

CESAP Pathfinder

A Dynamic Skills Response to Supporting the Transition to Net Zero



Executive Summary

November 2023

Executive Summary

1. Having a nation with the right skills will be fundamental to achieving the Scottish Government's ambitious target of becoming a net zero emitter by 2045. To support this, the skills system and labour market will need to be more agile and dynamic than ever before.
2. The Climate Emergency Skills Action Plan (CESAP) published in 2020¹ outlined the need for action to ensure that current and future skills investment in support of net zero is strongly evidence based. The CESAP Pathfinder is a direct response to this and has been led by Skills Development Scotland (SDS), in collaboration with the Scottish Funding Council (SFC) and forms part of the Shared Outcomes Framework².
3. The CESAP Pathfinder comprises two complimentary work packages: Work package 1: An Evidence Based Approach to Supporting the Transition to Net Zero and Work package 2: Decarbonisation of Domestic and Commercial Heating Pilots in two regions of Scotland. This report focuses on work package 1.
4. A key aim of the CESAP Pathfinder (Work package 1) was to establish a shared view of the breadth and quality of skills evidence in relation to the transition to net zero. This has been achieved through:
 - Understanding current and planned economic investment supporting the transition to net zero.
 - Assessing the breadth and quality of information on the demand for skills from the transition to net zero.
5. Mapping existing skills provision across apprenticeships, further education, higher education, upskilling and reskilling relevant to the transition to net zero.
6. Understanding current levels of skills investment in relation to the transition to net zero.
5. The findings from the CESAP Pathfinder advances the evidence base to identify current and future skills demand, establishes a baseline of green skills provision and identifies opportunities for action needed across the skills system to respond to the transition to net zero.
6. This report summarises the series of comprehensive research projects undertaken as part of the Pathfinder Work Package 1. Throughout this work, it has been critical to engage with relevant stakeholders. This has included consultations (21 organisations) and working with experts on the relative research, testing and validation of the approach and findings with stakeholders, including the subgroups of the CESAP Implementation Steering Group (ISG), sector experts, and colleagues at SFC and within SDS.
7. This work has been a significant undertaking over a 16 month period. Our engagement with stakeholders has identified a number of other ways in which Scotland's education and skills system is supporting the transition to net zero, including:
 - The development and deployment of research, innovation and new technologies to support the transition to net zero.
 - Action by institutions and organisations to reduce their carbon emissions (through, for example, travel reduction, estates investment, or switching to lower carbon intensive forms of heating).

¹ Skills Development Scotland (2020). Climate Emergency Skills Action Plan.

² Scottish Government (2022). [Skills: Shared Outcomes Framework](#)

Executive Summary

8. While these are important contributions, they are not within the scope of this research. Similarly, while we are aware of significant work to update apprenticeship, college and university curriculum, we have not been able to access information on this in a systematic way, so these efforts have not been considered as part of this work.
9. The focus of the Pathfinder activity has been on the five areas of economic opportunity identified in the CESAP. These sectors make a significant contribution to the net zero transition and are where there is also the greatest potential for skills implications and jobs growth arising from the transition. These broadly were:
 - **Agriculture (including Forestry and Fishing)**
 - **Construction**
 - **Energy and waste treatment**
 - **Manufacturing (including Engineering)**
 - **Transport**

Key Findings

10. Identifying known investment, understanding demand for skills and quantifying levels of current skills provision are all critical components of effective skills planning. By understanding these key components, we can determine and assess gaps and identify opportunities to address them, to ensure the skills system can effectively support the transition to net zero.

³ Gross Domestic Product. Scottish Government GDP Quarterly National Accounts, Scotland 2022 Quarter 2 (April to June), November 2022. Including oil and gas extraction in Scottish waters, Scotland's GDP in 2021 is estimated to be £179.9 billion in total.

⁴ Gross Value Added, see supplementary Demand Evidence Report for further details.

What do we know about green investment?

11. Investment will be a catalyst for the transition to net zero and lead to job creation. As a result, a core part of the Pathfinder was to map green investments across Scotland. A thorough process identified investments, importantly capturing the likelihood of investment materialising and the timeframe over which it was expected to take place. Key messages include:
 - Green investments (with known scale) total just under £90bn and are happening now or due to take place over the next 2-3 years. This is a significant level of investment and over the duration of the planned expenditure (up to 10 years) would be around 5% of Scotland's GDP³ annually over the period and just under a fifth of annual GVA⁴ from Scotland's CESAP sectors.
 - Energy Transition accounts for more than 65% of all known green investments at around £58.5bn. The largest component of this is investment in large-scale offshore wind farms (62% of identified Energy investment).
 - Of the total expected green investment, approximately £48bn (53%) is already going ahead or has a high likelihood of proceeding in the next 2-3 years.
 - The levels of known investment with a high likelihood of progressing are greatest in the Highlands and Islands, Edinburgh City Region, Aberdeen City and Shire, Tay Cities and Glasgow City Region.
 - There are also distinct geographical concentrations of known sectoral investment that is proceeding or likely to proceed by region, with Energy transition mostly concentrated in the north of Scotland and the east coast. Construction investment is concentrated in the Central Belt, while Transport investment is distributed across Scotland.

Executive Summary

12. This knowledge of investments can be used as a basis for prioritising evidence gaps and informing skills planning. It can also provide the basis for piloting specific sectoral skills interventions in regions where there is clear evidence of emerging activity.
13. There is investment that is known and investment highly likely to proceed across every region in Scotland that will require agility and responsiveness from the skills system over the next 3 years.
14. Crucially, what is presented is a snapshot of a point in time. It will be important to maintain the integrity and completeness of the insight going forward – and to communicate and share that evidence with partners in the skills system.

What do we know about the demand for green skills?

Green Jobs in Scotland

15. The Green Jobs in Scotland⁵ research, commissioned as part of the Pathfinder, advanced understanding of the types of green occupations in CESAP sectors, and across the whole economy. The report classified green occupations into one of three groupings:
 - New and Emerging occupations – where there is a need for unique work and worker requirements, which results in the generation of new occupations.
 - Enhanced Skills and Knowledge occupations – where the essential purposes of the occupation remain the same but

tasks, skills, knowledge, and external elements, such as credentials, have been altered.

- Increased Demand occupations – where the work context may change but the tasks do not.
16. The research estimated that more than one-quarter (25.7%) of all jobs in Scotland were in the Enhanced Skills and Knowledge category, one in ten (9.9%) were Increased Demand, and 4.3% were New and Emerging. This means that for every one job in New and Emerging, there are two jobs in existing occupations that we will need more of, but six jobs that already exist that need new skills to adapt to the implications of the transition to net zero. This highlights the critical role of upskilling in meeting the transition to net zero.

Demand in CESAP sectors

17. Looking across the CESAP sectors, in 2022 there were 690,900 people employed, accounting for 26.5% of Scottish employment. Construction accounted for the largest share of CESAP sector employment.
18. Not everyone who works in a CESAP sector is in a green job – but most are. Based on Oxford Economics employment estimates, for every ten people working in the CESAP sectors in 2022, seven worked in a green occupation and three worked in a non-green occupation.
19. Employment in the CESAP sectors is spread across Scotland. It is greatest in and around Scotland's cities and although lower in volume, green occupations accounted for an above-average share of employment in rural areas (33% compared to 27% across Scotland).

⁵ Cardenas Rubio, J., et al. (2022). [Green Jobs in Scotland: An inclusive approach to definition, measurement and analysis.](#)

Executive Summary

20. In the mid-term (2022-2025), demand arising from the need to replace workers far exceeds demand arising from growth. This is consistent with all sectors of the economy. Overall, 77,000 people are expected to be required to meet demand across the CESAP sectors from 2022 to 2025. The current level of employment, and outlook varies by CESAP sector.

Energy and Waste Treatment

21. The Energy and Waste Treatment sector is expected to face significant demand for new skills over the short to medium term. This will be driven by four primary factors:

- More than 12,000 people will be needed to fill jobs emerging because of replacement demand as existing skilled workers retire from the workforce.
- A significant reskilling requirement to support the transition of workers from high carbon intensive to low carbon intensive forms of energy production.
- Growth in the demand for new skills as new and emerging technologies such as Hydrogen production and Carbon Capture and Storage come to fruition.
- A significant requirement to upgrade grid and transmission infrastructure to accommodate new technologies.

22. The demand evidence highlights that many of the skills that are likely to be required in relation to energy and waste transmission are already in short supply – and that there is likely to be strong competition for these skill sets from other sectors.

Construction

23. The Construction sector in Scotland plays a key role in heat

decarbonisation, and as work ramps up to support this process, the sector is expected to face significant demand for new workers and new skills. The main factors driving this demand are:

- A requirement for substantial upskilling and reskilling to support the current workforce to acquire suitable skills for retrofitting and installing net zero heating systems.
- A substantial expansion and replacement demand is forecasted in the sector, with a total requirement of 21,700 people to meet demand in the sector up to 2025.
- An ageing workforce and reduced availability of migrant labour which is expected to contribute to high replacement demand and labour shortages.
- Shortages in key trades required for the decarbonisation of heat, including plumbers, electricians and retrofit coordinators.

24. The evidence highlights that there are challenges around upskilling and reskilling within the Construction sector, particularly due to financial barriers, availability of training and labour shortages. Notwithstanding the challenges, it is important to ensure upskilling and reskilling opportunities are readily available to employers to support the amount of training required in the heat decarbonisation space.

Transport

25. The Transport sector is expected to be subject to significant demand for changing and new skills as the sector adapts to the transition to net zero. The primary factors driving this are:

- Demand for skills to support the expansion of ULEV infrastructure.
- A significant requirement for training (for new starts and re-skilling existing workers) on the maintenance and repair of ULEVs.

Executive Summary

- Wider training requirements (for both new starts and re-skilling) around ULEVs relating to core and para Transport occupations. It is estimated that 65,000 people will need to undertake training to support the uptake of electric/hybrid vehicles.
 - Considerable total requirement – amounting to 24,900 people up to 2025, which includes replacement demand as the ageing workforce retires.
26. The expansion of ULEV infrastructure is vital in supporting the sector's transition to net zero. Primarily this reflects the need for more charging points to support the uptake of electric vehicles. It also includes wider infrastructure to support the decarbonisation of HDVs (e.g., hydrogen refuelling infrastructure) and trains (e.g., the electrification of lines).

Manufacturing (including Engineering)

27. The Manufacturing sector is currently heavily reliant on fossil fuels, and there will be major changes required in the sector to reduce emissions and meet Scotland's net zero targets. This will result in significant demand for skills and labour, which will be particularly driven by the following factors:
- An ageing workforce and reduction of migrant labour contribute to a replacement demand for 6,900 people in the sector up to 2025.
 - Shortages of workers trained in key trades required to support decarbonisation in the Manufacturing sector, including welders, fabricators, and engineers.
 - Significant upskilling and reskilling is required to allow

workers in the sector to adapt to new ways of working to support the decarbonisation of Manufacturing.

28. To support decarbonisation in the Manufacturing sector, there is an increasing demand for higher-level skills within the workforce. This is particularly due to the introduction of new technologies that require design, analytical and technical skills, as well as management skills. These skills will support the Manufacturing sector adapt to new ways of working that will reduce the sector's carbon emissions.

Agriculture (including Forestry and Fishing)

29. The Agriculture sector is of key importance to the transition to net zero. The sector is expected to face significant demand for new skills as it adapts to agricultural practice in a low carbon environment. The primary factors driving this are:
- A considerable replacement demand as the ageing workforce retires. This is the key driver of the 11,500 total requirement over the period to 2025.
 - Adoption of new digital technologies to support more efficient and sustainable agriculture.
 - Growing skills demand from peatland restoration. This is a new and growing sector, which is already leading to unmet skills demand. Estimates suggest there could be a need to fill 1,500 jobs in the period to 2030.
30. This is set against a challenging backdrop as labour availability has been affected by Brexit. The availability of housing and public transport in rural areas combined with challenges around sector attractiveness have also created difficulties in the Agriculture skills pipeline. However, the transition to net zero offers the opportunity for more technical/highly skilled occupations in areas such as peatland restoration, chemical management, soil testing and other occupations related to the greater adoption of digital technologies.

Executive Summary

What have we learned about the provision of green skills?

31. Understanding the scope, level and volume of 'green' provision is crucial for effective skills planning. The post-16 skills system has an important role in achieving the transition to net zero, by ensuring that new entrants who leave education and enter the labour market, and those within work who need to upskill or retrain, have the skills needed. Skills alone will not realise the economic opportunities presented by the transition to net zero, but they are an essential component part.
32. Looking across the data on provision, there is evidence that training and learning to support the transition is already taking place:
 - 27% (32,300) of college enrolments are in courses that are aligned to CESAP sectors.
 - Around 16% of graduates from Scottish universities were working in a CESAP sector 15 months after graduation.
 - Around 29% (7,400) of Modern Apprentices (MA) starts and 38% (400) of Graduate Apprentice (GA) starts were in sectors aligned to CESAP.
33. Retaining talent and skills in Scotland will be important to achieving the transition. There is some evidence of leakage from this pipeline of potential skills supply, however:
 - Of the university graduates going into a CESAP sector as their first destination, around 40% of these do so in a job that is outside of Scotland.

- Data on destinations for college enrolments at the detailed sectoral level – and therefore the extent to which people are entering CESAP sectors or going on to use qualifications and skills gained in CESAP sectors – is not available. This is an important data gap which should be filled.

34. Around 90% of GAs and MAs aligned to CESAP sectors were still working in the sector 15 months after completing their qualification.
35. Much of the university and college data used for this analysis will include elements of upskilling and reskilling. However, extracting this from the data has proved difficult. This is a significant gap in our knowledge, particularly given the importance of upskilling as a driver of skills demand.

Gap analysis

36. A key aim of the CESAP Pathfinder was to assess the strength and quality of the existing evidence base to support the transition to net zero and identify ways in which it could be strengthened. From the analysis that has been undertaken, we have been able to identify strategic evidence and underlying data gaps and offer a view on how these might be addressed. We are also able to identify evidence-based opportunities to respond to the transition to net zero. These are summarised below.

Investment

37. Whilst there are significant uncertainties about the timing and critical path to investments in some sub sectors, evidence on known and certain investments is strong at the level of CESAP sectors, allowing disaggregation by region and, in some cases, specific economic opportunities. The level of known investment is considerable – and should be of sufficient scale to signal the need to invest in anticipation of skill needs.

Executive Summary

1. To take advantage of upcoming economic opportunities in ScotWind, Hydrogen, CCUS and Green Freeports, developing an understanding of the investment aligned to these opportunities should be an early priority. This should look to provide up to date detail on known investments within Scotland, specific locations, and the nature and timeframes for investment. This will provide a stronger basis for subsequent skills demand assessment and a strong signal of potential future skills demand to skills providers.

Demand

38. The evidence on the volumes of people who might be needed across some CESAP sectors is less consistent and clear than we might have anticipated at the start of the Pathfinder. This is in part down to some uncertainties on investment timelines but also reflects a fragmented approach to the forecasting of skills requirements. However, competition for key skillsets across sectors and the expected retirements allied with the persistence of skills shortages suggests strong likelihood of people and skills availability acting as a barrier to achieving Scotland's net zero ambitions.
39. We have also identified evidence gaps in relation to the specific skills requirements that will be associated with different elements of the transition to net zero. These gaps are best filled by direct engagement with employers and those undertaking work in these sectors.

2. Further develop specific demand analysis across CESAP sectors, focusing on known opportunities and including direct insight from employers and industry. This analysis should also look to identify skills in demand across sectors and inform skills planning on a national and regional basis.

3. Undertake further engagement with relevant stakeholders and partners to assess and validate findings from this pathfinder work and explore ways to address data gaps collectively and strengthen the evidence base.

Provision

40. The demand evidence highlights the critical role that upskilling will play in supporting existing workers to contribute to the transition to net zero. The availability of evidence on discrete upskilling activity – and the extent to which existing provision is supporting upskilling is a key weakness – which should be addressed.
41. In addition, whilst there is evidence of alignment of existing provision to support the transition to net zero, leakage from this pipeline of potential skills supply is evident. A key data gap exists on the destination of college leavers in relation to CESAP sectors.

4. As a priority, establish a mechanism to better disaggregate the extent to which existing provision is supporting reskilling and upskilling to support the transition to net zero.

Executive Summary

5. For colleges, gather data on destination following completion. This approach should be in line with the Graduate Outcomes survey measures and the Real Time Apprentice Insights (RTAI) survey. A crucial part of this would be capturing where completers are working (by sector) and whether they are within Scotland.

6. Create a consistent evidence base on provision which takes account of starts, withdrawals, completers and final outcomes on a common basis across colleges, universities and apprenticeships. Work towards implementing a robust and annualised monitoring framework to ensure post-school provision is moving in the right direction to meet net zero needs.

To support this, it may be helpful to start with a pilot of a small number of green occupations critical to net zero with a standard set of measurements across the apprenticeship family, colleges and universities. The CESAP Pathfinder Work Package 2 (decarbonisation of domestic and commercial heating) could explore how best to achieve this.

42. It is important to consider what we can learn from elsewhere in terms of what good looks like in a dynamic skills response to support the transition to net zero. This would enable learning on how other countries are working towards net zero and climate resilience, with a specific focus on skills.

7. Identify any international best practice efforts to identify the evidence on investment, demand and provision of skills to support the transition to net zero, and embed any lessons in Scottish practice.

Gap Analysis

43. In relation to green skills needs in the CESAP sectors, the evidence points to the need for more workers in key occupations and for a substantial volume of upskilling for those already employed in these occupations. This reflects the anticipated higher levels of employment growth in the CESAP sectors – growth which will be essential if net zero is to be achieved.

8. Following the testing and validation of the Pathfinder findings (number 3 above) with partners and stakeholders, establish clear mechanisms to increase the volume of skills in those areas that have been identified as potential critical blocks in delivering the transition to net zero.

44. A significant amount of work has been undertaken as part of this research in what is a complex area and had not been attempted previously in a consistent way across CESAP sectors. Partnership involvement has been important throughout, and to successfully address the gaps and capitalise on the opportunities identified, collaborative working will be critical across partner agencies, with the involvement of wider stakeholders.

Executive Summary

45. This will enhance the lessons already learned and assist with the development of future research and an implementation plan, including agreeing priority areas of focus to support both immediate and emerging opportunities. The CESAP update, due to be published later in 2023, presents an opportunity to agree priority action areas with partners.

9. Agree implementation priorities across 1) Keeping data on investment intentions up to date and disseminating to partners 2) Filling strategic data gaps in provision 3) establish clear mechanisms to increase the volume of skills in those areas that have been identified as potential critical blocks 4) identifying priority areas to take forward further detailed demand assessment work and co-design of skills interventions (such as the one underway in Decarbonisation of Heat in Buildings).