



Policy Brief

Boosting UK-wide value-added and employment without further demands on the public purse: the advantages of developing an export base for Scottish CO₂ Transport and Storage

By Karen Turner, Antonios Katris, Hannah Corbett, Julia Race, Abdoul Karim Zanhoun, Anas Karkoutli

Summary

A nascent Scottish CO₂ Transport and Storage (T&S) sector linked to the Acorn T&S project could play a vital role in developing a UK export base involving servicing overseas demand for CO₂ sequestration services. Developing new greener export bases will be an important aspect of delivering a prosperous net zero economy, and it is one where Scottish T&S could offer particular opportunities relative to other UK Carbon Capture Utilisation and Storage (CCUS) clusters in leveraging the value-added, employment and revenue gains of planned investment in the CCUS cluster sequencing process without putting additional demands on the public purse. This could be an essential contribution in realising self-sustaining CCUS activity by 2035, in line with the UK Government's CCUS Vision.ⁱ

The potential benefits of extending Scottish CCUS capacity to exploit the export opportunity of an emerging international market in CO₂ T&S services for the UK economy are among the key findings of our research as part of the Scotland's Net Zero Infrastructure (SNZI) programme. Full details of all our findings and our approach are published in the final report, which is grounded in several pieces of peer reviewed research.ⁱⁱ In terms of the new export base opportunity for the UK economy, we find that:

1. If the Scottish T&S sector is able to sequester 10MtCO₂e, including shipping 3MtCO₂e of captured emissions from elsewhere in the UK and/or overseas, the number of full time equivalent (FTE) jobs supported by Scottish T&S across the wider UK economy could increase (relative to only piping Scottish cluster emissions) by 62%, from 765 to up to 1,236 FTE jobs. The Gross Value Added (GVA or GDP) supported could also rise by 56%, from £167M per annum (p/a) to £261M p/a.
2. Where the Scottish T&S sector can extend to service overseas demand for sequestration services, the costs to the public purse of supporting CCUS in the UK are reduced. This is achieved through a £55M boost to government revenue gains associated with exporting T&S services abroad, without any additional domestic public spending requirement.

Scottish cluster sequesters 10MtCO₂e from Scottish cluster (7MtCO₂e) + UK/overseas (3MtCO₂e)

1236 FTE jobs



£261M GVA p/a



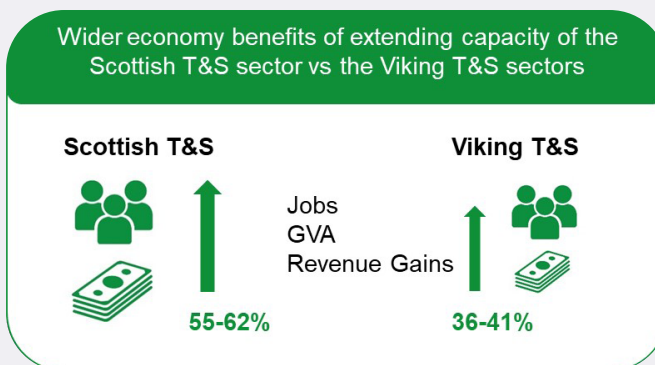
£55M revenue gains





- Generally, if UK public finances and emerging internal and/or external markets in T&S services can bear the higher costs of sequestering to Scottish North Sea stores, increasing the production

capacity of the UK-wide T&S sector could boost net macroeconomic gains without putting further pressure on our public finances. Currently the main opportunities to develop an export base in T&S are associated with the Track 2 CCUS clusters. Here, our export scenario simulation results indicate potential to boost the GVA, employment and consequent additional government revenue impacts of Scottish T&S, by between 55% and 62%, over what may be achieved by sequestering Scottish emissions only. The boost to GVA, employment and revenue gains associated with a similar extension of the Viking T&S sector are in the region of 36% to 41%.



“
...by expanding the Scottish T&S sector’s sequestration capacity by just over 40% ... the number of jobs supported across the wider UK economy by a Scottish T&S sector could increase by 62%...”

Maximising wider economic gains

In the absence of data on what emitters may utilise UK T&S, all our results are based on scenarios that maximise the potential emissions base and sequestration capacity associated with the planned Track 1 and 2 CCUS clusters. For Scottish T&S this implies 7MtCO₂e for domestic (Scottish cluster) emissions only, and 12MtCO₂e for Viking, the other Track 2 cluster.

In terms of the potential export base, according to the data available at the time of the study, both the Acorn T&S and Viking systems have plans in place to each service an additional 3MtCO₂e of emissions in addition to the requirements of the industries in the local clusters. Extending the capacity in this way will involve further investment, including a shift to international shipping rather than domestic pipeline transport in bringing emissions to North Sea stores.

Our research finds, as set out in Table 1 below, that by expanding the Scottish T&S sector’s sequestration capacity by just over 40% (to 10MtCO₂e) to sequester emissions from elsewhere in the UK and/or through development of an overseas export base service the number of FTE jobs supported across the wider UK economy by a Scottish T&S sector could increase by 62%, from 765 to up to 1,236 FTE jobs. The GVA supported could also rise by 56%, from £167M p/a to £261M p/a.



TABLE 1 Additional sustained macroeconomic impacts in the UK of extending capacity of the Track 2 T&S sectors to ship emissions from elsewhere in the UK or overseas

	SCOTTISH T&S SECTOR				VIKING T&S SECTOR				UK-WIDE T&S SECTOR (INCLUDING ENTIRELY DOMESTIC TRACK 1 & 2 T&S SECTORS)	
	Shipping additional 3MtCO ₂ e to Scottish stores from elsewhere in the UK		Shipping additional 3MtCO ₂ e to Scottish stores from overseas		Shipping additional 3MtCO ₂ e to Viking stores from elsewhere in the UK		Shipping additional 3MtCO ₂ e to Viking stores from overseas		(with shipping within UK for Scottish cluster and Viking)	(with overseas shipping for Scottish cluster and Viking)
	Additional impacts	Total impacts with 10MtCO ₂ e capacity	Additional impacts	Total impacts with 10MtCO ₂ e capacity	Additional impacts	Total impacts with 15MtCO ₂ e capacity	Additional impacts	Total impacts with 15MtCO ₂ e capacity	Total impacts with 50MtCO ₂ e capacity	Total impacts with 50MtCO ₂ e capacity
Public spending requirements (EM), composed of:	168	398	31	260	136	406	25	295	1,539	1,290
Direct spending on T&S (EM)	134	306	0	173	109	312	0	203	1,172	929
Nominal adjustments to meet real spending commitments (EM)	35	92	31	88	28	94	25	91	367	361
Additional government revenues generated (EM)	59	156	55	152	47	161	43	158	629	620
Net public spending requirement (EM)	109	241	-24	109	89	245	-19	137	910	670
Gross value added, GVA, or GDP (EM)	94	261	91	258	74	270	72	268	1,066	1,061
Gross value added, GVA, or GDP (% change)	0.005	0.014	0.005	0.013	0.004	0.014	0.004	0.014	0.056	0.055
Employment (FTE)	471	1,236	439	1,204	374	1,274	348	1,249	4,961	4,904
Employment (% change)	0.002	0.004	0.001	0.004	0.001	0.004	0.001	0.004	0.017	0.017
Unemployment (% change)	-0.037	-0.098	-0.035	-0.096	-0.030	-0.101	-0.028	-0.099	-0.394	-0.389
Average nominal wage (% change)	0.008	0.021	0.007	0.021	0.006	0.022	0.006	0.021	0.085	0.084
Average real wage (% change)	0.004	0.011	0.004	0.011	0.003	0.011	0.003	0.011	0.045	0.044
CPI – index to 1 (% change)	0.004	0.010	0.004	0.010	0.003	0.010	0.003	0.010	0.040	0.040
Exports (EM)	-41	-108	92	25	-33	-111	76	-3	-432	-191
Imports (EM)	83	176	78	171	68	177	65	174	650	641
Real household consumption (EM)	71	194	64	187	56	201	50	195	789	776
Total investment (EM)	57	163	55	162	44	170	43	168	674	672

Table 1 also highlights that similarly significant economic gains can be derived from expanding the capacity of the Viking T&S system. However, the wider economy benefits of extending capacity through shipping grow more in the Scottish case compared to Viking regardless of where emissions are shipped in from. The GVA, employment and consequent additional government revenue impacts of introducing Scottish T&S in Table 1 all increase by between 55% and 62%. For Viking, the gains from increasing capacity through shipping are also substantial, with the increase in GVA, employment and revenue impacts in the range of 36% to 41% compared to a case where only own cluster emissions are serviced.

It is important to note that our analysis reflects persistent worker and skills shortages challenging the broader labour market. This is critical because, as our research across the net zero space continues to highlight, these shortages can (and do in Table 1) constrain the magnitude of the economic gains that can be realised from the range of decarbonisation efforts that the UK is investing in.ⁱⁱⁱ Thus, action by UK Government, industry and others to address these shortages has the potential to increase the size of the prize from establishing new sectors such as T&S. Moreover, efforts need to focus on avoiding or alleviating the potential congestion and increased demands and competition for resources associated with multiple net zero projects coming online at the same time, and which is already being experienced in relation to CCUS deployment.^{iv v}

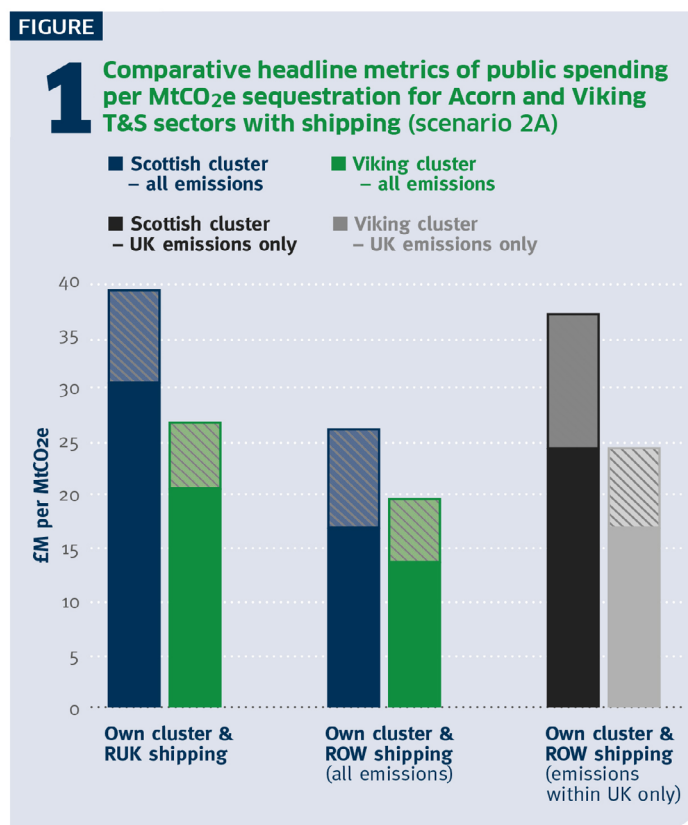
Reducing the burden on the public purse

Our research finds that by providing T&S services overseas or to other UK industrial clusters, as highlighted in Table 1, the level of additional jobs and GVA (in addition to servicing the Scottish cluster demand) is similar.

However, there are benefits for the public budget of the Acorn T&S system servicing overseas demand in comparison to demand from other UK clusters. Specifically, developing an export base could drive the creation of just over £150M p/a in government revenue generation associated with the wider economy expansion (£55M of which is attributable to overseas export activity). As the only additional public spending requirements are around £31M, associated with the wider expansion driven by the export activity and the price effects that it triggers, the net spending requirements are reduced by £24M, to £109M p/a.



This is £132M less than the net spending requirements associated with servicing Scottish cluster and other UK cluster demand which equate to £241M. (See Table 1). This is due to increased public spending requirements to guarantee UK industry demand as opposed to overseas users paying for UK T&S services, which do not count towards UK net-zero targets. Figure 1 below (in particular the middle frame) also highlights how the average cost per MtCO₂e falls for the UK Government where emissions are shipped from overseas (labelled as ‘own cluster & ROW shipping (all emissions)’).



It is worth noting that additional revenue gains associated with servicing overseas export demand, or other UK clusters, are limited due to the additional boosts to UK GVA and employment (and associated income) being less than proportionate to those associated with the initial pipeline-based domestic T&S sector activity. This is due to the leakage effect of relying on international shipping. Moreover, the greater CPI pressure reported in Table 1 and reflected in Figure 1 is driven by further wage-cost pressure for as long as labour supply constraints persist.

Policy implications

- Levels of coordination and collaboration**

The Scottish T&S sector has a key role to play in meeting Scottish/UK net zero ambitions as well as in realising broader economic outcomes at devolved and national levels. However, government needs to take a leadership role in making critical decisions regarding levels of coordination vs collaboration between clusters to ensure that both the policy priority of reducing industrial cluster emissions is met, and economic gains are maximised.



- **Ensuring a self-sustaining T&S sector**

A key insight from our analysis is that supporting development of an overseas export base could play an important role in ensuring that the T&S sector can become self-sustaining and play a role in alleviating the costs of net zero to the public purse.

- **Addressing worker and skills shortages**

Action on skills and labour market participation is crucial to maximising GVA and job gains, potentially above what is reported in this policy brief. More generally, skills and labour market participation need to be considered within wider debates and decision-making around sequencing projects and alleviating congestion and potential transitory negative economy-wide outcomes as different net zero projects compete for resources.

Acknowledgements and contact

- This brief was produced as part of the UK Research and Innovation (UKRI) Industrial Strategy Challenge Fund Scotland's Net Zero Infrastructure programme
- CEP@strath.ac.uk, The Centre for Energy Policy, School of Government and Public Policy, Humanities and Social Science, McCance Building, 16 Richmond Street, Glasgow, G1 1XQ

End-notes and references to underlying research

- i. The UK Government's CCUS Vision, published in late 2023, can be found at <https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-a-vision-to-establish-a-competitive-market>
- ii. See Turner, K., Race, J., Katris, A., Calvillo, C. Zabhuou, 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>.
- iii. For example, see our work for UK-wide CO₂ T&S published at <https://doi.org/10.1016/j.jcle-pro.2023.140084>.
- iv. Calvillo, C., Katris, A., Corbett, H., Race, J. and Turner, K. (2024) Regional employment implications of deploying CO₂ transport and storage to decarbonise the UK's industry clusters, Local Economy (under review).
- v. Calvillo, C., Katris, A., Corbett, H., Race, J. and Turner, K. (2024), Understanding jobs demand and displacement outcomes of decarbonising UK industry clusters, Policy brief, 2024 (forthcoming).