

## Could the deployment of CCUS in the UK constitute a new source of sustained 'green growth'?

*The Centre for Energy Policy (CEP) at the University of Strathclyde argues that labour market and business model challenges, combined with the trade-offs involved in different public funding approaches, make the national and regional economy-wide impacts of introducing CCUS in the UK difficult to predict.*

*By Karen Turner, Julia Race and Antonios Katris*

### A very different landscape

Since we last wrote about 'Making the Macroeconomic Case for CCS' in this journal back in 2016, much has changed in both wider UK climate policy and the approach to CCUS, as well as across the wider economy and political landscape.<sup>1</sup> The fundamental need to examine a broader set of costs and benefits from CCUS emerging and accruing across the UK economy in ways that align with HM Treasury's need to ensure fiscal responsibility as we considered back in 2016 remains. For example, in linking the service role of CCUS in supporting the decarbonisation and/or transition of different activities. However, the conditions and context have changed radically.

Firstly, the UK has arguably taken a globally leading role in being the first nation to legislate for 'net zero' in 2019 – aligning with recommended limits on mid-century global warming of 1.5 degrees Celsius. An increasing number of nations have followed this lead both before and after the delayed COP26 held in Glasgow in November 2021 under the UK's continuing Presidency. Here the role of CCUS in both delivering the extent of deep emissions reductions and enabling 'net zero' to emerge at a wider economy and international levels is arguably crystallising, and potentially providing new economic opportunities, for those nations with the capability and resource base to deliver CO<sub>2</sub> transport and sequestration services.

Secondly, within the UK, the central focus of CCUS policy and deployment has shifted to enabling competitive decarbonisation within and sustaining (and ideally growing) the (direct and indirect) GDP and employment contributions of the nation's regional industry clusters. UK Government strategy in this regard set out in a series of documents emerging through the 2017 Industrial Strategy and moving from the 2018 CCUS Action Plan through to the Prime Minister's 2020 'ten-point plan for a green industrial revolution'. The first stages of deployment are now emerging via the CCUS Cluster Sequencing Process, where CCUS for

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<sup>1</sup> See 'Making the Macroeconomic Case for CCS', by Karen Turner and Julia Race, published in the Nov-Dec 2016 issue of the Carbon Capture Journal.

power and hydrogen complement the industrial decarbonisation core (spread across six UK regional clusters).

Thirdly, and providing the main challenges that our own economy-wide research is designed and able to provide intelligence and evidence on, the economic landscape has changed radically. The (so far) elusive constant is the need to design and implement a commercially viable business and policy model for industrial capture that enables what is implicitly early mover activity on CCUS in internationally competitive firms, many operating in the context of complex global supply chains where markets for more costly 'green' products are yet to emerge.

Crucially, the capture business model challenge *and* the potential to realise 'green growth' and 'just transition' potential through repurposing some of the existing oil and gas industry and supply chain activity in the UK to deliver transport and storage services are also increasingly challenged by national and global economic conditions. Here, a combination of domestic labour supply constraints will interact with wider global supply chain challenges in impacting both the timely deployment of CCUS projects and the economic landscape in which public policy and industry decision makers must operate. An exacerbating factor will be the emerging cost-of-living crisis and its impacts on both fiscal conditions and the economic well-being and attitudes of people and businesses in near and mid-range timeframes.

### **Central insights from CEP's research on the likely medium to long-term impacts of industrial capture and UK transport on storage on the macroeconomy**

Several studies have suggested that CCUS could bring clear benefits to the wider UK economy, including sustained net gains to GDP and employment.<sup>2</sup> However, it is not clear that any or all of these studies take account of the constraining effects of the issues set out above, or of how the adoption of different funding models may affect outcomes. For example, there is a risk of potentially displacing activity elsewhere in the economy through directly affecting real household spending power (through taxation), or by impacting employment or other sources of income generation where the international competitiveness regional industry activity is adversely affected by increased costs. Our research uses economy-wide scenario analyses to consider the potential impacts of different public funding models: (i) when government is likely to play a role in guaranteeing demand for what may initially be an over-sized infrastructure-intensive transport and storage industry, and/or (ii) the impact of an 'industry pays' approach to carbon capture.<sup>3</sup> We analysed a case where CCUS is introduced to four of the six UK regional clusters, which

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<sup>2</sup> For example, the report commissioned by CCSA titled 'Economic Analysis of UK CCUS', published in July 2021, available from [www.ccsaorganisation.org](http://www.ccsaorganisation.org).

<sup>3</sup> See our 2021 report titled 'Moving early in Carbon Capture and Storage : Opportunities and Challenges for Delivering Green Growth and Just Transitions', co-authored with Oluwafisayo Alabi, Christian Calvillo, Antonios Katris, Jamie Stewart and Kim Swales, at <https://strathprints.strath.ac.uk/78347/>, which contains reference details for underlying peer reviewed research.

now include the Phase 1 clusters identified by the UK Government in October 2021, plus the Scottish cluster. Two central findings emerged:

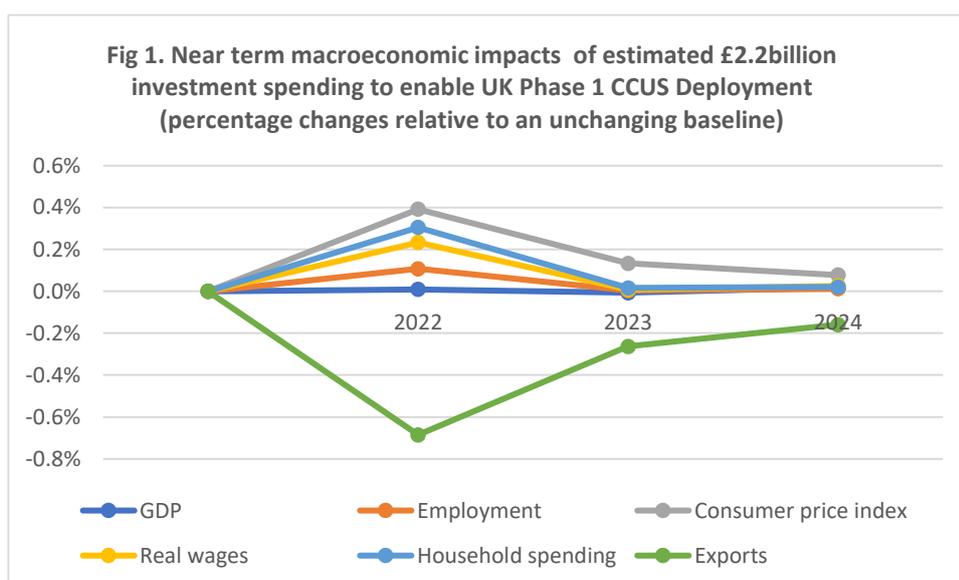
1. Deployment of CCUS *could* lead to sustained 'green growth' where it involves introduction of new CO<sub>2</sub> Transport and Storage (T&S) industry activity to the economy. We found that net positive impacts for UK GDP (up to 0.1% over what it would otherwise be by 2040) and employment (up to a sustained gain of 17 thousand jobs) are possible across all time frames once the new T&S industry is fully deployed. Note that these may be considered healthy but relatively modest returns compared to what may be predicted by more commonplace economic 'multiplier' analysis. This is because our analysis takes account of wage responses in supply constrained labour markets, where the consequent cost and price pressures (across all sectors) will act to erode gains. Moreover, net GDP and employment (combined with increased tax revenues) could be further eroded or entirely offset, with distributional and 'just transition' challenges emerging, if UK households as taxpayers or industry must bear the costs of guaranteeing demand for new T&S services. The worst outcomes were observed where industry is required to meet all costs and the international trade response to any consequent rise in UK output prices is high. In this case our findings suggest that the brunt of losses may be borne in the host economies where job losses and knock-on impacts on local spending are likely to be concentrated.
2. Operational carbon capture brings an additional challenge to the industry, requiring firms to use additional equipment to produce the same output. This translates to reduced capital efficiency of industrial firms with implications for returns on capital at the current production location. Crucially, the need to pass on increased capital costs through output prices is likely to have implications for the relative competitiveness of UK cluster firms in international markets. Here our applied work focussed on the case of UK Chemicals where we found that capital efficiency reductions of up to 30% in that industry alone could trigger a sustained contraction in GDP of up to 0.12% per annum at a cost of more than 14 thousand jobs. However, where public support focuses on enabling capture firms to make 'early mover' relative efficiency gains in using CCUS as a decarbonisation solution, we found that wider economy losses could be limited, with potential for some net gains in activity and employment at an industry level.

The crucial takeaway is that deploying CCUS, like any large-scale decarbonisation action and/or source of 'green growth' brings potential to deliver some degree of wider economy gains in some or all timeframes. However, where there are new costs involved that must be met somehow, and where expansion occurs in an economic landscape where there are constraints on funding and labour in particular, policy makers need to fully understand the trade-offs involved under different scenarios and alternative interventions, such as identifying and supporting efficiency and productivity gains to mitigate or, ideally, offset

pressures. This is crucial if the best potential outcomes are to be pursued in terms of maximising emissions reductions, whilst limiting costs and realising benefits, where possible, in different parts of the economy across nearer and longer-term timeframes.

### **New insights from initial research on the near-term impacts of investment activity to support the deployment of the UK Phase 1 CCUS clusters**

In terms of nearer term returns from deployment project activity in CCUS, our initial research – conducted prior to the October 2021 announcement of Phase 1 of the CCUS Cluster Sequencing Process in the UK – had to make assumptions regarding the level and timing of up-front investment. Now we know that some relatively substantial levels of investment spending will be required within the next 3 years if the Phase 1 Hynet and East Coast CCUS clusters (Merseyside, Teesside, Humberside) are to become operational by 2025. We have recently extended our initial research to focus on whether this may have some disruptive wider economy impacts in this near-term timeframe, particularly in the context of currently very challenging labour supply conditions, not least with multiple relatively large-scale CCUS projects potentially competing for the services of skilled workers in the initial construction and pre-deployment stages.<sup>4</sup>



We estimated the up-front investment spending required to enable deployment of the Phase 1 clusters (creating capacity to capture all industrial emissions generated in these regional clusters) to be in the order of £2.2billion spread roughly evenly over the years 2022, 2023 and 2024. Figure 1 shows the estimated impacts (assuming no other changes across the UK economy) where real wage rates adjust in the supply constrained UK labour market as demand for all kinds of labour rise. Gains in employment are concentrated in

<sup>4</sup> Our new research is initially reported in a CEP policy brief available to download at <https://strathprints.strath.ac.uk/79477/>.

construction supply chains, which draw workers from other sectors and/or from the existing pool of unemployed workers.

The percentage change results help illustrate that small net gains in UK GDP (maximised at just under £160million in 2022) are a balance of increased total household spending (enabled by increased employment and real wage rates) and falling exports. However, crucially in the context of the current cost-of-living crisis, note that the increase in the consumer price index, CPI (reflecting the price pressures that generally constrain expansion) is greater in all three years than the real wage growth, meaning that purchasing power will be eroded, potentially with important distributional implications not reflected in our results for total UK household spending.

However, perhaps of most concern for the CCUS projects themselves will be the how the wage pressures reflected in our results may combine with supply constraints in specialised areas of the UK labour market that the projects themselves must draw on to complete work within the 2025 timeframe for deployment as planned. Moreover, where other infrastructure projects are likely to be competing for the same pools of specialised labour, the actual labour cost impacts may exceed the average impacts reflected in our real wage results (where nominal costs to firms will be higher, as indicated by our CPI results).

### **More economic research is required**

Of course, the quantitative results of our scenario simulation analyses are, like any type of modelling, dependent on the data and information we can inform them with. As more specific and accurate information begins to emerge on required investments, capacity, and funding models for UK CCUS, scenarios and estimates of potential impacts can be updated and improved. However, at this stage, the main insight and message emerging is that there is potential for CCUS to constitute a new source of 'green growth' in the transitioning UK economy. However, if benefits are to be maximised, and the distribution of wider economy costs balanced to ensure that the burden is not disproportionately borne by businesses, workers, and households in particular regions or income groups, there is crucial need for coordination across different areas of public policy development and implementation, with particular focus on supporting UK industry to develop competitive advantage in emerging 'green' markets.