UNIVERSITY of STRATHCLYDE
CENTRE FOR
ENERGY POLICY

IDRIC

Driving effective workforce planning and project sequencing to aid efforts to decarbonise UK industry clusters and boost associated economy wide impacts

Hannah Corbett, Antonios Katris, Christian Calvillo and Paulina Gonzalez Martinez
Centre for Energy Policy, University of Strathclyde

April 2024
https://doi.org/10.17868/strath.00088667

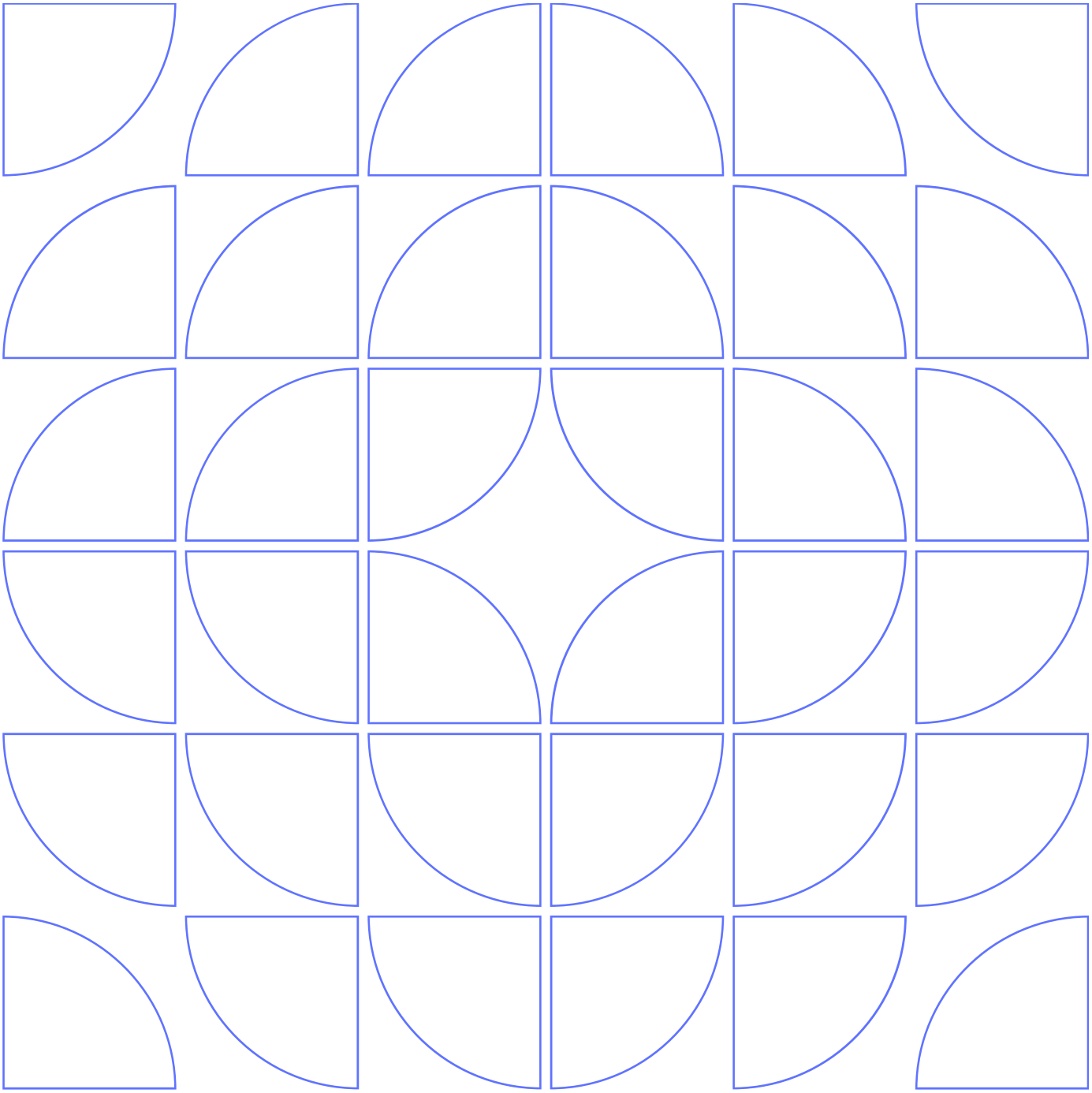
IDRIC

UK Research and Innovation

This work was supported by the UKRI ISCF Industrial Challenge, through the UK Industrial Decarbonisation Research and Innovation Centre (IDRIC) award number: EP/V027050/1, under the Industrial Decarbonisation Challenge (IDC)

This report is an output from IDRIC project **MIP 9.7 Labour market and other wider economy challenges in decarbonising the UK's industry clusters [LAB-CLUSTER]**

Find out more at idric.org



Driving effective workforce planning and project sequencing to aid efforts to decarbonise UK industry clusters and boost associated economy wide impacts

Overview

To deliver its Net Zero target by 2050, the UK government has outlined ambitious economic and environmental goals in its recently published Carbon Capture Utilisation and Storage (CCUS) Vision (December 2023)[i]. These include adding £5BN to the economy by 2050 and supporting 50,000 jobs by 2030. Achieving these ambitions will require a focus on understanding the potential 'congestion effects' driven by competition for resources associated with rolling out multiple CCUS-related projects simultaneously against the wider backdrop of persistent worker and skills shortages and other net zero activity taking place. The combination of which could drive up project and broader net zero costs.

Research from the Centre for Energy Policy[ii] funded by the Industrial Decarbonisation Research and Innovation Centre (IDRIC) brings timely new analysis and insights on these 'congestion effects' in relation to the deployment of a CO_2 Transport and Storage (T&S) sector linked to the Track 1 and 2 CCUS systems (Hynet, East Coast, Viking and Acorn).[iii] The research also draws and builds on work[iv] undertaken as part of the UKRI-funded Scotland's Net Zero Infrastructure (SNZI) programme, examining the wider economy impacts of establishing a CO_2 T&S sector in Scotland.

Key findings

Our research highlights three key findings which we set out in more detail below.

1. Scenario analyses that simultaneously simulate the staged introduction of all four Track 1 and Track 2 CO_2 T&S systems can capture the dynamic nature and impacts of potential congestion effects in the supply-constrained UK economy and should be used alongside analyses that looks at each system individually and then sums the results.

Our novel approach to modelling the wider economy impacts of the Track 1 and Track 2 CO_2 T&S systems (Hynet, East Coast, Viking and Scottish) does so at both individual (additive case) and simultaneous (simultaneous case) level.

- The **additive case** assesses the contributions from each subsector and sums the jobs and GDP impact totals.
- The **simultaneous case** aims to understand how the resource competition associated with more extensive nascent sector activity, occurring in the same broad timeframes, may exacerbate cost and price pressures, and the impacts thereof, beyond a simple summation of component elements.

Crucially, the simultaneous approach brings critical insights and learnings to a space where approaches to assessing the economic impacts (jobs and GDP) related to CCUS deployment has varied widely[v] [vi]. In turn, potentially hindering efforts to understand the wider economy impacts and deliver these projects in the most cost effective way as well as develop the necessary supply chains and maximise the associated economic gains to the wider economy.

Table 1 below highlights how the assessments of employment requirements and economic impacts across clusters vary widely with each looking at their own cluster in isolation. This poses challenges to both drawing direct and fair comparisons between assessments and understanding the true scale and complexity of the challenge.

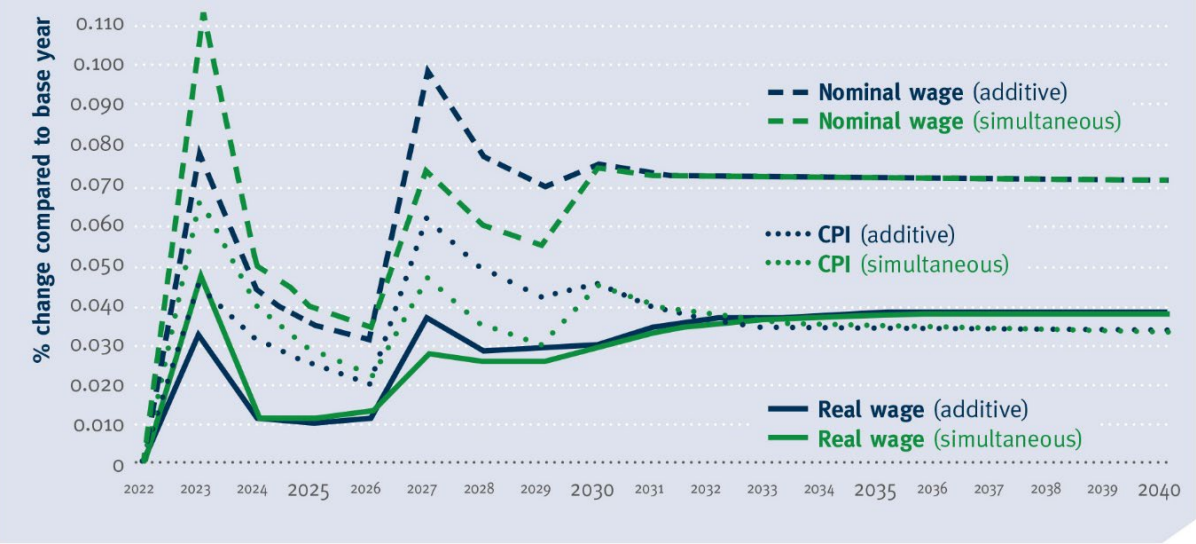
Table 1: Comparison of UK industry cluster plans employment estimates

IDC Cluster plan	Job creation reported	Methodology	Reference
Humber Industrial Cluster Plan (HICP)	The creation of over 22,000 direct jobs	System model developed by Element Energy and Cambridge Econometrics	HICP, Humber Industrial Cluster Plan: Together it is Possible, 2023, pg. 52.
Net Zero North West (NZNW) Cluster Plan	34,500 jobs	Economic multipliers Developed by MACE group	NZNW, North West Cluster Plan, 2023, pg. 5.
Repowering the Black Country (RtBC)	50-500+ jobs per hub (with 60 hubs expected to be required)	N/A	Repowering the Black Country (RtBC), Exploitation Plan, 2023, pg. 4
Scottish Net Zero Roadmap (SNZR)	Average of 5,000 jobs per year between 2023-2045	Input-output approach (Element Energy)	NECCUS, SNZR - A Net Zero Roadmap for Scottish Industry, 2023, pg. 5.
South Wales Industrial Cluster (SWIC) Cluster Plan	Help retain 113,000 industrial and manufacturing jobs in the region	N/A	SWIC, South Wales Industrial Cluster Plan: A Plan for Clean Growth, 2023, pg. 24
Tees Valley Net Zero (TVNZ) Cluster Plan	Up to 30,000 new jobs by 2040	N/A	TVNZ, TVNZ Key Findings Report, 2023, pg. 4.

*Table 1 compiled as part of Industrial Decarbonisation Research and Innovation Centre (IDRIC) funded project on worker and skills shortages.[vii]

Our own research highlights that transparency, consistency and continual evolution of modelling nascent sectors such as CO_2 T&S is absolutely vital.[viii] [ix] Moreover, Figure 1 below indicates the differences that emerge (including changes to wage costs and consumer price index, CPI) between the additive and simultaneous cases in modelling the wider economic impacts. Essentially, the pressures in terms of wage costs (nominal and real wages) and CPI are higher in the simultaneous case suggesting that investment and deployment will have significant wage-driven cost price impacts that are likely to constrain the wider economic expansion and exacerbate competition for resources.

Figure 1: Dynamic adjustment of UK real wage, nominal wage and CPI impacts due to the deployment and operation of the UK T&S sector (additive and simultaneous simulation results)

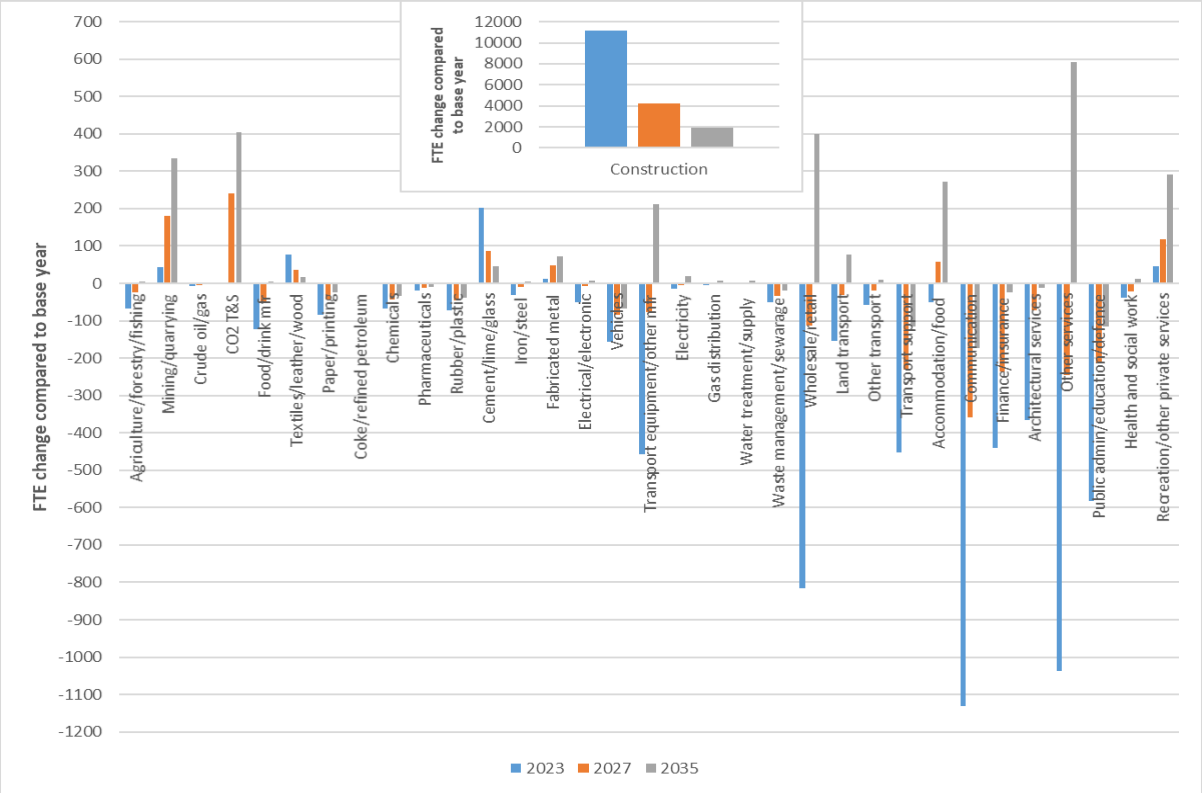


Hence, as Figure 1 suggests, and our second and third findings go on to demonstrate, analyses and modelling of the economy-wide impacts of net zero activities in silos could fail to accurately capture the extent and nature of the economic gains and adjustment, including the competition between systems for a limited pool of resources, including labour.[x]

2. The simultaneous staged introduction of a nascent UK CO_2T&S sector through the four Track 1 and 2 CCUS systems is likely to trigger congestion effects that exacerbate resource competition across all sectors and constrain wider economy gains.

Our findings suggest there will likely be transitory peaks in job creation in the UK construction sector, during the investment phase of enabling a new CO_2 T&S sector. As Figure 2 (where the construction sector has been separated from the other sectors, due to the significant difference in the scale of changes) below shows, in the simultaneous case, there are anticipated transitory annual peaks of circa 11,000 full-time equivalent (FTE) construction jobs occurring in 2023 when the Track 1 T&S systems rollout begins and around 4,200 FTE jobs with Track 2 T&S systems deployment. This compares to 7,730 and 6,700 in the additive case.

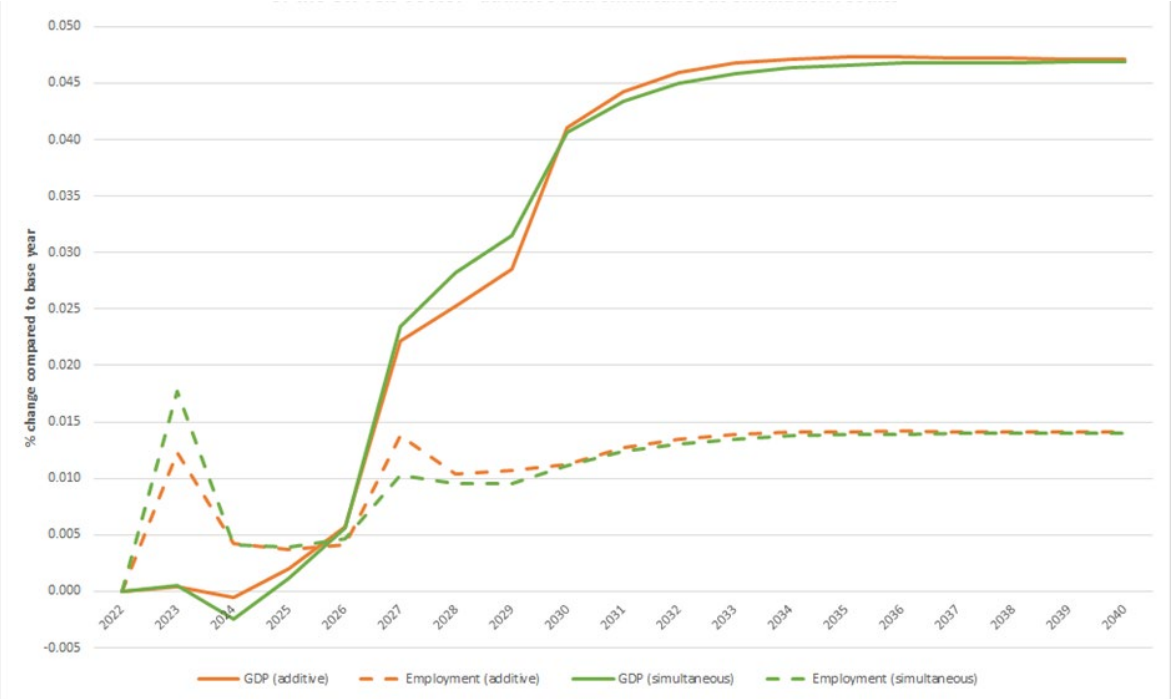
Figure 2. Sectoral breakdown of employment impacts due to the introduction of a new UK-wide T&S industry (simultaneous simulation)



Higher levels of employment demand where labour supply is constrained could lead to heightened competition for resources or congestion effects which in turn could drive up wage costs and possibly limited economic gains and job creation.

This is demonstrated in Figure 3 below which compares the dynamic adjustment of GDP and net employment impacts due to the deployment and operation of the CO_2 T&S sector between the additive and simultaneous cases. In particular, in 2027 the simultaneous case simulations show around 1,000 FTE less net economy-wide job gains compared to the additive simulations. Indicating that competition for the same pool of resources between Track 1 and 2 systems in the simultaneous case is heightened and economic gains are constrained (as demonstrated also in Figure 2 which compares wage costs and CPI impacts between the additive and simultaneous cases).

Figure 3. Dynamic adjustment of UK GDP and net employment due to the deployment and operation of the UK T&S sector – additive and simultaneous simulation results.



3. The congestion impacts of introducing a CO_2 T&S sector are time-limited and ease over time. However, they offer generic learnings for the wider net zero transition, which will involve many new projects and activities, potentially of much larger scales, in a constrained economic landscape.

Our results show that by 2035, the simultaneous introduction of a UK CO_2 T&S sector will lead to a per annum (p/a) GDP uplift of £893M and support a net additional 4,088 FTE jobs. See Table 2 below.

Table 1. Key 2035 macroeconomic impacts in the UK of introducing the T&S industry in Track 1 and Track 2 clusters.

	East Coast	North West	Scottish Cluster	Viking	UK-wide (additive)	UK-wide (simultaneous)
GDP (£million)	393	146	168	199	906	893
GDP (% change)	0.021%	0.008%	0.009%	0.010%	0.047%	0.047%
Employment (FTE)	1,813	668	773	919	4,173	4,088
Employment (% change)	0.006%	0.002%	0.003%	0.003%	0.014%	0.014%
Unemployment (% change)	-0.144%	-0.053%	-0.061%	-0.073%	-0.331%	-0.324%
Nominal wage - index to 1 (% change)	0.030%	0.011%	0.013%	0.015%	0.070%	0.070%
Real wage - index to 1 (% change)	0.016%	0.006%	0.007%	0.008%	0.037%	0.037%
CPI - index to 1 (% change)	0.014%	0.005%	0.006%	0.007%	0.033%	0.034%
Total investment (£million)	247	94	109	128	578	580
Total investment (% change)	0.036%	0.014%	0.016%	0.019%	0.084%	0.085%
Total exports (£million)	-154	-59	-68	-79	-360	-366
Total exports (% change)	-0.027%	-0.010%	-0.012%	-0.014%	-0.064%	-0.065%
Total imports (£million)	213	81	91	107	492	495
Total imports (% change)	0.035%	0.013%	0.015%	0.017%	0.080%	0.081%
Real household consumption (£million)	287	107	122	144	661	658
Real household consumption (% change)	0.022%	0.008%	0.009%	0.011%	0.051%	0.051%
Net government revenue (£million)	-306	-116	-132	-154	-708	-713

At this stage, the congestion effect has eased, as these results are only slightly smaller economic gains in comparison to the introduction of each system individually (i.e. not competing) and then summing the results; £906M GDP p/a and 4,173 FTE jobs p/a. See the UK-wide additive column in Table 2.

However, the CO_2 T&S sector represents a relatively small-scale investment and net zero activity, which we have looked at in isolation from the full range of large scale net zero investment activities that may take place at the same time (e.g., offshore wind, nuclear, electricity network upgrades). For example, the initial levels we have modelled for the CO_2 T&S sector involve a total of £3.2BN invested between 2023 and 2029. This compares to an estimated £17.4BN of investment in the hydrogen transmission network development over 25 years to 2050[xi] or £10.7BN to upgrade the electricity network to enable the electric vehicle rollout.[xii] Thus, the broader implementation of net zero activities within the same and/or similar timeframes could further increase and compound potential congestion effects, mainly if worker and skills shortages are not addressed.[xiii]

Policy implications

Based on the findings set above, we draw three main implications for policy as follows:

- A strengthened understanding of labour supply constraints and congestion effects must inform efforts to decarbonise industry clusters in the UK, which, left unaddressed, could increase costs for project delivery and the wider economy. This will require close collaboration between governments and industries working with academic partners to identify consistent approaches to analysing and assessing wider economic dynamics. In turn these can be used to inform project sequencing, and mitigate risks in workforce planning.
- Policy leadership will be required to minimise congestion impacts and smooth bottlenecks, using frameworks such as the Net Zero and Nature Workforce Action Plan and in developing new ones. These frameworks should consider including evidence-based mechanisms for incentivising the timing of actions to minimise system costs and maximise project and wider economy benefits.
- Net zero actions, such as industrial decarbonisation, and their implications for the wider economy must be assessed and planned for, both individually and alongside each other as part of an integrated approach to public policy making and economic-decision making.

Endnotes

[i] UK Government (2023) Carbon capture, usage and storage: a vision to establish a competitive market Available at: https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-a-vision-to-establish-a-competitive-market

[ii] The full details of our approach are set out in our final IDRIC report: Understanding and addressing labour supply constraints and their impact on efforts to decarbonise UK industry clusters and the wider economy. 2024. Available at: https://doi.org/10.17868/strath.00088665

[iii] UK Government (2023) CCUS Cluster Sequencing Track-2: Market update December 2023 Available at: https://www.gov.uk/government/publications/cluster-sequencing-for-carbon-capture-usage-and-storage-ccus-track-2/ccus-cluster-sequencing-track-2-market-update-december-2023

[iv] Turner, K., Race, J., Katris, A., Calvillo, C., Zanhouo, A., Karkoutli, A., Corbett, H. and Swales, K. (2024) A new Scottish CO2 Transport and Storage sector: supporting decarbonisation, jobs and value across the UK economy. University of Strathclyde. Available at: https://doi.org/10.17868/strath.00088173

[v] UKRI (2023) Enabling net zero: a plan for UK industrial cluster decarbonisation. Available at: https://www.ukri.org/publications/enabling-net-zero-a-plan-for-uk-industrial-decarbonisation/

[vi] Corbett, H., Calvillo, C. Katris, A. Gonzalez-Martinez, P. and Lucas, E. (2024) Providing certainty and acting with urgency – addressing skills and worker shortages for industrial decarbonisation. Available at: https://doi.org/10.17868/strath.00088310

[vii] Corbett, H., Calvillo, C. Katris, A. Gonzalez-Martinez, P. and Lucas, E. (2024) Providing certainty and acting with urgency – addressing skills and worker shortages for industrial decarbonisation. Available at: https://doi.org/10.17868/strath.00088310

[viii] Turner, K., Katris, A. and Corbett, H. (2023) What will investing in hydrogen transmission infrastructure mean for the UK economy? Available at: https://doi.org/10.17868/strath.00086711

[ix] Turner, K., Katris, A. and Corbett, H. (2024) What A 'Horse and Cart' Challenge - the Need to Understand 'Who Pays' before the Macroeconomic and Distributional Impacts of the Net Zero Transition can be Projected. Available at: https://doi.org/10.17868/strath.00087969

[x] Turner, K., Race, J., Katris, A., Calvillo, C., Zanhouo, A., Karkoutli, A., Corbett, H. and Swales, K. (2024) A new Scottish CO2 Transport and Storage sector: supporting decarbonisation, jobs and value across the UK economy. University of Strathclyde. Available at: https://doi.org/10.17868/strath.00088173

[xi] Turner, K., Katris, A. and Corbett, H. (2023) What will investing in hydrogen transmission infrastructure mean for the UK economy? Available at: https://doi.org/10.17868/strath.00086711

[xii] Alabi, O., Turner, K., Katris, A. and Calvillo, C. (2022) Can network spending to support the shift to electric vehicles deliver wider economy gains? The role of domestic supply chain, price, and real wage effects. Energy Economics Volume 110, June 2022, 106001. Available at: https://doi.org/10.1016/j.eneco.2022.106001

[xiii] These issues were also explored through research funded by the UK Carbon Capture and Storage Research Community and Industrial Decarbonisation Research and Innovation Centre funding and published in the following - Turner, K., Katris, A., Zanhouo, A., Calvillo, C. and Race, J. (2024) Industrial carbon capture utilisation and storage in the UK: The importance of wage responses in conditioning the outcomes of a new UK CO_2 transport and storage industry emerging in a labour supply constrained economy. Journal of Cleaner Production Volume 434, 140084. Available at: https://doi.org/10.1016/j.jclepro.2023.140084

IDRIC

UK Research and Innovation

This work was supported by the UKRI ISCF Industrial Challenge, through the UK Industrial Decarbonisation Research and Innovation Centre (IDRIC) award number: EP/V027050/1, under the Industrial Decarbonisation Challenge (IDC)

This report is an output from IDRIC project **MIP 9.7 Labour market and other wider economy challenges in decarbonising the UK's industry clusters [LAB-CLUSTER]**

Find out more at idric.org