

Annex A: Consultation Emission Sector Summaries

Table of contents

Annex A: Consultation Emission Sector Summaries	1
1. Introduction	3
2. Electricity and Heat Generation	3
Mapping and Key Milestones	3
Addressing the skills needs	8
Links to other sectors	10
3. Residential Buildings	11
Mapping and Key Milestones	11
Addressing the skills needs	14
Links to other sectors	18
4. Land Use, Land Use Change, and Forestry	19
Mapping and Key Milestones	19
Addressing the skills needs	21
Links to other sectors	25
5. Transport	26
Mapping and Key Milestones	26
Addressing the skills needs	28
Links to other sectors	29
6. Public Sector	30
Mapping and Key Milestones	30
Addressing the skills needs	33
Links to other sectors	36
7. Industry and Business	36
Mapping and Key Milestones	36
Addressing the skills needs	39
Links to other sectors	42
8. Agriculture	43
Mapping and Key Milestones	43
Addressing the skills needs	45
9. Waste and Circular Economy	50
Mapping and Key Milestones	50
Addressing the skills needs	52
10. General Questions	54
What skills are needed in Wales to meet the current and future net zero skills gaps?	54
Will these result in new jobs being created or broadly maintaining the existing number of jobs, but with a level of upskilling required or changes to the types of occupations? If so, please give details of opportunities and potential geography.	54
How can we future proof our skills delivery to meet our net zero ambitions?	55
What are the key milestones or timescales to deliver these skills in Wales?	56

Is the infrastructure in place in Wales to meet these needs?	56
What do you see as the impacts/barriers to address the skills needs in Wales?	57
What action is needed to remove those barriers?	58
What is the impact of these skills not being available in Wales?	59
What cross-cutting circular economy skills do you consider are required in your sector? (for example, eco-design, re-use, repair, remanufacture, reprocessing)?"	59

1. Introduction

1.1 The sector summary provides detailed information from each emissions sector.

2. Electricity and Heat Generation

Mapping and Key Milestones

Q.1.1.1 What investment, policies, transitioning impacts, technologies are expected to be implemented in Wales that will impact the net zero skills needs in Wales and their timescales?

2.1 Many respondents urged the importance of utilising the Welsh coastline for coastal/offshore wind power generation, including several specific mentions of the Celtic Sea and the Crown Estate leasing enough seabed to allow for 4.5GW of Floating Offshore Wind (FLOW) in the Celtic Sea by the year 2035. One response suggested that depending on the outcomes of the Floating Offshore Wind Manufacturing Investment Scheme (FLOWMIS) process, floating wind energy production opportunities could emerge in South Wales.

2.2 In terms of skills investment in readiness for this, there was reference to RWE's offshore training and apprenticeship programme based at Coleg Llandrillo Menai in Colwyn Bay, North Wales. Another response talked of investment in work which has commenced on a £14m Centre of Excellence for Engineering, which will see the development of a bespoke wind turbine centre.

2.3 There were a number of references to various schemes, policies, and investments at the UK (United Kingdom) level that will impact the Welsh market. These include leasing expectations around social value from The Crown Estate, changes in the Contracts for Difference Scheme, and the development of the Industrial Growth Plan. These factors highlight the importance of considering broader national initiatives when planning renewable energy projects in Wales.

2.4 One response promoted investment in hydrogen power, district heating systems and development of carbon capture, utilisation and storage (CCUS) technology in aid of reducing emissions from gas powered electricity generation and general industry. Considering Welsh coastline abundance, particular focus should be given to scaling marine energy generation. Although the response warns that the potential of each technology will require detailed assessments and studies conducted through collaboration between numerous stakeholders.

2.5 Many responses expected the composition of heat and electricity generation to change. Domestic air source heat pumps are seen as likely to be a preferred option for the eventual replacement of methane boilers, though one response mentioned that the gas industry workforce will maintain skills demands for decades, following:

- the recent extension of the phase out of domestic methane boilers
- impending legislation to secure annual North Sea oil and gas licensing rounds, and
- the expected decision against hydrogen having a primary role in the future of home heating.

Q.1.1.2 Will these result in new jobs being created or broadly maintaining the existing number of jobs, but with a level of upskilling required or changes to the types of occupations? If so, please give details of opportunities and potential geography.

2.6 According to one response, the Offshore Wind Industry Council (OWIC) Skills Intelligence Report 2023 predicted a need for over 100,000 skilled workers by 2030 to meet targets. Additionally, the development of offshore wind projects in the Celtic Sea and the transition to a low-carbon economy are expected to create thousands of new jobs. One response stated there are also opportunities for onshore wind and solar projects, especially in mid Wales, where they can coexist with farming and benefit local communities. As existing wind farms reach the end of their operational life, there is potential for the development of high-value industries and circular economy jobs through the replacement and recycling of materials.

2.7 One response suggested that the majority of homes still require decarbonisation through heat pumps and increased flexibility in demand through a combination of solar PV, smart meters and battery storage. This was said to indicate a clear need for well-trained and skilled installers in Wales to meet the ongoing demand. One respondent cited work by Solar Energy UK, which found that the solar industry in the UK will require around 60,000 workers by the mid-2030s. In addition, the Heat Pump Association is quoted as suggesting that the heat pump sector will need approximately 50,000 heating engineers by the same time. The Construction Industry Training Board (CITB) was also referenced by the respondent, in particular the estimation that the entire sector will require an additional 350,000 people, including 80,000 project managers and support staff, to meet the demand for building improvements.

2.8 There were also concerns that more thought should be given to the consumer advice side of the transition, with emphasis that companies need to anticipate customer demands and expect a degree of confusion, particularly because of the complex nature of the installation of a first heat-pump to a domestic property.

2.9 One respondent recommended that well paid jobs are created in the manufacturing and supply chain sectors. They suggested that the jobs will be UK-wide as the offshore wind supply chain matures and businesses acquire materials, services, and parts from across Wales and the UK. These jobs were expected to comprise long-lasting and well-paid positions in trades and technical skills, which do not require a bachelor's degree.

2.10 Some responses also mentioned that in their opinion exact numbers of new jobs are hard to predict because UK policy is not fully clear on the expectations for the energy sector.

Q.1.1.3 What will be the new, emerging or increased net zero skills demands in Wales as a result?

2.11 Most responses mentioned that upskilling of current jobs will be critical in the delivery of a net zero 2050. However, many responses suggested that current

demand for these skills cannot be met and that sectors are currently limited in capacity due to the lack of a skilled workforce in Wales.

2.12 Many responses recorded a need for more heat pump engineers to be trained. One response in particular mentioned the importance of retrofitting the UK housing stock but currently not having the number of skilled workers they require. Another response voiced concerns that especially in rural areas of the country, the Welsh Government's target of installing 600,000 heat pumps every year lacks the engineers to make this a reality. Considering an increasing number of heat pumps being installed and future projections, many responses voiced the idea that there will be significant need for maintenance employees and skilled technicians to maintain clean energy solutions.

2.13 Some responses highlighted concerns about the proposed Heat Strategy for Wales which focuses solely on heat pumps as a low carbon technology, ignoring other alternatives. The one-size-fits-all approach was seen as unlikely to achieve the goal of net zero emissions by 2050. There were doubts about the ability of individuals currently working in oil or solid fuel industries to quickly retrain for heat pump installation. Additionally, the implementation of the Clean Heat Market Mechanism is expected to negatively impact the availability of installers in Wales, potentially leading to a skills shortage and making it more challenging to meet heat pump targets across the UK.

2.14 Several additional responses talked to the lack of robust skills systems in the energy and utilities industries, with fragmented training and duplication of effort. Fast-tracking programmes to address these skills gaps was seen as critical for meeting decarbonisation targets and ensuring economic value. It was felt that failure to address skills needs could result in labour shortages and missed opportunities for local communities.

2.15 One response argued the importance of expanding the scope of upskilling to include an interconnected group of sectors across Wales, not simply training heat pump engineers. This would involve hundreds of trades and skills, starting with appropriate schooling in colleges and universities. Another response recognised not just the importance on upscaling the existing workforce but creating new career paths for younger people.

2.16 Multiple responses suggested that there is huge need for improving digital and data skills alongside identified engineering skills. Factors such as artificial intelligence, digital infrastructure, data analysis, robotics and SCADA system-related skills were all important. These skills related closely to emerging technologies across Wales and the need to promote jobs, design of new technology, carbon capture scientists and renewable innovation specialists.

2.17 Geographically, one response talked to the opportunity for fairness and a just transition in terms of upskilling, as all areas of the country are going to need to utilise these skills. For example, heat pumps will need to be widely distributed and will need local engineers for servicing purposes. Another response suggested that the current workforce in Wales faces huge upskilling opportunities, due to recent events such as the mass displacement of the Tata Steel Ltd employees.

2.18 Areas in need of upskilling, identified from responses:

- Mechanical / civil / electrical engineering
- Digital skills / data analysis
- Offshore construction – fabrication, welding, high-voltage engineers
- Marine and port operations experts
- Manufacturing
- Sustainable energy production maintenance
- Environmental specialists
- Innovative design
- Carbon capture scientists

Q.1.1.4 What are the key milestones or timescales to deliver these skills in Wales?

2.19 The following milestones were provided by respondents from the Electricity and Heat Generation sector:

- Short term:
 - One immediate milestone identified was the rapid establishment of vocational training programmes.
 - Short-term collaborations with educational institutions, mid-term implementation of specialised courses and certifications, and long-term efforts to sustain a skilled workforce.
 - Another response supported immediate action, stating that with appropriate training, existing tradespeople could potentially be in a position to begin installing good quality, efficient heat pump systems in a matter of weeks. This could help to address the shortfall in numbers of new young workers in the industry.
 - In the view of one respondent, the 580,000 heat pump installation target in Wales by 2035 is impossible without significant additional Welsh Government support for heat pump training, including apprenticeships, and further grants to reduce the up-front cost of installing a heat pump.
- Medium term:
 - On a medium-term basis, one response stated that The Crown Estate leasing rounds for floating wind in the Celtic Sea opened in December 2023 and the Contracts for Difference Auction Round 6 timescale will both payout in 2024.
 - Another stated that The Crown Estate leasing round for 4.5 GW of floating offshore wind in the Celtic Sea, is due to take place in Autumn 2025.
 - The 2025 milestone will initiate a significant step-up in skills requirements, whereas the 2035 heat pump target necessitates skills needs being met well in advance of this.
- Long term:
 - One response stated that the Net Zero Energy Workforce Report showed that the UK needs to fill 400,000 roles in the net zero energy workforce by 2050. It emphasised the importance of planning

curriculum developments in educational institutions to secure funding and provide stakeholders with a clear skills pipeline.

- The Welsh Government's target for 100% electricity demand from renewable sources by 2035 was mentioned, with industry requesting a delivery plan and milestones to track progress.
- Another response also mentioned the significance of linking milestones to a strategic programme aligned with industry demand and the opportunities in scaling up industries supporting wind energy projects.

2.20 Many responses agreed that change will be driven by policy, especially in the heating and electricity sector. As it stands, according to one response, the timescales are not fixed and will change.

Q.1.1.5 What cross-cutting circular economy skills do you consider are required in your sector?

2.21 Responses pertaining broadly to developing a Circular economy noted:

- One response suggested that in the low carbon electricity and heating generation sector there is a growing demand for actions rooted in circular economy principles to enhance sustainability and resource efficiency.
- Another response said that the heating and electricity industries would welcome support to allow their sectors to implement more circular measures and also government support for training SMEs (Small Medium Sized Enterprise) to build the local supply chain expertise in circular economy skills.

2.22 Job creation stemming from circular economy practices:

- Many responses speak to the idea of job creation outweighing the jobs lost from non-renewable sources. There is likely to be job growth in fields including waste management.

2.23 There was emphasis on design innovation:

- Some responses focused on the importance of design and draughting skills in creating process plants that maximise lifespan and minimise environmental impact.
- Advanced construction techniques such as modularisation, remote asset monitoring, digital twin capability, and data analytics contribute to plant longevity.
- Additionally, the need for professionals specialising in eco-design, reuse strategies, energy components, remanufacturing, reprocessing, material efficiency, and circular supply chain management is emphasised in designing energy systems with a focus on environmental sustainability.

2.24 Respondents discussed repair, reuse and recycle:

- Many respondents highlighted the importance of maximising the reuse of materials and minimising waste in the supply chain. This approach presents opportunities for the development of high-value industries and jobs, particularly in the context of decommissioning sites. Specifically, there are prospects for job creation and export opportunities through the reuse, refurbishment, remanufacturing, and recycling of wind turbine components and wider assets.

- Additionally, the production and use of green steel in Wales offer significant opportunities, as it is recyclable after its operational life in onshore and offshore wind.

Addressing the skills needs

Q.1.1.6 Is there provision to deliver these skills offered in Wales?

2.25 Some responses identified the realistic near-term opportunities for domestic supply chain capacity development in Wales. These opportunities include:

- steel fabrication capacity,
- potential for concrete casting and manufacturing capacity,
- coating of key components, and wire drawing capacity for inter array and high voltage cables.

2.26 It was recognised that the Welsh Government is already taking action to address the skills needs associated with these opportunities through policy recommendations, initiatives such as Green Personal Learning Accounts, and collaboration with local authorities such as Neath Port Talbot. Respondents believed there is a need for a centralised board or stakeholder to coordinate these efforts and ensure that the skills are effectively delivered to the main stakeholders and users within these new sectors.

2.27 Heating and electricity industry respondents believed there is some existing capacity in the academic sector to utilise expertise for the heat pump installation sector, but certain specialised skills are difficult to replace. People working in the sector felt that there is provision to meet the skill needs, but with limitations. The provision for junior entrants or those without previous experience was seen as challenging, as there is limited access to vocational training. OFTEC has relationships with training providers in Wales, but these centres may not be able to support the number of installers needing retraining for the proposed strategy.

2.28 Many responses highlighted concerns relating to the lack of up skilling education programmes and capacity to fill targets set by policy. However, multiple responses cited the Neath Port Talbot project as a best practise example of how local authorities in Wales can address the net zero skills gap.

Q.1.1.7 If not, are they being delivered elsewhere in the UK and can Wales based employers and individuals access this provision?

2.29 Responses mentioned several good examples of industry-led approaches to zero carbon training provision. These examples include:

- SGN's H100 training facilities, which collaborate with a local college to train network engineers and installers in delivering hydrogen demonstrations.
- Companies like Octopus Energy and Aria, which are developing comprehensive programmes that offer hands-on training in dedicated centres.
- Online platforms like Heat Geek provide installers with deeper knowledge of heating system design and access to an umbrella scheme for customer acquisition and peer-to-peer learning.

2.30 These examples demonstrate the effectiveness of collaborative efforts between industry and education/government sectors in promoting sustainable training initiatives.

Q.1.1.8 If these skills are being delivered in Wales, is the scale appropriate currently and does it meet Wales' future workforce needs?

2.31 Respondents answering under the sector of Electricity and Heat Generation did not provide information for this question.

Q.1.1.9 What do you see as the barriers to address the skills needs in Wales?

2.32 Lack of an industrial strategy:

- One response suggests there is a lack of industrial strategy that focuses on key competitive advantage areas, which hinders Wales' ability to leverage its strengths effectively.
- Secondly, the absence of clarity regarding leasing and consenting timelines creates uncertainty for projects, making it difficult for businesses and investors to plan and make informed decisions.
- Lastly, Wales lacks a singular, solid delivery plan that coordinates with the wider UK requirement, indicating a need for better coordination and alignment to drive progress. It was felt that addressing these issues through strategic planning, clear communication, and coordinated efforts can help overcome these challenges and foster economic growth in Wales.

2.33 Other barriers identified by respondents included:

- Skilled labour shortages
- Gender inequalities
- Limited pipeline opportunities for young people in STEM
- Lack of diversity

Q.1.1.10 What action is needed to remove those barriers?

2.34 Responses suggested various policy commitments for addressing the lack of clarity in project capacity, timeline, and location. One proposal was for a Just Transition Fund to support worker transition and investment in different areas. Additionally, the respondent suggested creating a strategic delivery plan with detailed analysis of sectoral skill requirements, particularly in key designated areas. Another response advocated that guidance for Local Regional Skills Partnerships should also consider explicitly addressing jobs related to climate change and renewable energy.

2.35 It was noted that attention is also required in addressing the recruitment issues the sector faces:

- Responses highlighted a need for further information dissemination and awareness raising in the energy sector and the need for training programmes, coordination, and collaboration to prepare for the use of new technologies.
- It was suggested that the focus should be on reframing jobs in the sector and inspiring the next generation to choose STEM careers.

- there was an emphasis on raising awareness of career opportunities through targeted marketing efforts, funding for training initiatives, and collaborations between educational institutions and industries.
- Innovative solutions, such as online training programmes and community outreach, were seen by one respondent as crucial in addressing geographic and demographic disparities.

Q.1.1.11 What is the impact if these skills are not available in Wales?

2.36 The following concerns were raised by respondents regarding the impacts if the necessary skills are not available in Wales.

2.37 Social:

- Many responses agreed that there will be intense competition for skilled workers across industries and regions and the social and health implications of not transitioning to cleaner energy include health risks and unequal access to energy, particularly in rural and economically disadvantaged areas.
- If skills are not available locally, they may need to be sourced from elsewhere, potentially reducing job opportunities for the local population and minimising economic impact.
- The lack of local skills provisioning can exacerbate issues of out-migration and the lack of local opportunities.

2.38 Economic:

- Economic challenges faced by Wales, including missed opportunities for investment, increased dependence on imported energy and skills, and potential negative impacts on investment decisions.
- The lack of available skills in Wales could result in lost job opportunities and developers seeking projects elsewhere, leading to weakened economic growth and potential outward migration.

2.39 Environmental:

- Concerns about Wales' transition to a net zero economy being slowed down. This could potentially lead to a shortage of talent, causing an increase in unemployment and a delay in adopting sustainable practices.
- Additionally, there are environmental consequences such as the inability to meet climate targets, loss of biodiversity, and increased pollution.

Links to other sectors

Q.1.1.12 Are there any dependencies with other sectors, with specific links to skills? If so, what are these and what are their impacts?

2.40 The responses highlighted the potential for floating offshore wind to benefit historically vulnerable communities and those affected by the decline of the fossil fuel sector. They also emphasised the dependencies and competition in the wind energy market, particularly with Irish and French offshore wind projects near the Welsh coastline.

2.41 Additionally, construction base dependencies are highlighted by the interconnection of various industries in the context of the floating offshore wind industry. Respondents recognised the importance of manufacturing, ports, and technology sectors in supporting the wider supply chain.

2.42 Respondents also noted the significance of the electricity and heating generation sector, along with related industries like construction, technology, and manufacturing. The maintenance, repair, construction, extraction, and production sectors are also mentioned as integral components. This was particularly in terms of designing, building, installing, and maintaining zero carbon heating solutions.

3. Residential Buildings

Mapping and Key Milestones

Q.1.1.1 What investment, policies, transitioning impacts, technologies are expected to be implemented in Wales that will impact the net zero skills needs in Wales and their timescales?

3.1 Respondents provided the following investments, policies, transitioning impacts, and technologies that they expected to be implemented.

3.2 Investments:

- Grants for households to install power wall batteries to save energy/sell energy to the grid
- ECO funding
- Warm Homes funding
- Welsh Government Optimised Retrofit Programme

3.3 Policy:

- Welsh Housing Quality Standards 2023
- Welsh Development Quality Requirements 2021
- Future Homes Standard 2025 consultation launch
- The associated revision of the modelling approach, away from the SAP and to a new Home Energy Model
- Local Area Energy Plans 2024
- Warm Homes programme
- Policies (e.g., the National Forest) to increase forest cover requires the recruitment of skilled people
- Timber Industrial Strategy
- Heat Strategy for Wales
- Restrictive planning conditions and restrictions within the Eryri National Park

3.4 Transitioning impacts:

- Impact on national grid infrastructure and ability to meet new demands
- Human behaviours - moving people from traditional methods to use new technologies
- Retrofit

3.5 Technologies:

- Solar energy
- Offshore and onshore wind
- Hydrogen technology
- Battery storage
- EV's, charging, and infrastructure
- Innovative technology
- Fabric first and insulation (EWI, IWI, Lime Render)
- Artificial intelligence
- Heat pumps
- Infrared heating
- Smart cylinders
- Small scale renewables

Q.1.1.2 Will these result in new jobs being created or broadly maintaining the existing number of jobs, but with a level of upskilling required or changes to the types of occupations? If so, please give details of opportunities and potential geography.

3.6 Respondents provided feedback in regard to the job landscape:

- New jobs
 - Surveying
 - Project management
 - Compliance
 - Trades including electricians and renewable / low carbon technology installers
 - Education
 - Local and national government
 - Retrofitting contractors and consultants
 - Insulation
 - Installers and engineers in the heat sector
 - Financial modelling
- Existing jobs with necessary upskilling
 - Oil and gas boiler fitters needing training in ASHP and GSHP
 - Electricians for battery storage
 - Roofers for technology skills
 - Homebuilders with skills of retrofit
 - Surveyors will need to upskill on data management

Q.1.1.3 What will be the new, emerging or increased net zero skills demands in Wales as a result?

3.7 The emerging skills required in the sector include:

- Proficiency in new energy sources, including in nuclear, tidal, wind, and hydrogen
- AI
- Whole life embodied carbon assessment
- Retrofitting evaluators and related specialist insulation specialisms
- Site Quality Control

- Building Performance Analysis

3.8 There is expected to be increased demand in the following:

- Advisory for how to use technology such as effective use of air source heat pumps
- Property surveyors (including for retrofit) and building performance evaluation including awareness of the new PAS 2035 and PAS 2038 processes.
- Small scale renewables
- Mechanical and electrical engineers, particularly with crossovers in both
- Engineering for emerging technologies such as solar PV, battery storage, and air source heat pumps
- Installation experts for both overhead and underground infrastructure installation and maintenance skills
- Installation experts in heat pumps Mechanical Ventilation with Heat Recovery (MVHR) and photovoltaic panels with battery storage will also be needed
- Project managers and coordinators in retrofitting
- Quantity surveyors with an awareness of embodied carbon

Q.1.1.4 What are the key milestones or timescales to deliver these skills in Wales?

3.9 Immediate:

- WDQR already in place for new homes

3.10 Pre-2030:

- Completion of the latest review of Parts L and F of the Building Regulations (Wales) - 2025
- Future Homes Standard and Building Regulation changes – 2025
- Adra targets to build 900 new homes between 2022-2025

3.11 2030 Onwards:

- WHQS timelines EPC C & SAP 75 - 2030
- Peak demand for new entrants for construction by 2030
- Social Homes to be minimum rating of SAP92-EPC A by 2033
- Net Zero 2035 Challenge
- 580,000 heat pump installation target in Wales by 2035

3.12 Longer term:

- Net Zero homes and buildings – 2050

Q.1.1.5 What cross-cutting circular economy skills do you consider are required in your sector?

3.13 Respondents mentioned design, repair and reuse and supply chain skills as the circular economy skills required in the sector of residential buildings.

3.14 In regard to design, respondents mentioned:

- The need for eco-design to be used in the development of new buildings and homes
- Retrofit measures such as a Sunamp hot water battery
- Standardising design principles in relation to Net Zero
- That designers be conversant with circular economy principles such as 'design for disassembly' and 'design for reuse'

3.15 For repair and reuse, respondents said that:

- More thought should be given to how heat pumps and other heat source appliances can be rebuilt with new components rather than completely replaced.
- They are already prioritising skills in the separation of excess materials, enabling waste streams to be viewed as useful and valuable resources.
- An area of consideration is the life cycle of correctly disposed of fuel tanks that become redundant as result of changing technologies.

Addressing the skills needs

Q.1.1.6 Is there provision to deliver these skills offered in Wales?

3.16 There was a mixed response to whether provision is currently available in Wales to deliver these skills in Wales. Those answering yes cited the following as evidence:

- The existence of college timber construction courses across Wales focussed on traditional approaches, for example site carpentry and bench-joinery.
- Action taken by the Welsh Government towards addressing skills needs, for example, 'Stronger, Fairer, Greener Wales – a plan for employability and skills' which sets out a clear series of policy recommendations to address the broader skills challenges across the Welsh economy.
- The example of initiatives such as Green Personal Learning Accounts
- Current work of the WJEC in developing Sustainability Qualifications
- Work by local authorities such as Neath Port Talbot (NPT) who are delivering a project to integrate skills and competency in retrofit jobs through new learning pathways.

3.17 Some respondents answered 'yes' with the following caveats:

- A lack of understanding about what skills are required and building the aspiration for the future workforce in specific green skills.
- Limited access to certain courses. Examples included there only being two specialist centres for forestry-related Further Education courses in Wales
- Although there are currently two centres offering heat pump training in Wales, these are small centres unlikely to be able to support the number of heat pump installers requiring retraining
- Limited vocational training to complement the 'classroom' elements of learning. Without access to vocational training, learners are not considered 'fully trained' and are thus not desirable candidates for employers.
- Many courses are still in development, with training and skills provision in the exceedingly early stages. An example given was the Construction Wales Innovation Centre (CWIC) commencing two pilot schemes in early 2024.

3.18 Those answering no to this question noted that:

- There is a training demand / provision gap despite the Welsh Government implementing initiatives such as Personal Learning Accounts (PLAs), Regional Skills Partnerships and Flexible Skills Partnerships to deliver Net Zero skills within Wales.
- This provision does not go far enough to provide for the magnitude of skills needed to deliver Net Zero by 2050 in Wales with there being a challenge to find suitable contractors to carry out normal repair and maintenance work, with it being even more challenging to add a decarbonisation element to the process.
- Another respondent mentioned that the level of workforce and recruitment is currently not sufficient, with a sizeable portion of the construction workforce looking to retire within the next 10 years.

3.19 A number of recommendations were included under this question, they included:

- Further provision from the UK and the Welsh Government including investment in campaigning to raising the profile or changing the perception of net zero skills, funding for development of content, and support to roll out courses in other regions.
- Support for business development, particularly for sole traders who will need to take on or work with other businesses in order to successfully deliver heat pump technology.
- Following the examples of successful collaborative working between local authorities, education providers and sector bodies to ensure that the training and skills are reflective of the industry needs. Current examples of good practice such as this exist through the SWITCH-On Skills project in Neath Port-Talbot.

Q.1.1.7 If not, are they being delivered elsewhere in the UK and can Wales based employers and individuals access this provision?

3.20 For courses that are currently being delivered elsewhere in the UK and Wales based employers can access, respondents mentioned:

- The IAA who are currently bidding into CITB to support some of this work
- The privately owned Retrofit Academy delivering PAS 2035 qualifications for retrofit early-stage discussions are also underway with private sector training providers.

3.21 One example of provision that employers in Wales cannot access was The Built Environment Sustainable Transition (BE-ST) institution in Scotland, part of the University of Strathclyde (similar to CWIC in Wales)

3.22 Good examples of work currently being done in England that could be replicated by the Welsh Government included:

- The IAA having been awarded 10 percent of the domestic retrofit fund in England from the Department for Energy Security and Net Zero
- Level 3 training courses such as those supported by the UK Government's Heat Training Grant in England.

3.23 The challenges and limitations in this sector were, however, thought to be UK-wide. Additionally, while discussions are underway to replicate delivery of courses such as practical training and skills for a decarbonised built environment in Wales, it was felt these are under resourced.

Q.1.1.8 If these skills are being delivered in Wales, is the scale appropriate currently and does it meet Wales' future workforce needs?

3.24 Respondents agreed that the scale is not currently appropriate to meet future work needs. Specific problems with provision mentioned were:

- The volume of delivery is not currently meeting the need
- Provision not being sufficient in north Wales
- Although there are a few new entrants into the market, they are currently not engaged with industry
- Funding beyond 2023/-24 was described as uncertain

Q.1.1.9 What do you see as the barriers to address the skills needs in Wales?

3.25 There were a number of barriers listed as relevant to addressing the skills need in Wales. The barriers mentioned can be grouped into the themes of training, a lack of a joined-up approach, professionalism and guidance, finance, and recruitment.

3.26 The barriers to effective training mentioned, were:

- A lack of tutors experienced in the sector with the ability to deliver skills training
- An insufficient number of qualified individuals to deliver practical training alongside practitioners for vocational skills
- A lack of onsite or vocational training to go alongside the online courses currently available that can cover practical skills and ensure entrants are industry competent
- The demand for more flexible training that can be modular and flexible in delivery to minimise lost fee earning time, better appealing to SME or micro-SMEs
- Knowledge gaps from businesses, installers, and consumers on what needs to be done to decarbonise buildings

3.27 The information provided from those who thought there was a lack of a joined-up approach included:

- The clarity of direction, consensus, strategy, knowledge, information and know-how from the Welsh Government not existing to the degree needed. Whilst road maps-built asset funding (Warm Homes), and skills funding exists (PLA (Personal Learning Accounts)) it is currently not aligned
- The development of a roadmap to show that an extensive career is possible, was thought to be an appealing way to attract new entrants into the market
- Embedding these roadmaps in careers advice for schools, colleges, parents, job centres, local authorities and RSLs could encourage new entrants into the sector as needed
- Headline targets published by the Government were not seen as achievable should the necessary practical infrastructure be put in place to make targets possible.

3.28 The lack of guidance within the sector was thought to be a problem due to those in the sector being unaware of the requirements for Net Zero skills and training needed:

- A need to enthuse new entrants into the industry on quality
- A current inability to highlight a clear and stable market demand to businesses and individuals in the sector. It was suggested businesses will be willing to commit staff time and funds to gain the specific qualifications / certifications where there is guidance to what is important and worth pursuing. Examples given were in both the MCS (Microgeneration Certification Scheme) and PAS 2030/35 schemes being linked to public funded works.

3.29 The financial barriers mentioned by respondents were the lack of necessary funding compounded by the tight timescale for delivering works to meet decarbonisation.

3.30 Those who cited recruitment and retention as a barrier, mentioned:

- Specialist training college lecturers and assessor salaries as insufficient to attract candidates.
- The poor awareness among educators of industry changes producing insufficient new entrants.

Q.1.1.10 What action is needed to remove those barriers?

3.31 The main themes identified as needed to remove barriers to address the skills need in Wales were funding, sector awareness, policy, training and recruitment.

3.32 Specific actions under funding included:

- Long term funding mechanisms and knowledge of the availability of future funding streams.
- Improved salaries for trainers and the support for new lecturers and assessors to achieve their teaching qualifications without putting them on a reduced development salary.
- Extending the funding currently available to support heat pump training to independent training establishments that offer recognised training such as OFTEC courses.
- Developing and improving existing initiatives such as Personal Learning Accounts and Flexible Skills programme.

3.33 Actions that involved increasing sector awareness included:

- Education, knowledge sharing, and raising awareness with employers across different sectors about the actions that can be taken to contribute to the Welsh Government's net zero ambitions.
- Encouraging the uptake of innovation to advance the delivery of energy efficient and low-carbon buildings.
- An extensive and interconnected group of sectors across Wales, involving a wide range of trades and skills, beginning with schools, colleges and universities.

3.34 Policy actions that the Welsh Government could take include:

- A more holistic and joined-up standards and policy regime that drives the construction of new buildings, and retrofitting existing ones using all the different trades, technologies, approaches and innovations available.
- To significantly boost efforts surrounding heat pump installation in housing stock.
- The continuation of the Welsh Government's work with local authorities and third sector organisations to identify ways to upskill staff.

3.35 Specific actions that could be taken on training, were:

- Accreditations, more qualified trainers and more local training courses for the sector.
- Creating new and improved qualifications, apprenticeships and internships to give young professionals a route into the sector.

3.36 Recruitment was suggested as one form of addressing these barriers. The action mentioned was to increase awareness among young people of both the potential impact of green jobs and routes to entry into the sector, with a clear view of the opportunities.

Q.1.1.11 What is the impact if these skills are not available in Wales?

3.37 The most frequently mentioned impacts for this sector were economic and environmental, these included:

- An outsourced skilled workforce
- A weakened circular economy in Wales
- An increased carbon footprint
- A failure to meet Net Zero / decarbonisation targets

Links to other sectors

Q.1.1.12 Are there any dependencies with other sectors, with specific links to skills? If so, what are these and what are their impacts?

3.38 The following industries were mentioned as critical to ensuring Net Zero is delivered for Residential Buildings:

- Manufacturing and construction
- Education
- Housing
- Transport
- Energy – specifically electrical infrastructure
- The circular economy

4. Land Use, Land Use Change, and Forestry

Mapping and Key Milestones

Q.1.1.1 What investment, policies, transitioning impacts, technologies are expected to be implemented in Wales that will impact the net zero skills needs in Wales and their timescales?

4.1 Respondents identified the need to invest in individuals with skills in ecology and nature conservation. These professionals will be responsible for various tasks such as habitat creation and management, woodland restoration, peatbog restoration, and implementing nature-based approaches to reduce flooding.

4.2 Furthermore, there was an emphasis on the importance of sustainable farming practices and the role of the Sustainable Farming Scheme in shaping the rural economy. Investment in training arborists and developing techniques to manage animal nutrients was highlighted as crucial. Moreover, the development of a universal method to measure "net zero" in farming was deemed important.

4.3 Additionally, the use of technology, such as robots, to minimise labour hours and improve yields in the horticulture sector was seen as important. The potential of artificial intelligence in the forestry sector was acknowledged, although its current development is limited.

4.4 The creation of woodlands and the increase in continuous cover forestry were identified as key strategies for carbon sequestration and biodiversity net gain. Private sector investment in commercial forestry and modern wood processing was expected to play a significant role in achieving these goals. Collaboration with the government to promote the forestry sector as a place for investment and professional growth was desired. In terms of construction, the expansion of forest cover was recognised as a proactive mechanism for carbon removal. Advanced Timber Manufacturing (ATM) and the development of a Timber Industrial Strategy were seen as important for promoting sustainable building practices and reducing carbon emissions in the residential sector.

4.5 There was also a call for identifying land that could be used as carbon sinks and nurturing the necessary skills to manage peatland.

Q.1.1.2 Will these result in new jobs being created or broadly maintaining the existing number of jobs, but with a level of upskilling required or changes to the types of occupations? If so, please give details of opportunities and potential geography.

4.6 Respondents highlighted the need for more professionals and skilled workers in various sectors related to land use, forestry, agriculture, and renewable energy. The current workforce is struggling to maintain and increase their own skills and standards, without capacity to also support the needs of new entrants. It was noted that there is a demand for professionals with expertise in forestry, arboriculture, urban forestry, and other disciplines to fill the current skills gaps.

4.7 It was suggested that encouraging horticulture could lead to an increase in jobs, although the adoption of technology may not necessarily result in a significant increase in employment numbers compared to a few decades ago. It was also commented that Land use change will require the creation of new jobs and skills to meet government commitments in protecting and enhancing the natural environment. This includes roles in marine and terrestrial nature conservation, environmental education, environmental protection, and various roles within NGOs.

4.8 Reskilling existing jobs was also considered important, to ensure sustainability and reduce the impact on the environment. This includes sustainable land management, fishing and fisheries management, renewable energy developments, and sustainable tourism operators. The Green Jobs Report was referenced, in particular its suggestion that up to 5,000 jobs could be created in land, forestry, and agriculture in Wales through physical infrastructure upgrades.

4.9 A respondent identified the need for upskilling in land, forestry/tree management, and wood processing jobs. They cited investment and policies aimed at different sectors having the potential to create new job opportunities, but noted that labour shortages and complex causes need to be addressed. Both new jobs and upskilling of existing jobs will be required in areas such as electricity and heat generation, public sector, land use, industry, and business.

4.10 It was noted that projections indicate a significant increase in the number of skilled workers required to meet targets, which currently outweighs the current reality and future trajectory of new entrants. Additionally, they signposted a need for new skills in the installation and maintenance of low carbon technologies, such as heat pumps and solar panels, with a focus on local availability to achieve Net Zero goals.

Q.1.1.3 What will be the new, emerging or increased net zero skills demands in Wales as a result?

4.11 Respondents identified the following skills:

- Business skills and leadership-based roles
- Forest management
- Knowledge of regenerative agricultural systems
- Soil husbandry
- Carbon auditing and advice
- Biodiversity expertise
- Habitat restoration
- Peatland restoration
- GIS mapping
- Plant health control and management

Q.1.1.4 What are the key milestones or timescales to deliver these skills in Wales?

4.12 Respondents identified three timescales to consider for this sector, immediate or pre-2030 and long term.

4.13 The immediate timescale was identified as necessary for the implementation of changes to the food supply chain in order to create a more diverse agriculture sector while delivering on biodiversity and nature stewardship. Similarly, a respondent suggested that immediate action was needed to increase investment in peatland restoration, monitor and manage protected sites and deliver the commitments made to protect 30% of land and sea by 2030. In addition, a respondent highlighted the “high urgency” required to establish new productive tree plantations, increase circular wood use and develop cross sectoral co-ordination.

4.14 The long term timescale was identified as the 20 to 30 years that it takes to convert a woodland into continuous coverage forest.

Q.1.1.5 What cross-cutting circular economy skills do you consider are required in your sector?

4.15 Respondents from the land use, land change and forestry sector identified the following cross-cutting circular economy skills:

- **Spatial planning:** Respondents emphasised the importance of spatial planning skills for effective land use and forestry management. This includes the ability to interpret remote sensing data, use geographical information systems, and model ecosystem services.
- **Data interpretation and management:** The consultation highlighted the need for skills related to data gathering and management. This includes inventorying natural resources, measuring carbon stock and sequestration, and conducting biodiversity assessments.
- **Circular economy expertise:** Respondents emphasised the importance of circular economy skills, such as life-cycle assessment and product design for circular and cascading reuse. These skills are crucial for sustainable resource management and reducing waste.
- **Sustainability management:** The consultation highlighted the demand for “green skills” like sustainability management, which involves considering the environmental impact of activities and implementing strategies for long-term sustainability.
- **Interpersonal and community engagement:** Respondents recognised the importance of soft skills, including community engagement, communication, and managing difficult situations. These skills are essential for fostering collaboration with stakeholders, such as farmers, woodland managers, and local communities.

4.16 These cross-cutting skills were identified as critical for addressing challenges related to land use, land change, and forestry, and for promoting a sustainable Welsh rural/natural resources economy.

Addressing the skills needs

Q.1.1.6 Is there provision to deliver these skills offered in Wales?

4.17 Respondents identified existing training opportunities and networks in Wales for ecologists, environmental managers, and those involved in land-based industries

such as aquaculture, agriculture, and horticulture. However, they suggested that further research is needed to map all available skill provision, as it is unlikely that the current courses cover the necessary skills at the required scale.

4.18 Respondents suggested that the lack of adequate provision in Wales was due to:

- Lack of understanding about Continuous Cover Forestry
- Disconnect between industry and education: There seems to be a disconnect between industry needs and the provision of short courses and further education in forestry and related sectors.
- Accessibility and awareness of the forestry sector: It is important for the government to make training accessible to all individuals interested in the forestry sector, including contractors who provide technical skills for forest maintenance.

4.19 A respondent suggested that Wales would benefit from implementing a degree apprenticeship scheme similar to the one in England, tailored to address the diverse challenges faced by the forestry sector. They gave the good practice example of The Institute, in partnership with the Forestry Commission, which advocates for apprenticeships for forest craftspeople (Level 3) and professional foresters at the degree level (Level 6). These apprenticeships offer work-based placements and employment opportunities.

Q.1.1.7 If not, are they being delivered elsewhere in the UK and can Wales based employers and individuals access this provision?

4.20 Respondents answering under the sector of land use, land use change and forestry did not provide information for this question.

Q.1.1.8 If these skills are being delivered in Wales, is the scale appropriate currently and does it meet Wales' future workforce needs?

4.21 One respondent suggested that Bangor University has the capacity to deliver the needed skills at degree level, however, there is a lack of applicants, and the capacity is not being sufficiently exploited. On the other hand another respondent suggested that there was a lack of capacity at the further education level.

Q.1.1.9 What do you see as the barriers to address the skills needs in Wales?

4.22 Respondents highlighted the following barriers to address the skills need in Wales:

- Lack of awareness and understanding: There is a general lack of awareness among individuals, businesses, and educators about the available opportunities and pathways in the environmental sector. This lack of awareness undermines aspirations and hinders career development.
- Skills gap and limited accreditation: There is a skills gap in practical field skills, particularly in ecology, and limited specific accreditation schemes for nature restoration and peatlands. Vocational, non-academic routes into the sector lack clarity and certainty, which excludes those who seek apprenticeships and other vocational opportunities.

- Reliance on unpaid work experience: The environmental sector heavily relies on unpaid work experience, which excludes individuals who do not have the financial stability to volunteer for extensive periods of time. This creates barriers for those who cannot afford to work on a voluntary basis.
- Lack of diversity and inclusivity: The workforce in agriculture, forestry, nature restoration, and related trades lacks diversity, with low representation of women and individuals from non-white ethnicities. This lack of diversity and inclusivity hinders the sector's ability to address challenges effectively.
- Limited access to appropriate courses and training: There is reduced access to appropriate courses and a lack of training opportunities for those who need to provide courses. This limits the development of necessary skills and knowledge within the sector.

Q.1.1.10 What action is needed to remove those barriers?

4.23 Several actions were suggested by respondents to remove barriers to developing net zero skills. Key actions include:

- Enhancement of the Careers Wales website: Respondents emphasized the need to enhance the Careers Wales website to better communicate the potential of "net zero" careers. This improvement would contribute significantly to overcoming barriers and promoting awareness of these career opportunities.
- Improvement of teaching in Welsh schools: Respondents highlighted the importance of enhancing the teaching on subjects related to net zero skills in Welsh schools. They specifically recommended increasing the fieldwork component in woodland settings to provide practical experience and a deeper understanding of these subject areas.
- Engagement with farming unions and NGO stakeholders: It was suggested that continued engagement with farming unions (NFU/FUW) and other non-governmental organisation (NGO) stakeholders is essential. This collaboration would help foster cooperation and support in developing net zero skills.
- Seeding a Welsh timber-based economy: Respondents proposed that the Welsh Government should seed a Welsh timber-based economy by reducing the export of timber reserves for the benefit of England-based mills. Instead, they recommended keeping the timber within Wales and establishing sawmills and training provisions in local communities. Furthermore, it was suggested to promote diversity and inclusivity by encouraging women and individuals from diverse gender backgrounds to run these initiatives, aiming to break down the perceived masculine-dominated culture.
- Joint working between training providers and in-house training: To build trust and ensure effective skill development, respondents emphasised the need for greater joint working between training providers and in-house training offered through organisations' internal programs. This collaboration could involve assessed or formalised modules leading to appropriate qualifications.
- Knowledge exchange with practicing professionals: Respondents stressed the importance of gaining explicit clarity and knowledge exchange with practicing professionals in the industry. Engaging with professionals and fostering shared understanding would help increase trust between the public and private sectors.
- Collaboration between allied professions: Respondents advocated for closer working relationships between professional foresters and farmers, as well as

encouraging collaboration between allied professions such as agriculture and forestry. This cross-sector learning and collaboration would help resist polarisation and promote mutual growth and development.

Q.1.1.11 What is the impact if these skills are not available in Wales

4.24 The respondents for this sector noted a number of impacts if these skills are not available in Wales:

- Increased reliance on imported wood: Currently, the demand for wood in Wales is primarily met through imports. However, global supplies of sustainably produced wood are becoming limited. Failure to increase the rate of sustainable production of wood from Welsh woodlands may result in increased sourcing of wood from overseas forests, leading to a reduction in their carbon stocks and an increase in global net emissions.
- Decreased land biodiversity: Skills gaps in Wales can contribute to a decline in land biodiversity. This can have negative consequences for the ecosystem and the overall health of the environment.
- Decreased food production: The lack of necessary skills in certain areas can lead to a decrease in food production in Wales. This can have implications for food security and the local economy.
- Decline in the rural economy: Skills gaps can negatively impact the rural economy in Wales. This can result in reduced employment opportunities and economic growth in rural areas.
- Decline in Welsh culture: The loss of specific skills can also contribute to a decline in Welsh culture. This may include traditional practices and knowledge that are integral to the cultural heritage of Wales.
- Limited democratisation of resource access: The export of timber resources without the opportunity to democratise access to their use and export value-added products can hinder economic development and limit opportunities for local businesses in Wales.
- Failure to meet woodland establishment and management ambitions: Skills gaps can impede the achievement of woodland establishment and management goals in Wales. This can have implications for environmental conservation and sustainable forest management.
- Inability to meet demand for low-carbon homes and retrofits: The lack of skilled workers in the timber frame manufacturing and joinery sectors may hinder the ability to meet the demand for new low-carbon homes and retrofit projects. This can impact efforts to address climate change and reduce carbon emissions.
- Loss of secure long-term jobs and brain drain effect: Skills gaps can result in the loss of secure long-term jobs in Wales. This can lead to a brain drain effect, where skilled individuals seek employment opportunities in other nations, further exacerbating the skills gap issue.
- Failure to meet Net Zero targets and ambitions: The presence of skills gaps can slow down the pace of transition towards achieving Net Zero targets in Wales. This can hinder progress in addressing climate change and meeting sustainability goals.

Links to other sectors

Q.1.1.12 Are there any dependencies with other sectors, with specific links to skills? If so, what are these and what are their impacts?

4.25 Respondents identified several dependencies between sectors in the context of nature conservation, restoration, and sustainable farming. These dependencies have significant impacts on achieving environmental and climate commitments.

4.26 Agriculture and Nature Conservation/Restoration:

- There is a need for re- and up-skilling in sustainable and nature-friendly farming methods.
- Farmers may require training to use fertilizers and manure more efficiently to reduce nitrogen loss.
- Shifting agriculture towards sustainable energy might require farmers to generate on-farm renewable energy or grow crops suitable for bioenergy.

4.27 Forestry and Agriculture:

- Breaking down the barriers in knowledge and skills between forestry and agriculture is crucial.
- Agroforestry should be considered as an integrated land use practice with specific skills requirements.

4.28 Forestry and Wood Processing Sector:

- There is a need for dedicated training to use timber effectively.
- Collaboration and good practice sharing are essential for boosting green skills and achieving environmental and climate commitments.

4.29 Forest Industries and Related Sub-sectors:

- The forest industries consist of sub-sectors that depend on each other for trade, such as tree nurseries, logistics, sawmills, timber merchants, and joinery.
- Networks involving the education sector, NGOs, charities, and trade bodies play a role in linking with the sub-sectors of the forest industries.
- The separation of agriculture from forestry and other land use sectors into separate silos can hinder the potential of land use to meet carbon budget targets under the net zero strategy.

4.30 The impacts of these dependencies include the potential to meet carbon budget targets, achieve environmental and climate commitments, and promote sustainable land use practices. To address these impacts, respondents suggest various skills are required, including knowledge of sustainable farming methods, efficient use of fertilizers and manure, renewable energy generation, agroforestry practices, timber utilisation, collaboration, and good practice sharing.

5. Transport

Mapping and Key Milestones

Q.1.1.1 What investment, policies, transitioning impacts, technologies are expected to be implemented in Wales that will impact the net zero skills needs in Wales and their timescales?

5.1 The policy changes identified as relevant to the transport sector included the following:

- The UK Government Zero Emission Vehicle mandate
- The Welsh Government's EV (Electric Vehicle) Strategy
- The transition towards non-internal combustion engine (ICE) vehicles

5.2 The sector foresaw the following investments in the sector, though no precise numbers were mentioned:

- Active travel infrastructure
- The transition and maintenance of a zero-emissions bus fleet
- Ongoing funds for EV charging
- The upgrading of local power supplies for electric vehicles

5.3 Limited technologies were identified, though respondents did mention:

- Hydrogen powered vehicles
- EVs

Q.1.1.2 Will these result in new jobs being created or broadly maintaining the existing number of jobs, but with a level of upskilling required or changes to the types of occupations? If so, please give details of opportunities and potential geography.

5.4 Respondents provided a range of examples of both new jobs and the opportunity to upskill in existing occupations in response to this question.

5.5 For new jobs, one respondent cited a study delivered by the Rail Delivery Group ("Catalysing a Green Recovery") which stated that decarbonisation in the rail industry across Great Britain could expect to create around 6,000 jobs – with 600 in Wales – as a result of electrification. A specific example of this given was the CAF (Construcciones y Auxiliar de Ferrocarriles) plant in Newport. Another respondent mentioned the need for environmental specialists when decarbonising bus operations.

5.6 There was a recognition from two respondents that existing roles will need upskilling to operate innovative technologies and become familiar with changing electric and charging infrastructure. These were:

- bus drivers
- mechanics
- electrical engineers
- transport planners

5.7 There was concern from two respondents of the likelihood of job losses, with many existing professions likely to reduce in demand. Examples included ICE Vehicle Servicing, and those working in the parts supply industry.

Q.1.1.3 What will be the new, emerging or increased net zero skills demands in Wales as a result?

5.8 Skills in emerging technologies included:

- installing, maintaining and operating EV infrastructure and EV's themselves
- hydrogen generation
- carbon/ energy management

5.9 Skills relating specifically to planning included:

- building climate resilient infrastructure
- flood management and mitigation
- new planning policy familiarity for planners
- EV infrastructure

Q.1.1.4 What are the key milestones or timescales to deliver these skills in Wales?

5.10 There was not a range of immediate milestones or timescales identified, however TfW (Transport for Wales) stated that they are currently following the Term of Government Remit Letter targets for climate adaptation which requires them to "ensure all TfW operations delivered on behalf of the Welsh Ministers are designed and delivered based upon the latest data on climate change risk and impacts and robust climate change adaptation plans are in place."

5.11 The key milestones for pre-2030 were:

- The goal for a 22 per cent reduction in transport emissions by 2025
- Zero tailpipe emissions for Traws Cymru bus fleet by 2026
- The most polluting 50 per cent of service buses to be replaced by zero tailpipe emission bus fleet by 2028
- A 2 per cent increase on mode shift to public transport by 2030
- Target to ensure 80 per cent of new cars in the UK are zero emission vehicles by 2030

5.12 For 2035 onwards, the key milestones were:

- 100 per cent of new cars in the UK to be zero emissions by 2035
- 100 per cent of the bus fleet to be zero emission by 2035
- The sale of non-zero emission HGVs (Heavy Goods Vehicles) to be banned from 2040 onwards
- The ambition to remove all diesel only trains by 2040

Q.1.1.5 What cross-cutting circular economy skills do you consider are required in your sector?

5.13 There were a number of skills mentioned under repair and reuse, including:

- recycling skills for vehicle mechanics
- battery repurposing
- battery storage
- vehicle to grid (V2G) technology

5.14 Also mentioned were skills needed in design:

- Low carbon construction for EV hubs/ bus depots e.g. BREEAM

Addressing the skills needs

Q.1.1.6 Is there provision to deliver these skills offered in Wales?

5.15 Both respondents answered 'no' to this question, citing a training demand / provision gap that is UK-wide, but particularly an issue in Wales. Respondents specifically mentioned that:

- The energy and carbon management apprenticeship currently being offered by the Welsh Government to public sector bodies is more specific to the operational management and reporting of these disciplines, rather than practical delivery.
- Issues regarding the regional availability of certain training courses.

5.16 Recommendations provided in this question, included:

- the provision of specific training programmes to upskill existing resource such as bus operators, vehicle mechanics and maintenance workers, and transport planners.
- the Welsh Government work with the relevant professional bodies to develop a comprehensive set of continuing professional development requirements to up and re-skill the transport sector.

Q.1.1.7 If not, are they being delivered elsewhere in the UK and can Wales based employers and individuals access this provision?

5.17 For the EV industry, it was mentioned that EV upskilling courses can be found online for technicians. It was suggested that EV modules will need to become a mandated part of any technician's training course, as will modules relating to hydrogen and other alternative fuels.

5.18 It was also mentioned that the skills gap is acknowledged by other regions as being a nationwide issue, and provision for other skills is difficult to access across the UK.

Q.1.1.8 If these skills are being delivered in Wales, is the scale appropriate currently and does it meet Wales' future workforce needs?

5.19 Respondents answering under the sector of Transport did not provide information for this question.

Q.1.1.9 What do you see as the barriers to address the skills needs in Wales?

5.20 Two respondents answered this question, mentioning the following barriers:

- Restrictive policy that stipulates procurement rules surrounding carbon requirements
- The lack of funding for further education establishments to invest in relevant net zero and climate change courses
- Gaps in training provision availability – specifically related to EV technician training.
- Guidance and support for employers regarding training and upskilling of the workforce.

Q.1.1.10 What action is needed to remove those barriers?

5.21 One respondent stated that the Welsh Government should examine where current training sites are for vehicle technicians, to visually present gaps in provision and ensuring SMEs in Wales can participate in procurement by providing carbon management training.

Q.1.1.11 What is the impact if these skills are not available in Wales?

5.22 The impacts included can be split into the categories of social, environmental and economic.

5.23 The social impact listed was:

- Community and infrastructure vulnerability to climate change risks

5.24 Environmental impacts mentioned were:

- The inability for the Welsh Government to meet net zero policy commitments
- The inability to meet mode shift policy targets within the transport sector in Wales
- Hesitancy for businesses to electrify their fleet in a timely manner

5.25 An economic impact mentioned was:

- An immature and unstable EV market in Wales

Links to other sectors

Q.1.1.12 Are there any dependencies with other sectors, with specific links to skills? If so, what are these and what are their impacts?

5.26 There are large dependencies on the automotive industry, manufacturing, the energy industry (specifically electric), research and development, and the chemical industry (for biofuels and hydrogen).

6. Public Sector

Mapping and Key Milestones

Q.1.1.1 What investment, policies, transitioning impacts, technologies are expected to be implemented in Wales that will impact the net zero skills needs in Wales and their timescales?

6.1 Public sector responses outlined a range of policy drivers and targets relating to renewable energy development. One respondent outlined that investment in hydrogen production and carbon capture and storage was introducing new processes and technology in North Wales, whilst improvements to infrastructure would be required to support offshore wind development. UK and Welsh targets for offshore renewables were raised as a key contributor to skills needs in Wales (UK offshore wind target of 50GW by 2030). Respondents discussed technological innovations in marine energy technologies (wave and tidal) with the 2021-2026 programme for government thought as a key driver in these expansions (e.g. Welsh Government Tidal Lagoon Challenge). One respondent highlighted a recent report by the Offshore Wind Industry Council which highlights the scale of offshore wind opportunities in the UK and identified a need for an additional 70,000 jobs for the offshore wind sector by 2030.

6.2 One respondent discussed possible developments of small modular nuclear reactors (at Trawsfynydd and/or Wylfa) and tidal stream developments in North Wales (Morlais and Minesto), as well as wave and offshore wind in Pembrokeshire and solar developments across Wales noting the challenges raised in ongoing maintenance.

A respondent referenced the Cymraeg 2050 strategy as a driver for net zero skill requirements by contributing to the development of a prosperous and sustainable economy where people have good quality jobs, attractive careers and homes. Another respondent highlighted constitutional barriers which impact the extent to which the Welsh Government is able to act. It was highlighted that these barriers are often cross cutting; impacting a range of critical sectors (including transport, infrastructure, public sector finances, and energy).

6.3 Several respondents discussed investments in Wales with a number highlighting that investment impacts are difficult to predict on Wales net zero skill needs given decreased investment levels since 2016. Another respondent raised the need for ongoing investment in enhanced grid infrastructures (both local and national) to support electrification.

6.4 Respondents outlined investments in awareness raising and the requirement for easier funding access for up-skilling and retraining, as well as more engagement with school leavers, technical college students, and universities which will inform net zero skills developments. One respondent highlighted that net zero skills is a cross cutting theme in the construction framework that builds on existing renewable energy engineering programmes within current degree apprenticeship frameworks.

6.5 Respondents mentioned the implications of modern technologies on the skills that will be required for the transition. One respondent discussed modern

technologies required for the monitoring of net zero operations (such as the Internet of Things). Another highlighted the significant energy efficiency upgrades required in social housing and the practical skills associated with their installation and maintenance.

6.6 Significant knowledge gaps in understanding and implementing safety regulations for zero emissions technologies (including Dangerous Substances and Explosive Atmospheres Regulations) were noted, indicating a need for specialised training and advisory services.

Q.1.1.2 Will these result in new jobs being created or broadly maintaining the existing number of jobs, but with a level of upskilling required or changes to the types of occupations? If so, please give details of opportunities and potential geography.

6.7 Overall respondents acknowledged that reskilling expertise in legacy industries presents an opportunity but will not alone be sufficient to meet net zero targets. Respondents expected additional jobs will be required, not only within the private sector for delivery of renewable energy and energy efficiency technologies but also within the public sector across various bodies such as Planning and Environmental Decisions Wales, Local Authorities, Natural Resources Wales, and the Health and Safety Executive.

6.8 Respondents raised concerns around potential shortfalls in capacity within statutory nature conservation bodies and regulatory bodies such as Natural Resources Wales, with this shortfall possibly impacting the ability to meet the demand in casework required to deliver renewable energy projects and net zero targets.

6.9 Respondents highlighted an anticipated benefit to retrofit skills and supply chains throughout Wales which would address existing reliance on skills from English contractors to meet client needs.

6.10 Public Sector respondents highlighted a range of key skills required for the net zero transition. One respondent outlined that a large proportion of the workforce in Wales, particularly in the public sector, lacks formal leadership or management training. As the economy transitions to net zero organisations it was highlighted that there will be a need to equip managers and leaders with green management skills to improve productivity and take advantage of emerging opportunities. Another respondent highlighted that many of the upcoming projects related to the transition will require extensive consenting processes with a need for expanded capacity amongst planning and consent specialists underscored by a skills survey which indicated anticipation of new job roles and skills aligned with the net zero agenda.

6.11 Energy projects, particularly offshore wind, were regarded as a key opportunity for developing employment. One respondent identifies a lack of apprentices and the strong need for technical skills in planning, consenting, and fabrication. Another respondent highlighted an opportunity to upskill the existing workforce in the oil and gas industry for roles in the transition, with a focus on specialised energy system

operation and management roles. A number of respondents discussed the need for new skills and job roles in areas with a strong industry base, identifying risks that some roles could be performed remotely or offshored, creating challenges for local employment growth.

Q.1.1.3 What will be the new, emerging or increased net zero skills demands in Wales as a result?

6.12 Public sector respondents identified a range of net zero skills demands spanning various sectors, disciplines, and geographies. These include:

- Regional Circular Economies
- Digitalisation and data analytics skills
- Renewable energy manufacture, installation and maintenance
- Administration and Project Management
- Planning, policy and legislation (One respondent highlighted a gap in current post-graduate planning education in North Wales)
- Procurement (One respondent outlined requirements for skills commitments from renewable energy developers in the tender process)
- Soft Skills and Information Literacy (anticipated high demand for soft skills such as communication, collaboration, problem-solving, creative thinking, and information literacy)
- Technical and Specialist skills (Particularly in relation to new and emerging technologies within the planning and renewable energy sectors)
- Language and Cultural support (respondents outlined the importance of integrating the Welsh Government's Welsh Language Strategy with net zero commitments)
- Engineering, Manufacture, and Scientific Skills (respondents noted a gap in nuclear energy skills, alongside a broad need for engineering and manufacturing skills).
- Construction and Retrofitting (respondents identified immediate skill gaps in low carbon construction and retrofit including roles such as Retrofit Coordinators, Assessors, Surveyors, Designers, Energy Evaluators)
- Diverse Skills and Transferable Skills (respondents outlined a need for more diverse skills including behaviour change disciplines and an emphasis on the importance of transferable skills)

6.13 One respondent highlight that current high levels of public sector vacancies were hampering progress towards net zero.

Q.1.1.4 What are the key milestones or timescales to deliver these skills in Wales?

6.14 Respondents highlighted that timescales are not fixed but are driven by policy and targets established as part of the transition with the need for enhanced skills is already evident and established.

6.15 One respondent outlined that the timeline for skilled workers transitioning to Net Zero skills was estimated to take less than 3 years, while for unskilled workers or workers on a pathway to becoming skilled, the timescales were less than 5 years.

6.16 Another respondent discussed the requirement for skills within manufacturing industries and current demands placed on suppliers for new technology and evidence of carbon reduction in production.

Q.1.1.5 What cross-cutting circular economy skills do you consider are required in your sector?

6.17 One respondent discussed the need to encourage global systems thinking and support a circular economy through enhanced sustainability management, life cycle analysis, and environmental impact assessment skills.

6.18 Another respondent highlighted links to innovation skills.

Addressing the skills needs

Q.1.1.6 Is there provision to deliver these skills offered in Wales?

6.19 A number of respondents highlighted the need for net zero skills to be included in college and university curriculums, drawing on current expertise from across Wales. There was a recognition of a need for stronger connections between further education colleges and engagement to enhance the delivery of net zero skills training and engagement with educational institutions to empower and encourage provision.

6.20 A number of respondents felt there was limited existing provision of these skills in Wales, with one respondent discussing challenges posed to Further Education by the profit incentive and requirements to ensure courses are filled. The respondent raised difficulties with ensuring that courses are affordable, and accessible, with a requirement to ensure that improved accessibility to modernised training and education are provided to all segments of the population.

6.21 One respondent discussed challenges around students leaving Wales for university and not returning post-graduation, which was felt to undermine the ability of the Welsh Government to plan for the needs of Wales.

6.22 One respondent highlighted discrepancies in approaches to apprenticeships in Wales, with suggestions to closer align English and Welsh training opportunities and reforming the Apprenticeship Levy to expand training availability and provider range. Support networks for apprenticeships were also highlighted as a barrier to the uptake of these courses in Wales.

Q.1.1.7 If not, are they being delivered elsewhere in the UK and can Wales based employers and individuals access this provision?

6.23 A respondent observed that UK regulators can share knowledge and expertise with other UK regulators, but that all are feeling pressures across the sector. A specific example of external provision mentioned is the lack of availability of small vessel crew and shipping simulation in North Wales, only found in Portsmouth, limiting the ability to update piloting licenses and train new ones.

Q.1.1.8 If these skills are being delivered in Wales, is the scale appropriate currently and does it meet Wales' future workforce needs?

6.24 Respondents expressed concerns over the level of skills provision in Wales for achieving net zero. These concerns include the training of electricians for electrified transport, engineers with renewable energy design skills, and heat pump installers. It was noted by a respondent that the UK's low levels of innovation contribute to a "long tail of productivity," and efforts are being made to increase investment in research and development.

6.25 A respondent observed that skills provision is being offered in small training facilities, but colleges and universities could more than meet the local needs. Along a similar vein, a respondent urged that collaboration between developers and educational colleges was considered crucial to ensure appropriate skills provision.

Q.1.1.9 What do you see as the barriers to address the skills needs in Wales?

6.26 Respondents from the Public Sector identified the following barriers:

- There is overlap between the Welsh Government Welsh Language strategy objectives and net zero commitments. The consultation does not consider these linkages or the role of the skills sector in Wales.
- Transport infrastructure is a barrier that must be removed. It contributes to poverty and deprivation in certain areas. The Welsh Government relies on the UK government to address this, which is not sustainable. Immediate solutions and devolution of transport infrastructure are needed.
- Lower pay and job insecurity affect skill retention in Wales.
- Incentives for companies to invest in skills are lacking.
- Access to education and training should be made easier. The education system does not cater to those who did not flourish during full-time education.
- Mismatch between educational offers and industry demand is a challenge for training providers.
- Reluctance to invest in relevant skills for jobs outside Wales is an issue in the nuclear sector.
- Cynicism among learners and education providers about low carbon opportunities in North Wales exists due to lack of interest.

Q.1.1.10 What action is needed to remove those barriers?

6.27 Responses from the public sector to what can be done to remove barriers included more information and guidance from the Welsh Government. Respondents specifically mentioned:

- An established narrative to engage organisations on the circular economy, and the value of adopting its principles.
- Certainty on project planning with regard to large investment and workforce opportunities. An example given was the Wylfa Newydd nuclear power station, which has gone on to create cynicism among young people and training providers for future opportunities.
- A Net Zero skills sector road map to support skills development.
- Tax incentives to enable employers to invest in skills as they do with plant and machinery.

6.28 Others wished to see action being taken in the training and education sector more specifically, these included:

- Incentivising the education system to develop new courses at speed, and with volume. Requiring appropriate funding and delivery strategies with all Welsh FE/HE providers.
- Designing and delivering course more flexibly
- Reducing barriers for those in the workforce looking to reskill or upskill
- Providing 'top up' qualifications or accredited units for those who have already completed or have been awarded high level qualifications.
- Ensuring the content of apprenticeships reflect the needs of net zero, particularly in relation to novel technologies.
- Improving the offer of Level 4 and 5 modules specific to low carbon sectors e.g. offshore engineering will provide bite-sized and sector-focused progression.

6.29 One respondent mentioned that they wished to see inward investment, attempting to strengthen a workforce that already exists in geographical boundaries as opposed to attracting external talent to the area.

6.30 One respondent wished to see improved coordination across subsectors in response to skills provision, whilst another noted that the pace of change in relation to digital and technological developments require agile systems to be able to both anticipate and respond to changing skills demands.

Q.1.1.11 What is the impact if these skills are not available in Wales?

6.31 The impacts mentioned if these skills are not available in Wales, they were mostly economic and social. The economic impacts mentioned were:

- Job opportunities are lost in Wales, impacting both the current and future workforce.
- The loss of secure employment, potentially leading to brain drain and the loss of skilled workforce to other regions.

6.32 There were also multiple social impacts noted, which include:

- A negative impact on the Welsh language,

- A continuation on the current trajectory of deprivation, poverty and a low skilled economy,
- The potential to damage population health,
- A missed opportunity to break a poverty cycle.

Links to other sectors

Q.1.1.12 Are there any dependencies with other sectors, with specific links to skills? If so, what are these and what are their impacts?

6.33 While there were no specific sectors mentioned by respondents, responses identified a need to strategically manage supply chains and supply capacity if several high-profile projects are to be delivered simultaneously.

7. Industry and Business

Mapping and Key Milestones

Q.1.1.1 What investment, policies, transitioning impacts, technologies are expected to be implemented in Wales that will impact the net zero skills needs in Wales and their timescales?

7.1 Respondents noted the following energy and renewable investment:

- Ambitious plans for offshore wind in particular, as well as marine, nuclear, and new programmes in Pembrokeshire using the SPF which could be replicated across Wales.
- It was urged by one response that wind energy sector is aspiring to be diverse and inclusive with clear pathways to employment for new talent.
- The emerging focus is on supporting priority occupations, cluster-based partnerships, and diversity for a just transition.
- Significant investment in education, skills and wider support is said to be needed for the heating and decarbonisation of homes; retrofit and refurbishment of buildings

7.2 Industry and Business respondents also referenced the following relevant policies:

- It was expected by one respondent that the UK and Welsh Governments will continue to support Net Zero initiatives more generally via the City Deals and UK SPF, in line with policies such as Carbon Budget 2 and Net Zero Public Sector 2030.
- There was another recommendation that emerging policy will need to be guided by the CCC Climate Risk Assessment of June 2021.
- Other policies such as the anticipated Welsh Government's 5-year climate change adaptation plan for Autumn 2024 are also predicted to shape the landscape.
- One respondent discussed the Welsh Government's ambitions surrounding heat pump installations by 2035 and Boiler Upgrade Scheme, Future Homes Standards, and Energy Smart Appliances. They urged that, as these policies,

legislation and investments drive the demand for heat pumps, the Welsh Government must work with the industry to deliver a highly skilled workforce fit for the future.

- A relevant policy that will impact the requirement for NZS in the housing sector was the Optimised Retrofit Programme (ORP), where the Welsh Government has embarked on a significant programme of investment to make energy efficient improvements and install renewable energy in Wales' social housing.
- Policy associated with the food and drink industry included 'A Vision for the Food & Drink Industry from 2021', referencing the importance of climate resilience and economic adaptability values and the help the industry will need to reduce their carbon footprint.

7.3 Concerns were expressed by one respondent about the proposed cuts to Apprenticeship funding, which would mean that reaching the emerging skills needs would be difficult. Transitioning impacts for one respondent was a rush into Net Zero Skills without proper planning would be damaging for their manufacturing base.

Q.1.1.2 Will these result in new jobs being created or broadly maintaining the existing number of jobs, but with a level of upskilling required or changes to the types of occupations? If so, please give details of opportunities and potential geography.

7.4 Industry and business respondents gave examples of both new jobs being created, and up/re-skilling of existing jobs. New and increased jobs are expected by the sector in electrician roles, heating (e.g. heat pump) engineers, recycling, and food retail. Respondents listed existing jobs in gas fitting, construction and manufacturing, electricians/electrical engineers, which would require upskilling but remain in their roles. These jobs would be vital for the shift to new net zero technologies such as EVs, which require transferable but updated skills.

7.5 Referencing the geography of these jobs, it was noted by two respondents that jobs and opportunities would be geographically spread across Wales, for example for electrification. However, one noted that there is likely to be a concentrated demand of electricians within areas with larger scale energy project such as North Wales offshore wind developments.

7.6 Concerns around job losses were expressed by two respondents, noting the decline in certain roles, for example, jobs reliant upon the fossil fuel industry. Another respondent noted that upskilling would incur costs which may pose a challenge for individuals/smaller organisations.

Q.1.1.3 What will be the new, emerging or increased net zero skills demands in Wales as a result?

7.7 Two respondents consider that net zero skills demand will be seen in Digital and IT, providing examples of specialisms such as Data Analytics, Cyber Security, Artificial Intelligence and automation.

7.8 Respondents noted skills in designing and installing emerging technologies such as:

- carbon capture
- battery development
- hydrogen production
- specific skills around new material fabrication and asset testing referenced.

7.9 Engineering skills pertaining to natural gas, hydrogen, transport, heating, and electrification were referenced by several respondents, with one respondent anticipating a move from siloed trades to multiskilled technicians.

7.10 Project management and administrative skills such as communications, compliance and planning were noted, in particular for new infrastructure developments. Some respondents mentioned an increase in the need for 'traditional' skill sets such as welding, for renewable energy projects, whilst others repeated earlier sentiments on the need for heat pump installers and engineers. Specialist ecology skills for impact assessment of new technologies were noted by one respondent in this sector.

Q.1.1.4 What are the key milestones or timescales to deliver these skills in Wales?

7.11 The Industry and Business sector mainly focused on more immediate, but vague, timescales for skills delivery, noting a need for proactiveness from the Welsh Government and for implantation of initiatives to be 'as soon as possible'. However, one respondent felt that milestones could not be set until they had the outcomes of the Welsh Government decisions on decarbonising heat and transport policy. Two respondents felt that the Welsh Government will need to work collaboratively with colleges, industry, and local authorities to develop a robust approach to managing the transition.

7.12 Specific milestone policies for 2030 and earlier included:

- the transition to all electric cars by 2030,
- the Welsh Government targets to halve food waste, and prevent biodegradable materials going to landfill, by 2025.

7.13 Longer term ambitions and fears included:

- the widespread adoption of net zero skills (including circular) across foundational occupations.
- working on reducing operational emissions to achieve net zero greenhouse gas emissions by 2040.
- One milestone target that a respondent expressed anxiety over was the 580,000-heat pump installation in Wales by 2035, which they felt was unachievable without increased the Welsh Government support for training.

Q.1.1.5 What cross-cutting circular economy skills do you consider are required in your sector?

7.14 Eco-design including designing out waste and included energy efficient materials produced from waste products. The design of sustainable, circular packaging to tackle issue in food industry, with producer responsibility rather than consumer, was mentioned by one respondent.

7.15 Waste management including repair, reuse, and recycle within industry and manufacturing such as vehicles and food and drink was considered to be of importance when considering cross cutting circular skills.

7.16 Several respondents discussed the need for a shortened supply chain, with materials produced in Wales and improvement of cross-industry synergies to help support the circular economy. One respondent felt that more global systems thinking could embed CE and drive an increase in the demand for skills in sustainability management and life cycle analysis.

Addressing the skills needs

Q.1.1.6 Is there provision to deliver these skills offered in Wales?

7.17 Business and Industry respondents mainly fed back that the provision exists, but it has limitations some improvements can be made.

7.18 Examples of skills provision offerings included apprenticeships supported by the Warm Homes Programme and funding from the Welsh Government Food and Drink sector including in regional colleges.

7.19 Shortcomings of existing skills provision included emerging skills not being catered for at present; problems with consistency in qualifications across nations in the UK; limited capacity and accessibility of training provision.

7.20 Recommendations were made to increase training capacity with more training centres, establish degree apprenticeships at level 6 to strengthen progression pathways, and more focus placed on providing net zero skills in decarbonisation targets

Q.1.1.7 If not, are they being delivered elsewhere in the UK and can Wales based employers and individuals access this provision?

7.21 This sector provided a range of feedback on the accessibility of skills provision outside of Wales. Respondents have observed skills provision being delivered in England, where Welsh provision is either unavailable or too far away. One respondent noted that the pace in England is greater than in Wales due to increased funding support for training.

7.22 However, there are limitations on the provision being provided in the UK outside of Wales, with Net Zero skills demand outweighing investment in FE; restrictive eligibility criteria for PLA's; poor accessibility; and inconsistency in qualifications.

Q.1.1.8 If these skills are being delivered in Wales, is the scale appropriate currently and does it meet Wales' future workforce needs?

7.23 The majority of Industry and Business Responses did not believe that the scale of skills delivery in Wales was appropriate, nor would it meet Wales' future workforce needs. Although it was noted by several respondents that the skills are being delivered, there are gaps in provision across Wales and that the demand for skills is greater than those available. Examples referenced included cyber security, decarbonising heating, and skills associated with the hydrogen sector. Apprentice numbers in skills such as electrical fall short of the needs, and that skills provision needs to be scaled up. One respondent recommended a collaborative approach was needed by the Welsh Government, industry, and academia to build this capacity, while another referred to building on the existing Green Personal Learning Account and Flexible Skills Programme which show promise but need improvement.

Q.1.1.9 What do you see as the barriers to address the skills needs in Wales?

7.24 Respondents flagged poor awareness as a key barrier to addressing skills need in Wales, referring to limited understanding of opportunities that net zero will bring; uncertainty around timescales and targets; recognition of the skills gap; and delay from businesses assuming they should wait for the 'technology to arrive before taking action. One respondent felt that there is a lack of urgency in trying to achieve Net Zero goals.

7.25 Recruitment and retention of skills within Wales and in industry was noted by several respondents as a barrier. Respondents mentioned challenges around:

- an aging workforce with some reluctance to retrain for net zero,
- lack of Continuing Professional Development plans for acquiring new skills,
- poor employment security,
- and challenges around recruitment for businesses more broadly.

7.26 Respondents also highlighted funding challenges in regard to the need for skill development in training and education for new systems:

- There is a demand for more skilled staff, but recruitment and training costs pose barriers.
- Cuts to funding for electrical apprenticeships threaten Wales' electrotechnical skills-base and net zero ambitions.
- SMEs prioritise survival over net zero skills.

7.27 To address these issues, increased support, marketing, and incentives for upskilling were recommended.

2.1. There were several issues mentioned related to training opportunities in the sector. These include:

- a shortage of training opportunities and practical facilities,
- a lack of training courses with the appropriate up-to-date knowledge,

- siloed training in the Welsh and English construction sector,
- and the need for development and consistency of qualifications across devolved nations.

7.28 Additionally, there is concern about the Welsh Government's planning and budgeting (e.g. for apprenticeships) for upskilling and retraining entire sectors quickly to meet decarbonisation and heat pump targets, and inconsistent geographical coverage of relevant training.

7.29 Industry and business responses highlighted the lack of a coordinated and national approach to skills funding and development as a barrier. Feedback emphasised the current lack of collaboration between various stakeholders, such as colleges, training providers, employers, and manufacturers, in addressing the uncertainty surrounding future skills requirements. The lack of practical infrastructure and inconsistent industry consultation has hindered the progress of net zero and other skills initiatives. Additionally, a respondent suggested that there is currently limited understanding of specific skills challenges is necessary for effective policymaking

Q.1.1.10 What action is needed to remove those barriers?

7.30 Government support was thought by several respondents to be an important action for removing barriers. For example, the importance of government guidance, support and skills programmes across the UK, as well as consistency between devolved nations. A respondent mentioned the potential use of a model similar to Local Skills Improvement Plans (LSIPs) in England to address skills needs. Another highlighted the importance of tangible benefits like tax relief for occupational health to help employers retain staff for longer.

7.31 Respondents identified the need for clear policies and cross-government commitment to support the goal of achieving net zero emissions. They also highlighted the importance of long-term collaboration between government, employers, workers, education, and the skills system to develop a workforce with the necessary skills for a greener and fairer future. Additionally, it was suggested that the Welsh Government should engage more closely with relevant industries, including engineering services representative organisations, to ensure effective policy dialogue and delivery of net zero targets.

7.32 Industry and Business respondents stressed the importance of continual learning and structured training. The presence of geographically dispersed training centres and improved support for apprenticeships was also emphasised, including a need for more training opportunities in Mid Wales. Additionally, there is a call for incentivising the educational system to develop new courses quickly and effectively, and promoting required skills in primary and secondary schools, apprenticeships and further education. Anticipatory investments in skills were recommended by one respondent to support the construction, operation, and maintenance of new assets in Wales between 2025-2030.

7.33 Respondents mentioned financial actions that will be required. These included the need for a central funding mechanism to address cross-cutting themes in Net

Zero Skills delivery and encouraging businesses to invest in upskilling. There were expressed concerns about funding cuts for apprenticeships in Wales and calls for financial support from the government.

7.34 Industry and Business pressed for more sector awareness:

- Normalising embedding net zero skills within businesses and marketing,
- the Welsh Government and Further (FE) and Higher Education (HE) being more proactive in highlighting technological developments and Net Zero opportunities,
- and a full understanding from sectors on what expertise and knowledge gaps need to be developed.

Q.1.1.11 What is the impact if these skills are not available in Wales?

7.35 Respondents noted social impacts including a 'brain drain' in Mid Wales and rural areas of Wales, with young people leaving to seek opportunities in big cities and in England. The impact would also be that industry would have to recruit and train from outside of Wales.

7.36 Respondents also highlighted potential economic impacts including missed targets for a thriving construction industry, increased costs, and the loss of jobs in Wales. One respondent gave an example of food and drink businesses being left behind as unable to comply with regulations and becoming unpopular with consumers.

7.37 Environmental impacts listed by respondents included Wales failing to meet its net zero targets, with wider implications for the rest of the UK. One response argued that these targets could be set back across sectors for multiple years if there are continued shortfalls in the number of competent and qualified electricians, with another noting that electric cars will not be as prevalent as hoped.

Links to other sectors

Q.1.1.12 Are there any dependencies with other sectors, with specific links to skills? If so, what are these and what are their impacts?

7.38 It was noted that manufacturers' demand for net zero skills will crossover with other sectors. These are likely to be engineering and technology sectors, including greater demand for management, leadership and innovation skills. However, this will have the impact of increasing competition with other sectors for some of these skills, presenting a challenge.

7.39 Industry and Business respondents urged that the strategic link between the education sector and industry is vital to meet challenges and requirements. The education sector, including schools and FE colleges, requires collaboration between the government, education institutions, training providers, businesses, and individuals to identify and deliver the necessary skills and qualifications. Education providers also play a crucial role in ensuring that the curriculum aligns with the needs of all sectors in achieving Net Zero. One respondent described how HE can develop basic/practical skills, while further education FE can collaborate with businesses for research and training to accelerate technological change.

7.40 While one response noted how infrastructure sectors including power, rail, road and water all have links to engineering, another respondent highlighted that the food and drink sector is linked to agriculture, tourism & hospitality. One response described that electrician roles are heavily involved in at least five of the sectors covered by the consultation. They urged the Welsh Government not to succumb to an overly siloed approach to net zero skills, but approach with an appreciation of challenges and solutions which may cut across sectoral boundaries.

8. Agriculture

Mapping and Key Milestones

Q 1.2.1 The Agricultural Bill (Wales) is leading to the Sustainable Farming Scheme in 2025, what new and transitioning skills are required to support new farming practices in Wales?

8.1 Respondents identified a number of transitioning and new skills have been suggested to support new farming practices in Wales. These are:

- Understanding the wellbeing framework and SDGs: This skill enables the development of working practices, partnerships, collaborations, and curriculum aligned with Welsh and global priorities for sustainability and net zero.
- Knowledge of soil biology and ecology: This skill is crucial for reducing greenhouse gas emissions (GHGs) from livestock, as these emissions result from hard-to-control natural processes.
- Understanding the global impact of food systems: Transitional skills should include awareness of the significant contribution of food systems to greenhouse gas emissions, soil degradation, and biodiversity loss.
- Carbon accounting: Skills in accounting for CO₂eq emissions, including methane and nitrous oxide, as well as carbon sequestration in soil, hedges, trees, and set-aside areas, are important for GHG reduction and sustainable management.
- Sustainable management principles: Development in sustainable management principles, including identifying changing consumer demand, understanding food provenance, and the impact of land clearance, is crucial for a just transition and resilience within the sector.
- Food security and climate change impacts: Skills related to food security, poverty, and hunger, with a focus on recognising the threats posed by climate change and biodiversity loss to food production, are essential.
- Resource use efficiency and nature-based solutions: Skills in resource use efficiency, including nature-based solutions like carbon sequestration, soil biology, bigger hedgerows, and better woodland management, reduce reliance on inputs and enhance biodiversity.
- Cultural heritage and landscape conservation: Transitional skills should include an understanding of cultural heritage, cultural landscapes, and the skills needed to conserve and enhance biodiversity, protect rural communities, and support sustainable tourism and nature-based activities.
- Technological advancements: Skills related to technological developments in vertical farming, hydroponics, and using technology on-farm are necessary for increasing yields within smaller areas and reducing land requirements.

- Carbon sequestration and land stewardship: Skills in understanding carbon sequestration within existing stocks of carbon, maintaining grasslands, woods, and hedgerows, and recognising the value of these areas of land are important for business resilience and cultural landscapes.
- Measuring and monitoring skills: Skills in measuring and monitoring carbon, resource and nutrient use, livestock efficiencies, water retention, habitat creation, genetics, and nutritional guidance are crucial for sustainable land management.
- Regenerative agriculture and agroforestry: Skills in regenerative agriculture, orchards, agroforestry, and understanding the role of native breeds can play in extensive grazing systems are important for sustainable farming practices.
- Climate change literacy and flexible skills: Broad climate change literacy and flexible, updateable skills are necessary to manage the increasing changes in the agricultural sector.
- Digital and tech skills: Skills related to modern farming practices, such as using technology on-farm, measuring and monitoring data, and utilising digital tools, are becoming increasingly important.
- Language skills: Recognising the importance of the Welsh language in rural communities, skills in Welsh language proficiency are crucial for supporting the viability of the language in the agricultural sector.

Q 1.2.2 Which emerging technologies would you expect to be rolled out and widely adopted by the agricultural sector in Wales over the coming years?

8.2 Respondents identified the following technologies:

- Innovation in vertical farming and hydroponics
- Biomass boilers with heat used directly on farms
- Robotics and artificial intelligence for livestock monitoring, and GHG data collection
- Localised renewable energy generation - decentralised renewable energy and battery storage
- Innovation in bio-based packaging
- Carbon calculators, mobile data collection for livestock records, antibiotics, movements etc
- Smart ear tags that produce data on weight gains, performance, illness
- Remote monitoring systems for animal health, livestock performance or crop performance and vertical farming
- Wider use of sensors on-farm
- Machines powered in various ways, e.g. methane tractors, the use of satellite imagery for additional benefits
- Electric farm vehicles and renewable energy technologies
- Controlled release fertilisers and inhibitors to increase efficient use of nitrogen and reduce emissions
- Feed additives to reduce methane emissions from ruminant livestock
- Precision farming for crops to deliver nutrients and crop protection more efficiently
- Anaerobic digestion to convert animal manures, crops and crop by-products into renewable energy

- Gene editing for disease resistance to improve health and productivity of crops and livestock and reduce emissions

Q 1.2.3 What additional investment in skills would be required to support these emerging technologies?

8.3 Respondents suggested investments that are aimed at supporting education, training, research, and skills development in sustainable management, net zero, biodiversity, carbon accounting, and business development. The identified investments include:

- Testing of innovation.
- Additional support to allow further education institutions to innovate in curriculum and ensure that agricultural courses generate an understanding of net zero, biodiversity loss, ecosystem services, and reflect the challenges facing the industry.
- Support farmers to access learning through Knowledge Transfer systems like Farming Connect.
- Develop and make available significant training material to the industry in a number of ways outside the standard Farming Connect delivery model.
- Invest in skills development to adapt to the increase in diversity of crops grown and address human diet and health.
- Plan for and support the development of skills required for different forms of agriculture, such as arable and horticulture, to achieve net zero farming.

1.2.4 What are the key milestones or timescales to deliver these skills in Wales?

8.4 Fewer respondents answered this question with only six responses. Two milestones were suggested without additional information, these were 2025-2028 and 2024-2030. Another respondent suggested that milestones and timescales should be linked to Carbon Budget 3 and CCC advice.

8.5 One respondent did include clear potential milestones for the delivering agriculture-related education in schools and FE/HE, including:

- Production of courses and modules in Spring 2024,
- Graduation and employment in July 2027,
- and additional experience to move into independent work in 2029

Addressing the skills needs

Q 1.2.5 What type of skills are most needed?

8.6 Respondents identified the following skills as necessary:

- Carbon accounting and understanding the limitations of measurement and data collection,
- Sustainable management principles, including diversification and business resilience.
- Resource use and efficiency, including nature-based solutions and carbon sequestration,

- Understanding cultural heritage, landscapes, and biodiversity conservation,
- Broadband access, online business promotion, IT and business development skills,
- Renewable energy,
- Bio-based packaging,
- Robotics, artificial intelligence, and data collection for livestock monitoring and GHG analysis,
- Localised renewable energy generation, battery storage,
- Innovation in vertical farming,
- Transition to electric vehicles, sustainable transportation, and sustainable business practices,
- Peatland restoration,
- Environmental literacy,
- Circular economy planning and water management,
- Energy management,
- Controlled environment horticulture,
- Soil and carbon management,
- Upskilling in agroforestry, woodland management and tree advice.

Q 1.2.6 Is there provision to deliver these skills offered in Wales?

8.7 Respondents offered mixed views in response to this question. Two respondents pointed to Farming Connect and Lantra's skills programme as offering the required skills, as well as the Knowledge Exchange Hub which is a joint collaboration between Farming Connect, IBERS and Aberystwyth University.

8.8 A key gap the provision was identified by one respondent who suggested that tertiary level horticulture education in Wales was declining. This was reinforced by another respondent who suggested that there is a lack of formal educational programs focused on edible horticulture, particularly agroecological growing. College courses offer better coverage for conventional land-based industries than for agroecological farming. Provision for edible horticulture has declined and is under-resourced. They suggested that it is difficult for new entrants in agroecological horticulture to identify opportunities for education, as there are multiple informal pathways. Furthermore, there is no single portal to discover these opportunities. Established educational routes may not support career changers, and academic programs lack applied learning for food growers.

8.9 Finally, a respondent suggested that skills gaps and shortages in the agriculture sector are poorly defined, and there is a need for a coordinated approach to monitoring and evaluating provision to meet current and projected demand.

Q 1.2.7 If not, are they being delivered elsewhere in the UK and can Wales based employers and individuals access this provision?

8.10 Respondents highlighted the work of the Apricot Centre and Plumpton College in offering accredited agro-ecological horticulture training, as well as funded traineeships. They also pointed towards online courses in horticulture but suggested these needed to be supplemented by practical training. They pointed to the

challenge for Wales based individuals to relocate for the period of training and the lack of suitable accommodation in rural areas. Another respondent pointed to the oversubscription of permaculture courses in the UK and beyond.

Q 1.2. If these skills are being delivered in Wales, is the scale appropriate currently and does it meet Wales' future workforce needs?

8.11 No respondents felt that the delivery is operating at the appropriate scale with a need to develop a co-ordinated delivery of training and education at the national level. However, a respondent pointed towards Black Mountains College NVQ in Regenerative Horticulture as a model for others.

Q 1.2.9 What do you see as the barriers to address the skills needs in Wales?

8.12 Respondents identified several barriers to addressing the skills need in Wales. These barriers include:

- **Lack of information and coordination:** There is a lack of clear pathways and coordinated information about available opportunities for new entrants and those seeking to develop expertise in agro-ecological farming. This lack of information makes it difficult for individuals to navigate the learning process effectively.
- **Financial constraints:** Access to educational opportunities in agro-ecological farming is limited by financial constraints. Many opportunities are unpaid or low-paid, creating financial difficulties for those who pursue traineeships. The cost of courses and training programs also poses a barrier, particularly for small businesses and individuals in remote locations.
- **Limited availability and flexibility:** The availability of training centres, distance-learning opportunities, and flexible course options is crucial for individuals seeking to access training. However, limitations in these areas can hinder participation, especially for those with travel requirements or time constraints.
- **Uncertainty and complexity:** Farmers may have uncertainty about the financial and environmental benefits of investing in Net Zero Skills. Additionally, the topic of agricultural training can appear large and complex, which may discourage engagement. Breaking down the topic into smaller units and providing a clear progression route can help address this barrier.
- **Limited diversity and quality of informal learning opportunities:** Agro-ecological farming relies heavily on informal learning opportunities such as internships and volunteering. However, the quality and conditions of these opportunities vary, making it challenging for trainees to guarantee the learning and experience they will receive.
- **Resistance to change and traditional mindset:** Nervousness, resistance to change, and a traditional mindset within the industry can act as barriers to trying new things and adopting new enterprises. Support and empowerment are needed to overcome these barriers and encourage a shift in mindset.

Q 1.2.10 What action is needed to remove those barriers?

8.13 Respondents identified the following actions to address the barriers faced by the agriculture sector:

- Achieving policy consensus between policy makers, industry and skill providers.
- Change procurement policy to drive agricultural practice change through sustainability and carbon measures and creating markets for local produce.
- Co-ordinate an approach to farmer education and CPD (Continuing Professional Development) with skills providers including Farming Connect, Higher Education institutions, colleges, and agricultural consultants.
- Develop a career pathway taking into account different routes depending on need i.e. apprenticeships, paid traineeships, reform of apprenticeship levy scheme.
- Establish links between education and industry through Increased research and innovation support and supporting existing communities of practice and organisations to work with research institutions.
- Support recruitment to industry of those from non-traditional backgrounds
- Support career establishment of new graduates.
- Support new cohort of graduates to access employment, land and opportunities in the sector.

Q 1.2.11 What is the impact if these skills are not available in Wales?

8.14 The impacts identified by respondents are:

- Decreased development of competence and skills in the agricultural sector, hindering the ability to capitalise on opportunities and adopt leading practices.
- Reduced number of spin-out and start-up businesses in Wales, potentially impacting economic growth and innovation.
- Decreased international investment opportunities, limiting potential growth and development.
- Increased financial risk for products and services in the agricultural sector due to market-led demands.
- Higher risk of resilience loss in rural communities, potentially affecting their ability to adapt and thrive.

Q 1.2.13 What knowledge or skills gaps are you aware of in the agriculture sector (including on farm or the wider supply chain) that are hindering Wales' transition to net zero and/or adaptation to climate change?

8.15 Respondents focussed on the uncertainty and lack of knowledge on skills gaps in this question with one pointing to evidence that the level of provision in land-based courses, or student numbers if difficult to ascertain due to insufficient data. The lack of horticulture in Wales was identified as a knowledge and skills gap with the sector requiring investments to incentivise others to take up horticulture.

Q 1.2.14 What format of training/knowledge transfer would best address the knowledge/skills gaps?

8.16 Respondents suggested that a variety of training and knowledge transfer methods would be most effective in addressing the knowledge/skills gaps. This would allow individuals to choose methods that suit their learning preferences and needs.

8.17 Additionally, using practical and realistic examples that demonstrate how the knowledge and information can be applied in operating farming businesses would be beneficial. This approach would help learners understand the practical implications of the knowledge and make it more relevant to their specific contexts.

8.18 Furthermore, respondents suggest that training and knowledge transfer should be delivered locally on sites/farms to ensure that it is practical and applicable to real-world situations. While online continuing professional development (CPD) modules are proposed, it is recommended to find a way to deliver training and knowledge transfer locally to maximise its effectiveness.

Q 1.2.15 Do you have any feedback or ideas/suggestions regarding the skills and knowledge transfer currently on offer for those in Wales?

8.19 Respondents offered feedback on the following areas:

- Increase engagement: Farming Connect should aim to engage with a higher percentage of farm holdings in Wales to ensure a wider reach and impact.
- Core focus on Net Zero messages: It is important to continue emphasising the importance of Net Zero messages in current activities and future sustainable development within the Sustainable Farming Scheme.
- Input from end users: Seeking more input from end users will help ensure that the skills and knowledge being delivered align with their needs and preferences.
- Increased funding: More funding for Knowledge Transfer and training programmes can support the expansion and improvement of skills and knowledge transfer initiatives.
- Local events and partnerships: Collaborating with local organisations like The Farming and Wildlife Advisory Group, Nature Friendly Farmers and PONT (Pori Natur A Threftadaeth) Cymru and universities such as Bangor University can provide valuable resources and expertise for skills and knowledge transfer. Events organised by these organizations can also facilitate learning and networking opportunities.
- Practical guides: Providing practical guides like Hybu Cig Cymru's "Perfecting the Welsh Way - a practical guide to sustainable sheep and beef farming" can serve as a valuable resource for farmers, offering guidance on sustainable farming practices

9. Waste and Circular Economy

Mapping and Key Milestones

Q 1.3.1 What investment, policies, technologies or trends are expected in Wales that are likely to change the skills needed in the waste and circular economy sector?

9.1 In terms of the investment expected in Wales that is likely to change the skills needed in the waste and circular economy sector, there was a call to use Made in Wales products and to stop importing garments and personal protective equipment. There was praise noted for the investment associated with the new skills academy associated with the Fashion-Enter factory in Newtown, Powys.

9.2 Policies mentioned included:

- Extended producer reliability for waste electrical and electronic equipment directive, batteries, textiles, packaging
- Beyond Recycling specific targets:
 - By 2025: 26% reduction in waste, zero waste to landfill, 50% reduction in avoidable food waste, 70% recycling
 - By 2030: 33% reduction in waste, 60% reduction in avoidable food waste
 - By 2050: One planet resource use, 62% reduction in waste, zero waste
 - Net zero carbon
- WRAP (Waste and Resources Action Programme) Levelling up Through a More Circular Economy (2022) based upon UK Government's 2022 Levelling Up White Paper:
- UK and EU- 27 Circular Models applied to data collected from Wales using key parameters of recycling rate (all waste streams), remanufacturing, repair and reuse, servitisation and biorefining as variables in three different modelling scenarios.
- WRAP recent review of repair and reuse skills in Wales (unpublished)

9.3 A respondent highlighted that current legislative priorities relating to recycling and achievement of associated targets limit capacity to support and scale-up re-use and repair activities. As local authority activities are driven by legislative priorities and targets, if there is a future shift in emphasis to repair and reuse, there will likely be an associated increase in the need for these skills.

9.4 Technologies highlighted included:

- AI and automation – maintenance, implementation
- Digitisation of all operations
- Transferred skills to digital
- Biorefining – accounting for only 0.6% of CE jobs in Wales.

9.5 Trends highlighted in this sector were focused on the increase in the number of jobs and subsequent increase in GVA, modelled under the UK and EU Circular models Scenario 2.

9.6 Further trends explored included a general increased understanding of the flows of waste, and the sector wide skills gap and investment mechanisms needed to

support the circular economy reported by WRAP (2022). This is explored in more detail in subsequent questions.

Q 1.3.2 Will these changes result in new jobs? If yes, please give details of new jobs and skills needed.

9.7 All waste and circular economy stakeholders agreed that these changes will result in new jobs. The specific jobs and skills needed included an increase in apprenticeships at Levels 3 and 4, jobs in eco design, net zero and CE consultancy, and CE business models.

Q 1.3.3 Will these changes result in new skills or occupations within the existing waste management sector jobs? If yes, please give details of the changes and skills needed.

9.8 All waste and circular economy respondents agreed that these changes will also result in new skills or occupations within the existing waste management sector.

9.9 Changes listed included the better utilisation of recycling, upcycling, as well as niche and difficult waste streams, through the implementation of innovation, new technologies and new products.

9.10 Skills needed included:

- data analysis,
- waste consultants (mapping from manufacture to remanufacture),
- CE supply chain experts, material scientists, engineers, drivers, as well as a pivot in marketing,
- business,
- negotiation,
- communications,
- contracting.

9.11 There was also a concern that the practical skills and trades relied upon within the repair and reuse sector are being lost as workers reach retirement age.

Q 1.3.4 What are the key timescales to deliver these skills in Wales, especially in relation to the targets and action milestones in Net Zero Wales and Beyond Recycling?

9.12 The respondents who answered this question stressed that these skills are needed either now, or within 6-12 months. One respondent mentioned that the timescales are paramount, as Wales has an opportunity to lead on CE 'as it once did for the industrial revolution', but upskilling is crucial.

Addressing the skills needs

Q 1.3.5 Is there provision for the workforce to train or develop these skills in Wales?

9.13 The respondents who answered this question broadly believed that there is provision for the workforce to train or develop these skills in Wales. Specific opportunities listed included Levels 2-4 apprenticeships in waste and resource management and Levels 1-5 qualifications hosted by CIWM.

9.14 Specifically related to the repair and reuse sector, a respondent shared that there is limited availability when looking up courses on Google that were hosted in Wales. They did go on to explore how this varied depending on the sector and subject area searched for, and that courses on waste management in Wales were among the most difficult to find. In addition, numerous repair and reuse courses were identified as being delivered in only one location in Wales, creating accessibility issues due to the cost and quality of transport. The lack of online provision for these 'hands on' courses was mentioned.

9.15 Responses went on to outline the barriers and opportunities of the skills provision, covered in the questions below.

Q 1.3.6 If not, are they being delivered elsewhere in the UK and can Wales based employers and individuals access this provision?

9.16 One respondent mentioned that they are a UK-wide operation with several bases. Therefore, they are agile to be able to deliver training / workforce development in Wales as well as in other countries within the UK.

Q 1.3.7 If these skills are being delivered in Wales, is the scale appropriate currently and does it meet Wales' future workforce needs?

9.17 The respondents who answered this question mentioned that the scale can be grown, and early years engagement alongside careers advice would be beneficial. The need to cover all levels of employment was also mentioned, not just jobs requiring formal qualifications.

Q 1.3.8 What do you see as the barriers to address the skills needs in Wales?

9.18 Respondents mentioned the need to attract people to the sector, advertising it as employment with competitive salary and employment packages and a need for direction for those who don't know where to start within the sector. Also outlined was the need to provide easily accessible funded courses / schemes, as well as training for the 'right people', as there are differing levels of education and investment in skills. This is related to the disadvantage felt by SMEs having smaller budgets for professional development and training. The ability to attend taster courses would also be advantageous.

9.19 It was shared that the repair and reuse workforce is heavily reliant on volunteers, with social inclusion, equality and diversity being key drivers to

establishing many initiatives. The respondent explained that this sees a diverse workforce composed of those furthest from the labour market or are marginalised in society e.g. people with disabilities, learning difficulties or mental health issues, people of retirement age, and people from the prison system. Given this, careful consideration needs to be given to the types of education and training provision offered to upskill the current and future workforce – there needs to be a balance between formal and informal training. Within the repair and reuse sector, most of the current training is informal and ‘on the job’, however as the repair and reuse sector professionalises, the requirement for qualifications and accreditations may increase which could alienate the current workforce. Furthermore, this respondent mentioned the impact of the cost of living crisis creates challenges in the promotion of enrolment in costly formal education and training costs.

Q 1.3.9 What action is needed to remove those barriers?

9.20 There were limited responses to this question. One suggestion was that the sectors central to net zero (including resource efficiency) be prioritised for funding. Another mentioned the concept of ‘Buy Wales Buy Local’, suggesting that the Welsh Government encourages companies to relocate to Wales. One specific example mentioned was the United Repair Centre.

Q 1.3.10 What is the impact if these skills are not available in Wales?

9.21 If these skills are not available in Wales, respondents raised that this would result in Wales failing to meet policy commitments. One response mentioned losing the ‘Made in Wales’ status, mentioning specific contracts. Another mentioned a greater environmental impact from manufacturing from raw materials rather than from waste, with huge opportunities being missed to carve out a new economic sector for Wales, and the CE failing as a result. They explained that Wales would lose resources to landfill and incineration as well as overseas export.

10. General Questions

What skills are needed in Wales to meet the current and future net zero skills gaps?

10.1 A range of skills were identified to meet current and future net zero skills gaps in Wales. The main areas identified were communications and engagement, digital, environmental, project management, engineering, manufacturing and trade, sustainability and planning.

10.2 There were several additional comments that were not related to specific sector or themed skills. One respondent wished to see an increase in degree apprenticeship frameworks in Wales, while another stated there was an opportunity to develop net zero skills through community benefit funds.

10.3 There was an emphasis placed by one respondent on empowering small and micro businesses have access to skills development, enabling development and innovation impact on a macro scale.

Will these result in new jobs being created or broadly maintaining the existing number of jobs, but with a level of upskilling required or changes to the types of occupations? If so, please give details of opportunities and potential geography.

10.4 Respondents were broadly in agreement that there would be a combination of new job creation as well as necessary upskilling for those in current occupations. One respondent stated that new roles are likely to emerge as technologies do.

10.5 One respondent cited the UK Government's Climate Change Committee Expert Advisory Group, who stated that it will be critical to improve the retention of current construction industry staff, as they will comprise 80% of the people who will deliver progress toward net zero.

10.6 Another respondent recommended that there should be a geographical spread of investment for local employers to offer upskilling opportunities, with the Welsh Government utilising the pockets of good practice already happening around Wales to stimulate investment into net zero skills.

10.7 In Neath Port Talbot specifically, one respondent mentioned they are anticipating both retraining/upskilling for current staff and for more roles to be created as new sectors are introduced to the area. The need to build capacity was caveated with the ability to be agile and flexible to deliver when new sectors come into operation.

10.8 In Pembrokeshire, it was noted that there will be a range of new opportunities for young people, including the renewable offshore wind sector; Gwynt Glas.

10.9 The broader Swansea Bay City Region will also benefit from developments that are ongoing in the Celtic Sea, as well as new port deals currently in development.

10.10 One respondent noted that skills shortages in emerging technologies are likely to be felt more intensely in rural areas of Wales, where support infrastructure is less developed.

How can we future proof our skills delivery to meet our net zero ambitions?

10.11 To future proof skills delivery, a number of respondents expressed a need to better align the education system with industry needs. Practical forms of doing so might include:

- accelerating the process for approving new qualifications and curriculum changes to meet employer demand
- ensuring that educational organisations are linked with industry
- providing support and training for both current, emerging and future technologies

10.12 It was suggested that with this alignment, the workforce will become more adaptable and skilled at managing rapid change.

10.13 Aligning courses and the curriculum more closely with net zero was also mentioned frequently. Suggested ways to achieve this included:

- embedding sustainability/climate within course aims, objectives and outcomes
- ensuring that sustainability/net zero is a mandatory element within all areas of curriculum delivery, including tutorials
- providing opportunities to take part in courses focusing on carbon data collation and analysis and circular economy, whilst including a clear understanding of climate and net zero
- providing specialist sustainability/climate/net zero courses in addition to the mandatory elements within all curriculum delivery

10.14 Some respondents stated that there should be sufficient opportunities to retrain and upskill. Suggestions on how this could be done included mandatory continuing professional development and ensuring re-training and upskilling opportunities are available for existing/current roles across all sectors which align with both the climate and ecological emergencies.

10.15 Two respondents noted that existing expertise and networks could be further utilised to future proof skills. These networks included higher education institutions and local energy ownership, with best practice examples such as:

- Menter Mon Morlais
- Ynni Ogwen
- Ynni Sir Gar

10.16 Two respondents cited a need to educate people on the principles on waste and circular economy, to ensure that future generations are inspired to move into roles that support the net zero economy.

10.17 Two other respondents wished to see greater guidance from Welsh Government on the priority areas for the future, based on policy objectives and targets. Then the development of a coherent offer alongside other programmes, including Personal Learning Accounts.

10.18 A range of other suggestions was also made, these included:

- dedicated resource to ensure educational governing bodies have representation assigned to look at sustainability risk and action
- develop centres of excellence which may focus on a specific sector or area. e.g. food and farming, or housing
- embrace innovative procurement practices to drive positive regional and national outcomes
- ensure that suitable education and training pathways are available locally and through the medium of Welsh
- financial support for re-training and upskilling
- take advantage of the social enterprise ecosystem in Wales

What are the key milestones or timescales to deliver these skills in Wales?

10.19 Respondents did not provide specific timescales or milestones in response to this question; however the general sentiment was that embedding net zero knowledge and skills needs to be done as soon as possible. The need to be timely was supported by existing and forthcoming ambitious policy such as the Infrastructure (Wales) Bill.

Is the infrastructure in place in Wales to meet these needs?

10.20 Most respondents did not believe there was sufficient infrastructure in place to meet these needs. It was felt that there is limited training and insufficient range of qualifications for areas as diverse as large grid and digital/wi-fi connections delivered by providers in Wales. It is currently understood to be difficult for schools to provide advice to students on how certain apprenticeships are supported in Wales, and greater clarity is needed.

10.21 Suggestions for improving current infrastructure were provided by some respondents, such as:

- a need to operate under a joined-up plan and strategy which is established centrally by the Welsh government
- convert intelligence from Regional Skills Partnerships into actionable programmes
- flexible and responsive funding and training infrastructure to support change and innovation
- the current transport infrastructure is not seen as adequate to support the future needs of the workforce
- utilising the experience and knowledge within the third sector by ensuring they have the capacity and resource to allow for employees to undertake professional development within net zero skills

10.22 Despite the lack of infrastructure at present, there was a range of examples provided of interventions underway to develop the required infrastructure. It was noted that many FE colleges have detailed and up to date local and regional knowledge, and most have business engagement units to inform curriculum planning to meet local needs. Several colleges have launched net zero/green skills academies and collaboration is improving between colleges and universities, to ensure the development and delivery of higher-level technical education e.g. through the University of Wales Technical Institute (UWTI) collaboration.

10.23 Relationships between colleges and awarding organisations are said to be well established, allowing for qualifications development to support the delivery of net zero skills.

10.24 One respondent did mention the risk that this lack of infrastructure will be exacerbated if the Welsh Government proceeds with planned reductions to FE and apprenticeships budgets.

10.25 A smaller number of respondents felt that the infrastructure is in place as this would provide a strong basis for infrastructure to meet the skills necessary to achieve net zero. Another highlighted a lack of co-ordination, suggesting that although the infrastructure in the form of individual training providers such as universities and colleges exists in Wales, an overarching strategy and organisation to set direction to develop and deliver content in a coordinated manner across Wales is missing.

What do you see as the impacts/barriers to address the skills needs in Wales?

10.26 Emergent themes from this question included:

- awareness
- coordination
- diversity and inclusion
- finance
- recruitment
- staff resource / capacity
- training opportunities

10.27 Many respondents felt that there was a lack of awareness from employers about how they might go about upskilling their existing staff in net zero skills, stemming from a lack of a clear 'upskilling' pathway. In this vein, one respondent noted that young people would like more information on green career options and what green skills are. The rise of new emergent industries/ technologies can go unnoticed in education, meaning students, their teachers and parents / guardians are often unaware of the career opportunities supporting the decarbonisation agenda.

10.28 A lack of coordination between identified skills gaps and curriculum development was seen by two respondents as challenging the ability to have a coherent approach to addressing skills needs.

10.29 A barrier noted by four of the respondents was finance, with the cost of implementing measures, and attracting, retaining, and upskilling staff being a barrier to commitment for employers. With pressure on small businesses already, some respondents felt that capacity and resource was currently impacting on their ability to take part in skills development. One respondent referenced research from NESTA, which found that changes in the language framing green skills training did not meaningfully increase interest, but the availability of loans, subsidies, and especially grants, did so substantially.

10.30 The lack of training opportunities which are flexible, provide distance-learning, and course progression opportunities was also perceived by some respondents as a barrier.

10.31 Two respondents felt that the recruiting of new entrants was not as efficient as it could be. It was thought to be due to both a lack of support for new entrants, and the need to appeal to career metrics which younger generations deem important (such as the ethics of an organisation).

10.32 Finally, one respondent noted that socio-economic factors can play a role in determining who might be able to access educational resources and opportunities. Minority groups often face barriers in accessing certain skills development programmes, and it was suggested that a more inclusive approach be developed.

What action is needed to remove those barriers?

10.33 Respondents identified several actions that could be taken in order to remove previously discussed barriers. The most common theme raised was funding, followed by new qualifications / curriculum changes, awareness raising and employer engagement.

10.34 Under the need for funding, respondents specifically mentioned support for individuals to undertake training, through heavily subsidised courses and training opportunities at all levels and especially for SMEs, and new investment in the post-16 sector.

10.35 Respondents wished to see changes to educational curriculum and qualifications that related to new apprenticeship programmes and aligning the curriculum in schools with the demands of employers to keep pace with the needs of industry.

10.36 To combat a lack of awareness on career opportunities, respondents suggested that young people should be made aware of green jobs and high impact careers that are available in their areas. Examples of how this could be achieved included the Welsh Government's Employability and Skills Action Plan and Careers Wales' five-year strategic plan Better Futures. It was also suggested that the Welsh Government could use the forthcoming Net Zero Skills Plan to ensure there are clear actions and accountabilities on:

- defining and delivering upon industry requirements for green skills
- developing national occupational standards
- stimulating green skills demand
- building on the labour market intelligence of Regional Skills Partnerships to map and forecast green skills demand

10.37 Two respondents wished to see more employer engagement initiatives that include educating employers on what 'green skills' might look like in their industry. Then developing coordination between employers and education providers to ensure that there is efficient skills delivery.

10.38 The remaining suggestions were as follows:

- a holistic approach that can improve participation (e.g. improving public transport and funding support for childcare)
- advice and guidance
- ensuring qualifications are more flexible
- guidance from the Welsh government on future roles and skills – dedicated pathways

- promotion of diversity in net zero skills development
- providing 'top up' qualifications

What is the impact of these skills not being available in Wales?

10.39 The expected impacts of these skills not being available in Wales can be split into economic, social, and environmental.

10.40 Economic impacts were mentioned most frequently, and these included:

- an inability to secure vital investments and the loss of opportunities for communities
- an increase in local unemployment (e.g. Tata Steel)
- difficulties for employers in relation to recruiting
- education institutions unable to capitalise on opportunities to train and upskill staff
- potential stagnation in the Welsh economy
- sectors becoming less capable to develop the competence and skills to capitalise on opportunities to develop leading practice
- the loss of economic opportunities to neighbouring regions

10.41 Social impacts were also mentioned, including:

- continued fuel poverty for households
- heightened vulnerability
- the inability to achieve a just transition

10.42 Finally, two respondents mentioned possible environmental impacts:

- a failure to meet net zero targets
- business sustainability is not secured

What cross-cutting circular economy skills do you consider are required in your sector? (for example, eco-design, re-use, repair, remanufacture, reprocessing)"?

10.43 A number of cross cutting skills were thought to be needed, these included:

- basic understanding of waste and end of life resources
- carbon accounting in organisational planning and reviews
- carbon calculations in eco design
- lifecycle assessment (LCA) skills for measuring the true impact of material, products etc.
- nutrient management planning in agriculture
- principles of the circular economy in business purpose, products and services
- quantifying social and community value
- repair and re-manufacturing products
- understanding nature-based solutions in product and service design (biophilia)