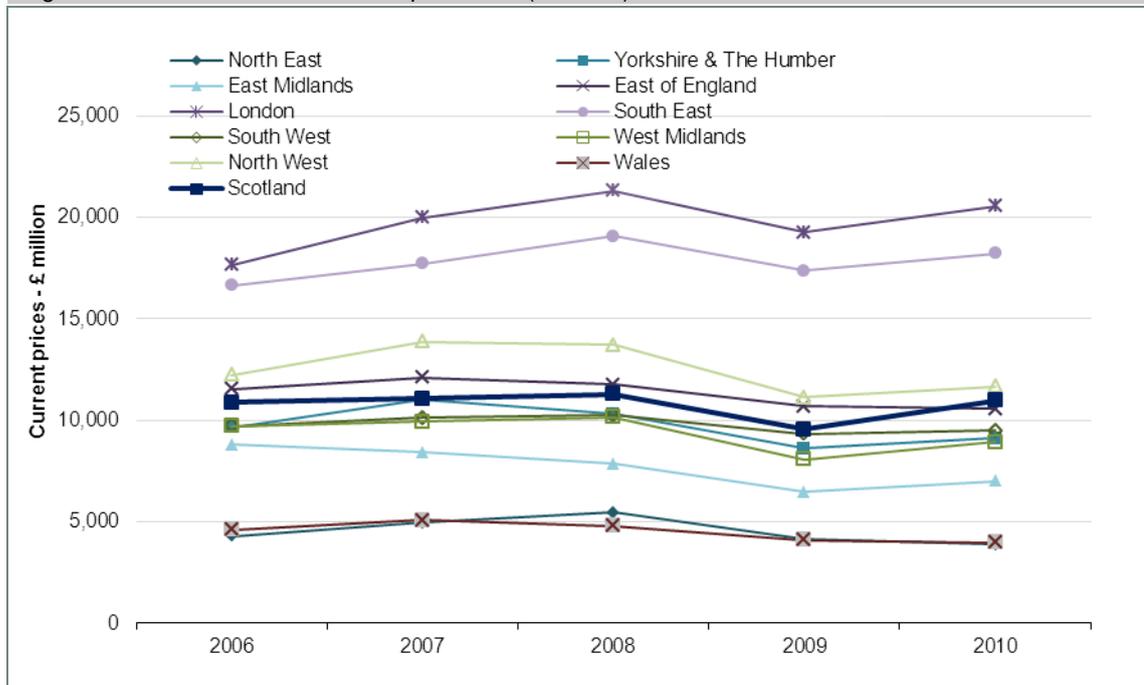
Source: The Construction Index, available at <http://www.theconstructionindex.co.uk/market-data/top-100-construction-companies/2011> and SQW review of company websites

Recent performance of Scottish construction sector vs. other UK regions

Construction output

- 9.6 The value of construction output in Scotland is similar in size to the other UK regions with the exception of London and the South East (see Figure 9-2). For most regions there had been steady growth in the value of construction output up until a decline in 2009 and a slight return to growth in 2010 (apart from the East of England, the North East and Wales). Historically London, the South East, the North West and the East of England performed better than Scotland. Yet in the most recent data the value of construction output in Scotland surpassed the East of England and is on a par with the North West.

Figure 9-2: Value of construction output 2010 - (£ million)

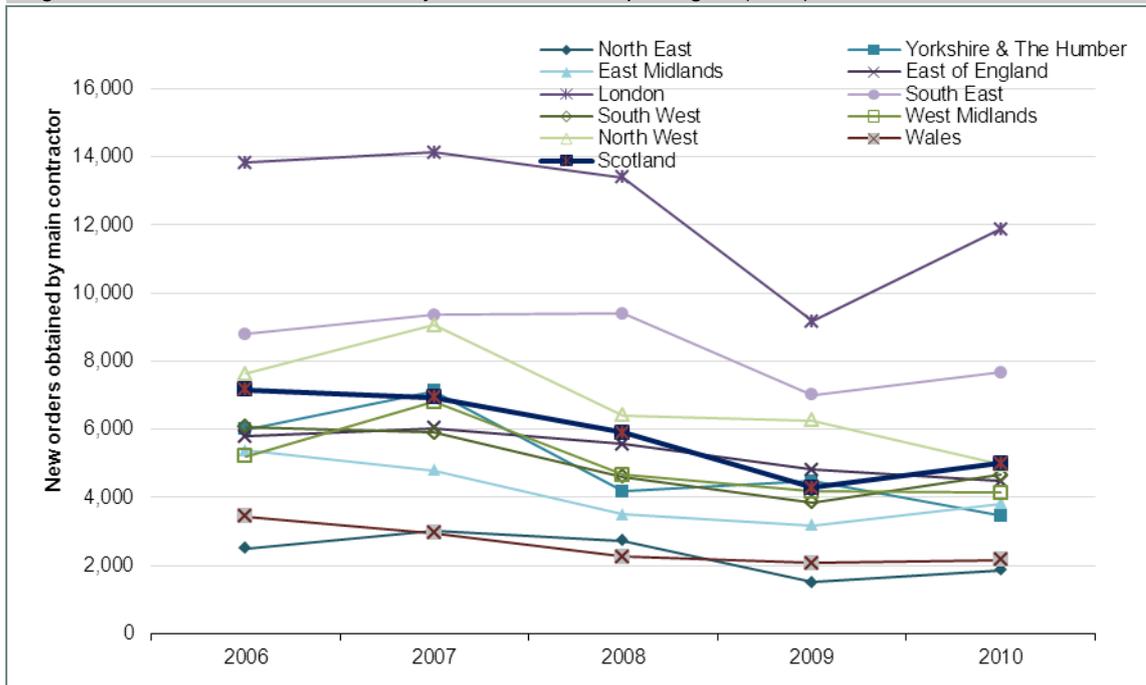


Source: Construction Statistics Branch, Office for National Statistics.

Construction orders

9.7 General construction order trends show (Figure 9-3) for most regions there was a weighty decline in orders in 2008 and this continued until 2010 when there was a return to growth for most regions (apart from North West, East of England and Yorkshire and The Humber). Overall Scottish orders have been on trend with patterns in other regions. Although the decline in Scottish orders was evident in 2007, rather than 2008 in most other regions. Scottish orders peaked in 2006 and in the most recent data (2010) are back at 2003 levels. In terms of volume, historically London, the South East and the North West out-performed Scotland. However Scotland surpassed the North West in 2010 but there is still a significant gap between London and the South East.

Figure 9-3: All new orders obtained by main contractors per region (2010)

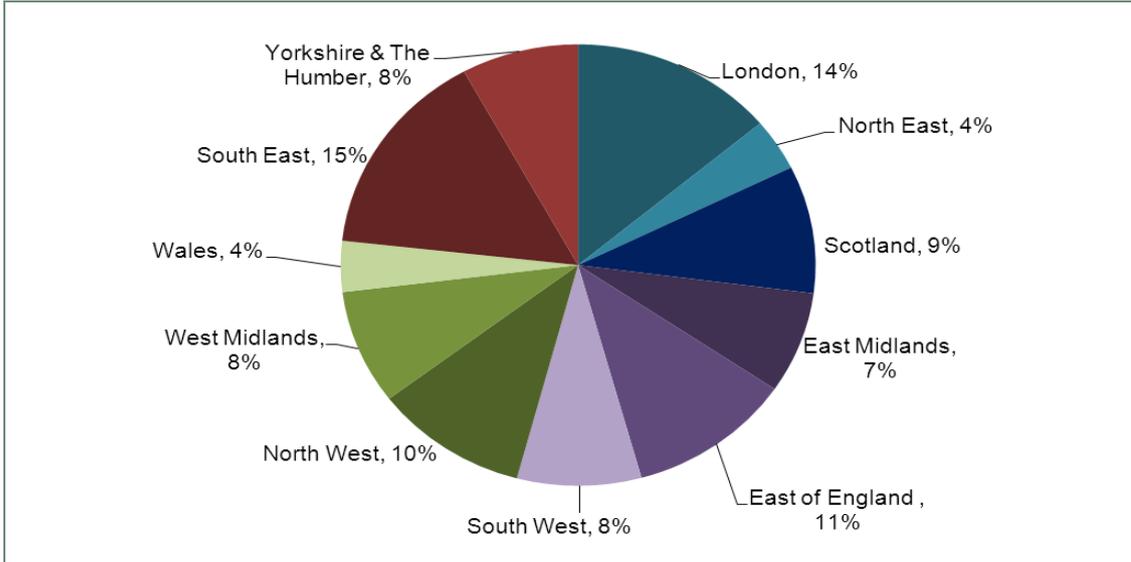


Source: Construction Statistics Branch, Office for National Statistics.

Economic contribution

9.8 Scotland contributes around nine per cent of total UK construction GVA (Figure 9-4), yet it performs well in comparison to the other regions on GVA per employee basis (see Figure 9-5) – suggesting higher productivity levels in Scotland. Although the London region has the highest level of GVA per construction employee at approximately £71,000 - the North East, Scotland and the East Midlands are the next best performing regions with a similar GVA per employee figure of about £66,000. The South East and the Yorkshire and the Humber region are the worst performing in terms of construction GVA with values of £56,000 and £55,000 respectively.

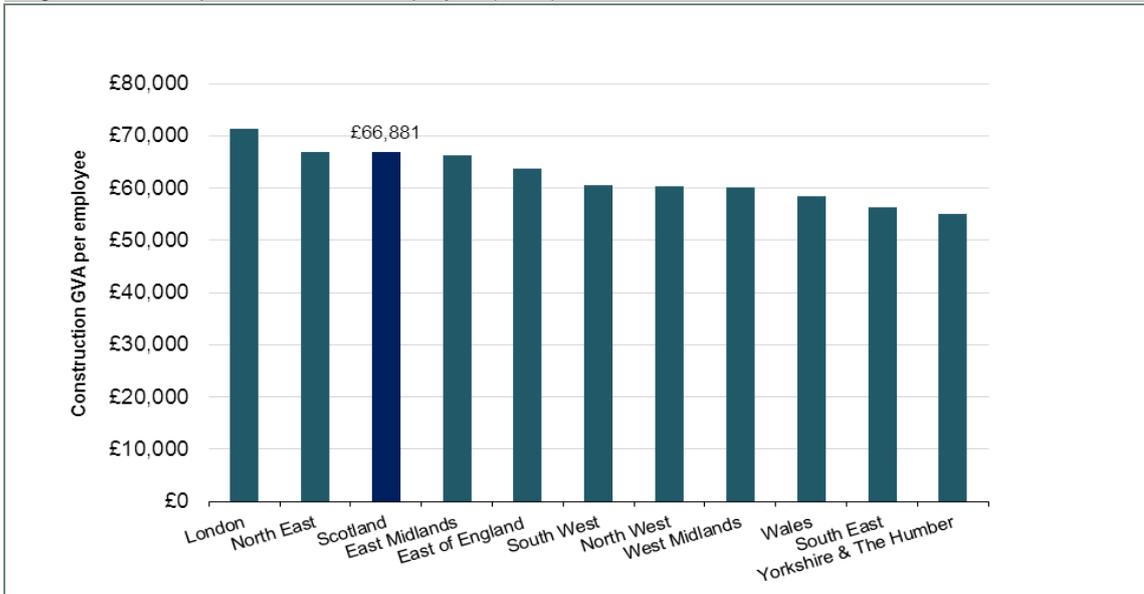
Figure 9-4: GVA as a percentage of total UK construction sector GVA - 2008



Source: Regional Economic Activity, Office for National Statistics – base; £78,500 million

9.9 The differences in productivity levels across the regions is highlighted below, showing that Scotland performs relatively well in a UK context.

Figure 9-5: GVA per construction employee (2008)



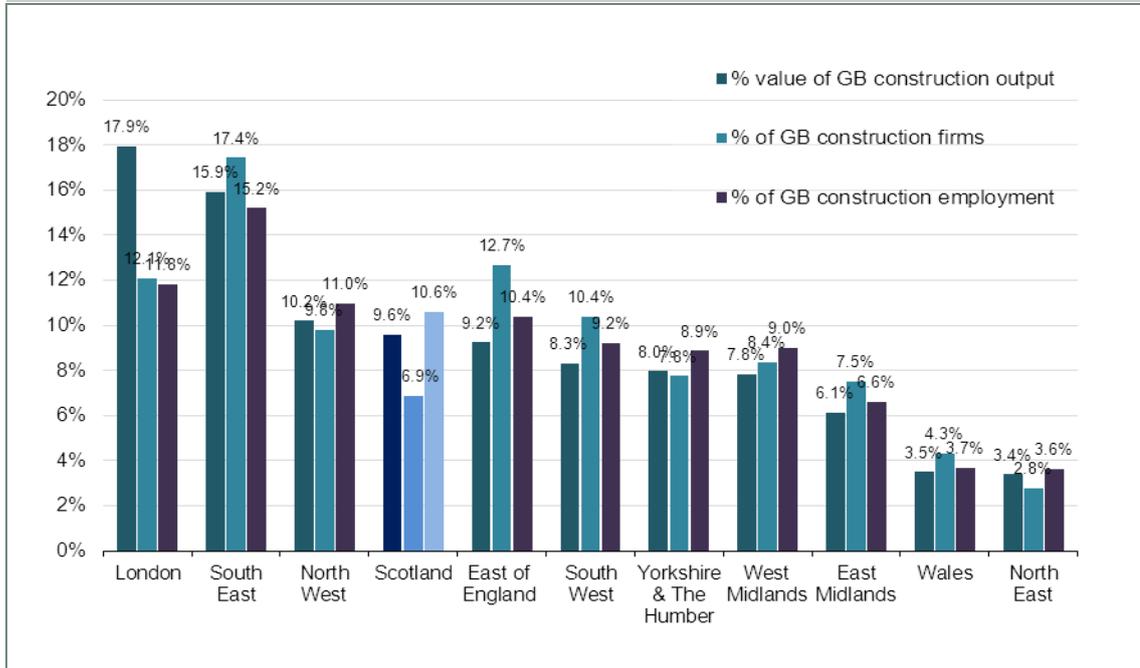
Source: SQW analysis of Regional Economic Activity data, Office for National Statistics

9.10 Figure 9-6 shows a proportional breakdown of output, number of firms and employment in the construction sector in Great Britain by region. Ten per cent of British construction output is attributable to Scotland with seven per cent of firms and 11% of employment. Comparatively Scotland performs well, and is only surpassed by London and the South East.

9.11 Just under one fifth of British construction output can be attributed to the London region but yet the region has only approximately 12% of construction firms and employment. Whereas the output attributable to the South East and North West regions is quite similar to the proportion of firms and employment in those areas. A noticeable difference is that although the East of England has 13% of firms only 9% of construction output is attributable to the East of England.. The North West region is very similar to Scotland in terms of scale of

output and employment. However there is a difference in the size of the construction sector business bases as Scotland had 17,667 construction firms in 2010 and the North West had 25,149.

Figure 9-6: Construction output, no. of firms and employment by region (2010)

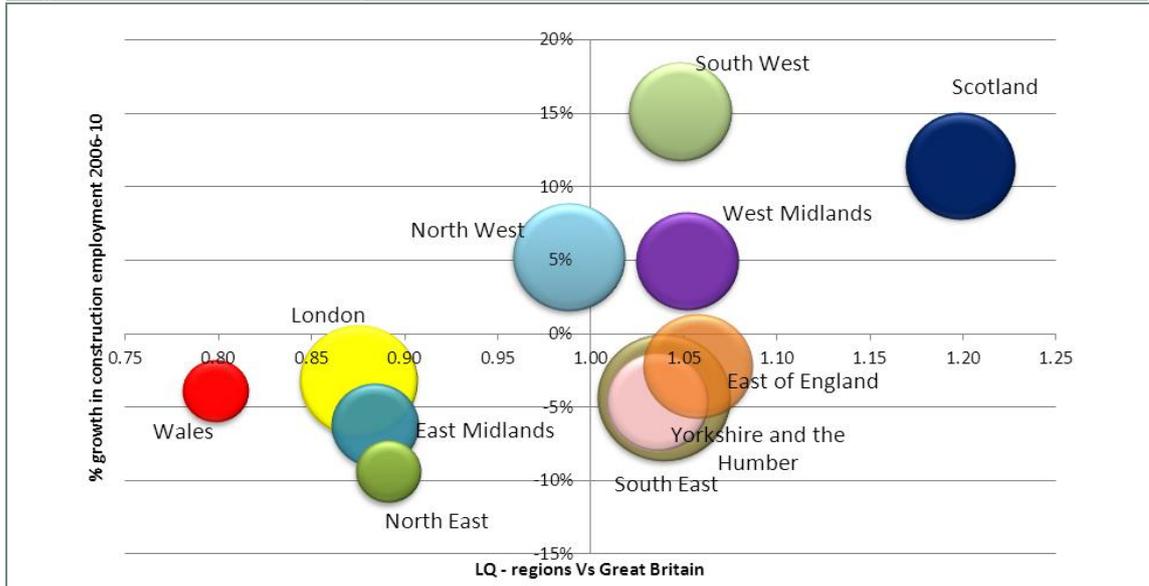


Source: Construction Statistics Branch, Office for National Statistics – base: Great Britain construction output £114,430 million, Great Britain construction firms 256,411 and Great Britain construction employment 1,222,200.

Key differences between Scotland's sector and other regions

- 9.12 The construction sector in Britain has undergone a substantial degree of restructuring over recent years as illustrated in Figure 9-7. This location quotient diagram shows the relative significance (in employment terms) of the construction sector across the regions, which is indicated by the size of the bubbles, as well as a number of other indicators.
- 9.13 The x-axis shows the size of regional construction sectors relative to the GB average (i.e. Scotland is higher than other regions). The y-axis shows employment growth between 2006 and 2010 relative to the GB average and again shows Scotland in a reasonably positive light along with the South West of England.

Figure 9-7: Construction industry LQ - 2010

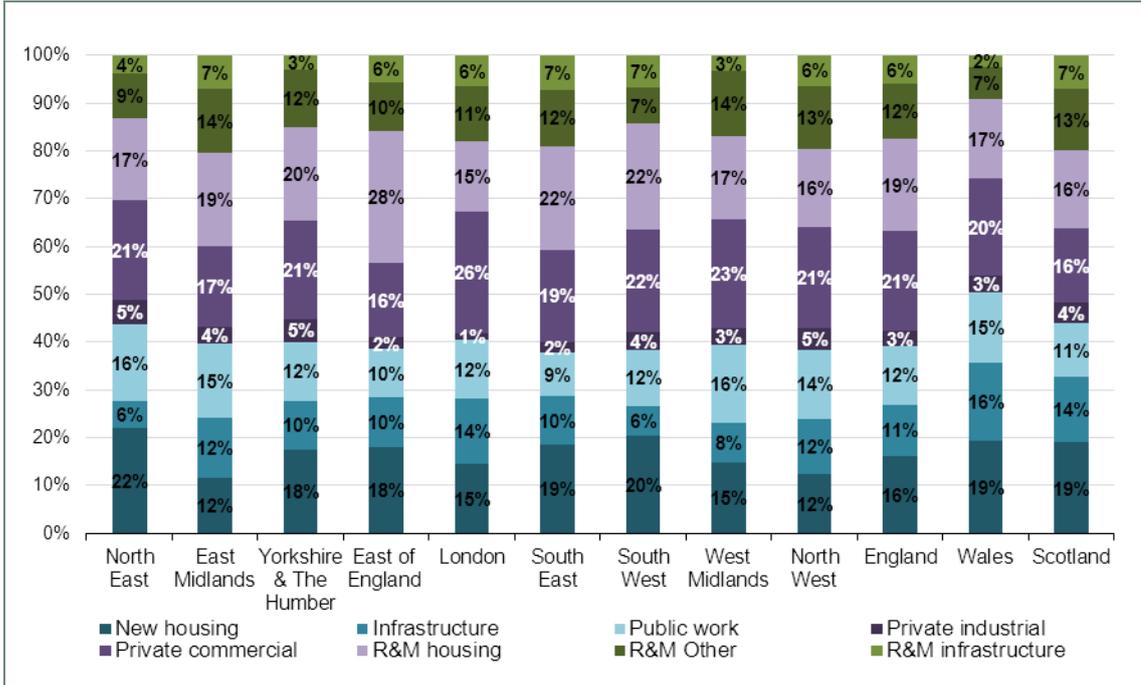


Source: Construction Statistics Branch, Office for National Statistics²⁴

- 9.14 Figure 9-7 compares the proportion employed in construction by region, with the average proportion employed in construction in Great Britain – with bubbles to the left of the axis showing that construction is under-represented in a region relative to Great Britain, while bubbles to the right show over-representation. As can be seen – the employment bases in Scotland, East of England, South West, South East, West Midlands and Yorkshire and the Humber are all structurally dependent on the construction sector – all over-represented, while Wales, London, East Midlands and the North East are all less dependent on the construction sector in their local economies. Bubbles above the horizontal axis, imply that in the last five years construction employment has increased – the South West is especially prominent. The majority of regions have seen a decrease in construction employment (Wales, London, East Midlands, North East, South East, East of England, Yorkshire and the Humber).
- 9.15 Figure 9-7 indicates the employment structure of the construction sector is very different across the regions. The construction employment structure in the North West, West Midlands, East of England, South East and Yorkshire and Humber is becoming more like that of Great Britain – with these bubbles been on or coming close to the intersection of the horizontal and vertical axis. Scotland is diverging from the general trend. The Scottish bubble is noticeable on Figure 9-7 in the top right quadrant not clustered by any other regions. This signified the unique nature of the Scottish construction sector relative to the rest of Britain – where the construction employment base is prominently over-represented in the overall Scottish workforce and there has been growth in construction employment.
- 9.16 The total value of construction output in Scotland was £10.9 billion in 2010 – just under a fifth of output value came from new housing which is in line with other UK regions. The proportion of private commercial output (16%) is slightly lower in Scotland than in other regions (apart from the East of England with 16% too). Overall the type of construction work carried out in Scotland is similar to that in other regions of the UK.

²⁴ Employment data used by ONS here is from two different databases IDBR and BIS' Builders' Address File. The fact that these different sources have been used may explain why some regions saw a particularly high increase in employment from 2009 to 2010

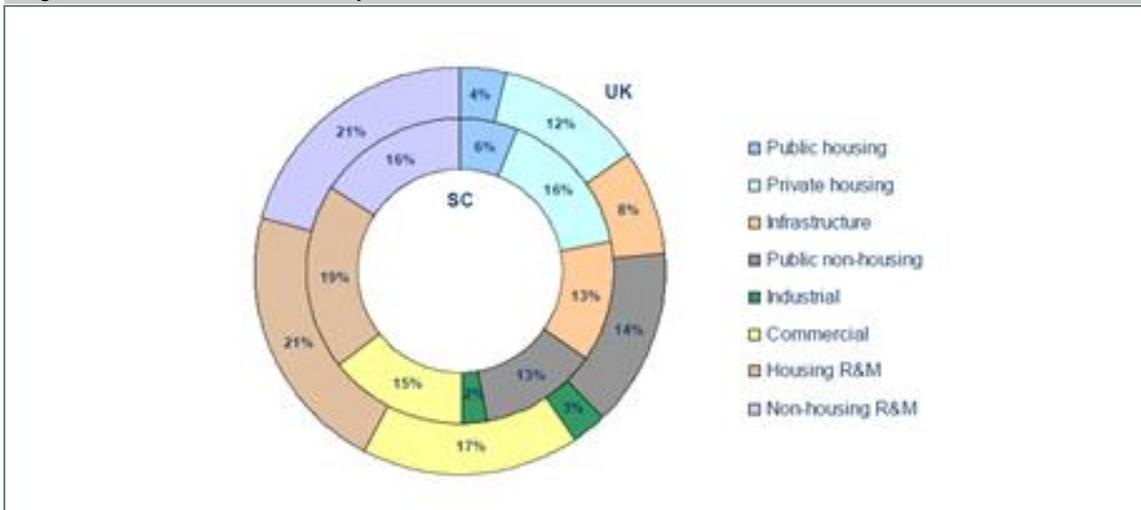
Figure 9-8: Value of Construction output by type (2010)



Source: Construction Statistics Branch, Office for National Statistics

9.17 Looking at how Scotland’s industry structure compares to the UK as a whole, it is notable that in 2009 Scotland had more activity in private housing and infrastructure. R&M, for housing and in other areas, accounted for a smaller proportion of work in Scotland than the UK.

Figure 9-9: Construction industry structure – Scotland vs UK in 2009



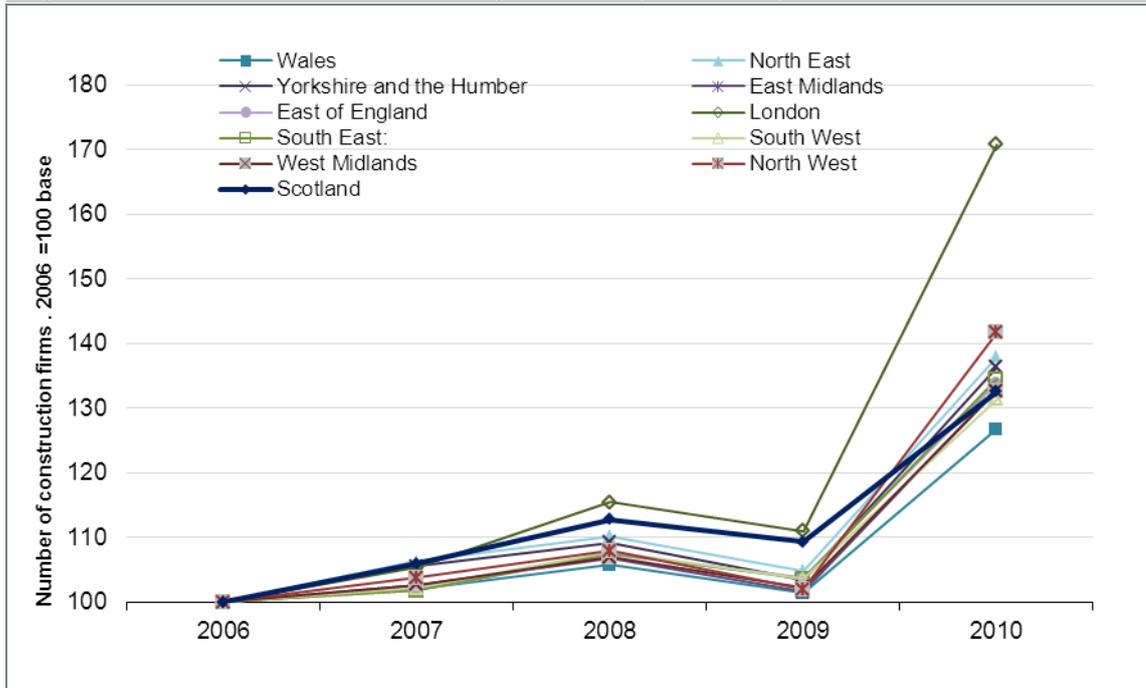
Source: Construction Skills Scotland

9.18 Figure 9-10 shows how the number of construction firms has changed since 2006 across Britain. All regions have witnessed an increase in the number of construction firms since 2006 levels – London has seen the most significant increase at 71% and Wales, at 27% has seen the smallest increase since 2006. The number of construction firms in Scotland only increased by 33% in this period, an average performance relative to the other regions.

9.19 In 2009 the number of construction firms fell in all regions in Britain by approximately five per cent on the previous year’s figures. However 2010 saw significant growth in the number of registered construction businesses. There was growth of between 50% (London) and 20%

(Scotland) on the 2009 figures. This level of significant growth can be explained by two reasons. First, the construction work related with the 2012 Olympics in London will account for some of the increase in London and the surrounding areas. Secondly a proportion of people that were made redundant through the 2009 decreases will have set-up their own firms and this will have contributed to the increased numbers in 2010. It should be noted that many of these new firms will be very small in nature and provide few, if any, employment opportunities.

Figure 9-10: Number of construction firms – growth index (base = 2006)



Source: Construction Statistics Branch, Office for National Statistics. Information relates to the number of firms on the ONS Interdepartmental Business Register (IDBR).

Future projections Scotland vs. other UK regions

9.20 Overall economic growth projections are constrained for the coming years, with household disposable incomes and consumer spending under pressure from higher price than earnings inflation, rising taxes and falling benefits, and still increasing unemployment. Despite these challenges there are positive growth projections for the construction sector – although the estimated growth rates vary depending on the analysis.

- Datamonitor²⁵ analysis estimates the UK construction & engineering market (excluding house-building) had total revenues of £53.6 billion in 2010, representing a compound annual growth rate of 2.1% for the period spanning 2006-2010. The economic downturn has affected the industry strongly since 2009. However the market is expected to recover in 2012 and retain a stable growth rate until the end of the forecast period in 2015, which is expected to drive the market to a value of £59.1 billion (see Table 9-2) by the end of 2015 (CAGR 2%). This gives an annual average growth rate of 1.7% for the period 2010-15.

²⁵ United Kingdom construction and engineering trends (Datamonitor – August 2011)

Table 9-2: United Kingdom construction & engineering industry value forecast

	£ billion	% Growth
2010	53.6	-0.10%
2011	53	-1.10%
2012	54.4	2.50%
2013	55.9	2.70%
2014	57.4	2.80%
2015	59.1	2.90%

Source: *United Kingdom construction and engineering trends (Datamonitor – August 2011)*

- Global Construction 2020²⁶ estimates that construction output in the UK declined by an average of 0.7% per annum in 2005-10 and it expects it to increase by on average 2.4% per annum in 2010-15, but that the rate of growth will then slow in 2015-20 to an average of around 1.9% pa.
- CSN²⁷ estimate the average annual change in construction output to be 2.3% in the UK over the period 2012-16 (Table 9-3).

Table 9-3: Construction output forecasts

Annual Average % Change 2012-2016	UK	Scotland
Public housing	-3.30%	-4.30%
Private housing	6.50%	6.30%
Infrastructure	4.40%	5.00%
Public non-housing	-8.40%	-6.10%
Industrial	5.10%	1.10%
Commercial	4.20%	4.40%
All new work	2.60%	2.80%
Housing R&M	1.90%	2.70%
Non-housing R&M	1.80%	0.80%
All R&M	1.80%	1.60%
Total work	2.30%	2.40%

Source: *CSN Forecasts for 2012-2016 - Experian analysis for Construction Skills Scotland*

- 9.21 As the estimated growth rates have used slightly different time periods and the construction sector definitions used are not clear – the estimates do need to be considered with caution. However it is fair to say that forecast growth in the construction sector ranges from 1.7%-2.4% per annum up to the period 2015, an average rate of 2.1%.

²⁶ Global Construction 2020: A global forecast for the construction industry over the next decade to 2020 (2011), published by Global Construction Perspectives and Oxford Economics.

²⁷ CSN Forecasts for 2012-2016 - Experian analysis for Construction Skills Scotland

9.22 Output growth for Scotland is predicted to be roughly in line with the UK average (2.4% vs. 2.3%). Compared to the UK as a whole, it is predicted that Scotland will see stronger growth in infrastructure (5% vs. 4.4%) and housing R&M (2.7% vs. 1.9%). On the other hand it is predicted that the UK will see annual growth of over 5% for new industrial output compared 1.1% in Scotland. Table 9-4 illustrates future growth prospects in the UK and Scotland.

Table 9-4: Future growth prospects UK vs. Scotland

UK	Scotland
<ul style="list-style-type: none"> Public housing output is almost inevitably going to fall significantly over the next couple of years in the light of a public funding pot for 2011-15 not much more than half what it was in 2008-11 in England The infrastructure sector is predicted to see a sharp slowdown in its growth rate this year as a number of sizeable projects reach completion. Some previously planned projects have now been cancelled, while others are slow to start. Activity levels on the Crossrail project will not peak until 2013/14 The outlook for public non-residential construction is poor in the light of the scrapping of the Building Schools for the Future (BSF) programme, the completion of most Olympic venues by the middle of this year and the overall reductions in Departmental Capital Expenditure Limits (DEL) Demand for new office space seems to be strengthening, although that for retail and leisure premises remains muted. 	<ul style="list-style-type: none"> Public housing output is likely to decline in 2011 with the Scottish Government's capital budget for housing and regeneration falling by 25% between 2010/11 and 2011/12 The private housing market remains fragile, with survey information showing the balances on site visitors and net reservations continuing to be negative compared with a year ago Scotland is developing its own alternative financing mechanisms to cope with public expenditure cuts - The National Housing Trust has been launched to develop an extra 1,000 affordable homes over the medium term The Non-profit Distributing (NPD) model is intended to provide up to £250m of support to fund up to £2.5bn of capital expenditure including the Borders Railway project, improvements to the M8, M73 and M74, the Aberdeen Western Peripheral Route and A90 Balmadie. This mechanism is also intended for use to deliver social infrastructure projects such as the Royal Sick Children's Hospital in Edinburgh.

Source: CSN Forecasts for 2012-2016 - Experian analysis for Construction Skills Scotland

9.23 Employment in construction is expected to stagnate this year and fall in 2012 as lower expenditure by the public sector on construction services constrains overall activity. Employment is predicted to start to rise again in 2013 and increase overall by nearly 10% between 2012 and 2016. Architects, wood trades and interior fit-out and civil engineering operatives are projected to have the highest growth rates among construction-specific trades and professions. The average annual employment growth rate over the period 2012-16 in the UK is estimated at 1.3% and Scotland has a marginally higher rate at 1.4%

10: Global benchmarking

Summary of UK position globally

10.1 The following summarises the UK's (and Scotland's where available) position in the construction sector relative to other countries.

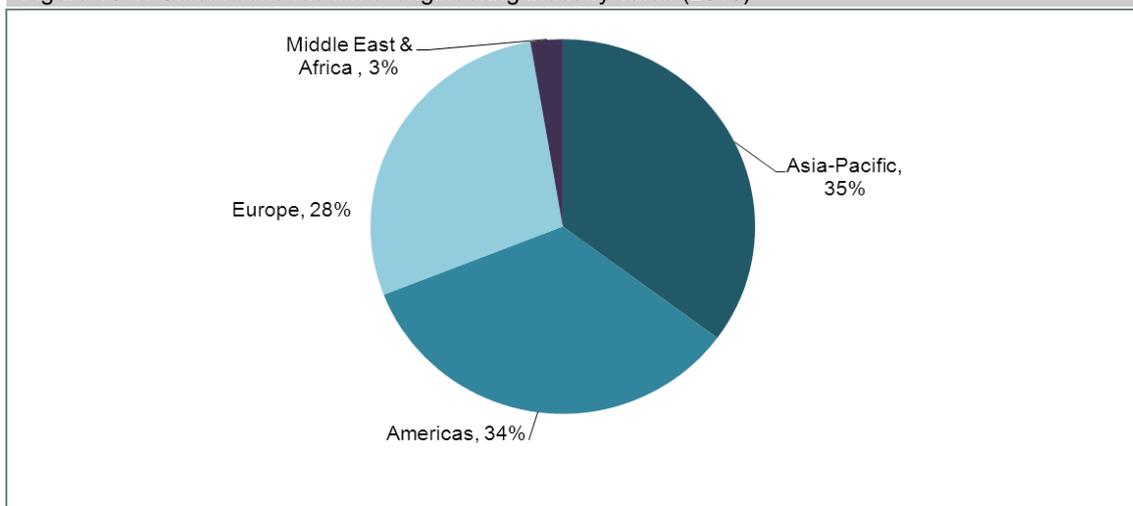
- The UK accounts for 13% of the European construction & engineering industry value. Germany accounts for a further 14%, Spain 13% and France 12% of the European industry. From a European perspective the UK is a key contributor.
- The UK construction index rate has been very much in line with the EU (27) average – it has not suffered as steep a decline, and nor did it experience the rapid growth after 2005 that characterised many other European countries. Although peaking in 2007, relatively the UK construction sector has had a stable performance over the last decade and a fairly consistent level of construction activity has been maintained.
- The construction sector in the UK absorbs a greater proportion of the employment base than in many other developed western European economies (Germany, Netherlands, Denmark, Austria, Switzerland, Sweden, and Norway). Countries where the economic structure has a relatively high dependence compared to the UK on construction tend to be the developing eastern European economies and countries that recently experienced property bubbles (Ireland and Spain).
- Analysis of recent Eurostat data (up to 2010) on professional construction services by shows that the most negative impact has been in Estonia, Ireland, Latvia and Lithuania, followed by Greece, Spain and Slovenia. The average quarterly change in turnover since 2007 has remained positive in Austria, Bulgaria, Denmark, Finland, France, Germany, Hungary, Malta, the Netherlands, Poland, Romania, Sweden and the United Kingdom, that is, in at least 13 of the EU27 Member States.
- UK construction output was 9.8% of GDP in 2010. Scotland construction output contributes just over 10% to GDP which is slightly higher than some of its western European counterparts (Germany, Sweden and Netherlands) but lower than some others (France, Italy and Belgium).
- The UK is earmarked for growth at a modest rate (relative to global trends) of 2.2% annually up to 2020. Greece and Sweden are the only other Western European countries with a growth rate above 2% (2.2% and 9.5% respectively). Positive demographic trends in the UK and Sweden will help residential construction rebound, as credit conditions moderate. Greece will register growth, but this will in fact be a small recovery from recent economic shocks. Comparatively infrastructure in the UK will grow by less than 10% by the end of the decade, compared with growth of almost 135% in Asian emerging markets.

- Scotland has fared relatively well measured against most Western European economies with a recent growth rate of 2.4%. But this is well behind the growth rate of over 6% for the Eastern European economies, and Sweden at 9.5%.

Recent performance global trends vs. UK

- 10.2 Estimates from Datamonitor²⁸ put total revenues in the global construction & engineering market at £1,467 billion in 2010, representing a compound annual growth rate (CAGR) of 1.7% for the period spanning 2006-2010. The economic downturn has affected the industry quite strongly since 2009. However the impact has varied between countries, some governments are investing in major new infrastructure systems, in the hope of pushing more money into economy through construction. For example the French government proposed to invest over £2.6 billion on construction projects and the Japanese government is joining forces with domestic companies to carry out infrastructure projects worth approximately £550 million. Figure 10-1 shows a breakdown of the global construction and engineering industry, where Asia-Pacific accounts for 35.1% of the global construction & engineering industry value closely followed by the Americas at 34%.

Figure 10-1: Global construction & engineering industry value (2010)

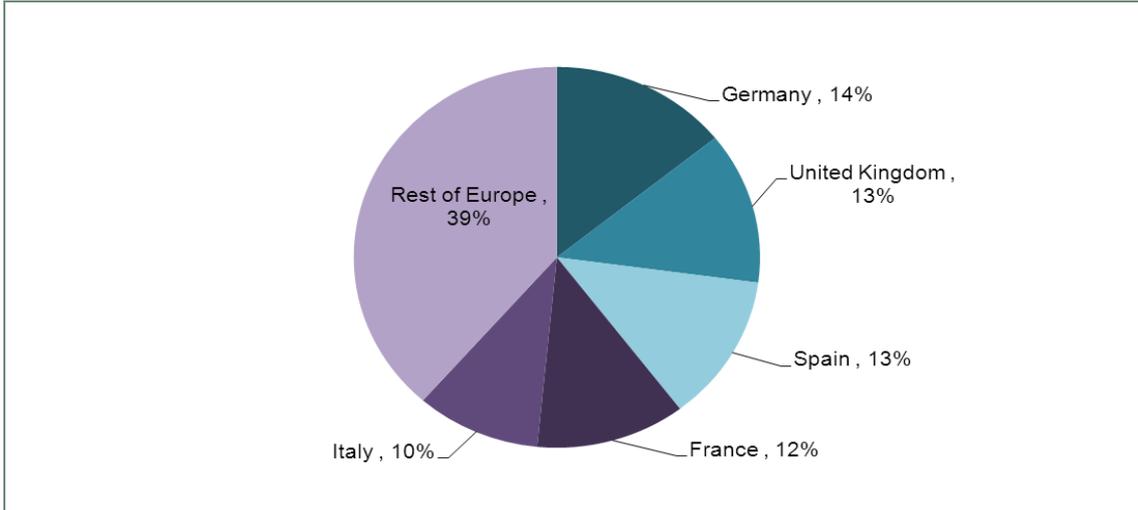


Source: Global construction and engineering trends (Datamonitor – August 2011)

- 10.3 Globally, the industry is fragmented – it is characterised by the presence of large companies such as VINCI and Bouygues S.A with a wide range of smaller scale companies operating alongside these players. Overall rivalry in the construction industry globally is assessed as moderate. The degree of rivalry within a country is affected strongly by the rate of growth witnessed over recent years. Where there has been recent strong growth, as in the United States, competitive rivalry tends to be less evident. However in regions where the industry has fallen into decline, competitive rivalry is intensified as players are forced to compete for smaller industry revenue.
- 10.4 As shown below, the UK has one of the largest construction markets in Europe, accounting for 12.9% of the European construction & engineering industry value. The other main countries are Germany, Spain and France (see Figure 10-2).

²⁸ Global construction and engineering trends (Datamonitor – August 2011)

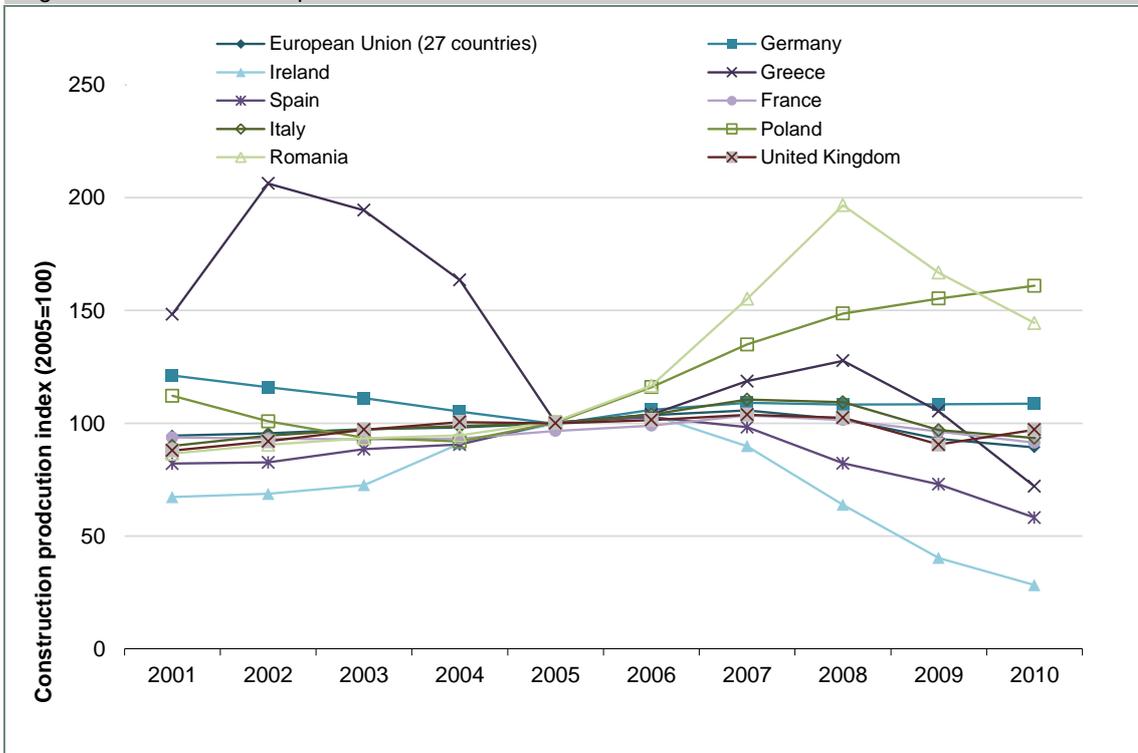
Figure 10-2: Segmentation of European construction and engineering value



Source: United Kingdom construction and engineering trends (Datamonitor – August 2011)

10.5 Figure 10-3 shows the construction production index for Europe for selected countries – the general trend had been growth across all countries until 2008 when production rates fell. Prominent are Ireland and Spain who have had steep downward trajectories since 2007. Noticeable also is Poland which has been on an upward path since 2005. The UK rate has been very much in line with the EU (27) average – it has not suffered a steep decline nor did it experience rapid growth after 2005. The high levels of construction production in Greece prior to 2004 can be attributed in large part to the preparation for the 2004 Athens Olympics.

Figure 10-3: Construction production index

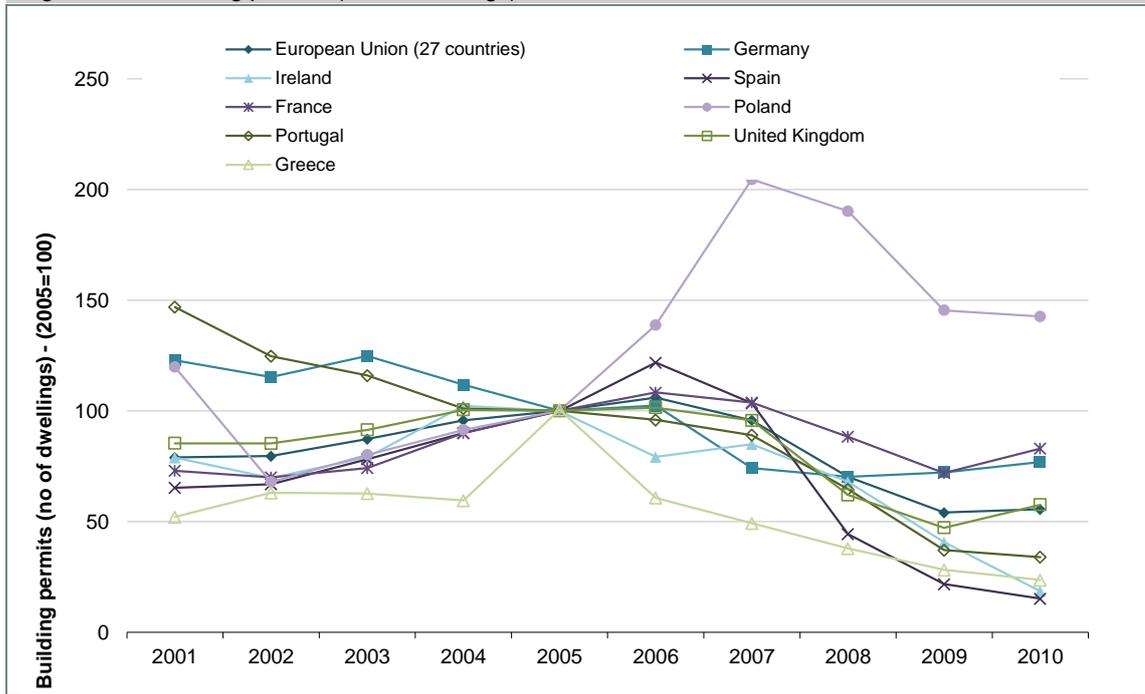


Source: Industry, Trade and Services Statistics, Eurostat.

10.6 The European building permit index is illustrated in Figure 10-4, again for selected countries. Here again the UK is similar to the EU (27) average. Building permit rates have varied across

Europe as illustrated in the dispersion of lines in Figure 10-4. In 2010 the number of building permits was well below 2005 in the majority of countries with Poland the notable exception.

Figure 10-4: Building permits (no. of dwellings) index



Source: Industry, Trade and Services Statistics, Eurostat.

10.7 Text box 10-1 gives a more detailed view of the construction sector and trends in a selection of countries – some are struggling (Ireland), others are demonstrating significant growth (India, Brazil) and others have diversified (France).

Text box 10-1: Country profiles

Ireland

The Irish construction sector is in great difficulty and this is expected to continue. The housing market in Ireland has collapsed and with it the construction sector, large numbers of houses/ offices remain unoccupied throughout Ireland as well as a large number of unfinished projects. Architects are particularly badly affected. However many companies are diversifying in country and expanding out with (e.g. many Irish companies have won contracts as part of the London Olympics²⁹), one logical area includes the new push towards Sustainable Development and opportunities in the retrofit market.

Turkey

Turkey is home to world's second largest construction export industry. Over 30 Turkish contractors are in Engineering News Record's (ENR) Top 225 International contractors. Turkey is also among the top 12 producers of building materials in the world. The domestic market with its young and developing population is full of potential in infrastructure, healthcare buildings and commercial spaces. Many top Turkish contractors are also part of some of the biggest holding companies in Turkey with their diverse range of activities. There are growing number of infrastructure projects in Turkey, with funding available from the EU, World Bank, European Investment Bank, European Bank for Reconstruction and Development etc. Arup, Swanke Hayden Architecture, RMJM, Bovis Lend Lease, AECOM and WYG are some of the UK companies that have offices in Turkey. A recent addition to these was Mott Mac Donald, who made also a successful entrance to Turkish market.

India

²⁹ This is also backed up by comments from consultees about increasing numbers of Irish contractors winning work in Scotland over the last year or two

Construction is the largest employer in the country after agriculture, employing approximately 31 million people. The decision by the Government to allow 100% FDI in real estate in 2005 has led to significant additional interest and growth, both in the real estate and construction sectors. Major international real estate companies are now looking to India to help drive their business growth. Rising income levels, rapid urbanisation, availability of credit and affordable interest rates are key drivers of growth in the housing market. India will need nearly 25 million dwelling units by 2015 requiring over £10 billion investment. The national Highway Authority of India is planning to add 50,000 km to the Indian road network by 2015. The Road projects in the Country require a total investment of £25 bn approx. Other areas of growth opportunities for the construction sector are: retail development (malls/multiplexes), hospitality industry, healthcare, Special Economic Zones, Integrated townships, green building and regeneration.

Poland

Construction output has been on the rise in spite of the global crisis. Poland's allocations of €37.6bn of European Funding, together with projects in the cities due to host the EURO 2012 Football Championships, have been the main drivers for infrastructure development. This will remain the case for several years. The largest infrastructure projects are in road construction: 710 km of roads are now under construction and over 900 km of roads are yet to be constructed. Also the Polish power sector has suffered from chronic under-investment in the past and is now planning substantial modernisation and investments worth an estimated €50bn.

France

The French market for construction products and equipment linked with renewable energies has been growing very rapidly over the last few years. This is largely due to revenue tax credit, 0% eco-loans and direct subsidies schemes put in place at both national and local levels. Insulation works in homes for example can be included in the scheme, as well as benefit from the 5.5% VAT scheme for renovation works. The market for sustainable construction materials and equipment has now entered a 'sustained' growth era, with innovations, increased public awareness and competition paving the way for a profitable sector of activity.

Brazil

The Brazilian construction sector is enjoying a boom, and its best performance ever. The Accelerated Growth Programme (known as "PAC Plan") launched in 2007 has driven investments in the areas of energy, transport, housing and sanitation. In 2010, the Brazilian government announced a new PAC 2 providing £580bn in infrastructure and public projects, targeting two main social areas: housing and health in addition to increasing energy production. In addition, the construction programmes for the development of the 2014 FIFA World Cup and 2016 Olympic Games are seen as the main driver for opening up a wide range of opportunities in the areas of construction services and goods. Construction relies heavily on manual labour, which is inexpensive in the country but there seems to be a reluctance regarding the use of new technologies to substitute this type of work.

Source: UKTI sector briefings

- 10.14 Globally construction sector performance has been divergent, with performance levels falling in many of the traditionally strong countries and the BRIC economies emerging with growing performance levels. Closer to home, in most European countries construction activity peaked between 2006 and 2008, after which there was a downturn (often considerable) in activity. A peak was reached as early as 2006 in Denmark, Ireland and Spain, while relative highs were recorded in 2007 for Belgium, the Czech Republic, Germany, Estonia, France, Italy, Latvia, Luxembourg, Austria and the UK. Portugal or Hungary (where construction output fell consistently) had no peak in activity, nor, for different reasons, did Poland (where output continues to expand). Relatively the UK construction sector has had a stable performance over the last decade and has maintained a consistent level of construction activity.

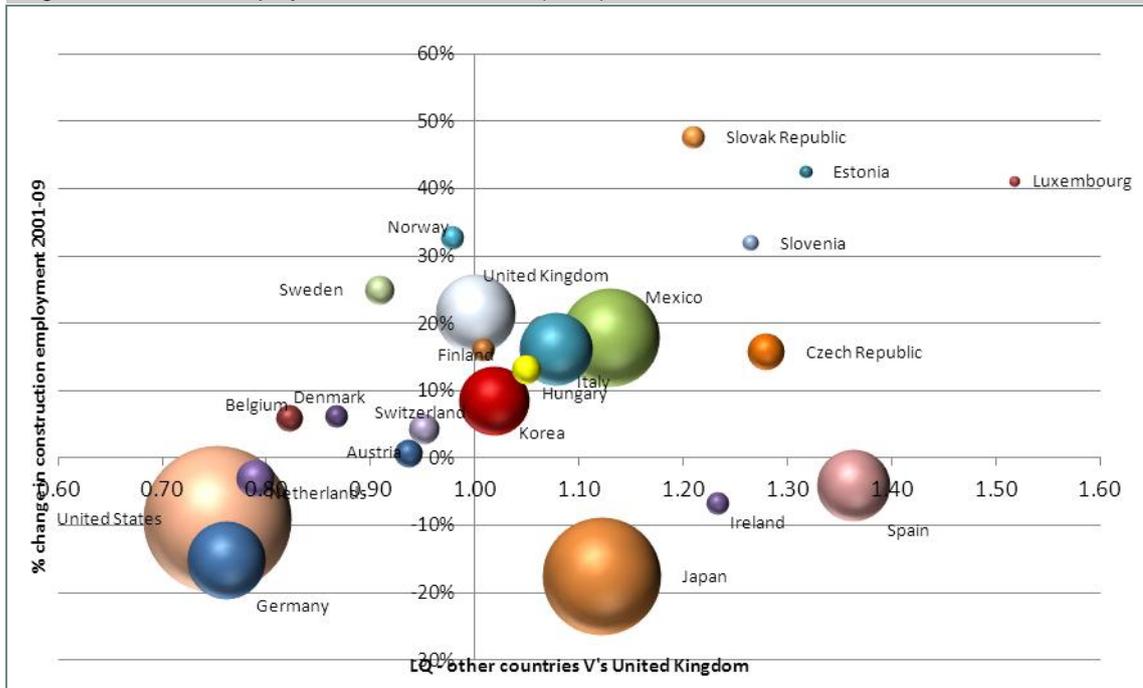
How big is the UK sector relative to other major countries

- 10.15 The relative significance in employment terms of the construction sector across 23 OECD countries relative to the UK is shown in Figure 10-5. The size of the bubbles represents the total number of employees in the constructions sector – as to be expected given population

sizes the US, Japan and Mexico all have large bubbles, whereas Luxembourg and Ireland have relatively small bubbles.

- 10.16 Bubbles to the left of the axis show that construction is under-represented in a country relative to the UK, while bubbles to the right show over-representation. Compared to the UK structure Germany, US, Netherlands, Belgium and Denmark are all less dependent on construction as part of their employment structure. Whereas the employment bases in Luxembourg, Estonia, Slovenia, Slovakia, Czech Republic, Ireland and Spain are all over-represented by the construction sector relative to the UK.
- 10.17 Bubbles above the horizontal axis indicate that construction employment has increased in the period 2001-09. Eastern European countries are especially prominent. Countries below the horizontal axis have witnessed a decline in construction employment - these include Spain, Ireland, Japan, Germany, US and Netherlands (some of these countries are notable casualties in the global economic downturn). As the bubbles are quite dispersed throughout Figure 10-5, it indicates the structure of the construction sector has a very different makeup in different countries.

Figure 10-5: Total employment construction LQ (2009)

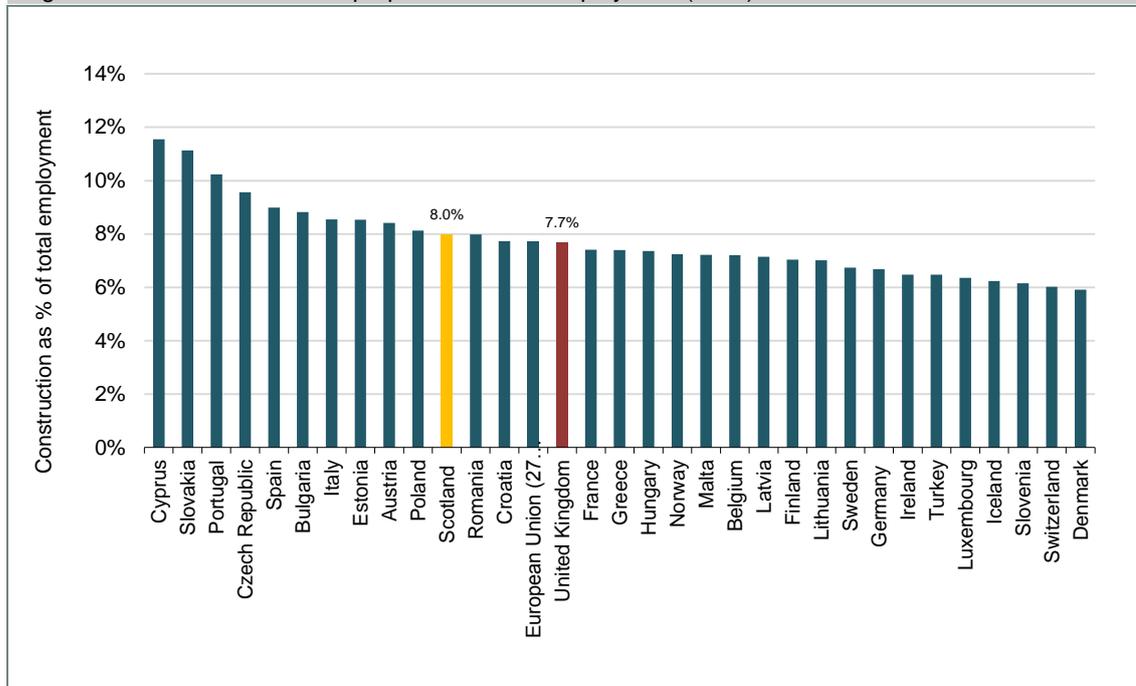


Source: OECD.stat – based on ISIC. Rev 3 definitions

- 10.18 Similar to some of the OECD data represented in Figure 10-5, the analysis in Figure 10-6 based on Eurostat data shows construction employment as proportion of total employment. Cyprus has the highest proportion of construction employment at 11.5% and Netherlands the lowest level at 5.5%. The European average is 7.7% and the UK has an identical rate to this. Here again many of the Eastern European countries are prominent as having high levels of construction employment. Much of this can be accounted for by the increased levels of European capital funds that these countries have had access to in recent years.
- 10.19 The construction sector in the UK uses a greater proportion of the employment base than many other developed Western European economies (Germany, Netherlands, Denmark,

Austria, Switzerland, Sweden, Norway). Countries where the economic structure has a relatively high dependence (compared to the UK) on construction tend to be the developing Eastern European economies and countries that recently experienced property bubbles (Ireland and Spain).

Figure 10-6: Construction as a proportion of total employment (2010)

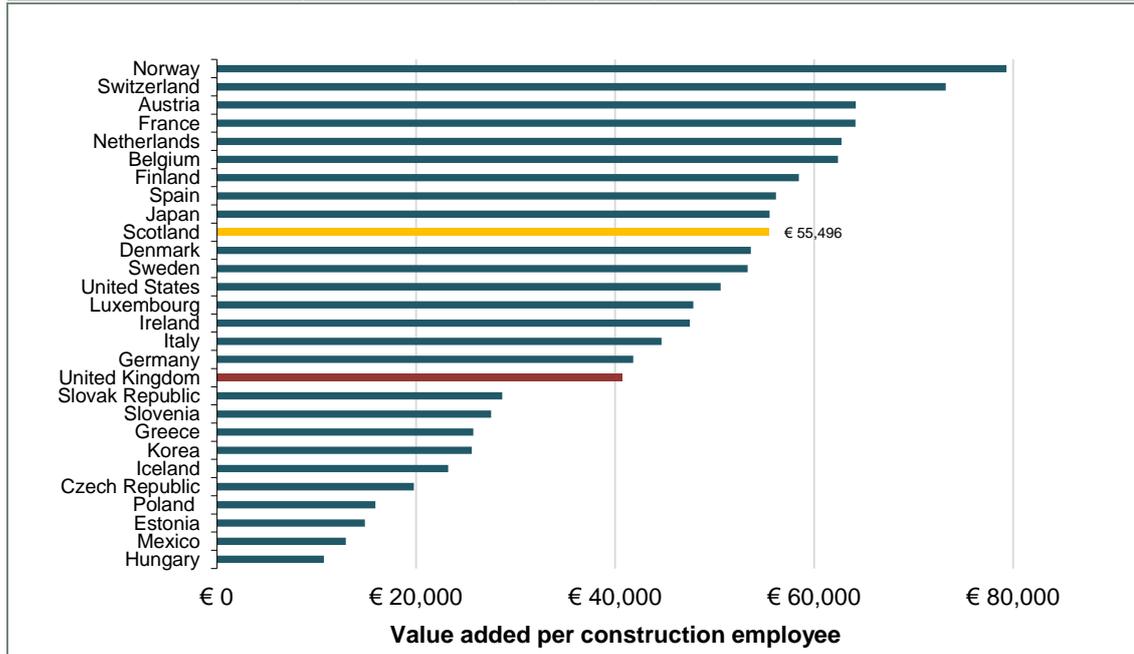


Source: Industry, Trade and Services Statistics, Eurostat.

Who are the top performing countries in construction?

- 10.20 To ascertain the top performing countries in the global construction sector, examining output trends and the employment base is not sufficient. Other indicators need to be analysed and accounted for, such as productivity levels.
- 10.21 Value added per construction employee for 27 OECD countries and Scotland is presented in Figure 10-7. The figures represent a significant range with construction employees in Norway providing the highest level of value added at approximately €79,000 per head, while Hungarian employees provide the lowest level of value added at €10,000 per head. The average level of value added across all 27 countries was €43,000. The figure for the UK was €41,000 and Scotland fared relatively better at €55,500 per construction employee.
- 10.22 A notable trend in the data is that many of the countries with smaller construction employment bases have higher value added rated per construction employee (e.g. Austria, Switzerland, Netherlands, Belgium), while many of the growing construction sectors have a low level of value added per employee (e.g. Poland, Slovenia, Czech Republic). This indicates that the construction jobs offered in many of the developing and growing economies are at the lower scale of the value added spectrum compared to the employment in the more mature economies.

Figure 10-7: Value added per construction employee (2009)



Source: OECD.stat – based on ISIC, Rev 3 definitions (except Scotland sourced from SABS)

- 10.23 Table 10-1 shows that higher productivity levels are recorded in the new European Member States in the lower value added construction employment, whereas productivity rates are higher in the Nordic countries, Benelux, UK and France in higher value added construction sectors. The analysis in Table 10-1 used 2007 data, so where available ECORYS have carried out analysis of quarterly Eurostat data (number of persons employed, new orders, production volume and/or gross wages and salaries depending on country) to get an indication of productivity levels since 2007.
- 10.24 Trends for onsite and manufacturing construction have been most negative in Denmark, Estonia, Greece, Hungary, Ireland, Latvia, Lithuania, Luxembourg, Portugal, Spain and the United Kingdom. On the other hand, Austria, Belgium, Finland, France, Germany, Poland, Romania, Slovakia and Sweden have fared relatively well in the crisis. In these countries the average quarterly change across available Onsite construction indicators has stayed positive. It is notable that those countries with the highest decreases in construction activities since 2007 are especially those that had the highest growth rates up to 2007.
- 10.25 Analysis of recent Eurostat data (up to 2010) on professional construction services by ECORYS shows that the most negative impact has been in Estonia, Ireland, Latvia and Lithuania, followed by Greece, Spain and Slovenia. The average quarterly change in turnover since 2007 has remained positive in Austria, Bulgaria, Denmark, Finland, France, Germany, Hungary, Malta, the Netherlands, Poland, Romania, Sweden and the United Kingdom, that is, in at least 13 of the EU27 Member States.

Table 10-1: Productivity in construction (onsite and manufacturing – apparent labour productivity relative to average personnel costs) and (professional construction services – turnover per person employed)

Chart	Details																																																														
<table border="1"> <caption>Wage adjusted labour productivity - Onsite Construction 2007</caption> <thead> <tr> <th>Country</th> <th>Productivity (%)</th> </tr> </thead> <tbody> <tr><td>EU27</td><td>130%</td></tr> <tr><td>EU15</td><td>128%</td></tr> <tr><td>EU12</td><td>168%</td></tr> <tr><td>AT</td><td>135%</td></tr> <tr><td>BE</td><td>117%</td></tr> <tr><td>BG</td><td>277%</td></tr> <tr><td>CY</td><td>153%</td></tr> <tr><td>CZ</td><td>124%</td></tr> <tr><td>DE</td><td>111%</td></tr> <tr><td>DK</td><td>125%</td></tr> <tr><td>EE</td><td>155%</td></tr> <tr><td>ES</td><td>125%</td></tr> <tr><td>FI</td><td>134%</td></tr> <tr><td>FR</td><td>113%</td></tr> <tr><td>GR</td><td>118%</td></tr> <tr><td>HU</td><td>132%</td></tr> <tr><td>IE</td><td>227%</td></tr> <tr><td>IT</td><td>121%</td></tr> <tr><td>LT</td><td>146%</td></tr> <tr><td>LU</td><td>123%</td></tr> <tr><td>LV</td><td>229%</td></tr> <tr><td>MT</td><td>112%</td></tr> <tr><td>NL</td><td>179%</td></tr> <tr><td>PL</td><td>146%</td></tr> <tr><td>PT</td><td>209%</td></tr> <tr><td>RO</td><td>110%</td></tr> <tr><td>SE</td><td>141%</td></tr> <tr><td>SI</td><td>175%</td></tr> <tr><td>SK</td><td>179%</td></tr> <tr><td>UK</td><td>179%</td></tr> </tbody> </table>	Country	Productivity (%)	EU27	130%	EU15	128%	EU12	168%	AT	135%	BE	117%	BG	277%	CY	153%	CZ	124%	DE	111%	DK	125%	EE	155%	ES	125%	FI	134%	FR	113%	GR	118%	HU	132%	IE	227%	IT	121%	LT	146%	LU	123%	LV	229%	MT	112%	NL	179%	PL	146%	PT	209%	RO	110%	SE	141%	SI	175%	SK	179%	UK	179%	<p>Onsite construction productivity - this shows that the New Member States generally tend to record comparatively higher wage adjusted labour productivity levels than enterprises in the EU15 Member States led by enterprises in Bulgaria, Latvia and Romania, which generated more than two Euros of value added for each Euro paid in personnel costs in 2007. Seven of the 11 New Member States for which data are available recorded wage adjusted labour productivity levels above 150%. Only Ireland and the United Kingdom among the EU15 Member States recorded wage adjusted labour productivity levels above 150% driven by a comparatively high value added per person employed. The lowest wage adjusted labour productivity levels among the EU15 Member States in 2007 were recorded by Germany, France, the Netherlands and Sweden</p>
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Source: ECORYS (2011) – Sustainable Competitiveness of the Construction Sector

However, based on output other countries fare better...

10.26 Table 10-2 shows construction output as a percentage of GDP for a range of countries. The contribution of construction to GDP varies significantly between countries, ranging from 22% to 3%. From the emerging economies – India and China can relate approximately one fifth of construction output to GDP. While the relationship of construction output to GDP in Russia and Brazil (at roughly 8%) is more similar to that of the more developed and diversified economies of Germany and the USA. Scotland construction output contributes just over 10% to GDP which is slightly higher than some of its western European counterparts (Germany, Sweden, UK, Netherlands) but lower than some others (France, Italy, Belgium).

Table 10-2: Construction output as a percentage of GDP (2010)

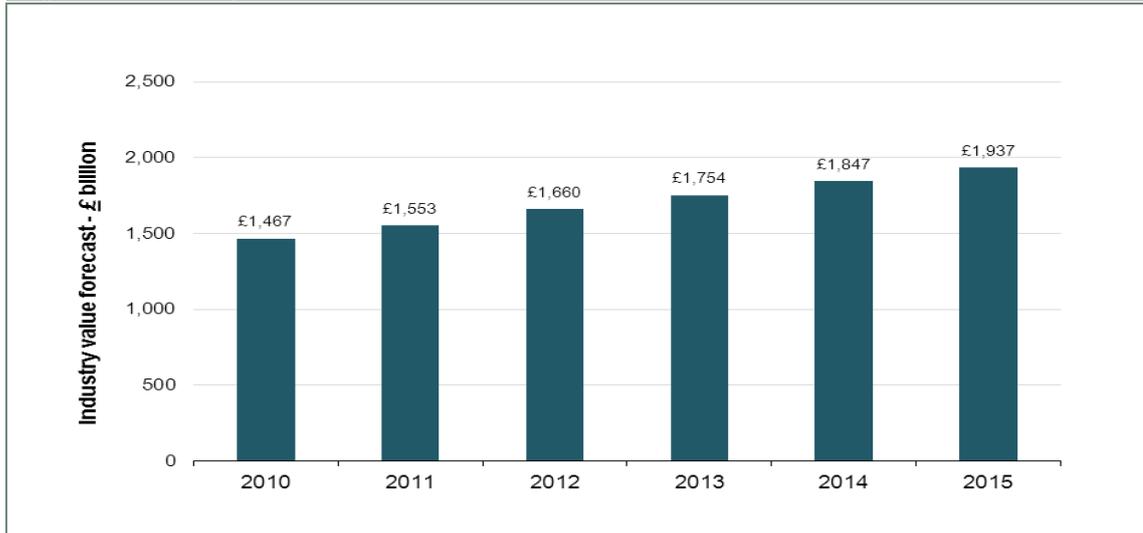
Country	Construction output as a % of GDP (2010)	Country	Construction output as a % of GDP (2010)
Indonesia	28.50%	Japan	11.20%
India	22.20%	Egypt	10.60%
Algeria	21.80%	Scotland	10.40%
Bulgaria	20.80%	Mexico	10.30%
Vietnam	19.50%	Argentina	10.30%
China	18.90%	Netherlands	10.10%
Spain	18.10%	UK	9.80%
Czech Republic	17.20%	Sweden	9.50%
Australia	16.40%	Turkey	9.20%
Romania	16.30%	Singapore	9.20%
Canada	16.20%	South Africa	8.80%
Chile	15.50%	Hungary	8.50%
UAE	15.40%	Germany	8.40%
Columbia	15.30%	Russia	8.30%
Poland	15.10%	Brazil	8.10%
Philippines	14.40%	Greece	8.10%
Morocco	14.00%	Thailand	7.40%
South Korea	12.80%	Hong Kong	6.90%
Belgium	11.90%	USA	6.70%
Italy	11.90%	Libya	5.40%
Saudi Arabia	11.80%	Ukraine	5.20%
Qatar	11.60%	Kuwait	3.70%
France	11.20%	Nigeria	3.00%

Source: Global Construction Prospects and Oxford Economic (2011) – *Scotland ONS

Future projections UK vs other countries

- 10.27 Datamonitor³⁰ estimates that in 2015, the global construction & engineering industry is forecast to have a value of £1,937.5 billion, an increase of 32% since 2010. The compound annual growth rate of the industry in the period 2010–15 is predicted to be 5.7%. Comparatively, the European and Asia-Pacific markets will grow with CAGRs of 3.6% and 7.8% respectively, over the same period, to reach respective values of £494.4 billion and £751.6 billion in 2015.

Figure 10-8: Industry value forecast



Source: *Global construction and engineering trends* (Datamonitor – August 2011)

Overall output growth, growth in different sectors (e.g. housing, infrastructure, R&M etc.) and growth in different occupations

- 10.28 Global Construction 2020³¹ provides long-term forecasts and analysis of the key drivers for growth in construction globally. Table 10-3 shows the annual growth forecasts for the construction sector in a range of countries for the period up to 2020. The countries earmarked for high growth include: Qatar, India, Vietnam, Sweden, Nigeria, Turkey and Poland.
- 10.29 These estimates indicate that the next decade will see a continuing shift in global construction towards Asia and other emerging markets where rising populations, rapid urbanisation and strong economic growth are drivers for construction. By 2020 emerging markets will account for 55% of global construction, up from 46% today. Construction will make up 16.5% of GDP in emerging markets by 2020, up from 14.7% in 2010. This shift is led by China and India, with strong contributions to growth from Indonesia and Russia. US construction will stand out from most developed countries by registering a sharp cyclical rebound. Canada and Australia will also lead construction growth in developed countries, boosted in part by demand for natural resources. Like the US, they will benefit from population growth. Also Brazil construction sector should see strong growth due to infrastructure investment as it prepares for the 2014 FIFA Soccer World Cup and the 2016 Rio Olympics.

³⁰ Global construction and engineering trends (Datamonitor – August 2011)

³¹ Global Construction 2020: A global forecast for the construction industry over the next decade to 2020 (2011), published by Global Construction Perspectives and Oxford Economics.

- 10.30 Russia and Turkey are projected to be construction hotspots in Eastern Europe over the next decade as infrastructure is built linking trade between Asia and Europe. Russia's construction growth will be more rapid than growth in GDP, as it invests in transport infrastructure and seeks to double energy output. Russian construction will also be driven by rail, road and airport upgrades to prepare for hosting the 2014 Winter Olympics in Sochi and the 2018 FIFA World Cup. Poland and Ukraine will invest in infrastructure before hosting the Euro 2012 soccer tournament. Turkey's increased investment to upgrade infrastructure ahead of potential EU membership will boost construction output sharply and move it ahead of Poland as the region's second biggest market by 2020.
- 10.31 Construction in most developed countries will be constrained by large public deficits, austerity programmes, muted population growth and limited economic expansion. Austerity programmes will severely limit recovery for construction in Western European countries. Populations are stagnating and even declining in countries such as Germany, Italy and Japan. These countries also have shrinking working-age populations, which will inevitably constrain economic growth and construction output further.
- 10.32 Countries such as France, Germany and the Netherlands have higher quality infrastructure that does not need urgent upgrading. For the UK, the US and others with relatively poor infrastructure, public spending constraints will limit necessary upgrades unless governments can attract private investment. Australia and Canada stand out among developed countries, as growth is boosted by positive demographics as well as infrastructure investment driven by demand for natural resources. Australia and Canada have been successful in attracting private financing for infrastructure development.
- 10.33 The UK is earmarked for growth but at a more modest rate of 2.2% annually. Greece and Sweden are the only other Western European countries with a growth rate above 2% (2.2% and 9.5% respectively). Positive demographic trends in the UK and Sweden will help residential construction rebound, as credit conditions moderate. Greece will register growth, but this will in fact be a small recovery from recent economic shocks. Comparatively infrastructure in the UK will grow by less than 10% by the end of the decade, compared with growth of almost 135% in Asian emerging markets.
- 10.34 Relatively in terms of Western European economies Scotland fares well with a growth rate of 2.4%, although this is well behind the growth rate of over 6% for the Eastern European economies and for Sweden (9.5%).

Table 10-3: Global Construction 2020 growth predictions 2010-2020

Country	Growth predication p.a. to 2020	Country	Growth predication p.a. to 2020
Qatar	12.5%	Thailand	5.0%
Sweden	9.5%	Australia	4.7%
India	8.7%	Algeria	4.6%
Vietnam	8.7%	UAE	4.5%
Nigeria	8.7%	Brazil	4.4%

Country	Growth predication p.a. to 2020	Country	Growth predication p.a. to 2020
China	8.3%	Canada	4.3%
Turkey	8.2%	Kuwait	4.2%
Indonesia	7.6%	South Korea	4.1%
Poland	7.5%	Argentina	4.1%
Ukraine	7.1%	Hungary	4.0%
Russia	6.8%	Czech Republic	3.5%
Egypt	6.4%	Hong Kong	3.0%
Bulgaria	6.3%	Scotland*	2.4%
Romania	6.3%	UK	2.2%
Singapore	6.3%	Greece	2.2%
Philippines	5.9%	Belgium	1.9%
Mexico	5.9%	Germany	1.8%
USA	5.9%	Netherlands	1.7%
Morocco	5.8%	France	1.6%
Saudi Arabia	5.7%	Italy	1.5%
Libya	5.7%	Spain	1.1%
South Africa	5.4%	Japan	1.1%
Chile	5.2%	Columbia	Not available

Source: Global Construction Prospects and Oxford Economic (2011) – Scotland* figure is for the period 2012-16 and based on CSN estimates

Main trends affecting growth in the next few years

10.35 A recent 2011 study³² explores trends that could impact on construction growth in the coming years. The issues highlighted include: sovereign debt crisis, championship economies, price pressures and the trend towards horizontal construction from vertical.

- The global nature of the current sovereign debt crisis could prolong the reconciliation process. In the past, countries with debt problems could often increase net exports significantly by weakening their currency, which helped support GDP growth during periods of deleveraging. It is unlikely that highly leveraged economies could achieve this in the current climate. Consequently, there is a risk that the mature economies may remain highly leveraged for a prolonged period, leading to a fragile and perhaps unstable economic outlook over the medium term.
- There is a group of sometimes overlooked emerging markets, with huge construction growth potential - the 10 ‘Championship Economies’ – Argentina, Egypt, Indonesia, Korea, Mexico, Poland, Saudi Arabia, South Africa, Turkey and Vietnam. Generally

³² Davis Langdon (2011) – Key issues for the global economy and construction

these are middle-income emerging countries with large populations, rapid urbanisation, industrialisation and changing lifestyles, all of which is attracting investor interest. Global construction businesses are developing an appetite for expanding into the ‘Championship Economies’ and as early entry provides opportunities to create markets and shape industry structures, there is likely to be more companies entering these countries.

- Increased pressure on construction prices. Loss of capacity and increased raw material prices have put upward pressure on construction costs during 2010, even though prices in many regions have continued to soften or have stagnated at best. In the UK, Europe, US and pockets of the Middle East, construction is enduring difficult times from a demand perspective, and this trend is set to continue as public support is withdrawn and private sector demand remains largely lacklustre. At the same time, construction input costs have risen. The combination of poor demand and rising input costs is likely to continue to challenge market participants.
- On a global basis, private sector construction is still suffering the after-effects of the global credit crisis, with retail, industrial, commercial and residential projects struggling with subdued demand and expensive funding costs. This, together with increasing investment from the emerging and frontier markets, has led to a shift in the type of construction from vertical to horizontal such as public transport systems, including rail, road, ports and airports, as well as water and energy projects. However this trend may well reverse again in the future, as strong economic growth in countries such as China, Brazil, Saudi Arabia and many others, is presenting a new challenge - urban policy.

11: Market opportunities

- 11.1 This section on specific market opportunities in relation to the construction sector in Scotland is based on desk based research and the discussions with businesses and stakeholders.

Summary of market opportunities

- 11.2 The two main areas of market opportunities for the construction sector in Scotland are likely to be around developing solutions that help to address the drive towards a low carbon economy and a move towards generating efficiencies and improved quality standards through the use of Modern Methods of Construction.
- 11.3 Previous research has shown Scotland has a significant number of businesses, estimated to be around 14,000, that are already involved to some extent in producing goods and services required for developing a low carbon built environment. This is about half of all businesses and organisations involved in construction. A range of businesses and research organisations are already designing low carbon buildings, developing sustainable building materials and developing other innovative approaches that will help Scotland take advantage of business opportunities in this area mainly domestically but potentially internationally.
- 11.4 Similarly, there is an increasing tendency for businesses to develop MMC with off-site construction becoming more commonplace. Scotland has particular strengths and traditions in developing timber framed houses and is now doing more in terms of developing pre-fabricated components to be used for constructing low or zero carbon buildings.
- 11.5 The main implication of these developments is to make sure that enough is done to educate all types and sizes of businesses in the sector regarding these emerging opportunities, in order to ensure that the skills and expertise required is developed in Scotland.

Low carbon

- 11.6 Low carbon activities refer to ‘the range of products and services which have the potential to reduce the carbon emissions from a building during its operational lifetime’³³ and interest in this area is being driven, largely by Government policy, both at the Scottish and UK level.
- 11.7 The Scottish Government’s Low Carbon Economic Strategy³⁴ was introduced in 2010 and has a specific section outlining the opportunities and challenges in relation to creating a low carbon built environment. Indeed, since the built environment (including the heating, lighting and running of buildings) accounts for more than 40% of CO₂ emissions in Scotland, it is identified as an area where there needs to be ‘a major focus for efforts to reduce emissions and change behaviours’. Consultees reported that the introduction of legislation, such as the

³³ Building Research Establishment (2010) Developing Scotland’s low carbon built environment – Phase 1 summary report, for Scottish Enterprise; and BRE (2010) Developing Scotland’s LCBE – Phase 2 Report, for Scottish Enterprise..

³⁴ Scottish Government (2010) A Low Carbon Economic Strategy for Scotland, Edinburgh: Scottish Government. Available at: <http://www.scotland.gov.uk/Publications/2010/11/15085756/0>

Energy Performance of Buildings Directive (EPBD) and subsequent changes to building standards have helped to drive developments in the sector in relation to the low carbon agenda. According to the Low Carbon Economic Strategy the main drivers and barriers to developing a low carbon built environment.

Table 11-1: Drivers and barriers shaping the low carbon built environment

Drivers	Barriers
<ul style="list-style-type: none"> • Value of energy savings • Higher comfort levels • Health benefits • Co-benefits and intangible benefits • Awareness and motivation • Public sector procurement of green buildings • Scottish planning policy • Improved energy standards in building regulations • Energy efficient low carbon design • Carbon trading schemes • Demand for 'green credentials' in supply chains • Increasing energy prices • Reducing dependence on imported energy sources • Enhanced resilience to future climate 	<ul style="list-style-type: none"> • Investment cost • Poor information, lack of awareness • Commercial buildings owners not always the user benefitting from improvements • The gap in energy consumption that can exist between buildings as designed and their actual performance on completion • Focus on the initial capital cost rather than 'whole life' costs • Multiple building ownership delays agreement to retrofit • Inertia to new investment and change

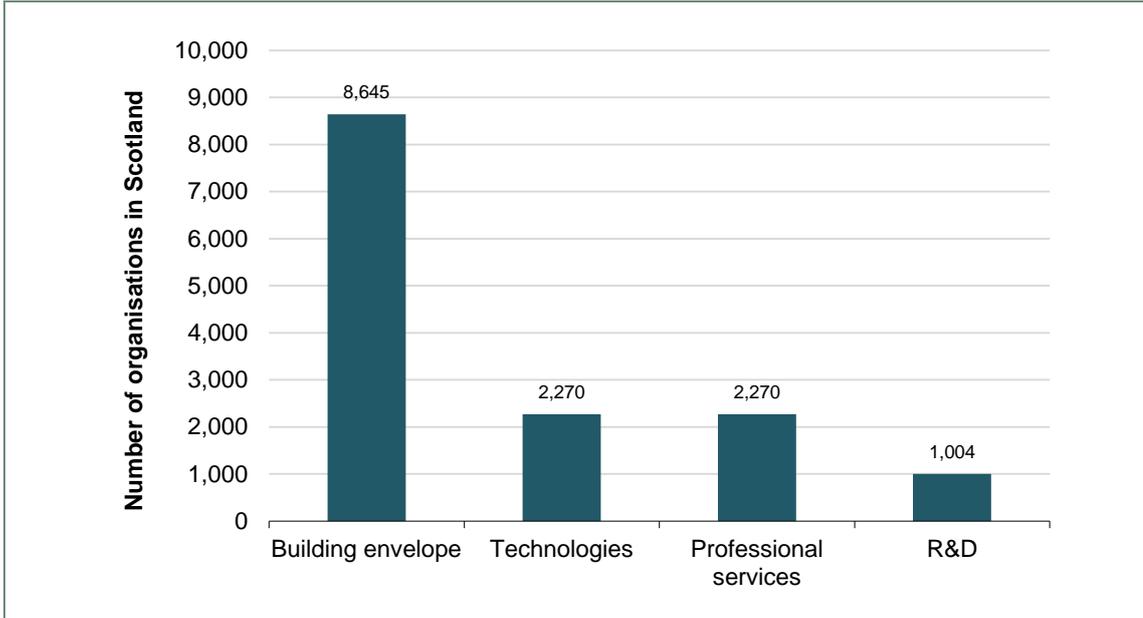
Source: Scottish Government (2010) Low Carbon Economic Strategy

Scottish businesses operating in LCBE

11.8 Research by BRE (2010)³⁵ estimated that over 14,000 organisations are already involved in LCBE (Low Carbon Built Environment) activity, as shown in Figure 11-1. The report notes the difficulty though in establishing how many firms work in the design, development and construction of low carbon buildings and related products. In order to estimate the scale of the LCBE, BRE divided the LCBE sector into four sub-sectors: 'building envelope'; 'technologies'; 'professional services'; and 'research and development activities'. These were selected because of their 'influence' on the LCBE sector and their 'categorisation' through SIC codes. In total BRE found that the building envelope sub-sector to be the largest, comprising over 60% of these firms. This is followed by technologies and professional services with equal share; and R&D firms comprising the smallest share.

³⁵ BRE (2010) Developing Scotland's low carbon built environment – Phase 1 summary report, for Scottish Enterprise; and BRE (2010) Developing Scotland's LCBE – Phase 2 Report, for Scottish Enterprise.

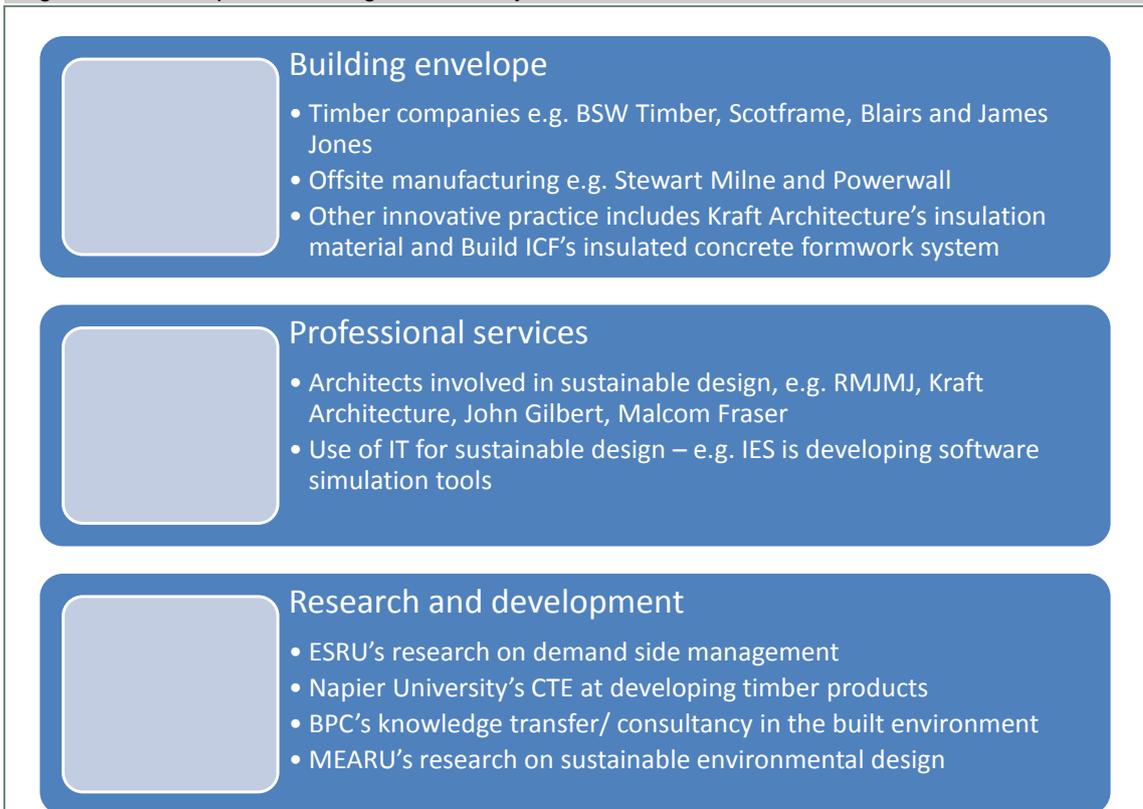
Figure 11-1: Number of LCBE (Low Carbon Built Environment) organisations in Scotland



Source: BRE (2010), *Developing Scotland's low carbon built environment – Phase 1 summary report*

11.9 Examples of organisations operating in LCBE activity are provided below.

Figure 11-2: Examples of existing LCBE activity in Scotland



Source: BRE (2010), *Developing Scotland's low carbon built environment – Phase 1 summary report and individual company websites*

Research and development and LCBE

- 11.10 The Scottish Government (2010, p58)³⁶ argued that “EU/UK and Scottish low carbon regulations (ETS, CRC energy efficiency scheme, Climate Change targets, new building standards) are already obliging the construction sector to address the growing imperative to invest in research and development and implement the use of innovative products and methods.” In addition to in-house R&D activities, there is evidence of a good level of academic activity relating to LCBE in Scotland. BRE (2010) noted that there is a history of R&D of Intellectual Property (IP) in the built environment and academic activity in LCBE is widely disseminated through journal and conference publications and networks. This suggests that Scotland is well-placed to take advantage of future market opportunities arising from this research.
- 11.11 The Research Assessment Exercise (RAE), 2008 measures the quality of research output by universities by subject area. Table 11-2 presents the Scottish universities awarded a 4* (‘world-leading’) rating for subject areas relating to LCBE. A 4* rating is defined as research quality ‘that is world-leading in terms of originality, significance and rigour’.

Table 11-2: Scottish universities awarded RAE (2008) rating of 4*

	Architecture and the built environment (ABE)	Civil engineering (CE)	Electrical and electronic engineering (EEE)
Edinburgh Napier University	X	X	
University of Edinburgh (joint submission with Edinburgh School of Art)	X		
Heriot Watt University	X	X	
Glasgow Caledonian University	X		
University of Glasgow		X	
University of Strathclyde	X	X	X
University of Dundee	X	X	
Robert Gordon University	X		

Source: BRE (2010) *Developing Scotland's LCBE – Phase 2 Report*

- 11.12 Table 11-3 presents the proportion of research staff within Scottish universities conducting research in subject areas relating to LCBE, which have been awarded a 4* and 3*. A 3* rating refers to research quality that is ‘internationally excellent in terms of originality, significance and rigour but which nonetheless falls short of the highest standards of excellence’.

³⁶ Scottish Government (2010) A Low Carbon Economic Strategy for Scotland, Edinburgh: Scottish Government. Available at: <http://www.scotland.gov.uk/Publications/2010/11/15085756/0>

Table 11-3: Scottish universities awarded RAE (2008) rating of 4* and 3*

	Research subject (ABE, CE, EEE)	Percentage of activity awarded 'world-leading' (RAE 4*) rating	Percentage of activity awarded 'internationally excellent' (RAE 3*) rating
Edinburgh Napier University	ABE	5	30
	CE	5	25
University of Edinburgh	ABE	25	44
Heriot Watt University	ABE	10	50
	CE	5	50
Glasgow Caledonian University	ABE	15	45
University of Glasgow	CE	15	40
University of Strathclyde	ABE	5	35
	CE	5	35
	EEE	15	35
University of Dundee	ABE	5	35
	CE	15	70
Robert Gordon University	ABE	10	20

Source: BRE (2010) *Developing Scotland's LCBE – Phase 2 Report*

Market opportunities

11.13 The Low Carbon Economic Strategy (Scottish Government, 2010, p60)³⁷ identifies the following two market opportunities within the built environment, which we explore further below:

- *“reducing the current energy and carbon emissions associated with new and existing buildings through energy efficient, low carbon design and specification; and*
- *exploiting innovation in sustainable building technologies in both domestic and global markets.”*

Reducing the emissions of new and existing buildings

Low/zero carbon new buildings

11.14 The move to low/zero carbon new buildings is being largely driven by new building standards. The EU Directive 2002/91/EC (also known as the Energy Performance of Buildings Directive, EPBD) defines requirements for the energy performance of buildings. It was introduced in the UK from January 2006 with a three year implementation period ending January 2009. Further new building standards are due to be introduced in 2013 and 2016 and

³⁷ Scottish Government (2010) *A Low Carbon Economic Strategy for Scotland*, Edinburgh: Scottish Government. Available at: <http://www.scotland.gov.uk/Publications/2010/11/15085756/0>

are expected to continue placing an emphasis on lowering carbon emissions although it is not clear from the existing evidence the scale that this future growth will take.

- 11.15 Scottish based organisations are already involved in R&D activities in this area. For example, the Mackintosh School of Architecture, along with Powerwall, is involved in the ZEMCH (Zero-Energy Mass Custom Home) network and this is attracting international interest. This network was established with the aim to “*enhance industry-academia collaborations to tackle issues around the delivery of socially, economically and environmentally sustainable homes in developed and developing countries*”.³⁸
- 11.16 There are also many examples of Scottish companies becoming increasingly involved in the development of low carbon homes. For example, Chap Construction in Aberdeenshire is planning to create one of Scotland's largest sustainable construction projects at Kincluney; Stewart Milne Construction and Servite Housing Association will build 50 new low carbon homes, and expertise is being developed at RGU in relation to Passivhaus construction design. A demonstrator project in South Lanarkshire, involving more than 50 partners has also been set-up. Further details about this are provided in the box below.

Aurora Low Carbon House Partnership

The Aurora project is a partnership between South Lanarkshire college, Glasgow Caledonian University, Dawn Homes and more than 50 private sector partners. It is a demonstration house that is showcasing innovative low-energy technologies and high insulation methods. It is expected to be ‘net zero carbon’ once operational and exceeds the building standard requirements that are expected to come into force in 2013 and 2016.

The house is expected to generate potential energy savings of up to £1800 per year through its use of photovoltaic panels, solar hot-water panels, an air recovery system, ground source heat exchanger, low-energy heating systems, low air leakage and energy-saving light tunnels. Data monitoring is being carried out by Glasgow Caledonian University to assess the effectiveness of the design.

The house is also being used as a training facility so that students can learn the principles behind low-energy buildings and develop related skills.

<http://www.south-lanarkshire-college.ac.uk/Renewable-Technologies/Renewable-Technologies/low-carbon-house.html> ;
<http://www.scotland.gov.uk/Topics/Built-Environment/regeneration/pir/learningnetworks/EnergyEfficientHousing/CaseStudies/CaseStudy122AuroraHouse>

Reducing the emissions of existing buildings

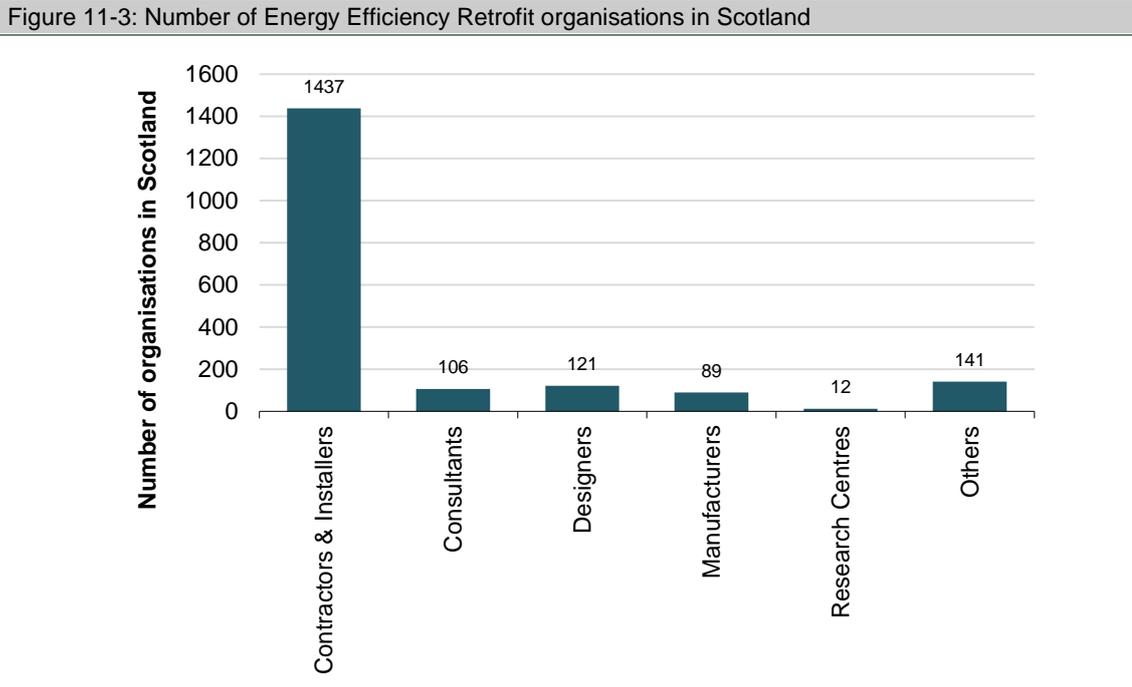
- 11.17 In addition to improving the performance of new builds, the Scottish Government (2010, p58)³⁹ has also identified a need to upgrade and retrofit existing buildings in order to improve energy performance. The Building Technologies report (AEA, 2011)⁴⁰ acknowledged that “*No data is currently collected on the size of the energy efficiency retrofit market in Scotland*” and the study sought to gather evidence about the retrofitting supply chain.

³⁸ <http://www.zemch.org/>

³⁹ Scottish Government (2010) A Low Carbon Economic Strategy for Scotland, Edinburgh: Scottish Government. Available at: <http://www.scotland.gov.uk/Publications/2010/11/15085756/0>

⁴⁰ AEA (2011) Building Technologies: Energy Efficiency Retrofit in Scotland, Report to Scottish Enterprise

Through this research, AEA developed a database of 1,834 organisations that had (potential) involvement in the retrofitting supply chain. These were broken down into six categories, as shown in Figure 11-3.



Source: AEA (2011)

- 11.18 As can be seen, the majority of these businesses are contractors and installers. The research also identified a number of competitive advantages that Scotland holds in relation to retrofitting activities. These included: a strong research base and support for knowledge transfer; market leadership in development of simulation software; availability of locally produced materials; and well-established companies in most relevant sub-sectors.
- 11.19 In terms of future growth, Frost and Sullivan (2009, p3-1)⁴¹ suggested that the renovation sector is likely to offer greater market opportunities than the new-build sector: *“Market dynamics for the renovation and new-build sector are notably different. While legislation is stricter and better enforced in new-builds, the renovation sector is set to account for a bigger share of market and opportunity. Innovation will be a bigger driving factor in the new-build market, while volume growth will be the key driver for the renovation sector.”*
- 11.20 In addition, the AEA research⁴², identified the following competitive advantages for Scotland and opportunities for growth:

Table 11-4: Opportunities and competitive advantages in energy efficiency market	
Opportunities for growth	Competitive advantages
Developing skills required for designing retrofit solutions, quality control of retrofitting and installing/maintaining new technologies	Strong research base in universities, BRE and Historic Scotland – BRE developed Standard Assessment Procedure (SAP) for energy ratings and Glasgow Caledonian/ Strathclyde Universities and BRE developed Simplified Building Energy Model (SBEM)
Improving building fabric – addressing the market for	Market leaders in simulation software with Strathclyde

⁴¹ Frost and Sullivan (2009) Western European Market for Materials for Energy Efficient Buildings.

⁴² AEA (2011) Building Technologies: Energy Efficiency Retrofit in Scotland

Opportunities for growth	Competitive advantages
cavity wall insulation (1.7m homes in Scotland with cavity wall construction) and also insulation of non-domestic buildings	University, Heriot Watt University and BRE all involved
Improving lighting systems to make it more efficient	Insulation materials being produced in Scotland including timber (with Neil Sutherland Architects and Kraft promoting use of home grown timber), wool (with sheepswool particularly useful for older buildings), and mineral wool (being made out of recycled glass by firms such as Superglass).
Improving control and monitoring technology – all non-domestic properties requiring smart meters by 2013 and domestic properties by 2019	Biomass for heating using wood waste resource
Improving hot water efficiency – described as a relatively unexploited area currently generating 25% of household CO2 emissions	Support, advice and funding through organisations such as Energy Savings Trust Scotland, Carbon Trust Scotland, Energy Saving Scotland, local authorities and other public agencies
	Distinctive housing stock , including tenements and tower blocks – Scottish firms will be able to promote breadth of expertise outside Scotland

Source: AEA (2011)

Exploiting new sustainable building technologies

- 11.21 There was some evidence that the market for new sustainable building technologies is expected to grow over time. Frost and Sullivan (2009, p3-11), for example, estimated the following compound annual growth rate (CAGR): “*The market for energy efficient building materials is expected to grow at a CAGR of 5.2 percent in unit terms, reaching a volume of 697.2 million units to 2015.*” In revenue terms, they estimated that it would grow at a CAGR of 10% between 2008 and 2015.
- 11.22 These opportunities were directly linked to the growing trend for reductions in household energy consumption in Europe, driven by a number of factors including the introduction of legislation, public opinion in favour of energy efficiency and fuel price fluctuations. The research (Frost and Sullivan, 2009) also set out a number of challenges that are expected to impact the industry over the short and medium term and would be expected to affect future market opportunities. These included the global economic downturn, a lack of willingness of homeowners to invest in energy efficiency renovations, fluctuating raw material prices and responding to regulation changes. In addition, the following factors (shown in Table 11-5) were identified as ones which would affect future growth of energy efficient building materials in both the renovation and new building markets.

Table 11-5: Total Energy Efficient Building Materials for New buildings Market (W. Europe), 2009-2015

Driver	New building	Renovation
Legislation and directives enforce higher energy performance requirements	✓	✓
Improved and more efficient building techniques to incorporate insulating materials	✓	
Increasing costs of energy	✓	✓
Relatively long time period for establishment of alternative energy resources	✓	✓
Growing consumer awareness of environmental issues	✓	✓
House building activity	✓	
Government financial subsidies and spending towards energy efficiency		✓
Larger market for renovation due to high number and long -life span of existing houses in Europe		✓

Source: Frost and Sullivan (2009)

11.23 In terms of supporting businesses to access these market opportunities within the LCBE sector, BRE (2010) suggested:

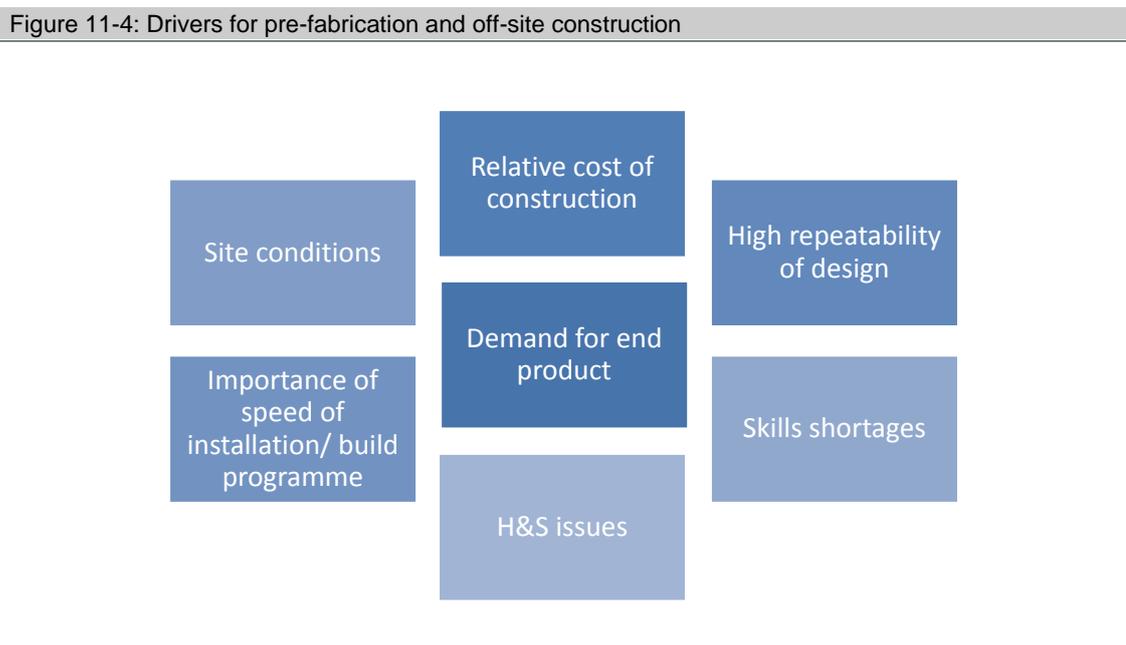
- Supporting firms that are developing new products and systems within the building envelope sub-sector (e.g. Powerwall, Stewart Milne, BuildICF, CCG (Scotland), BSW Timber, Scotframe and James Jones). This support could include:
 - provision of funding for product and/or manufacturing capability
 - generating demand for these firm's products (e.g. pre-commercial procurement model)
 - provision of a 'platform' for dissemination of new product information and engagement with wider industry
- Utilities and renewables sub-sector could be supported e.g. renewable heat
- Support could be provided to 'cleantech' firms (e.g. Proven Energy, Ghia Wind and Windsave)
- Also, more support might accelerate the commercialisation of technologies from the university base.

Modern Methods of Construction

11.24 Modern Methods of Construction (MMC) refers to "a range of processes and technologies which involve prefabrication, off-site assembly and various forms of supply chain specifications"⁴³. This is an area which consultees felt is growing in importance, fuelled by various factors such as site conditions and the need to minimise waste. Research by WRAP

⁴³ BRE (year unknown), BeAware Supply Chain Resource Efficiency Sector Report: Modern Methods of Construction, available at: http://www.bre.co.uk/filelibrary/pdf/rpts/BeAware_MMC_Sector_Report_02Mar09.pdf

(2007)⁴⁴ identified the following drivers for pre-fabrication and off-site construction, as shown in Figure 11-4.



Source: WRAP (2007)

11.25 Although consultees anticipated that this was an area offering future market opportunities, the existing evidence base did not provide any quantified forecasts for market growth. In terms of existing market activity, the Offsite Online directory⁴⁵ identifies 35 Scottish companies involved in the supply of off-site systems. Examples of organisations listed in the directory include the following.

Table 11-6: Examples of off-site construction in Scotland

Company	Scottish HQ/ office	Activity
CCG	Cambuslang	In 2010 it opened a new facility in Cambuslang for the off-site assembly of timber-framed houses. The company is involved in building houses for sale or rent as part of the £200 million Commonwealth Games Athletes' Village. CCG is a key member of the City Legacy Consortium involved in building the £200 million Commonwealth Games Athletes' Village in Glasgow. The Village project will include the development of 700 riverside homes and related accommodation for the Games Village. CCG is a major employer in the construction sector with 570 staff, including 75 apprentices ⁴⁶
Powerwall	Wishaw	Industry leaders in Premixed Renders, Insulation Render Systems, Single Skin Walling Systems, Aluminium Honeycomb and Volumetric Modular Building Systems allowing for Offsite Manufacture.
ScotFrame	Cumbernauld	Offer a range of advanced, closed panel, factory insulated, high thermal performance wall, roof and floor systems. The company has its own 'Val-U-Therm' system for timber frames manufactured in a factory quality controlled environment that minimises waste and provides a cost effective solution.

⁴⁴ WRAP (2007) *Current Practices and Future Potential in Modern Methods of Construction*, WAS003-001: Full Final Report

⁴⁵ <http://www.offsiteonline.co.uk/>

⁴⁶ Scottish Government press release (2009)

Company	Scottish HQ/ office	Activity
Carillion	Bishopbriggs (Carillion Civil Engineering)	Carillion was the lead contractor for the £370 million Airdrie – Bathgate rail link project. This project is highlighted as a good example of addressing logistical challenges to reduce waste and also help to reduce carb on emissions. One example was the use of off-site manufactured bridges which allowed an accelerated programme, in some cases reducing installation time from 16 weeks to two weeks.

Source: Company websites, Scottish Government and WRAP

Skills implications from increased use of MMC

- 11.26 Consultees noted that an increase in off-site construction would have implications for future skills development in the industry. This was supported by research carried out by Construction Skills (2008)⁴⁷ which found that *“The main implications of an increase in MMC for training appear to be training for new skills on-site, more mechanical handling on-site, a reduction in demand for certain trades on-site, but a compensating increase in parallel trades off-site in factory environments, and higher levels of computer aided design (CAD).”* At the same time, the research found that MMC was less likely to have a significant impact on the skills required for repair and maintenance jobs.

⁴⁷ Construction Skills (2008) 2020 Vision – The Future of UK Construction, available at: http://www.cskills.org/uploads/2020VisionScenariosforconstructionskills_tcm17-11077.pdf

12: Conclusions

- 12.1 In this section we set out the main headlines and conclusions from the research and provide some recommendations for the areas which could be explored further and developed as part of the sector's strategy.

Economic performance

- 12.2 Based on the data provided by the Scottish Government, the overall number of employees (i.e. individuals that are employed) in the Scottish construction sector and supply chain decreased from 171,000 in 2006 to 168,000 in 2009 (but with a significant dip between 2008 and 2009). Total employment (i.e. taking into account people with more than one job) in the Scottish construction sector and supply chain decreased from 203,800 in 2008 to 184,400 in 2009 (no employment data was available for 2006 and 2007). Based on ONS estimates in 2009, there were also 59,000 self-employed in the construction sector.
- 12.3 Again using ONS data on employment since 2009, it would appear that employment in the sector decreased by a further 9% but that self-employment increased over those two years by 12%, from 59,000 to 66,000. **According to ONS, the overall number of jobs in the construction sector in 2011 was estimated to be 236,000 (i.e. 170,000 employee jobs and 66,000 self-employed).**
- 12.4 The economic performance in terms of sales and GVA in the construction sector and supply chain increased marginally over the three year period from 2006 to 2009. However, there was a significant drop from 2008 to 2009, when sales and GVA both fell by approaching £3 billion. The employment trends data point to a similar fall in sales and GVA in the sector and supply chain between 2009 and 2011. Based on the most recent available data (2009), two of the three main construction sub-sectors have higher productivity levels than the average for all sector. This is also the case for professional services which make up part of the construction sector supply chain

Recent trends

- 12.5 According to ONS construction output data, sales relating to private sector housing decreased from £2.5 billion down to just over £1.4 billion in 2010 (-43%). All output relating to new work has decreased by 11% over the four years with a particular large drop between 2008 and 2009.
- 12.6 Output relating to repair and maintenance increased by 30% over the last four years mainly through increases in housing and infrastructure R&M. For all construction output, a 1% increase was recorded over the four years but in with a significant dip in 2009.
- 12.7 Trend data on the number of insolvencies, housing supply and planning applications all demonstrate how demand and activity in the sector has fallen over the last four years.

Industry mapping

- 12.8 The construction sector is dominated by micro-sized businesses. These account for 90% of the sector in Scotland. Businesses with less than five employees account for approaching 90% of firms involved in architectural activities. Civil engineering firms tend to be slightly larger.
- 12.9 In terms of overall construction employment numbers, the main concentrations are to be found in Glasgow, Aberdeen, Edinburgh and Aberdeenshire, together accounting for 42% of Scotland's workforce.
- 12.10 The construction sector is an important driver of the wider economy due to the impact that construction investment has on other sectors. Based on Scottish Government's Input Output data, construction has the 10th highest output multiplier out of 126 industry groups.

Key issues – strengths and weaknesses

- 12.11 The main strengths of the sector were as follows:
- The acceleration of capital expenditure and delay in Scottish public sector cuts helping to maintain activity during 2010 – this was seen as helpful in 'softening the blow'. The ability of the Scottish Government to make its own funding decisions was seen as a positive in relation to construction projects.
 - Research excellence in Scotland's universities and work of BRE in innovation/skills areas. Also the fact that academics and industry are willing to collaborate – it was stated that this is easier to do in a smaller country through face-to-face networks involving key players.
 - Work of skills agencies and FE in supporting skills development e.g. availability of Modern Apprenticeships for construction and related sectors. There is a strong tradition of developing graduates. More generally the skill set of the Scottish workforce was highlighted their being particular strengths in engineering.
 - New legislation to address climate change and carbon emissions is believed to be driving innovation in the sector. Scotland is believed to be well placed to respond to zero carbon challenge compared to rest of UK (e.g. tradition of timber frame housing) and the significant investment in renewables infrastructure in Scotland is seen as a strength.
- 12.12 The main weaknesses of the sector were as follows:
- One of the main weaknesses identified by businesses and stakeholders was the low levels of private sector demand in the last few years following the recession. This has been particularly noticeable in the major decrease in house building. It was stated that there continue to be difficulties for construction firms in trying to access bank lending
 - Public procurement practices and procedures were also said to be a weakness. The scaling up of contracts (with more administrative burden) has reportedly made it more difficult for Scottish SMEs to bid/ win work. There was also a general

perception that in the last few years there has been increased competition from Irish/English based contractors

- Although there are some existing testing facilities such as BPAC, it was believed that Scotland needs to have a national testing centre with all relevant public, private and academic partners involved. The fact that many Scottish firms currently need to send products to England for testing is reportedly hindering the sector's ability to bring new products to market.
- The planning system was highlighted by some businesses as too bureaucratic and contributing to project delays resulting in additional costs – 'too much red tape'
- Some consultees also stated that the effects of the recession will mean that capacity is lost to the sector. For example, representatives of both the architects and surveyor sub-sectors highlighted examples of newly qualified graduates moving abroad or into other sectors to find work. Due to the current lack of work, insufficient numbers of apprenticeships are being supported. Certain sub-sectors are expected to have issues with an ageing workforce with a limited supply of new workers coming through.
- On the whole, most businesses stated that the economic conditions have made it more difficult to invest in training, skills and innovation (but this was contrasted by some larger companies that have seen increased competition as a driver for being more innovative, in order to survive).
- The general attitude of the sector was described as being 'reactive' – evolving in line with what the market and clients demand. It was stated that although the public sector has been forthcoming in terms of policy ambitions in terms of developing a low carbon economy. Guidance for the sector on how these policies will actually translate into solutions was said to be less clear.
- Some consultees also highlighted the fragmented nature of the sector as a weakness especially in terms of representation and lobbying. One consultee stated the 'need for industry to be heard, not just represented'.

Growth prospects – opportunities and threats

12.13 The main opportunities for the construction sector are believed to be the following:

- Scottish Government's continuing commitment to large capital projects (V&A, Forth Replacement, Aberdeen WPR) and more SFT/NPD projects coming through such as Sick Kids Hospital Edinburgh, Glasgow Colleges
- It was also believed that there would be significant opportunities associated with building the infrastructure and facilities (e.g. athletes village) required for the Commonwealth Games
- Increasing demand for sustainable/ low carbon technologies was seen as a major opportunity for Scotland – particular opportunities in retro-fitting insulation into

traditional housing stock (e.g. addressing energy efficiency in older buildings could make a major difference to CO2 emissions from the built environment)

- Increasing demand from the public sector for social/ affordable housing – with at least some housing being built in the short term (notably, 1,000 homes through NHT) in order to address continuing growth in population and a move towards smaller households
- Developing the supply chain in growth areas of R&M, energy efficiency, waste management and providing clearer guidance on standards and technologies that need to be used. A particular need and opportunity was identified to develop the supply chain in Scotland for zero carbon housing (at present there is still a need to bring in overseas companies to fit components)
- Increasing the number of Scottish companies winning work in England. It was also stated that more could be done to help Scottish firms to internationalise and take leading edge innovation developed in Scotland overseas
- Ensuring the procurement process is efficient at the same time as ensuring smaller firms can access public sector contracts was seen as an opportunity, especially at a time when the sector remains dependent on public sector work
- More joined up working between the different sub-sectors and the different representative bodies was seen as very important in order to develop a single voice for the wider construction sector. This would then be beneficial for dealing with Government, promoting the sector as a career for young people and helping Scottish firms to tap into overseas markets.

12.14 The main threats were believed to be:

- General concerns about double-dip recession. There is a risk that uncertainty in the Eurozone and further global economic shocks will dampen demand further in both the private and public sector. This would also impinge on mortgage lending and depress any potential housing demand revival
- Continuing decline in public sector investment (housing, schools, hospitals & some smaller infrastructure projects). The recent Scottish Government Infrastructure Investment Plan highlights the upcoming cuts to capital spend. The private sector is being expected to pick up the slack when public sector cuts kick-in – but will not be in any position to take the lead
- On-going economic uncertainties and low confidence levels e.g. Eurozone crisis – whilst there was perhaps some recovery in 2010, confidence fell again in 2011, raising doubts as to when the economy will actually get back on track
- Increasingly complex procurement procedures – difficulties for smaller firms. Framework/ Hub company approach tends to suit larger rather than smaller firms (although some big firms state that having fewer larger contracts to bid for makes it difficult for them too)

- Shortage of housing due to lack of private sector investment and availability of mortgages (supply and demand issues). For many house-builders there are concerns about the costs of implementing low carbon technologies into new housing (meeting new building regulations)
- Loss of skills in different sub-sectors – the realisation that a whole generation of school leavers will be lost to the sector which could have longer term implications.

UK and global benchmarking

- 12.15 In 2011, the top 100 building contractors in the UK, many of whom are active in Scotland, saw a drop in turnover of £0.5 billion, demonstrating the continuing economic challenges in the UK construction sector.
- 12.16 In terms of construction output, Scotland has the fourth highest levels out of the UK regions, behind only London, South East and South West.
- 12.17 Using ONS output data, Scotland's construction sector has one of the most productive workforces among UK regions, at around £67,000 GVA per employee it is behind only London and the North East. Scotland also differs from other UK regions in terms of the scale of growth in recent years and its size relative to the total workforce. Although Scotland's construction sector appear to be relatively high in a UK context, there remains scope to improve it to move towards higher performing countries such as Norway and Switzerland which have the highest levels of value added in OECD countries.
- 12.18 The projection for annual growth in the UK construction sector over the next four years is estimated at around 2.3 to 2.4%. Construction Skills puts Scotland marginally higher than the UK average which would tie in with the fact that Scotland appears to have one of the better performing construction sectors in the UK.
- 12.19 The construction sector in the UK uses a greater proportion of the employment base than in many other developed western European economies (Germany, Netherlands, Denmark, Austria, Switzerland, Sweden, and Norway). Countries where the economic structure is more dependent than the UK on construction tend to be the developing eastern European economies and countries that recently experienced property bubbles (Ireland and Spain).
- 12.20 The Global Construction 2020 report provides long-term forecasts and analysis of the key drivers for growth in construction globally. Table 10-3 shows the annual growth forecasts for the construction sector in a range of countries for the period up to 2020. The countries earmarked for high growth include: Qatar, India, Vietnam, Sweden, Nigeria, Turkey and Poland. However, the largest construction sectors will continue to be China, India and the US.
- 12.21 The UK is earmarked for growth but at a more modest rate of 2.2% annually. Greece and Sweden are the only other Western European countries with a growth rate above 2% (2.2% and 9.5% respectively). Positive demographic trends in the UK and Sweden will help residential construction rebound, as credit conditions moderate.

Market opportunities

- 12.22 The two main areas of market opportunities for the construction sector in Scotland are likely to be around developing solutions that help to address the drive towards a low carbon economy and a move towards generating efficiencies and improved quality standards through the use of Modern Methods of Construction.
- 12.23 Previous research has shown Scotland has a significant number, estimated to be around 14,000, of firms that are already involved to some extent in producing goods and services required for developing a low carbon built environment. This is about half of all businesses and organisations involved in construction. Many businesses and research organisations are already engaged in designing low carbon buildings, developing sustainable building materials and bringing forward other innovative approaches that will help Scotland take advantage of business opportunities in this area – initially mainly in the domestic market but potentially internationally.
- 12.24 There is also an increasing tendency for businesses to develop MMC with off-site construction becoming more commonplace. Scotland has particular strengths and traditions in developing timber framed houses and is now doing more in terms of developing pre-fabricated components to be used for constructing low or zero carbon buildings.
- 12.25 The main implication of these developments is to make sure that enough is done to educate all types and sizes of businesses in the sector regarding these emerging opportunities, and to ensure that the skills and expertise they require are developed in Scotland.

Recommendation to take forward for strategic priorities

- 12.26 Given these headline opportunities, the main recommendations are for areas where new initiatives, led by the industry but supported by the public sector, might have a substantial impact in accelerating further development. These are:
- Developing a ‘Centre of Excellence for Scotland’, combining training and testing of new technologies to ensure new products can be brought to market much more quickly. Although there is clearly much being done by FE/HE/BRE and others, this type of idea would help create a national focus and ensure greater collaboration between different parts of the industry
 - Ensuring skills providers are geared up to main areas of demand. This is perhaps quite an obvious recommendation but the feedback from industry suggested that skills requirements are changing quickly, especially with the expected move towards more repair and maintenance. Organisations will need to think through the different skills sets – some will be building on traditional skills, others, for example, around installing smart energy and heating systems, may be more specialist.
 - Ensuring more information and support on low carbon implications for SMEs in the sector. Consultees noted that while much has been said about the importance of the built environment in creating a low carbon economy, and high level policies are in place, guidance as to how this can be realised in practical terms has still to emerge

- Promoting the economic and environmental benefits of offsite construction and MMC. Some of the larger companies have started building their own facilities for off-site fabrication but more could be done to promote its importance, by helping to address health and safety issues, bringing down costs, ensuring higher quality through pre-installation testing and incorporating low carbon technologies.
- Ensuring that more Scottish SMEs have the ability to access public sector contracts. This remains one of the most important issues for businesses, especially smaller firms, and has perhaps taken on greater importance because of the dependency on public sector contracts in the last few years. It would appear that more could be done in terms of working with the Scottish Government to try to ensure more contracts can be won by Scottish SMEs which are acknowledged as the 'life blood' of the sector, either through further adaptation of procurement policies or via encouraging SMEs to 'collaborate better to compete'.
- Assisting in promotion of Scottish research and industry overseas. Up until now most export activity has been restricted to the professional services (e.g. architects) associated with construction. Feedback from industry suggests that more could be done by Scottish Enterprise, SDI and the Scottish Government to help promote businesses and research organisations in Scotland which are leading on new innovations that could be taken to other markets.

Annex A: SIC code supply chain analysis

- A.1 As agreed at the inception meeting for the project, the main source of data on the economic performance of the sector was an analysis provided by the Scottish Government based on the most relevant SIC codes. This included the ‘core’ SIC 07 codes for construction – SIC 41 (Construction of buildings), SIC 42 (Civil engineering) and SIC 43 (Specialised construction activities) – and also a series of ‘supporting’ SIC codes to capture the main elements of the construction sector supply chain. The data shows the number of employees, total sales and GVA generated by the sector and supply chain. SIC 07 codes were used for 2008 and 2009 data and SIC 03 codes were used for 2006 and 2007 data.
- A.2 As part of our desk review, we reviewed the Scottish Government’s input-output tables to establish the construction sector’s links with other sectors in the economy. Although the latest input output tables are from 2007, it was agreed in consultation with Scottish Government statisticians that the relationship between sectors is likely to be relatively similar year on year. The table below shows the SIC codes that were included in the supply chain analysis.
- A.3 The percentages of ‘attributable activity’ were based on the proportion of sales from these sectors purchased by the core construction sector (SIC 41 to 43). In order to avoid any disclosure issues, data for the supply chain were grouped into three categories. The first group includes quarrying, logging and all manufacturing, the second group includes wholesale activity and the third group includes architectural, engineering and technical consultancy activities. It was decided, in agreement with Scottish Enterprise that notional percentages where their relevance to the construction supply chain was more apparent.

Table A-1 : Agreed SIC 07 codes to use in construction sector and supply chain analysis

SIC code	Description	Attributable activity	SIC code	Description	Attributable activity
41	Construction of buildings	100%	23.63	Manufacture of ready-mixed concrete	90%
42	Civil engineering	100%	23.64	Manufacture of mortars	90%
43	Specialised construction activities	100%	23.65	Manufacture of fibre cement	90%
2.20	Logging	20%	23.69	Manufacture of other articles of concrete, plaster and cement	90%
8.11	Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate	70%	25.11	Manufacture of metal structures and parts of structures	60%
8.12	Operation of gravel and sand pits; mining of clays and kaolin	70%	25.12	Manufacture of doors and windows of metal	60%
16.23	Manufacture of other builders' carpentry and joinery	40%	25.21	Manufacture of central heating radiators and boilers	40%
20.30	Manufacture of paints, varnishes and similar coatings, mastics and sealants	25%	25.29	Manufacture of other tanks, reservoirs and containers of metal	40%
22.11	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	20%	25.30	Manufacture of steam generators, except central heating hot water boilers	40%
22.19	Manufacture of other rubber	20%	26.11	Manufacture of electronic	35%

SIC code	Description	Attributable activity	SIC code	Description	Attributable activity
	products			components	
22.23	Manufacture of builders' ware of plastic	35%	46.13	Agents involved in the sale of timber and building materials	50%
23.41	Manufacture of ceramic household and ornamental articles	60%	46.63	Wholesale of mining, construction and civil engineering machinery	50%
23.42	Manufacture of ceramic sanitary fixtures	60%	46.73	Wholesale of wood, construction materials and sanitary equipment	50%
23.43	Manufacture of ceramic insulators and insulating fittings	60%	71.11/1	Architectural activities	100%
23.44	Manufacture of other technical ceramic products	60%	71.11/2	Urban planning and landscape architectural activities	50%
23.49	Manufacture of other ceramic products	60%	71.12	Engineering activities and related technical consultancy	50%
23.32	Manufacture of bricks, tiles and construction products in baked clay	85%	71.12/1	Engineering design activities for industrial process and production	50%
23.51	Manufacture of cement	25%	71.12/2	Engineering related scientific and technical consulting activities	50%
23.52	Manufacture of lime and plaster	25%	71.12/9	Other engineering activities (not incl engineering design for industrial process and production for engineering related scientific and technical consulting activities)	50%
23.61	Manufacture of concrete products for construction purposes	90%	74.902	Quantity surveying activities	100%
23.62	Manufacture of plaster products for construction purposes	90%			

Source: SQW analysis of SIC codes

Annex B: Consultee list

B.1 We are grateful to the following stakeholders who participated in this study.

Table B-1 : Consultees

Organisation	Consultee
BRE Scotland	Rufus Logan
CECA	Alan Watt
Edinburgh Napier University	Professor Sean Smith
Glasgow School of Art, Mackintosh School of Architecture	Dr Masa Noguchi,
Homes for Scotland	Karen Trouten
RIAS	Neil Baxter
RICS Scotland	Neil Freshwater, Policy and Practice
Robert Gordon University, The Scott Sutherland School of Architecture & Built Environment '	Gokay Deveci,
Scottish Government - Building Standards	Gavin Peart
Scottish Government - Housing	Ewan Cameron-Neilson
Scottish Government - Procurement	Colin Judge
Scottish Water	Bob Wilson
SDS	Ian Goudie
Transport Scotland	Stephen Thomson
Zero Waste Scotland	Marissa Lippiatt