



New Housing & Future Construction Skills

Adapting and Modernising for Growth

May 2019

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Chair Foreword

The house building sector provides a significant contribution to Scotland's economy, environment and society. Over the last decade innovation and improvements in building performance has resulted in some new homes having energy bills which are 15% of the average second hand home fuel energy costs. Carbon reductions have reduced 75% compared to 1990 baseline levels and site waste and landfill has been reduced through increased use of offsite construction approaches. Community benefits can be wide ranging including employment, skills investment, sub-contracting companies and being the largest non-public sector contributor for new schools, roads, infrastructure and community facilities. Housing delivery encompasses a wide range of stakeholders involving private house builders, developers, large contractors, SMEs, housing associations and local authorities.

Whether through the number of people directly employed, and the indirect jobs which are supported, its reach is across Scotland both urban and rural. Ensuring there is the correct supply of appropriate skilled staff to deliver the required housing and future types of technologies for design, management and construction is critically important. Our communities depend upon the delivery of new homes which has legacy into future generations. During the course of the past eleven months I have had the opportunity to meet many different stakeholders and organisations who contribute so much to this sector. To hear from SMEs and large companies of their plans and ambitions for the future provided helpful insight towards this report. It has also provided the opportunity to listen to issues and barriers which may directly or indirectly affect skills development and future supply.

The current high employment levels in Scotland creates a very competitive environment with other industry sectors to attract future entrants. Early engagement in primary and secondary schools, better use of social media to promote the sector and creating a more diverse workforce could help attract new entrants. Fairness and investment in skills, as outlined by the Taylor Report on *Modern working practices*, can be a key attribute in attracting future workforce.

In the short term there are skills supply shortages and an ever pressing need for more homes to be built. Scotland has led many of the changes in the UK for offsite construction, particularly for timber based homes. Companies have invested in manufacturing facilities for offsite construction for new homes but they also require known future activity pipelines to support housing growth and future skills investment. Additional training support both for new entrants and upskilling existing staff is required both for offsite and onsite.

The new build housing sector is on a journey and over the next 10-20 years will be transformative in terms of the types of technologies and homes it will build. The pace of technology in other sectors has been faster but we are now in a transitioning period for house building and wider construction sectors. Given the range of potential changes in future new home power supplies, smart technologies, energy saving devices, EV charging and self-powered homes the coming period presents challenges but also exciting opportunities for new skill sets, workforce diversity, new entrants and their careers. Investment in our colleges to update and integrate new training facilities for the technologies ahead is required. This is an opportunity to

adapt and modernise and to reach out to attract young people to have a future career in the house building sector.

At the same time with growing offsite construction and new technologies there needs to be a balance. The industry still requires a supply of expert site and craft skills. As such the industry, skills funders and government are at a confluence of having to address both areas. For the sector to grow and deliver the 28,000 new homes per annum needed over the next decade will require all key stakeholders to work together. Investment in skills supply and upskilling in both private and public sector is required.

Foundation, modern and graduate apprenticeships now provide a suite of entry routes which enables in-work training, mentoring and career development. Given the number of retirees in the industry and public sector over the next 5 to 10 years such apprenticeship routes enable knowledge transfer between generations and are well aligned to the sector's needs. The strong support by the sector towards graduate apprentices (GA's) is evidenced by the significant industry and public sector demand outstripping supply for places. Investment in public sector planning and building control departments is essential. It would not matter if the industry had an abundance of skills supply if the primary statutory public sector gateways to new housing development are not sufficiently supported. Local authorities require additional support from government to increase their number of planners and building standards officers.

Needs of the industry are also changing. Some would wish to see more skills development focused on housebuilding, or the opportunity to have staff trained and developed in more than one skill set or application. New types of job roles and approaches are likely to increase. If parts of the industry are requesting or seeking such change it is incumbent on those who fund training development to be responsive to such needs. Initial pilot projects and trials are still required to provide a baseline platform and feedback on lessons learnt on new approaches. Furthermore during the course of the last year a number of companies have outlined their intentions to increase direct employment and investment in skills to reduce their exposure and reliance on sub-contractors.

The Scottish construction industry has much to be proud of across so many areas. Our completion rates for apprentices is one of the highest of any sector and they are regularly recognised at international skills awards. For both traditional craft skills and new technology skills sets a common factor in the SLWG and in external discussions was 'quality'. Increasing the quantity of skills supply and training needs was foremost in the discussions of all parties, but it was not to be at a cost of reducing the quality of new homes.

Given the transformation in future demand and technologies and the acute role construction and new housing have to so many areas of policy, it is recommended that either there is a ministerial portfolio solely for construction, or a new post is formed for a senior civil servant for the construction sector. Co-ordination across departments, fore-sighting future policy pathways, skills planning and enablement of Scottish innovation in the sector will be required at the highest levels of government if

the full economic, environmental and societal benefits and impacts are to be achieved over the coming years.

During the course of the SLWG the potential impacts of Brexit were discussed. As this was a 'live issue' but also one which the SLWG would be unable to affect a short summary of potential skills factors associated with Brexit is provided in Annex B.

I wish to thank all of the members of the working group for their time and contributions and to those who came to present and discuss various topics with the SLWG (see Annex A). The report includes a wide range of issues and factors which were addressed and discussed by the working group. There were only a few areas where there was not total agreement and I have tried to reflect these comments and factors that should be considered if taken forward. I also wish to acknowledge the excellent support the working group received from the Scottish government 'new homes delivery team' before, during and after the meetings.

Finally, to deliver the future new homes on the scale required will require all stakeholders to engage, to promote a sector which is attractive to future new entrants, underpinned by a fairer society approach, to be ready for the new technologies and to adapt to the opportunities ahead.

Professor Sean Smith
Chair
Short Life Working Group
New Housing & Future Construction Skills

Executive Summary

The short life working group (SLWG) met during 2018 and was established to assess and provide recommendations for 'future new housing and construction skills'. Members included housebuilders, industry organisations, college, university, public sector, training and skills organisations. The SLWG split the future time periods into three areas covering short term (3 years), medium term (4 to 9 years) and long term (10 years+). The group also discussed the role of new technologies and build methods, foresighting of key areas and the factors which can affect skills supply factors. Forty recommendations are included within this summary report.

During the first phase the group discussed current skills pressures, importance of tracking future skills needs, the funding and investment areas which may be required and where specific initial regional focus should be provided. It was found that there were particular shortages and skills pressures in Highland and Islands and also south east Scotland. New courses specific for housebuilding would be useful but must still fall within and contribute towards a modern apprenticeship framework pathway.

Given the importance of offsite construction as a mechanism to step up the supply, various recommendations were discussed. This included using future procurement methods to request offsite construction for larger sites as a pipeline or framework to enable companies to invest in skills and manufacturing for offsite delivery. A number of the recommendations have synergies with those of the UK wide Farmer Review in 2016. The SLWG agreed that there should be 'capex' investment in Scotland's college sector to support new training facilities for the technologies and future skills needs the sector will require. Investment to increase the number of planning and building standards officers is critically important if new housing applications and future growth in delivery are to be achieved through statutory gateways. Use of regional data capture of skills needs would be very helpful and should include the SME sector, if it is to encapsulate the new build subcontractor directions and needs.

Attracting and diversifying the future workforce are essential and a number of recommendations were provided in this area specifically greater social media promotion of the careers, salaries, clean-tech opportunities and pan-Scotland learner journey routes available. Funding and co-ordination across schools outreach activities in Scotland linking with SDS and DYW would be beneficial. Better annual data 'snapshots' of those in training and in employment for all parts of the construction sector both private and public would help foresight and plan ahead for future skills needs, both for housebuilding and other subsectors.

Over the next decade the industry is entering a period of transition as new construction technologies, processes, energy devices and smart systems enter into use and mainstream. It is important for the sector to look ahead and plan with all key stakeholders, not only for the industry but also for the economy, environmental and societal benefits which will result from new housing. Finally a key change which would help new housebuilding and construction as a whole is the appointment of either a separate ministerial portfolio for construction, or the appointment of a senior civil servant. This role should have oversight and interlinks across many government departments to align and support the exciting growth opportunities for new housebuilding and construction in the coming decade.

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Introduction

Scottish Construction Sector and New Housing

In 2018 Scotland's construction sector employed over 170,000 people (10% of Scottish workforce) with up to a further 60,000 self employed workers and consisted of 45,500 businesses. The sector contributes £21.5bn to Scotland's GDP and 10% of Scotland's GVA [1]. The positive impact of the sector in the range of skills and training entry points includes foundation apprentices, modern apprentices, graduate apprentices, further education and higher education programmes. With over 30 organisations covering trade skills, industry bodies and professional and institution organisations the sector provides a series of skills support and careers entry routes. New housing supply contributes approximately 25% of the construction sector activity accounting for £5bn per year to the economy. Employment figures on the new housing sector in Scotland have previously illustrated over 31,000 direct jobs, over 22,000 indirect jobs and supported 4 jobs for every home built [2]. The delivery of new housing supports the development of new communities, low cost energy efficient housing, stimulates innovation and provides significant additional benefits through investment in schools, transport infrastructure and community facilities.

Future Supply of New Housing and Skills Demand

During the pre-recession period 2003-2008 the average annual supply of new build housing completions [3] was approximately 25,000. Figure 1 illustrates the impact of the recession on the supply of new housing. During the period 2009 to 2017 the difference in the supply of new housing versus the pre-recession period was 81,400 homes.

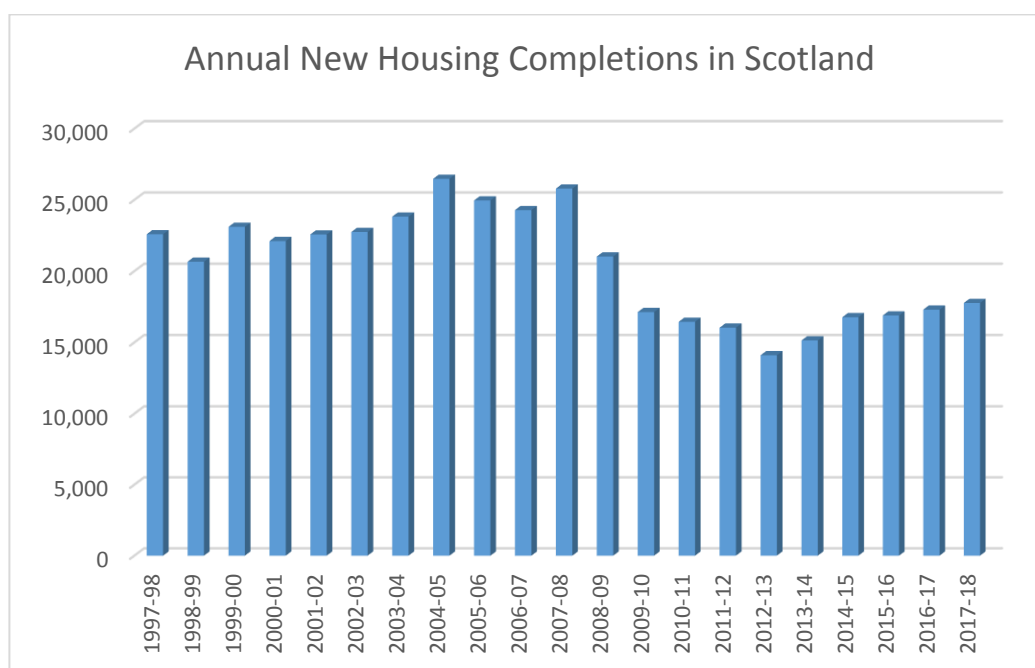


Figure 1: Scotland's annual new housing completions (1998 - 2018) [3]

The National Records of Scotland forecast that the Scottish population would grow by 5% from 2016 to 2041 [4]. The number of households is forecast to increase by 13%. This 8% shift is primarily related to people living longer and smaller household sizes, with a specific increase in one person households in Scotland of 252,000 (2016-2041). This shift in household sizes has been occurring for a number of years prior to 2019, which has also led to pent up demand.

The Scottish government have invested significantly in affordable housing supply. A target of at least 50,000 affordable homes by 2021 was set during the current parliament period and represents a 67% increase in affordable housing supply [5].

Given the post-recession period under supply of new homes, the increasing number of households and future demand, it is estimated that Scotland would require to deliver at least 28,000 new homes per year for the next 10 to 15 years [6]. This is a seismic shift (50% uplift) compared to the current 2017-18 completion delivery of 18,750 new homes [7]. This will require significant additional skills supply and increased use of modern methods of construction, such as offsite construction techniques.

The impact of the recession on Scotland's construction sector was the loss of over 40,000 jobs and some areas losing 45% of their workforce [8]. The SME sector was particularly badly hit with many pulling back from housebuilding or closing. Economic reviews of the '10 years post-recession' by the Office for National Statistics (ONS) found during the post-recession period 2009-2014 the UK construction sector was on average the weakest in terms of GVA recovery [9]. The 2017 SDS report on 'Jobs and Skills' in Scotland found that the construction sector was one of the weakest sectors in terms of jobs recovery 2009-2014 [10]. This is not surprising given the double dip recession, fragility during recovery and loss of key skilled workers both on site and non-site based. The sector has higher average age levels across the workforce, compared to other major industry sectors, with some construction sub-sector areas expressing concerns due to the number of retirements in particular subsectors within the next five years. The 2016 Farmer Review of the UK Construction Labour Model [11] highlighted key issues in relation to training models, workforce size and demographics.

In the coming decade there will be other skills pressures on the construction sector involving retrofit of existing stock, climate change plan targets, future installation of electric vehicle charging points, incorporation of new technologies and early years and new schools programs. As such the new homes sector skills provision will most likely require to adapt to meet future supply needs and pressures. The significant increase in new housing required was also stated by trade body Homes for Scotland in December 2018 [12], with key aspects that should be addressed to help towards growth including 'encouraging more entrants to the sector'. This is perhaps even more profound given the impact of Brexit on the construction sector in the UK as a whole. Whilst the Scottish construction sector has approximately 3-4% EU workforce [13] the rest of the UK average is 9-10%. According to the 2017 Home Builders Federation Workforce Census [14] approximately 17% of the UK new house building sites workforce are from the EU countries. Furthermore EU workforce on new housing sites in London are typically 50%. Also recent studies by recruitment consultancies have found healthcare and construction to be the most affected

sectors in terms of downturns of European web-based job seeking opportunities into the UK.

Given the previous effects of skills shortages in London during the 1980's, 1990's and 2004-2008, which attracted skilled operatives from across the UK to work in London, the UK wide effect of Brexit on the construction workforce is likely to further diminish the availability of future skills supply in Scotland. Potential issues related to Brexit are described further in Annex B.

Short Life Working Group on New Housing Construction Skills

The short life working group (SLWG) was established to assess and provide recommendations for skills needs the sector would require covering the short term (3 years), medium term (4 to 9 years) and long term (10 years+). The group would also discuss the role of new technologies and build methods, foresighting of key areas, the skills supply factors involving both professional and tradecrafts, potential shortages of skills in both public and private sector occupations and the future diversity of the workforce and attracting new entrants.

The SLWG group involved housebuilding companies, industry bodies, skills development, training and education providers and was supported by Scottish Government officials from the housing delivery team.

Five meetings took place between April 2018 and November 2018 involving different focus areas, these included:

1. **Remit of SLWG, Timelines**, Focus on **short term key pressure skills needs**, Example of proposals within South East Scotland City Region Deal for skills and presentations by CITB and SDS on existing data and also skills analysis projects currently ongoing.
2. **Short courses** - Bricklaying and major shortages of skills supply (potential new shorter course for housebuilders), regional variations in skills needs, future demands and upskilling.
3. **Offsite construction** and also **medium term factors** for the sector – other industry future skills needs & pressures (non-housing). This may assist to identify what aspects could be started in the short term to benefit the future medium to longer term needs.
4. **Key statutory gateways skills pipeline and future technologies** – included presentations and information provided by local authority building standards (LABSS), local authority planning officers and also future medium to long term industry technologies and influences (CSIC).
5. **Utilities and building services**, with focus on electrical skills and future increasing demand, water installations and pump systems including substructure. This meeting also included discussions and summary recommendations to be reviewed with feedback from SLWG members.

Invitations were also extended to external organisations to present or give input at specific SLWG meetings. This included CCG, Centre for Offsite Construction at

Edinburgh Napier, heads of local authority planning (HOPS), local authority building standards (LABSS), Scottish Water, electricians industry body (SELECT) and SME companies involving bricklaying (Forth Brickwork) and water and waste pumping systems (ID Systems UK).

An agreed listing of potential recommendations were then formulated by the SLWG. This listing was then supplied back to the SLWG members and they were asked to state whether they were in agreement, and if not, to provide additional comments and feedback. Each SLWG organisation or member would respond individually and all responses were received by mid-January.

This report is the culmination of the SLWG's work over the last 11 months and includes forty recommendations on the themes and topics considered. For the vast majority of the recommendations there was unanimous agreement from the SLWG members. In several areas such as 'bricklaying for house building', 'multi-skills' and 'annual skills and employment touchpoint' survey there were some disagreements and some of these aspects are captured in the report. In addition, the report includes information on progress to date as well as suggestions of how some of the recommendations and actions could be taken forward.

Thematic Areas

The report and recommendations are structured around key thematic areas that were discussed by the SLWG, which included:

- Specific early focus on skills pressures
- Tracking current skills supply and future need
- Funding and investment
- Statutory and regulatory pathways and skills
- Offsite construction sector
- Upskilling and career pathways
- Government and local authority policies
- Attracting future workforce
- Medium (years 4 to 9) to long term (years 10+)

Given the wide range of aspects covered over a short period it is important to emphasise that the thematic areas and recommendations are not set in stone. There could be other issues which may arise in the short term, particularly given the uncertainty around Brexit and other external factors, which the industry may need to address. It was not the purpose of the group to calculate or forecast specific numbers of future skills and professions. This should be a separate follow up research project which could utilise some of the insights, findings and recommendations of this report.

As will be found in the report a number of recommendations and aspects discussed by the SLWG are already being taken forward for further development. However, there is a need to engage with the wider industry and public sector areas aligned with new housing delivery on the recommendations provided by the SLWG. Following the feedback from the sector the proposal is for a 'work plan' to be developed indicating key stages, actions and identifying thematic leads from across the industry organisations and public sector to take forward and implement the recommendations.

Chapter 1: Short Term Skills Pressures

There are currently specific skills shortages in the new build sector primarily in relation to site skills, such as bricklaying, joinery, site managers and other trades. There are also regional 'hot spots' where there is an under supply of on-site skills. The SLWG heard from the CITB of areas such as the Highlands and south east Scotland which have specific acute shortages in key site skills supply [15]. Currently there is a shortage of 300 bricklayers in SE Scotland. Presentations from Edinburgh Napier University highlighted the significant number of new homes that would be required in south east Scotland [16]. In the 20 years 1988-2008 (prior to the recession) 103,000 new homes were built within the 6 local authorities (City of Edinburgh, Fife, Scottish Borders, East Lothian, Midlothian and West Lothian). In the next 20 years (2019-2039) over 145,000 new homes will be required, approximately a 40% increase [16]. In some of these future years it is likely that 1 in 4 or 1 in 3 of new homes in Scotland will be built in south east Scotland. Edinburgh and the south east of Scotland is forecast over the next 15 years to be the fastest growing city region of Scotland and the 5th fastest growing in the UK, in terms of population [17] and housing [16].

At present there are many sub-contractor and house building companies who are operating with a more mobile workforce to tackle the skills shortages. However, this adds further costs and time periods to projects, reduces productivity, increases transport emissions and places further skills supply pressures on other regions of Scotland where the workforce is drawn from.

Sufficient supervision and management of new housing sites is extremely important. The oversight in delivery of the designed construction, health & safety of site staff and subcontractors, construction quality, effective timely completion and resultant building performance are highly dependent on the site management team. Without sufficient numbers of trained site management staff, not only in relation to new entrants but also in relation to upskilling opportunities, for new methods, technologies and systems can restrict the future number of new house building sites which are operational in Scotland. Given the higher average age of this working group and numbers approaching retirement it will be essential that Scotland has sufficient pipeline of new entrants to this role. Specifically in relation to the important role that mentoring of new entrants by existing site managers provides towards knowledge transfer and sector continuity.

General site operative roles (and non-craft on site skills) also provide a starter career route for many entering the sector. This can lead to the opportunity for the site operative to then decide which key skills trade they wish to embark on in the future. Concerns were expressed by SLWG members that general site operatives are an integral component to the site function and delivery and care should be taken to ensure there is sufficient entry points and opportunities to attract new entrants.

Multi-skills for on-site operatives was also discussed by the SLWG. In discussions with companies beyond the SLWG such roles were seen by house builders and

contractors as being some of their most valuable staff in relation to productivity and resilience of operations and the ability to adapt to site operation changes. The background of such multi-skill operatives was often having learned a specific craft to then have been upskilled to undertake other site operations. Note that none of the operatives discussed were involved in electrical or gas works. Future provision of upskill training for existing staff to learn other site activities and operations of equipment are valuable for the resilience of the company, employee and sector.

In addressing the current shortage of key site skills the SLWG discussed the significant shortfall in the number of bricklayers across Scotland and in particular south east Scotland. Both data sets from CITB [15] and Edinburgh Napier University's skills mapping [16] (for future city region deal housing construction projects) identified current shortages and projected shortages in coming years. The SLWG discussed at length the potential for developing specific skill sets which are required for housebuilding. However, it was agreed that any such course would have to be aligned to career progression, contributing towards qualification for a full modern apprenticeship and there would have to be evidence of industry demand. Previous evidence of specific skills training developed for one sector is the Forster roofing programme. Through the Forster Roofing Academy apprentices are trained for specific skills and general skills required, creating an expert supply of installers and erectors with an approved qualification. Such adaptation to specific skills sets and industry needs is likely to increase given the range of diverse activities and technologies the industry sector will require to undertake in the coming two decades.

Recommendations

R.1.1 There should be a focus on the delivery to increase the supply of bricklayers, joiners* and painter & decorators to tackle industry shortages, with an initial focus on Highlands & Islands and south east Scotland. * **Note:** recent statistics of Scottish college new entrants to joinery has increased and is now 58% of modern apprenticeships for the sector. This is very welcomed but will have to continue for a number of years to achieve an optimum future supply. However, there is an ongoing specific shortfall in both bricklayers, painters & decorators and plasterers entering into the current training programmes.

R.1.2 Adapting the supply of craft and non-craft on-site skills for house building in future through improved foresighting of skills needs relevant to the house building sector.

R.1.3 Additional support and investment should be provided to assist training and supply of site managers and upskilling of current site managers.

Note: Recently a new fast track pilot programme for site management modern apprenticeships was announced, involving Stewart Milne Homes in partnership with CITB. Miller Homes have also joined this programme. Such programmes are welcomed to enable and support future pipelines of new staff and employees for such roles. **Expansion of such programmes and involvement of more companies across Scotland would help embed such opportunities both in urban and rural locations.**

R.1.4 Multi-Skills for on-site operatives – enhances workforce resilience, employability and supports inclusive growth.

There was strong support from industry housebuilders and education providers. Industry bodies raised a number of issues. There may be specific restrictions on which skills should not be part of 'multi-skills' due to health & safety concerns and accreditation/registration requirements. Where new MA's do come forward in future there should be strict oversight on the development, content, structure and that there is industry evidenced demand for them. There was full agreement for topping up new additional skills areas post MA qualifications. This may also lead to better future productivity on sites.

R.1.5 Skills courses developed which align to house building needs where there are specific shortages and offers faster entry to work (e.g. bricklaying for house building) - but which are part of the qualification route towards an MA, but would require further future top up in training, development and assessment prior to reaching full MA qualification.

All companies, housing delivery and education providers supported this recommendation. However, industry bodies raised a number of important issues. It would require future progression towards MA in bricklaying to support future career pathways and job opportunities outside of house building. Concerns were raised (linking to Edinburgh Schools investigation and the Cole report findings) of such roles then working outside their remit into non-housing projects. Sub-recommendations are:

- It would have to be closely monitored and have 'qualification recognition' with funding available for further top up to full MA, so trainees could have a pathway to full craft skills and non-housing projects.
- Skill cards should be considered to indicate this level of qualification and would assist site managers and companies to know the skills levels of employees and those on site.
- Such a route towards a qualification for bricklaying for housebuilding should be directly sponsored and supported by an employer. If the employer guaranteed top up funding and support for the employee to progress towards an MA qualification in Bricklaying this would provide opportunities for future career progression and wider employment opportunities.

Note: Recommendation is for a pilot program to work with companies, industry bodies, and FE colleges to develop a framework and pathway towards such a course and contribution as part of future full MA level in bricklaying. **[Ongoing activities]** SE Scotland has the greatest shortage of bricklayers. House building companies via Homes for Scotland have offered up to 40 trainee places in SE Scotland if a pilot was developed. SE Scotland City Region Deal has offered to undertake a pilot program with industry and FE. This would also support inclusive growth and faster entry to work opportunities.

Chapter 2: Tracking Future Needs & Skills Supply

In 2014 an analysis of various growth forecasts and new homes delivery (post-recession period to 2022) was developed by Homes for Scotland [18]. The current net supply of new housing completions in Scotland is following an annual average 5% growth trajectory from 2014 levels. Whilst Scotland's population is increasing to 2041 by 5% the household demand is increasing by 13% [4]. This 8% difference is due to a number of reasons including people living longer, delaying release of housing back onto the market, and need for more single and two person occupancy homes.

During the course of this parliament Scottish government is investing £3 billion to support 50,000 affordable new homes by 2021 [5]. To meet both current demand on new housing and future demand Scotland requires to build at least 28,000 new homes per annum for the next 10 years [6]. Figure 2 shows the number of average annual new homes completions (2003-08) versus 2017/18 supply and future required annual supply. This illustrates the step change from current levels that will be required and there are already existing pressures of skills demand and is likely to increase in future.

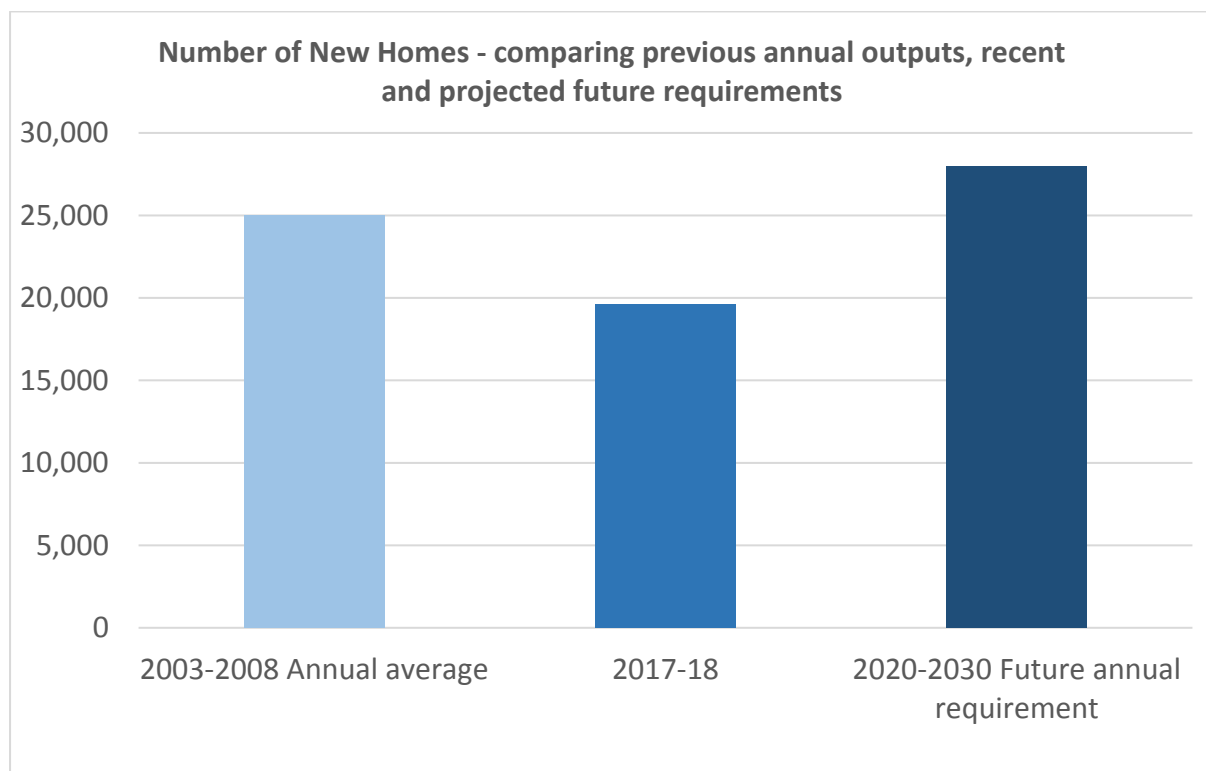


Figure 2: Comparing previous new homes supply prior to recession, recent and future requirements

Skills planning to meet forecasted demand can guide skills investment and help the sector prepare. Such forecasts are not straight forward given the range of external factors, time periods involved, economic and regional variations, mobility of workforce within construction subsectors and diverse investment sources for housing. Some of the formats for skill needs and job forecasts for the construction sector in Scotland have previously been based on a macro level analysis involving data from larger companies and pipeline activity often aligned to infrastructure projects. Whilst housing activity forecasts have also been included the regional variations for new housing plans, skills and jobs demand have not been commonly developed in detail.

The house building sector is reliant on medium, small and micro companies through sub-contracting. If many of these companies are not part of the macro skills forecast analysis for the construction sector, and regional variations in new build housing forecasts are not within future demand analysis, it is likely that gaps or variations between what is required in future skills supply may occur. The current shortages and demands on skills suggest that one of the contributing factors may have been gaps or errors in previous skills demand forecasts. Given the lead in time to skill-up to appropriate qualifications occurs over several years, and if data analysis used may have an error factor, this may lead to be a compounding factor.

There are some excellent databases which illustrate the current enrolments of activity in training and employment. Current separate statistics and datasets include, FE college skills training, university degree enrolments, industry trade and profession organisations, private training providers and public sector workforce related to the sector. However, there is currently no annual collective “snapshot” dataset which covers the entire sector of construction for all trades, professions and public sector workforce. Having such a macro overview annually of numbers enrolled in training and employed across all sectors would assist both the whole industry and government with future planning and identifying key areas or gaps for investment and growth.

Given the shortages in key skills supply both for professional and craft skills the SLWG discussed what data sets and information are available to better plan ahead. Given the ability for the workforce to operate in areas which are also non-housebuilding it would be useful for the construction sector as a whole to have annual data.

During the SLWG meetings the CITB presented data skills supply for regions across Scotland [15]. This received very positive feedback from the SLWG and helped identify specific aspects to different regions in Scotland for skills supply aligned to housebuilding. Given the differences in urban and rural areas of Scotland and the geographic spread, such regional variations and needs data could be very useful to assist with future skills planning, local delivery and support an inclusive approach for the regions and local authority areas. Mobility of subcontractors does provide adjacent regional sector flexibility. However, excessive mobility and travel by subcontractors across Scotland to travel to sites may temporarily fill regional skills gaps but can impact on the sector’s productivity, diverts local skills supply, impacts on work-life balance and increases transport emissions and cost. The highest emissions in Scotland stem from the transport sector. Reducing excessive fossil-

fuelled vehicle mileage and better utilisation of local workforces, through sufficient skills supply, would be a positive factor for the sector.

Whilst there are many different industry trade bodies, industry organisations, skills groups and professions institutes there is not currently a singular collective skills and professions body or organisation which brings all pan-Scotland groups together. There is transferability of some skills between housing, infrastructure, non-housing, retrofit and other subsectors. Future demands on skills will increase and new types of skills and technologies will also enter the market. The opportunity to have a collective overview of the common areas of skills, supply and upskilling opportunities may assist the entire construction sector.

A movement towards better forecasting, involving new house building by region, more in-depth involvement with SMEs to feed into forecast projections and a national overview of all skills and professions in the construction sector would help towards better skills planning.

Recommendations

- R.2.1 Establishment of national annual ‘touchpoint’ dataset of the number of apprentices, skilled workforce, professions and construction related public sector workforce in Scotland to track sector supply, identify future gaps and provide proactive engagement for sector in working with government to better plan for the future.** *Note: To confirm this is not to establish a national database of individuals but to track levels of skills and workforce supply activity by requesting existing professions, skills bodies and providers to feed in macro ‘state of the sector skills and professions supply’ annually.*
- R.2.2 To develop annual regional skills analysis for those in training, identify key skills gaps to assist regional variations for industry training and future supply needs.**
- R.2.3 Establishment of a construction skills and professions council for Scotland bringing all industry trade bodies and professional organisations together.** *Note: During the course of the SLWG meetings the Construction Scotland industry leadership group established a new skills group structure. This is welcomed. It is recommended that the skills group should either be enlarged to include all industry trades, industry organisations, skills and professional bodies, or to have a bi-annual event which brings all such groups together. This would support a collaborative approach across the sector and for all levels.*

Chapter 3: Funding, Investment & Fairness

During the course of the SLWG meetings a number of aspects were raised and discussed relating to investment which the sector receives, the investment paid by the sector via levies, investment in training facilities and fairness in approach of funding of apprentices. The construction sector receives some of the largest investment of any sector via the apprenticeship routes and skills investment [19]. This is welcomed by the sector but also highlights the strategic importance and need. Given the future number of retirees and future growth in housing supply required it is likely the sector will need further investment from government if it is to deliver the future societal and economic benefits and housing targets.

Current investment by industry occurs mainly via the CITB levy and the apprenticeship levy (AL). Concerns were raised that whilst in England a company can track expenditure and direction on the AL skills development the current detail of spend profile into sectors by the Scottish government using AL funds is not clear. Whilst the distribution of AL to Scotland is within the block grant further clarity or detail of how the AL funding is spent by Scottish government relative to industry sectors would be helpful.

The recent announcement by CITB (20) involving the increase in annual attendance grant funding to apprentices and the increased funding for achievement grants, on successful completion, is very positive for the sector and apprentices. This raises the support funding from CITB for a full apprenticeship from £10,250 to £14,500.

Given the number of SME companies in Scotland aligned to construction and housebuilding, specifically the number of sub-contractors involved, they provide a critical delivery route for the construction of new housing and skills supply. SDS funding into skills and training for construction is delivered via delivery contracts. It would help the sector and provide greater clarity if the proportion of funding and impacts, which reaches SME's was provided, as SME's provide the largest contribution of apprenticeship routes into the sector.

During the SLWG anecdotal evidence was provided that some small and micro businesses in house building were becoming less engaged with apprentices and unaware of other types of skills support funding available. This is worthy of further research to identify if and why this is the case. This may be clarified from a parallel SLWG looking at SME businesses.

Having a well funded industry training programme which treats apprentices, new entrants and existing employees with fairness is attractive for those considering entering or returning to the construction and house building sector. There are variations in salaries, payments and support to apprentices across the sector.

One particular scheme which is worthy of further mention is the programme managed by the Scottish Building Apprenticeship and Training Council (SBATC). This programme of support creates a level playing field for all apprentices and

companies involved and through set payments to apprentices provides a cohesive sector investment in future skills pipelines. The scheme also provides monitoring and support to apprentices. Such a common approach across the sector would be helpful to attract new entrants and also help the sector compete with other industry sectors to attract a wider diverse entrant group, who may not have originally considered construction and housebuilding career pathways. Other strong industry sector programmes of specific interest include the in-depth training and support for electricians via the industry trade body SELECT, with over 1,200 member companies employing over 15,000 people.

During the course of the last decade the further education (FE) sector has gone through a number of major changes involving mergers, reduction in programmes and changes in scope of delivery and assessment requirements. At the same time the industry as a whole has required an increase in new entrants, increased skills portfolios and new skills training and assessment to be delivered. The FE sector play a vital role in engaging with local SME's, schools, widening access, inclusive growth and providing pan-Scotland training provision into highly practical career opportunities.

However, there has been a lack of investment in FE training facilities, technologies and software provisions the sector has required over the last decade. Whilst accepting that it may not be possible to invest in every college for every new training aspect having regional investment of key facilities and programmes for colleges to share would help. Such regionally shared facilities could accelerate delivery, specifically training for offsite, new technologies, EV charging points, health & safety and utilisation of virtual training techniques.

Provision of adaptable training facilities where several different modes and types of training provision can be undertaken in one location or space would also support training productivity. One aspect mentioned by staff in some colleges during visits and meetings by the chair was in relation to level of basic maths and writing skills evidenced by some new entrants. Other key 'soft skills' were also raised. The provision of additional pre-apprenticeship support was mentioned as one way to support this area. This would demonstrate the sector's ambition to be attractive for all and an inclusive approach, particularly for school leavers who may be from disadvantaged groups and may need additional support.

The sector has an alignment with inclusive growth aims via support for veterans and training for future jobs, community benefits and employment reach into SIMD 10 and 20 areas. This is very positive for communities and society and the sector should continue to engage and if possible increase further this important activity.

A specific project which aims to support inclusive growth is the recent Housing, Construction and Infrastructure (HCI) Skills Gateway within the South East Scotland City Region Deal [21]. This is funded by Scottish government and is an eight year project 2019-2027. The projects brings together HE, FE, local authorities, industry and government organisations to maximise an inclusive growth approach towards job entry short courses, upskilling and advanced skills to support better workforce diversity and employment opportunities. Some SLWG members suggested that such an approach should be incorporated across Scotland. Scottish government may wish

to consider how other regions and City Deals could benefit from a similar approach for Skills Gateways to be incorporated in their future programmes.

Finally, given the competition with other industry sectors to attract new talent and entrants the construction sector as a whole may wish to consider taking a lead on incorporation of the 'living wage' approach. If other employment sectors shift in this direction and the construction sector lags behind this may further compound attracting new entrants and talent in future.

Recommendations

R.3.1 Review and clarity of the quantity of Scottish Government construction skills funding actually reaching sector for training and specifically SMEs.

R.3.2 Fairness in approach across apprentices would be positive for the sector and be attractive to new entrants to the industry.

R.3.3 A greater clarity for industry on outcomes of their contributions to the apprenticeship levy.

R.3.4 Investment in resources / capex for FE sector to deliver future levels, quantity and quality of future skills training required, such as adaptable training facilities.

R.3.5 Pre-apprenticeship support should be enhanced to maintain high completion rates and be used as a tool for attracting diverse markets for future skills / jobs needs.

Chapter 4: Public Sector Statutory Skills Pipelines

The initiation of new housing developments are dependent on permissions and authorisations provided via statutory gateways involving local authority planning and building standards departments. Even if there is sufficient funding into house building industry trade skills and professions the delivery and supply of new homes is dependent on the availability of a sufficient supply of a skilled public sector workforce for planning and building standards.

The SLWG was provided with information and summaries from the local authority Heads of Planning group (HOPs) and Local Authority Building Standards Scotland (LABSS) which outlined the pressures on current staffing levels and also future regulatory changes and policies which will increase the work required. Both the Planning (Scotland) Bill and the future changes in building regulations and technical standards will require additional workloads for such staff. For building standards officers this may include further onsite inspections, increased building performance measures and increased compliance enforcement duties.

According to Royal Town Planning Institute (RTPI) [22] the number of new planning trainees has increased in the rest of the UK by 7% but this has not been the case in Scotland. Both RTPI and HOPS [23] have outlined key staffing issues and skills supply and recommended investment and support to encourage more people to consider planning as a career. Recent LABSS surveys [24] of the 32 local authorities found:

- 81% of authorities stated that building standards teams have reduced in FTE numbers
- potentially 25% of existing workforce may retire within the next 5 years

Recent education pathways such as graduate apprenticeships (GAs) have proved to be highly successful (SQA Levels 7-10). In 2018 the Construction & Built Environment (CBE) GA framework provided by Skills Development Scotland had a strong level of interest from companies interested in GAs for surveying routes such as building surveying, quantity surveying and real estate. More recently this included pathways such as architectural technology due to commence in 2019. It appears that both school leavers and parents are attracted to the GA route through the “*work, earn and learn*” approach.

If the sector is to attract more school leavers to consider planning and building standards officers roles as career pathways then the incorporation of such roles within this GA CBE framework may assist. Also embedding such career roles and pathways within such frameworks increases awareness to school careers officers of the routes available. Furthermore, as the four year GA route includes a significant level of work based learning and mentoring it also provides an opportunity to support skills transfer from one generation to the next, from expert and highly skilled planners or building standards officers who may retire in the coming years.

Both planning and building standards career pathways could be attractive to some who may wish to change their career direction and undertake accelerator training routes to enter such roles. One route may be via part-time diploma or Masters (MSc) routes (SQA Level 11). During the course of the SLWG period and additional discussions with house building companies, industry has suggested that if local authority building standards officers supply could not increase sufficiently then perhaps the government should re-consider allowing private building control providers for low rise housing. This has been through a consultation process in recent years.

The SLWG also discussed the significant importance of building standards officers roles in light of the Grenfell fire, Edinburgh schools Cole Report [25] and other events. Given the important health and safety aspects aligned to such issues the SLWG considered that the role of the building standards officer (verifier) should have increased importance aligned to the health & safety outcomes of technical standards both during and post construction. At present funding for planning and building standards departments is devolved to local authorities to decide. Local authorities may need to use their funding for other key areas and this may negatively impact planning and building standards departments. Given the significant importance in housing delivery, health and safety factors for building occupants and number of new regulations and future construction technologies which will require to be inspected, the SLWG considered that some form of ring fencing or additional funding should be provided for building standards departments. LABSS currently operates a type approval process to assess technical standards compliance of designs and drawings. The SLWG suggested that greater use and promotion of type approval processes both by local authorities and those organisations within the scheme and greater uptake by housebuilders may help with productivity and site development starts.

Recommendations

R.4.1 Investment in future Graduate Apprenticeship routes for new Building Standards Officers (BSO) and Planning Officers for Scotland (SQA Levels 7 and 11).

***Note:** During the SLWG period LABSS, Building Standards Division, Edinburgh Napier University and Glasgow Caledonian University have met with SDS GA staff and the **CBE Framework for graduate apprenticeships has now been modified to include 'Building Standards'**. Both universities have offered to work together on a jointly delivered future graduate apprenticeship route.*

R.4.2 Ring fenced funding for BSO roles aligned to health & safety outcomes post occupancy.

R.4.3 Greater use of 'Type Approval' processes by local authorities and industry through LABSS, where possible, may improve on-site progression and productivity.

www.labss.org/partnership-schemes/scottish-type-approval-scheme/labss/1

Declaration of conflict of interest: The Chair of the SLWG is a non-executive director with an organisation which is included within one of the 'Type Approval' processes.

Chapter 5: Offsite Construction Skills

Offsite construction has been a growing manufacturing sector for the house building industry in Scotland over the last decade. Offsite construction is one of the largest domains within modern methods of construction (MMC). Investments by companies in new offsite manufacturing facilities and previous support mechanisms, such as the Scottish government greener homes scheme, have helped transition such approaches. Many of Scotland's homes include offsite construction systems varying from modular or volumetric whole house approaches, closed panel wall and floor systems to specific offsite roof systems.

With current and future demand increasing for new housing delivery in Scotland and the UK, adopting greater use of offsite construction could assist new housing 'superstructure' delivery. Offsite construction has additional benefits through waste reduction, enhanced performance through controlled construction, alignment with BIM (building information modelling) approaches and can reduce on-site demand for some traditional skills.

Offsite also assists with productivity through closer B-2-B supply chains and design for manufacture approaches, reduces incorrect onsite product replacements and provides opportunities for inspection during manufacture and increased quality control. In itself offsite is not a panacea for solving new housing delivery but it is an essential ingredient to contribute to increasing supply when traditional construction approaches and skills are in short supply.

Offsite Solutions Scotland (OSS) involving nine Scottish companies provides a co-operative approach to developing training, innovation and delivery. In 2012 a *Strategic review of offsite construction in Scotland* [26] identified a number of recommendations from industry to support the sector's future growth, including:

1. Recognition in the public procurement process for future housing sites,
2. Investment in offsite training facilities,
3. Future recognition in *Technical Standards (Scotland) Section 7: Sustainability* of the benefits from offsite sector.

The SLWG heard from OSS, CCG's offsite manufacturing division and Edinburgh Napier University's offsite construction experts of the benefits and delivery via offsite. It was stated by industry that to assist future investments by companies in Scotland for new facilities and offsite training skills provision requires a known future pipeline of offsite demand. The sector could grow significantly if there were procurement frameworks and guidelines which required offsite delivery. Large sites in particular provide the opportunity for offsite partnership approaches, (e.g. Glasgow Commonwealth Games) and for knowledge sharing to maximise the delivery and skills benefits.

Public procurement routes for new housing, which request offsite construction systems, via government or local authorities could also help trigger pipeline activities, manufacturing investment and skills development. Homes England [27]

recently announced their intention to promote and encourage offsite construction via procurement routes. Given Scotland's knowledge and expertise in offsite construction there is an opportunity for the sector and skills to grow with the right balance of 'procurement enablement'.

There is some offsite training provision provided by CSIC in Blantyre and at South Lanarkshire College. Scotland's College Partnership ESP have also established close working partnerships between some of Scotland's offsite companies and local colleges. Currently there are research projects investigating offsite construction involving CSIC, CITB, Scottish government and Scotland's universities.

Whilst partnerships between offsite companies and local FE college partners is a positive step there are limited training routes and generic information on offer. Recent publications for offsite by Structural Timber Association (STA) and CITB provide some basic elemental training aspects, however the sector requires a significant increase in training provision both for offsite manufacture and 'offsite-onsite' skills development. Investment in such provision to support the FE and HE sectors enhance learner content and delivery would assist the sector's skills provision and reach.

Currently there is no centralised skills training facility for 'offsite onsite' which would support training for site managers, site inspectors, erection teams, building control, housing association and local authorities. The development of an offsite training academy both physical and online would help the sector widen the skills training reach and provide a more inclusive platform particularly for rural areas.

Due to the majority of offsite construction being manufacture based it requires a number of different aspects and activities during the build stage. This provides a platform for companies to train staff in a range of skills. The sector has for some years requested to have a recognised training platform, such as an MA, which can integrate a diverse range of skills and thus provide an offsite trainee with a portfolio of multi-skills. Development of such a qualification would enhance and recognise the skills provision the sector uses and requires. The Forster Roofing Academy has set a precedent on how such an approach can be provided for a specific sector involving a range of skills that do not sit within a traditional MA route.

The development of a multi-skills or offsite MA qualification could be undertaken in partnership with the industry skills trade bodies to ensure that it did not conflict with specific trades which require specialised registration and certification. Limitations on whether for example electrical works would or would not be included would have to be identified early. Inclusion of training provision within an offsite MA may for example include specialised tooling, machinery operations, fitting of insulation, membranes, windows, facades and onsite erection and logistics.

The offsite approach also shifts the majority of the component build operations from the external environment (on-site) to a controlled assembly (clean-tech offsite) environment. This may also be more attractive for some to consider entering the construction sector and may also assist diversify the workforce.

As mentioned in Chapter 2 in terms of short terms skills and supply shortages for bricklaying, the use of some offsite constructions systems, which can also

incorporate external linings (e.g. insulated render boards or brick slip panels), provides an opportunity to adopt alternative outer layers systems. This could reduce some of the short term pressures on bricklaying skills demand through a widened portfolio of design external layer material options. At the same time this would assist housebuilders who currently specifically require bricklaying skills supply to utilise the existing workforce. This may 'buy time' until current bricklayer MA apprenticeships have qualified and the workforce supply has increased.

Upskilling and supporting architects, structural engineers and also clients to better understand and consider offsite solutions and innovations available, can also assist in increasing the use of offsite construction approaches from inception and early design stages. This could also form part of the offsite training academy and a future 'client focused' outreach programme.

Whilst much of the focus of the SLWG was primarily in relation to future skills supply and training for delivery of Scotland's future new housing there are additional wider economic benefits for Scotland to grow the offsite sector. This relates firstly to the export potential for offsite systems beyond Scotland's borders, whether rest of the UK or overseas. This would generate additional income, increasing Scotland's manufacturing base and help support a more sustained order book. Secondly, if more offsite construction was adopted, which can increase output and delivery within Scotland and reduce other skills pressures, this provides additional benefits for those considering to invest in Scotland (for housing and non-housing future projects), as there would be increased market investor confidence of future delivery, supply and skills being available.

Recommendations

R.5.1 To introduce procurement pathways and new housing sector frameworks to encourage Offsite/MMC approaches specifically for larger sites – would provide an enabling pipeline platform for industry to invest further in offsite skills and Scotland's manufacturing capabilities. *Note: such frameworks and procurement pathways should not infringe SME entry into this sector and preferably should encourage collaboration between different company sizes for such projects. This supports knowledge sharing across such partnerships, combined skills and innovation developments and greater supply chain benefits and geographic spread.*

R.5.2 Support the development of growing the supply of future offsite skills, such as an offsite training academy.

R.5.3 Support in the development of multi-skills for offsite.

Chapter 6: Upskilling and Career Pathways

Over the last decade as new building regulations and construction technologies have developed these have led to new types of skills being required and job opportunities in the new housing construction sector.

The sector is highly dependent on training and upskilling being embedded in both private and public sector domains given the close interactions in planning, design, regulatory compliance, technical knowledge, product and system innovations and sustainable development goals.

The SLWG discussed a number of aspects and issues which were seen to be impeding the training and skills development within the sector and the apparent absence of explanatory 'career pathway' options for parts of the sector. Often the current phrasing by industry and training providers of classifications for education and skills levels used in Scotland are the English qualification levels or the previous older Scottish levels. It is then not surprising for those entering the sector or employed within the sector to be confused by such terminology which is not aligned to the current Scottish qualification levels. Clarity and consistency of terminologies used by the sector would reduce such confusion.

There are websites with some information including My World of Work (MWOW), CITB, Go-Construct, Professional Institutions, FE and HE sectors, industry organisations and trade bodies. For someone new to the sector or being advised in secondary schools of different career options the landscape appears quite complex. To attract people into the sector and to train those who advise on career pathways requires sufficient and clear pathway information. This is not to undo what is already there but it does provide an opportunity to have a 'go-to' website for Scotland's construction skills and profession career routes, which links across to the various platforms and information available and which is aligned to SQA levels. Some career descriptors within MWOW could also be updated or revised to better reflect the job roles, opportunities, career aspects and activities involved. For example updated salaries information would be helpful, MWOW states £28k as average salary for bricklayer when the average is £40k and can be up to £90k for top earners.

As the sector innovates and develops new technologies, softwares, build systems and employment opportunities it is vitally important that Scotland's school career officers are upskilled and aware of these opportunities. This also aligns with Chapter 8 'Attracting future workforce'.

Furthermore as new approaches, innovations and construction methods are developed to assist in successful installation, their deployment and growth requires a close alignment with new skills and training provision. Many new construction components coming onto the market do not require lengthy training provision. Some training may be only be 30 minutes to 2hrs to upskill staff on new tools, equipment, processes or regulatory building standards changes which address a specific

technical change. Recent changes to reduce support provision for short training and upskill sessions by training providers was cited by SME's as a disadvantage to encourage and embed such onsite skills development. This may require further analysis to determine how such training can qualify for funding support to ensure companies and their existing staff can access upskill provision.

More recently the Climate Change Plan (CCP) 2018 [28] sets out some of the future directions and targets for emissions reduction for the residential sector for 2030 and 2050. New build housing contributes less than 1% of the stock each year and will over time contribute approximately 20% by 2050. Replacement of older existing stock, such as by 'plot renewal' [29], provides opportunities to further increase the deployment of new build housing where it is uneconomic to retrofit. Future construction systems and technologies for halls of residence, care homes and other non-domestic new build sectors will require similar skills provision to those for new build homes. Scotland's new housing sector is typically 75% timber based. Growing the provision and development of courses, funding support and training materials which can upskill and support new skills entry will support new housing development and performance but also align with CCP emission reduction objectives.

Recommendations

- R.6.1 Supporting those new and already in the sector with clear and functional Scottish education, training and career pathways through a centralised information portal for Scotland.**

- R.6.2 Provision and supply of (flexible) upskilling or “top-up” knowledge (for all levels), which is encouraged by employers, public bodies and industry organisations.**

- R.6.3 On-site and Offsite based short training sessions (less than half a day) should be funded to accelerate upskilling.**

- R.6.4 Provision of upskilling funding support is required for BSO / Planners and public sector funded areas such as local authority and housing association staff.**

- R.6.5 There is a need to up-skill education and careers staff (schools) and FE in readiness for future jobs, new career paths and opportunities.**

- R.6.6 Upskilling in new timber construction systems and low carbon technologies.**

Chapter 7: Supportive Public Sector Policies

The introduction of new building regulations, planning policies and public procurement requirements can be an enabling tool and catalyst to support technical, environmental and process changes. However, there has been a lack of skills impact analysis for the introduction of such changes.

One example is in relation to BIM (building information modelling) which was incorporated as a requirement (BIM level 2) for public sector projects valued at over £2 million [30]. Whilst the objective and vision for such an approach is to be welcomed, due to the short notice between announcement and policy start period the sector did not have sufficient numbers of staff trained and ready. This led to significant turnover (churn) of staff between companies due to the skills supply shortfall as some companies offered increasing higher salaries to attract BIM qualified staff. Initially due to lack of qualified and quality training provision in Scotland staff had to travel outside of Scotland for upskilling. Research also identified lack of penetration of BIM adoption into supply chains [31]. If FE, HE and industry training providers had received funding support for BIM development training courses, BIM software upgrades and facilities in timely advance of the policy coming into effect this may have better supported the BIM skills transition for the sector (see also Chapter 9). A recent report [32] also identified varying degrees of skills and understanding by industry of what is involved for BIM Level 2 related competency. At present there are more BIM training providers in Scotland and Scottish Futures Trust (SFT) and CSIC have been supportive in helping the development of the sector transition.

If a Skills Impact Analysis (SIA) had been undertaken during the early phase of the policy development this may have assisted identifying where the gaps in provision, understanding, skills and facilities were and pro-actively channelled skills investment and training at an earlier stage. Given the extensive range of new technologies and changes ahead of the sector and climate change plan (CCP) ambitions [28] over the coming decades it is recommended that Skills Impact Analysis (SIA) should be included as part of the future government consultations for the sector. This could include proposed major changes in building regulations and policies affecting the construction and house building sectors.

Public sector procurement can play an integral role in enabling support towards apprenticeships and skills investment by companies via local community benefits. The SLWG discussed the positive aspects of how this has helped but also in how further developments may be more effective. The SLWG recommended that the public sector should continue to use procurement as a catalyst to encourage skills training, inclusive growth and investment by companies and their sub-contractors.

An important aspect to consider is completion rates of such skills investment aligned to procurement for projects. This is not quite as straight forward particularly if the project being procured has a shorter period than the apprenticeship training period. In which case it is difficult to evidence the full effectiveness and outcomes of delivered skills successes through contracts other than having statistics of apprenticeship starts.

It may be useful in future for public sector procurement contracts to include evidence by bidders of not only planned apprenticeship starts but also previous track record in skills completions and upskilling. This latter aspect may have to be limited to medium and large companies so as not to exclude or hinder small, micro and new start-up companies from tendering.

Recommendations

R.7.1 Proposals for future policies and regulations by government – should include a Skills Impact Analysis (SIA) – this would help sector readiness and training providers gear up.

R.7.2 Continue to use public sector procurement to encourage skills development.

R.7.3 Improved outcomes and deliveries through community benefits linkages to skills training & employment.

Chapter 8: Attracting Future Workforce

The future delivery of new housing will be highly dependent on attracting the next generation of entrants and diversifying the workforce. In addition, promoting and engaging with other industry sectors, which may have a reduction in future workforce requirements due to technological change or artificial intelligence (AI) impacts, may provide additional entrants with alternative and applied skills. Given the increased levels of housebuilding required across Scotland and future construction technologies, digital applications, smart buildings and offsite systems there is an opportunity for the whole sector to attract a wider and more diverse portfolio of entrants due to the range of job and career opportunities. Due to the range of future technologies the sector may adopt the ongoing engagement via STEM Hub Partnerships and events will be important to maintain and also likely require to be increased.

Gender balance has been improving in some of the university graduate profession level sectors for the industry, from 14% in 2015 to 18% 2018 [33]. More recently industry's direct involvement with graduate apprenticeships has provided an opportunity for companies to commence in year one, as opposed to waiting four years later nearer graduation, to diversify their workforce and new trainee entrants. Some new GA routes have an average of 25% female enrolments [33]. These changes have been helped by industry and universities outreach to schools where female ambassadors in the sector have provided role model routes to attract new entrants.

However, for modern apprenticeships the take up has been less than 2% [34]. Future promotion into schools by female role models who are involved in site skills, logistics, management operations and offsite construction is likely to help the sector. Offsite construction has been cited by others [35] as an area where the sector workforce has an opportunity to increase diversity. The future Construction Scotland Inspire program could provide a Scotland wide platform to support and align to such outreach.

From discussions and meetings with school teachers and parents of children in secondary schools during the SLWG period, it became clear that many were unaware of the salary levels being offered by the sector for craft skills and also the shift towards offsite and clean-tech technologies. This suggests the industry as a whole needs to 'raise the game' for outreach in informing schools, parents, pupils and wider society.

Early intervention in secondary school years S1 and S2 can also support pupils to understand the subject choices and help them shape future career options and sector employment opportunities. Provision of taster sessions, of the varying types of job roles, can help start the pathway for young people to consider their future career paths in the sector.

Primary schools can play a critical role in 'planting the seed' of the types of career and job opportunities the sector can provide. Early interventions and outreach, for example 'budding engineers' can provide problem solving activities and 'fun' introductions to construction and technical design softwares. Industry, FE and HE engagement in secondary schools via 'design-engineer-construct', 'constructionarium', 'women in engineering' and the 'Inspire' programme provide opportunities for pupils to hear about the sector, careers, build physical models and apply many of the subjects they are learning in schools into 'real life' problem solving aspects. Feedback from school teachers and outreach trainers identified early outreach interventions and taster sessions as a positive approach to supporting future entrants to the sector. However, such outreach activities are quite sporadic, currently not interlinked and some do not have dedicated funding or delivery frameworks. This may lead to patchwork interventions in parts of Scotland and not have security of continuity.

To maximise the reach for both urban and rural areas it is suggested that such programmes and others should receive dedicated outreach funding to provide continuity and Scotland wide opportunities to attract the future diverse talent pool required. Through such funding and linking with Developing Young Workforce, MWOW and Skills Development Scotland (SDS) there is an opportunity to reach many more schools and provide a cohesive learner journey approach. This could be overseen by the Construction Scotland industry leadership skills group and be led by SDS.

In recent years the industry has modified the images used in documents, advertising and media to help diversify its image and the opportunities. However, the industry must continue to update its media engagement, profile and key information if it wishes to compete against other industry sectors. In particular the sector needs to engage more through social media promoting the jobs, salaries, clean-tech and opportunities if it is to improve its reach with younger people and sufficiently compete with non-construction sectors.

The industry should promote better the international opportunities and skills transfer which working in the sector provides. Whilst this may create some intermittent small gaps in workforce, as some spend time periods abroad, it is a feature other industry sectors promote, which does not appear to negatively impact on their supply.

Recommendations

R.8.1 Promotion of future pipeline of activity and investment in sector and future job opportunities.

R.8.2 Improving gender balance, inclusive growth and diversity of workforce the sector should use a range of ambassadors and role models to demonstrate the various careers and opportunities.

R.8.3 Increase promotion of the sector, salaries and career pathway prospects through social media and schools.

- R.8.4 Increase support for early years outreach to primary and secondary years S1 to S4 such as via the future Construction Scotland "Inspire program". Engage and support with dedicated funding through local delivery partnering or sub-contracting with existing outreach programmes to maximise the geographic reach and number of schools involved. Such programmes should be linked with DYW and SDS to provide a cohesive approach. This should include skills taster sessions and engagement with training workshops where available.**
- R.8.5 Ensure development of media, articles and images used by industry to attract future entrants are aligned to supporting wider gender balance aims supporting diversity and inclusive growth.**
- R.8.6 Explaining and promoting the new clean tech, multi-discipline, construction technology and engineering careers which are possible and the international work opportunities.**
- R.8.7 Attracting skills transfer from non-construction sectors, bringing new attributes for future skills and technology needs for construction.**

Chapter 9: Enabling Medium & Long Term Skills

The following section outlines some of the projected future medium and longer term skills needs for the housebuilding sector. Medium term covers years 4 to 9 and Long term 10+ years. By planning over the next 4 years for the forthcoming medium and longer term skills needs provides an early preparation period for trials, pilots and skills mapping. Industry partnering to assess and evaluate new technologies, processes and systems helps not only share the risk but widen the knowledge at an early stage. This facilitates mainstreaming these technologies and a cohesive approach to skills development.

In the coming years as BIM level 2 (Building Information Modelling) becomes more fully integrated in the sector higher levels of BIM will emerge as technology, softwares and processes improve. Pre-planning of how higher levels of BIM Skills can have a more smoother adoption and take-up than experienced previously with BIM level 2 is important. It is also necessary to consider issues which can arise with the introduction of new technologies and training. A key lesson learnt from the introduction of BIM Level 2 was the rapid switch by some education providers to include BIM training. This led to the removal of some basic construction technology being taught and also the learner being so focused on the digital drawing and not understanding the underpinning construction technology. The learner journey should have the basic construction technology first before embarking on complex software modelling techniques.

Offsite construction is increasing and also can vary into the number of components and 'levels' of offsite [36]. In the future it is expected that more assembly of different components will be undertaken offsite. In addition, as technology improves and if set up costs do not increase too much then volumetric or modular may also increase. Given the shortages of housing available for one person and two person households and the significant increased demand forecasted by the National Records of Scotland [4] there is an opportunity for modular construction to deliver solutions for this market. Investment in skills training to support companies that currently or will invest in modular construction would help the sector grow to meet this societal challenge. This would align well with current and future Design for Manufacture approaches.

Scotland currently has approximately 8,000 electric vehicles (EVs) and 2,300 EV charging points of which 740 are hosted by local authorities or in public charge points. Current ratio of charging points to EVs is 1:3. If technologies improve and more rapid charging points are installed this ratio may reduce to 1:6 or 1:8. It is forecast by the National Grid [37] that the UK may have 11 million electric vehicles (EV) by 2030. If Scotland's share was to be 10% (1.1 million EVs) this would require a substantial year-on-year increase in EV charging point installations. This would suggest that over the coming decade Scotland would require to install 150,000 accessible charging points.

One of the considerations by Scottish government for future new homes, which would support the Climate Change Plan (CCP) [28] and emission reductions, is the integration of charging points in new homes. Note this would be in addition to the 150,000 required for publically accessible areas. Investment to support skills training and increasing the number of skilled EV installers for new housing would also help address the wider community needs for other EV installations. EV vehicles also offer a secondary energy portal back into the home. Future propositions include the home drawing down energy from the EV during the day or evenings. The EV then recharges at night during off-peak periods. Skills investment to augment and support the EV charging points installation delivery over the coming years will be critical to meet the oncoming forecasted uptake for EV and LEV vehicles.

One feature which has featured prominently in future planning is the digital built environment. Whether through integration of sensors, intelligent buildings and homes and the use of data driven innovation there are a number of new technologies which may go into future new homes. Alignment of skill sets and training courses to prepare for such a shift will be required. New housebuilding design provides a strong opportunity to enable combined integration of BIM, Offsite, Blockchain and Cloud approaches.

During the next 80 years due to global population increasing by almost 50%, the world will need to build approximately 2 billion homes. This will result in significant pressures on raw materials. As such investment in training and upskilling now for Designing for Deconstruction and Re-use of new homes will be important to avoid future generations being unable to re-use housing material assets at the end of their life cycle. These are factors which are commonly found in automotive sectors and other industries where 'designing for deconstruction' at the outset significantly improves re-use and materials recovery.

It is likely that many countries will shift towards more sustainable materials such as timber. Scotland has 70% of the UK softwood supply. Most timber frame is imported but recent research funded by Forestry Commission Scotland and Scottish companies has also identified applications and led to new homes being built using home grown timber. In particular there have been successes in modular, closed panel and CLT housing construction systems. To support this development and help the industry upskill a new MSc course in Timber Architectural Design & Technology at Edinburgh Napier University will commence in 2019.

With the global demand for housing increasing significantly in the coming decades this will place pressures on housing supply and skills. Early policies and investment by Scotland to support offsite and skills development for housing may also provide opportunities to increase exports or joint ventures for international markets. Companies partnering in skills development can also help form a 'critical mass' approach particularly for new innovations and future training programmes.

Use of virtual systems are increasing and recent applied research projects have been undertaken by Scottish companies, CSIC, Strathclyde University and Heriot-Watt University. Some companies have utilised virtual systems (VIR/VR/VS) for installations works, which provide instructions projected in front of the installer. One area which could benefit significantly from VS is site inspections and monitoring.

Whereby the site manager and/or building inspector can check the project site using specialised head-sets with pre-programmed design drawings to compare with as-built. This also provides digital recording facilities to track and file for retrieval at a later date if required. In recent years various construction issues on new build have occurred and loss of life events involving retrofit projects (such as Grenfell) have led to major changes to construction regulations. The ability to enhance inspection and verification through such on-site VIR/VR/VS technologies would be a major step forward. This would benefit not only the construction process but also provide a useful reference record for the buildings life cycle and future maintenance.

As new energy and control systems are developed to reduce energy consumption, costs, fuel poverty and emissions the integration of smart control technologies for new homes is likely to increase in the coming years. Future intelligent buildings will involve integrated micro-sensors pre-fitted during construction, such as via offsite. The shift to reducing gas usage and move to more electric energy sources may also involve increased innovation and involvement of hydrogen based energy systems and advanced fuel cells. Together all of these aspects and other technologies may enhance the route map to self-powered homes, which also create an energy surplus such as via the holistic integration of EV.

Given all of the above for new homes, the wider construction sector also has a significant pipeline of future activity, policies and additional skills pressures. The Climate Change Plans (CCP) provides a useful insight into the future demands on retrofit skills. Over the coming decade over 200,000 private rented properties will require to increase by two EPC bands. District, community and localised low carbon heating systems will be increased. The two CCP scenarios of either electric or hydrogen (towards 2050) will be shaped by much of the innovation, trials and pilots over the coming decade. This in turn will set the scene for some of the future specific skills needs for 2030-2050.

Improvements in energy efficiency for other existing housing stock, early years programme for schools, increase in new care homes and adapted existing homes to allow the aging population to remain longer in their own homes, will augment construction sector skills demands. Early action to support skills growth and offsite in the new build housing sector is therefore critically important to avoid future 'skills pull demands' from other construction activities.

Some housebuilders have reported issues and site project interruptions due to delays with ensuring utilities works are started and completed within the correct site project time period. It appears there are skills supply shortage issues within utilities sector for new house building sites. Utilities and groundworks are keystones for later superstructure works and are critical path enablers. Given the future growth towards more electric utilisation both in house building and other new construction sectors if critical pathways are interrupted or unable to commence this would cause major delays in future new housing delivery. Civil engineering contractors involved in site preparations, groundworks and substructures should be supported early to enable the project flow of sites to maximise the benefits of offsite delivered superstructure.

The construction industry is quite complex and also fragmented but many skills routes can transfer between different sectors. Whilst a key issue for the future is to

maximise the inter-links of knowledge, data and workforce across the industry, an equally important aspect is to ensure that all government departments, ministerial portfolios and public sector organisations are interlinked. The construction industry currently reports to, or, intersects across seven different government departments and ministers. Given the transformation in future demand and technologies and the acute role construction has to so many areas of policy, it is recommended that either there is a ministerial portfolio solely for construction or a new post for a senior civil servant for the construction sector is appointed. Co-ordination across departments, fore-sighting future policy pathways, skills planning and enablement of Scottish manufacturing in the sector will be required at the highest levels of government if the full economic, environmental and societal benefits and impacts are to be achieved over the coming years.

Recommendations

NOTE: These recommendations are for the current forthcoming period to help support and enable short, medium and future longer term new housing skills delivery.

- R.9.1 To establish a ministerial post for construction or to appoint a senior civil servant to oversee the construction sector and house building and co-ordinate across government departments and organisations.**

- R.9.2 To map the future demands and skills supply requirements to enable the delivery and deployment for the future electric built environment and to assess utility installers skills needs.**

- R.9.3 Support to industry to move to higher level offsite categories and more modular approaches, where practical.**

- R.9.4 Future skills needs are required within the sector to support the enablement in digital processes, BIM current & next stages, sensors, LEV installations, VIR / VS systems, design for manufacture and others.**

- R.9.5 To ensure that the use of digital training is at the right stages and levels before introducing more advance versions to the learning pathways stages and the underpinning construction technology knowledge is not diluted.**

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ANNEX A

Short Life Working Group Members

The short life working group (SLWG) membership is listed below:

Core Group Members

Homes for Scotland
Edinburgh Napier University
Offsite Solutions Scotland
Energy Skills Partnership (ESP)
Persimmon Homes (East Scotland)
Miller Homes Limited
Stewart Milne Group
Federation of Master Builders (FMB) Scotland
Springfield Properties
Cruden Homes (East)
Hart Builders (Edinburgh) Ltd
Scottish Building Federation (SBF)
Link Group Ltd
Edinburgh College
Inverness College UHI
Construction Scotland Innovation Centre
Construction Industry Training Board (CITB)
Skills Development Scotland (SDS)
Scottish Government

Secretariat - Scottish Government

Presentations and guests to discuss specific topics:

Forth Brickwork
CCG (OSM) Ltd
Centre for Offsite Construction, Edinburgh Napier University
Local Authority Building Standards Scotland (LABSS)
Heads of Planning Scotland (HOPS)
ID Systems UK
Scottish Water
SELECT

We would wish to thank Homes for Scotland and CSIC who kindly hosted the SLWG meetings.

ANNEX B

Potential effects of Brexit

The Scottish construction sector has approximately 3-4% EU workforce and the UK average is 9-10%. London and south east England have typically 45-55% EU workforce on new housing construction sites. Previous effects of skills shortages in London during the 1980's, 1990's and 2004-2008 attracted skilled operatives from across the UK to work in London. If EU workforces opt to leave the UK wide effect of Brexit on the construction workforce is likely to further diminish the availability of future skills supply in Scotland. Table B.1 provides summary information on EU workforce in Scotland. Table B2. Provides information of which skills and job roles areas EU workforce are typically employed, based on 2017 datasets.

The potential negative effects of Brexit may also impact on the sector via indirect routes in relation to World Trade Organisation tariffs (WTO) on material imports if there is a no-deal outcome. Scotland is more exposed to construction material imports for new housing than other parts of the UK primarily through the high proportion of new build timber frame and imported timber and wood panel materials. Engineered wood panels have a WTO tariff of over 10%. If the value of the pound falls relative to other currencies for a period of time import costs will increase. This may then create a two factor increase in additional costs. As has been shown in previous times of cost increases, house building sites under construction which have not included for unforeseen price increases, can sometimes force companies to reduce investments in other areas, such as skills development.

Whilst the Scottish construction sector has a low number of EU workers many other sectors in Scotland are higher, such as tourism and hospitality. If the EU workforce decreases in other economic and industry sectors, for both urban and rural, this will significantly increase competition between industry sectors to employ available workforce. Given the training and qualification time periods involved for some site based skills it may be difficult for construction to be as attractive, versus other sector training programs.

This is further affected by the current high employment rate and low unemployment rate in Scotland and the UK. As such there is not a sufficient available pool of unemployed workforce to draw upon. Shortages in available labour supply can also create inflationary pressures on salaries and site running costs.

House building skills demand is currently very high across regions of Scotland and the current EU workforce in employment play an integral role. Many EU workforce employees arrived with skilled qualifications. If EU workers in the new housebuilding sector decide to leave Scotland and the UK there is in effect a 4 to 8 year gap in new training entrants to be skilled up to similar levels of some of the EU workers who have left. This would impact on productivity and delivery of new house building. Increasing offsite construction may 'offset' some of the traditional skills supply issues, however it may still be difficult to fill gaps for site operators, groundworks, infrastructure, services, roofers, utilities, carpenters and fit out staff.

Table B1 – Key Points: Scottish EU workforce in construction [13]

Key Points: Scottish EU workforce in construction (2017)	
EU workforce in Scottish housebuilding	4%
EU workforce in Scottish civils and construction	3%
EU workforce in UK construction industry	217,000
EU Workforce in Scotland's construction sector	7,000

Table B2 [13]

EU Workers in Scottish Construction	As share of all workers in occupation (%)	As share of all EU Workers in construction (%)
General labour	4.1	21.7
Finishing trades	4	13.3
Brickwork	3.5	3.5
Carpentry	3.3	16.9
Other	2.8	17.2
Demolition / groundworks/frames	2.4	5.2
Management & professional	2.4	12.9
Roofing	1.5	1.4
Electrical	1.5	4.5
Plumbing	1.4	3.5

Note: the above table is based on Census 2011 and as such can only be used as a guide.

ANNEX C

Summary of Recommendations

Short Term Skills Pressures

- R.1.1 There should be a focus on the delivery to increase the supply of bricklayers, joiners* and painter & decorators to tackle industry shortages, with an initial focus on Highlands & Islands and south east Scotland.
- R.1.2 Adapting the supply of craft and non-craft on-site skills for house building in future through improved foresighting of skills needs relevant to the house building sector.
- R.1.3 Additional support and investment should be provided to assist training and supply of site managers and upskilling of current site managers.
- R.1.4 Support to develop Multi-Skills for on-site operatives to enhance workforce resilience, productivity, employability and supports inclusive growth.
- R.1.5 Skills courses developed which align to house building needs where there are specific shortages and offers faster entry to work (e.g. bricklaying for house building) - but which are part of the qualification route towards an MA, but would require further future top up in training, development and assessment prior to reaching full MA qualification.

Tracking Future Needs & Skills Supply

- R.2.1 Establishment of national annual 'touchpoint' dataset of the number of apprentices, skilled workforce, professions and construction related public sector workforce in Scotland to track sector supply, identify future gaps and provide proactive engagement for sector in working with government to better plan for the future.
- R.2.2 To develop annual regional skills analysis for those in training, identify key skills gaps to assist regional variations for industry training and future supply needs.
- R.2.3 Establishment of a construction skills and professions council for Scotland bringing all industry trade bodies and professional organisations together.

Funding, Investment and Fairness

- R.3.1 Review and clarity of the quantity of Scottish Government construction skills funding actually reaching sector for training and specifically SMEs.
- R.3.2 Fairness in approach across apprentices would be positive for the sector and be attractive to new entrants to the industry.
- R.3.3 A greater clarity for industry on outcomes of their contributions to the apprenticeship levy.
- R.3.4 Investment in resources / capex for FE sector to deliver future levels, quantity and quality of future skills training required, such as adaptable training facilities.
- R.3.5 Pre-apprenticeship support should be enhanced to maintain high completion rates and be used as a tool for attracting diverse markets for future skills / jobs needs.

Public Sector Statutory Skills Pipelines

- R.4.1 Investment in future Graduate Apprenticeship routes for new Building Standards Officers (BSO) and Planning Officers for Scotland (SQA Levels 7 and 11).
- R.4.2 Ring fenced funding for BSO roles aligned to health & safety outcomes post occupancy.
- R.4.3 Greater use of 'Type Approval' processes by local authorities and industry through LABSS, where possible, may improve on-site progression and productivity.

Offsite Construction Skills

- R.5.1 To introduce procurement pathways and new housing sector frameworks to encourage Offsite/MMC approaches specifically for larger sites – would provide an enabling pipeline platform for industry to invest further in offsite skills and Scotland's manufacturing capabilities.
- R.5.2 Support the development of growing the supply of future offsite skills, such as an offsite training academy.
- R.5.3 Support in the development of multi-skills for offsite.

Upskilling and Career Pathways

- R.6.1 Supporting those new and already in the sector with clear and functional Scottish education, training and career pathways through a centralised information portal for Scotland.
- R.6.2 Provision and supply of (flexible) upskilling or "top-up" knowledge (for all levels), which is encouraged by employers, public bodies and industry organisations.
- R.6.3 On-site and Offsite based short training sessions (less than half a day) should be funded to accelerate upskilling.
- R.6.4 Provision of upskilling funding support is required for BSO / Planners and public sector funded areas such as local authority and housing association staff.
- R.6.5 There is a need to up-skill education and careers staff (schools) and FE in readiness for future jobs, new career paths and opportunities.
- R.6.6 Upskilling in new timber construction systems and low carbon technologies.

Supportive Public Sector Policies

- R.7.1 Proposals for future policies and regulations by government – should include a Skills Impact Analysis (SIA) – this would help sector readiness and training providers gear up.
- R.7.2 Continue to use public sector procurement to encourage skills development.
- R.7.3 Improved outcomes and deliveries through community benefits linkages to skills training & employment.

Attracting Future Workforce

- R.8.1 Promotion of future pipeline of activity and investment in sector and future job opportunities.
- R.8.2 Improving gender balance, inclusive growth and diversity of workforce the sector should use a range of ambassadors and role models to demonstrate the various careers and opportunities.

- R.8.3 Increase promotion of the sector, salaries and career pathway prospects through social media and schools.
- R.8.4 Increase support for early years outreach to primary and secondary years (S1-S4) such as via the future Construction Scotland "Inspire program". Dedicated funding through local delivery partnering or sub-contracting with existing outreach programmes to maximise the geographic reach and number of schools involved.
- R.8.5 Ensure development of media, articles and images used by industry to attract future entrants are aligned to supporting wider gender balance aims supporting diversity and inclusive growth.
- R.8.6 Explaining and promoting the new clean tech, multi-discipline, construction technology and engineering careers which are possible and the international work opportunities.
- R.8.7 Attracting skills transfer from non-construction sectors, bringing new attributes for future skills and technology needs for construction.

Enabling Medium and Long Term Skills

- R.9.1 To establish a ministerial post for construction or to appoint a senior civil servant to oversee the construction sector and house building and co-ordinate across government departments and organisations.
- R.9.2 To map the future demands and skills supply requirements to enable the delivery and deployment for the future electric built environment and to assess utility installers skills needs.
- R.9.3 Support to industry to move to higher level offsite categories and more modular.
- R.9.4 Future skills needs are required within the sector to support the enablement in digital processes, BIM current & next stages, sensors, LEV installations, VIR / VS systems, design for manufacture and others.
- R.9.5 To ensure that the use of digital training is at the right stages and levels before introducing more advance versions to the learning pathways stages and the underpinning construction technology knowledge is not diluted.

ANNEX D

List of Abbreviations

AI	Artificial Intelligence
AL	Apprenticeship Levy
BIM	Building Information Modelling
BSO	Building Standards Officer
CBE	Construction & Built Environment
CCP	Climate Change Plan
CITB	Construction Industry Training Board
CLT	Cross Laminated timber
CSIC	Construction Scotland Innovation Centre
DYW	Developing Young Workforce
ESP	Energy Skills Partnership
EPC	Energy Performance Certificate
EV	Electric Vehicles
FA	Foundation Apprenticeship
FE	Further Education (colleges)
FMB	Federation of Master Builders
GA	Graduate Apprenticeship
GDP	Gross Domestic Product
GVA	Gross Value Added
HA	Housing Association
HE	Higher Education (universities)
HOPS	Heads of Planning Scotland
LABSS	Local Authority Building Standards Scotland
LEV	Low Emission Vehicles
MA	Modern Apprenticeship
MMC	Modern Methods of Construction
MWOW	My World of Work
OSM	Offsite Manufacture
OSS	Offsite Solutions Scotland
RTPI	Royal Town Planning Institute
SBF	Scottish Builders Federation
SDS	Skills Development Scotland

SFT	Scottish Futures Trust
SIA	Skills Impact Analysis
SLWG	Short Life Working Group
SME	Small and Medium Enterprises
SQA	Scottish Qualification Authority
STA	Structural Timber Association
STEM	Science, Technology, Engineering, Mathematics
VIR	Virtual Intelligence Robots
VR	Virtual Reality
VS	Virtual Systems



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