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Policy Brief

Jobs and UK CCUS: the constrained employment impacts of a new UK CO_2 Transport and Storage industry

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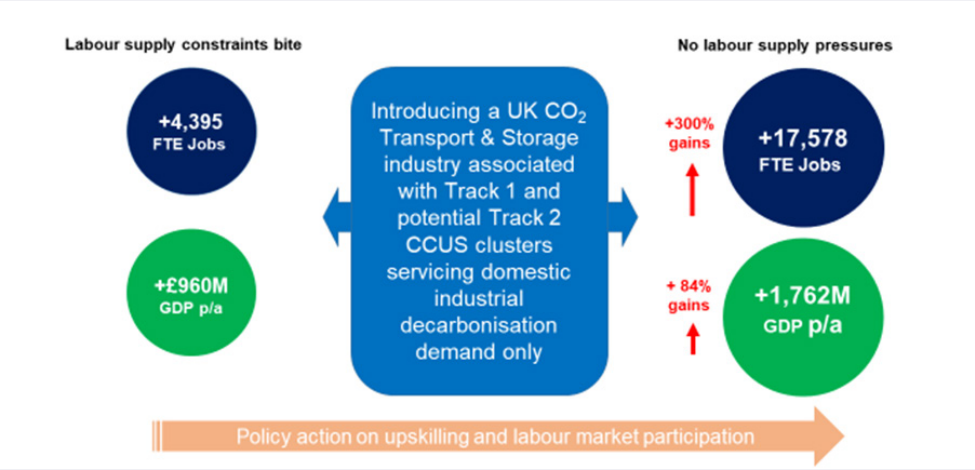
Summary

In addition to the clear emissions reductions benefits of investing and deploying CCUS networks in the UK, and the need to ensure that UK industry can decarbonise in a competitive way, a key focus in policy deliberations and debate has been on the employment that could be supported across the UK economy. One key activity in this regard is the emergence of a new CO_2 Transport and Storage (T&S) industry, which could draw on and play a key role in transitioning existing capacity and supply chains associated with the oil and gas industry.

Estimates from economy-wide scenario simulation analysis indicate **that just over 17,500 jobs and a GDP uplift of £1,762M per annum could potentially be supported across the UK by a new T&S industry, once it is fully operational and sequestering around 54 million tonnes of CO_2** in offshore reservoirs that once held fossil fuel reserves. Here our scenarios consider the deployment of the T&S industry moving through the Track 1 cluster sequencing already announced (the Hynet and East Coast clusters in the Merseyside and Teesside/North Humber regions) and a potential Track 2 involving the Scottish and South Humber clusters.

However, this headline estimate of 17,578 full time equivalent (FTE) jobs ultimately sustained, with 432 of these in the T&S industry itself, is based on a scenario where there are no persisting constraints in the UK labour market. **If the current labour supply and skills shortages impacting the UK economy persist**, and wage bargaining pressures cause labour costs to rise across all sectors, we estimate that the total employment supported will be substantially reduced. **Our central estimate is of 4,395 full-time equivalent (FTE) jobs being sustained across the UK economy by the mid-2040s associated with a GDP uplift of £960M per annum.**

Figure 1. Sustained job creation (full-time equivalent, FTE) associated with a new UK CO_2 Transport and Storage industry



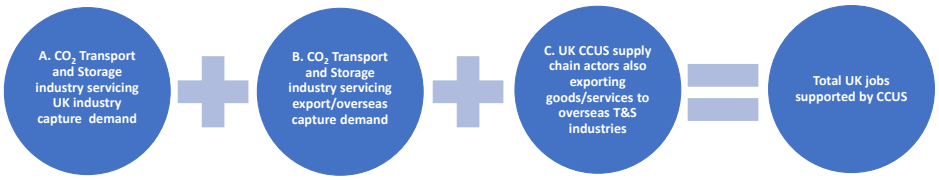
Generally, we find that the skills and worker shortages may trigger real wage and broader labour cost pressures, during both the investment and the operation phases. These wage pressures affect the wider economy, limiting the potential economic expansion driven by the development and operation of a T&S sector, with a risk of both displacing employment across (more labour-intensive but less GDP-intensive) sectors and adding to costs of living and doing business in the UK.

However, our findings also show that if the wage bargaining pressures of bringing UK workers back into employment can be reduced – for example by acting to address skills shortages – the transitory and sustained employment gains could increase substantially, even in the presence of a persisting constraint on the number of workers. In the near term, some temporary focussed migration to enable specialised construction activity during the upfront investment stage of developing the UK's CCUS clusters could also act to temporarily relieve cost and price pressures and mitigate displacement of jobs across sectors.

Introduction

The UK Government's 2021 roadmap on CCUS supply chains cites the 2019 Energy Innovation Needs Assessment estimate that the potential employment supported by CCUS in the UK could be as high as 50,000 jobs, with approximately 10,000 of these associated with the currently planned domestic-facing activity of sequestering emissions from the UK's regional industry clusters. This cuts across a fairly wide range of activities, including potential exports of sequestration services by a UK CO_2 Transport and Storage (T&S) industry as well as of other CCUS-related services and/or technological developments. See Figure 2 for the scope of such potential jobs estimates.

Figure 2. Scope of potential CCUS jobs estimates



This policy brief focusses on estimating element A in Figure 2 now that information is forthcoming on what the initial CCUS rollout may look like in the context of current Track 1 and Track 2 CCUS cluster sequencing process, where the initial focus is on sequestering domestic emissions only, starting with those generated within the proximate clusters.[i]

In doing so, we develop on the 2019 Energy Innovation Needs Assessment estimates by considering the employment that could be supported by UK T&S, made operational through the already announced Track 1 and potential Track 2 stages of the CCUS cluster sequencing programme. This involves limiting focus to the new T&S industry sequestering own-cluster emissions only.

In short, the cluster sequencing process had not begun at the time of the 2019 estimates cited above, including the 10,000 estimate from that work associated with the element A of Figure 2 that we focus on here. Moreover, in this policy brief, we give attention to the potential impacts of the persisting labour supply constraints (worker and skills shortages) that characterise the UK labour market, arriving at a wide estimate range of just under 4,500 to just over 17,500 supported jobs.

The analysis is conducted using our UKENVI economy-wide model of the UK, updating previous fully peer-reviewed work for new data on the structure of the economy and scenarios refined to focus on the now-announced Track 1 and potential Track 2 developments.[ii]

"... maximising jobs supported by UK CO_2 transport and storage …. requires policy action on skills and/or to increase the labour supply in ways that limit wage bargaining impacts on costs and prices as workers are induced or enabled to participate in the labour force."

Research Findings

1. The estimate T&S industry picture

Table 1 summarises our estimates of the key economic characteristics of the new UK CO_2 T&S industry that emerges first through the already identified Track 1 of the CCUS cluster sequencing process: the Hynet (Merseyside) cluster in the northwest of England and the East Coast clusters (Teesside and North Humber) in the northeast. We assume investment begins in 2023 and Track 1 becomes operational from 2027. In the second column of Table 1, we introduce an assumed/potential Track 2 development, based on the Scottish and Viking (South Humber) clusters already having secured licences.[iii] Here investment begins in 2027 with Track 2 operational from 2030. Our upfront and ongoing investment requirements are based on separate work on the capital requirements to transport and store emissions in each of these clusters.[iv]

Table 1. UK regional cluster emissions sources and interventions/impacts of linked CO2 Transport and Storage capacity

Key T&S industry investment and operational characteristics	Track 1 clusters only	Track 1 & 2 clusters
Total capital stock created (£m)	1599	3047
Pre-operation investment (£m) - Evenly distributed over 4 years to 2026	2007	4210
Ongoing additional annual investment (£m)	240	431
Total output/demand serviced (£m)	553	994
Direct employment (FTE)	241	432
Value added (GDP) (£m)	349	627
Total industrial emissions serviced (Mt, millions of tonnes of CO_2)	30.60	53.84

Once the new T&S industry is fully operational (from 2030) it sequesters just under 54Mt of industrial CO_2 emissions per annum, the total direct contribution to UK GDP is £627m per annum and direct T&S employment is 432 full-time equivalent (FTE) jobs. The initial stimulus to the wider economy emerges through the £4.2billion of investment to create T&S industry capacity involving a £3billion capital stock. Once the industry is fully operational, there are two sources of sustained stimulus; via annual investment spending of £431m per annum to maintain the T&S capital stock and the £994million of demand per annum (we assume guaranteed by the UK government) for the industry's output.

2. Net headline employment impacts

Table 2 reports the key sustained macroeconomic outcomes of introducing the UK T&S industry. All scenarios involve the assumption that the UK Government guarantees demand for T&S output; that is, government subsidises capture firms so that their use of the T&S network is initially costless (to those firms). There are two main drivers for the expansion: (1) the upfront and ongoing investment activity, where the biggest direct beneficiary is the UK construction industry; (2) the operation of the T&S industry, which we assume largely shares the supply chain characteristics of the current oil and gas industry.

Under Scenarios 1 and 2, the sustained outcomes reported are achieved by the mid-2030s, a timeframe under which this funding assumption may be reasonable. Scenario 3 involves a greater expansion and adjustment of the economy so that outcomes reported in the final column take longer to achieve, but with over 95% of the adjustment by 2045, which we take as the timeframe for comparing across scenario results.

Table 2: Key long-run macroeconomic impacts in the UK of introducing the T&S industry in Track 1 and Track 2 clusters (alternative wage bargaining assumptions)

	Scenario 1: Central Case	Scenario 2: Reduced Real Wage Response	Scenario 3: No Real Wage Response
Net public deficit impact (£million), composed of:	-762	-715	-565
Net additional government revenues (£million)	557	526	429
Direct spending on T & S (£million)	-994	-994	-994
Nominal adjustments to meet real spending commitments (£million)	-326	-248	0
GDP (£million)	960	1,151	1,762
GDP (% change)	0.050%	0.060%	0.092%
Employment (FTE)	**4,395**	**7,547**	**17,578**
Employment (% change)	0.015%	0.026%	0.060%
Unemployment (% change)	-0.349%	-0.599%	-1.395%
Nominal wage - index to 1 (% change)	0.075%	0.057%	0.000%
Real wage - index to 1 (% change)	0.039%	0.030%	0.000%
CPI - index to 1 (% change)	0.036%	0.027%	0.000%
Exports (% change)	-0.068%	-0.052%	0.000%
Imports (% change)	0.087%	0.083%	0.071%
Real household consumption (% change)	0.055%	0.057%	0.064%
Total investment (% change)	0.089%	0.098%	0.127%

Our central case estimate (Scenario 1) is that by 2045 the net sustained employment impact is 4,395 full-time equivalent (FTE) jobs, 432 of which is direct employment in the new T&S industry, with all additional workers drawn from the pool of unemployed labour in the UK as wage rates rise.

That this is a net employment impact is crucially important. Due to the labour supply constraint and cost-price pressures triggered by real wage bargaining in the labour market, there is some displacement of employment in other sectors, and purchasing power is eroded across the economy.

However, the results for Scenario 2 illustrate that if the influence of wages on attracting workers (back) into the labour force can be reduced (here by just over half, for illustrative purposes), the increase in employment gains could be substantial. One route to such an outcome could be action on skills and other non-wage inducements.

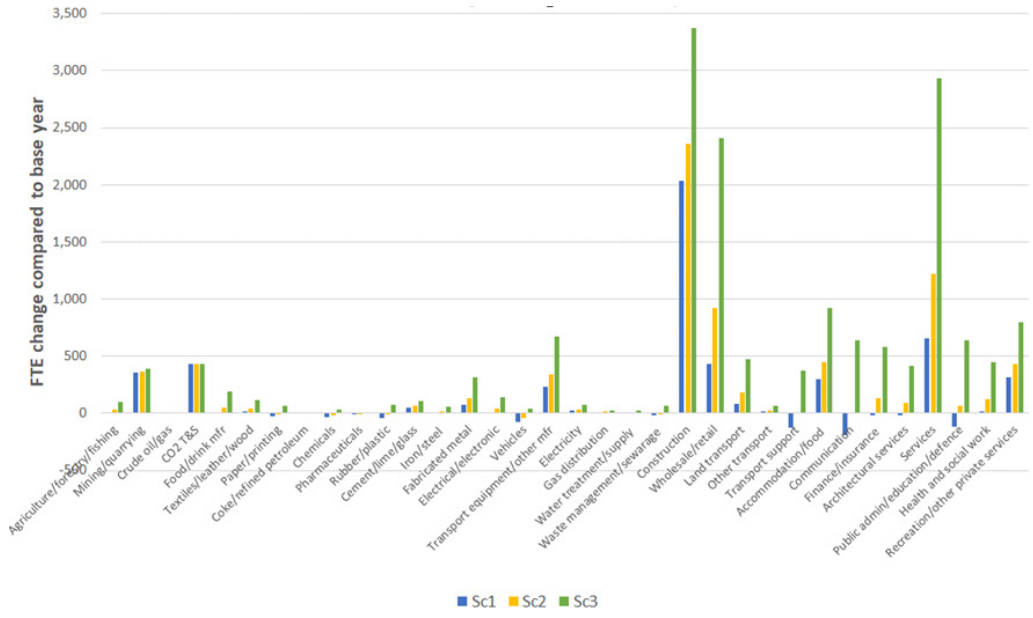
In order to achieve the Scenario 3 outcome, on the other hand, there would need to be no sustained real wage response when labour demand increases. Our scenario simulations suggest that the Scenario 3 outcome could be achieved even in the presence of a wage response, but this would require an increase in the total number of workers over time.

3. Employment outcomes and the wider economic picture

Under all our scenarios, a picture emerges where the combined investment and demand stimulus of introducing and publicly supporting the new T&S industry triggers a marginal but sustained net increase in activity across the UK economy. Under our central Scenario 1, this maps to a sustained uplift in GDP of £960m per annum (in 2018 prices – an increase of 0.5% relative to what it would otherwise be). There is also a net increase in total government revenues per annum (p/a) (£557milllion) that partially offsets the public spending requirement (£994m) of guaranteeing demand for T&S output.

Note that the sustained increase in UK employment (0.015%, 4,395 jobs) is less than proportionate to the GDP uplift. This is a compositional effect, driven by the relatively high capital intensity of the T&S industry and its supply chain. However, with an uplift in total household consumption of 0.055%, there is a small but sustained stimulus to more labour-intensive consumer facing sectors.

Figure 3. Impacts on sectoral (full-time equivalent, FTE) employment by 2045 of introducing the CO_2 T&S industry



Overall, however, Figure 3 shows that (by 2045) some sectors still suffer marginal net losses in employment under our central Scenario 1, as wage rates and price levels increase with the economy expanding in the presence of the persisting UK labour supply constraint. These include those manufacturing industries where the 0.068% contraction in export demand is concentrated and several more labour-intensive service sectors that benefit less, if at all, from increased T&S supply chain and consumer demand.

Generally, though, the results for Scenarios 2 and 3 in Table 2 and Figure 3 demonstrate that if the influence of wages on drawing UK workers out of unemployment and/or the labour supply constraint is relaxed, not only do the macroeconomic outcomes improve but sustained displacement of jobs across sectors can be reduced and ultimately avoided.

Conclusions and future directions

The central finding of the work reported here is that introducing a new UK CO_2 T&S industry is likely to support thousands of jobs across the UK, including in service sectors boosted by increased income from employment (with caution advised in interpreting the latter as 'green job' creation, at least in the absence of other decarbonisation activity). However, maximising jobs supported by UK CO_2 transport and storage, while minimising job displacement in other sectors of the economy, requires policy action on skills and/or to increase the labour supply in ways that limit wage bargaining impacts on costs and prices as workers are induced or enabled to participate in the labour force.

In the full work underlying this policy brief, we have explored a wider range of scenarios, and the dynamic processes by which sectoral employment and the wider economic picture develop.[v] The next step of our research[vi] will involve a more detailed investigation at how persisting labour market supply constraints and other cost pressures (e.g., continuing energy price volatility) may impact regional CCUS project delivery and the sectoral/wider economy outcomes thereof.

Going forward, we will also look to extend the scope of our work to consider a fuller range of CCUS-related activities, including export opportunities not only for T&S services but for the technology and expertise that may be developed throughout the UK's CCUS supply chains.

End notes

i. Linked to our work on the Innovate UK SNZI project, we have (in a separate policy brief) considered the potential employment and other wider economic benefits associated with extending clustered CCUS capacity in Scotland to service T&S export demand from capture demand overseas, i.e., element B in Figure 2.

ii. See Turner, K., Race, J., Alabi, O., Calvillo, C., Katris, A. & Swales, J.K. (2022). Policy trade-offs in introducing a CO_2 transport and storage industry to service the UK's regional manufacturing clusters. Ecological Economics, 201: 107547. https://doi.org/10.1016/j.ecolecon.2022.107547. A paper fully detailing the updated work reported here is currently undergoing peer review, but a copy is available on request from the lead author, karen.turner@strath.ac.uk.

iii. Our assumptions on the potential Track 2 clusters are also in line with the UK Government's 'Powering Up Britain' policy paper where Acorn (the core of the Scottish Cluster) and Viking are mentioned as "…leading contenders for Track-2 T&S Systems" (p.21)

iv. See Calvillo, C., Race, J., Chang, E., Turner, K. & Katris, A. (2022). Characterisation of UK Industrial Clusters and Techno-Economic Cost Assessment for Carbon Dioxide Transport and Storage Implementation. International Journal of Greenhouse Gas Control, 119: 103695. https://doi.org/10.1016/j.ijggc.2022.103695.

v. A copy of the full paper is available at https://doi.org/10.1016/j.jcleprop.2023.140084

vi. Our research is continuing through the LAB-CLUSTER project funded by the Industrial Decarbonisation Research Centre (IDRIC).

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