University of Glasgow

# CC(U)S FUTURES 2

Visions from within the sector, Spring 2024

WORLD CHANGING GLASGOW

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# Introduction

**Carbon Capture (Use) and Storage – CC(U)S – is widely seen as necessary if we're to meet commitments to limit global warming and avert what is likely to be catastrophic changes to environmental conditions across the globe. As in many other nations, politicians, policy-makers and high-level leadership within the energy, manufacturing and construction industries talk about the capture of greenhouse gas emissions at source and geological long-term storage as essential steps in transitioning to a "green" economy and a Net Zero future.**

On the other hand, CC(U)S does not seem to be cutting through into public consciousness or understanding [1].

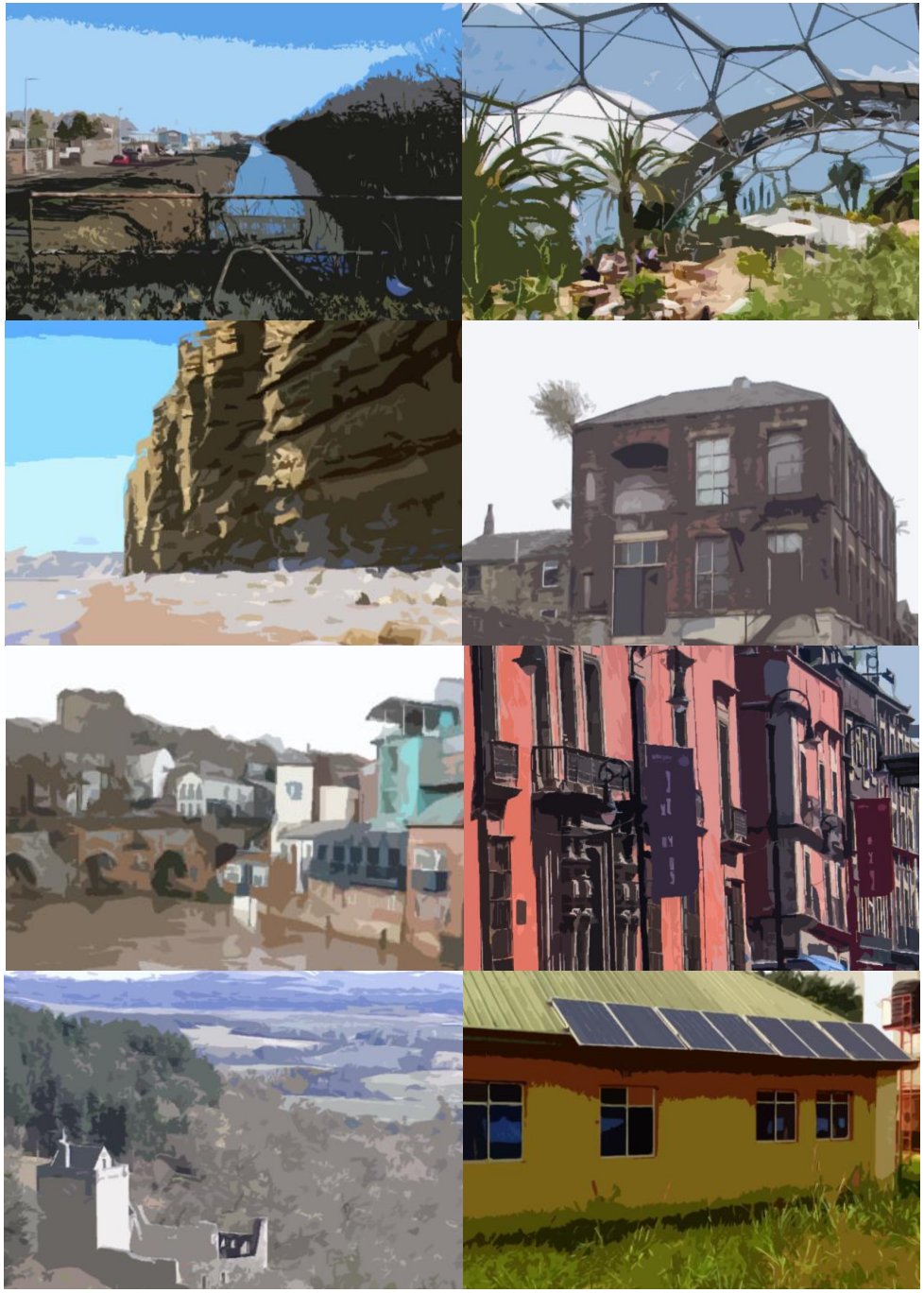
In a previous report [2], we used Place-Based Participatory Speculative Fiction (PBPSF) [3-4] to explore how adults in education in relevant fields (and some of those involved in educating them) imagine local lives and landscapes might be changed by CC(U)S. We showed how these 'CC(U)S imaginaries' are rooted in prior experiences and shaped by powerful sociocultural dynamics.

In this report, we explore the CC(U)S imaginaries of a range of people working within the CC(U)S R&D sector and industry that will be directly affected. The stories that follow are the result of PBPSF processes where participants were primed by discussions of place-specific industrial and technological change in previous eras, but no prompting was given in relation to CC(U)S itself.

They were generated from three workshops, one in each of Scotland, England and Wales, between March and June 2024. Some were created on the spot within the workshops; others are syntheses of stories and responses created by the team. The participants included early career and established academic researchers and people working in industry from apprentice level to middle management.

The stories reveal some perhaps surprising similarities and differences with those that we described in our previous report [2]. They again highlight the importance of historical and contemporary sociocultural dynamics in shaping CC(U)S imaginaries..

[1] Evensen, D., Dickie, J. & Bartie, P. (2024). *Public reactions to carbon storage in the UK: Quantitative survey findings*.
[2] Wilson, A., Robertson, G. and Marlatt, C. (2024). CC(U)S Futures 1: Visions from the Scottish Cluster, 2023/4.
[2] Wilson, A., Robertson, G., & Dickie, J. (2024). Future ordinaries: Assembling place-based knowledges and literacies in real and imagined harmscapes. *Futures, 159,* 103376.
[3] Wilson, A. (2024). From Crime and Punishment to Future Archaeologies – reimagining relationships of waste and value. In: Jordan-Baker, C. and Holloway, P. (eds.) *Writing Landscape and Setting in the Anthropocene*. Palgrave Macmillan.



*Venice of the North* was written by the team as a synthesis of some of the most common negative visions expressed in the stories and responses that were generated in the project.

Many participants expressed the firm belief that CC(U)S will never happen in the UK. For some, this was a result of repeated experience of timelines being pushed back and investment failing to materialise. For others, it was related to a perception that the financial interests of both commercial companies and nation states meant that oil and gas would never be abandoned.

The story also expresses a sense that if nothing is done, the worst that will happen is that there will be minimal disruption and things will stay pretty much the same as they are now. In this sense, the underlying logic of this story is not that different from Future Perfect.

*Image:* Forth and Clyde canal at Bainsford, Falkirk © *Anna Wilson.*

# Venice of the North

To be honest, I always thought it might end up being a waste of time and money, if it ever happened.

For years, the Government kept announcing it was investing in CC(U)S. A parade of ministers and prime ministers made speeches about how capturing carbon was essential for emissions reduction and the Green Transition. But they were always announcing the same money; and first injection kept getting pushed back.

So I was genuinely surprised when Acorn went ahead; but not so surprised when it turned out to be too little, too late. Sure, Scotland's air quality improved, but the US and China weren't doing it, and without the big players joining the game, what was the point? We were never going to be able to capture enough carbon to reverse climate change while they carried on making a fortune from oil and gas.

And anyway, the consequences haven't been so bad. Sure, sea levels have risen, but I've swapped my car for a boat and Bainsford's become a thriving tourist destination since the "Venice of the North" campaign.

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*Future Perfect* was written by the team as a synthesis of several stories and responses received during the project. It captures some of the most common themes running through the more positive visions of the future, particularly as they emerged in the workshops we ran with people working in CC(U)S-related R&D and in industry where CC(U)S might be implemented.

It expresses what we came to think of as Generic Green Futures – stories and responses in which carbon capture was completely absent, and in which we had somehow managed a green transition that completely avoided climate change, social disruption, disadvantage or indeed any stress at all.

*Image: © Mr Eugene Birchall, CC BY-NC-SA 2.0.*

# Future Perfect

CC(U)S? No, that's not ringing any bells.

Really? Did people really think we needed to extract CO2 from the air and store it? Where on earth did they think they were going to put it?

No, I really don't remember anyone talking about that. You're pulling my leg, aren't you? Or was it one of those pie-in-the-sky schemes that the mad environmentalists, the ones really on the fringe, used to promote? Or was it Big Oil, before they understood that the future really was Green?

Anyway it's all turned out fine, hasn't it?

The weather's great, the fields are green and lush, the air is so clean it sparkles, the water in the rivers is so pure you can drink it and we've got an endless supply of clean energy to power our cars, phones and exercise bikes. Life's as good as ever.

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*Type Location* was created by Lucy Tweed in a workshop at the UKCCSRC Early Career Researchers Away Day in Manchester in March 2024.

Lucy described how having chosen to think about the West Bay Cliffs in Dorset early on in the workshop, she was initially struggling to think of it changing as a consequence of CC(U)S implementation. Then it struck her – perhaps they could serve as a type locality, allowing geologists, engineers and chemists to explore an analogue to supplement what would always otherwise be extremely expensive undersea experiments or always-partial computational models. Her story describes a transformation not only of the scientific research, but also of the local area: the influx of money and technological expertise enact changes here that echo what happened to Aberdeen in the North Sea oil boom.

*Image:* East Cliffs, West Bay, Dorsett *by Nigel Mykura, CC BY-NC-SA 2.0*

# Type Location

The West Bay Cliffs were once famed for their striking colour and the eroded ridges that striped across them. A smattering of geologists would come and look at the cliffs, intrigued by the ridges that recorded the rise and fall of ancient seas. Sea birds also appreciated the ridges, which provided perfect safe nesting spots. But mostly the cliffs were enjoyed by tourists. Their soaring aspect provided a beautiful backdrop for the sandy beach and the cold English sea.

Hordes of working-class tourists would come from London and the Midlands. They would buy fish and chips and amuse their kids at the arcades after a day spent on the beach.

The tourists have mostly gone now. Ever since the Bridport sands, of which the cliffs are formed, was identified as the perfect analogue for $CO_2$ storage reservoirs, they have been claimed by geologists. In 2030 the cliffs were declared the type locality for characterising reservoir properties. Since then the trickle of geologists turned into a torrent. On most days the beach is littered with men and women in hard hats, bespoke geo-engineering consultancies have popped up along the harbour front replacing the arcades and holiday apartments. The land which once hosted the sprawling caravan parks has been bought out for a drilling site. The fish and chip shops are mostly gone, upscale seafood and cocktail bars have been set up in their place.

When I tell my children that the world-famous West Bay was once a hub for budget seaside holidays, they hardly believe me.

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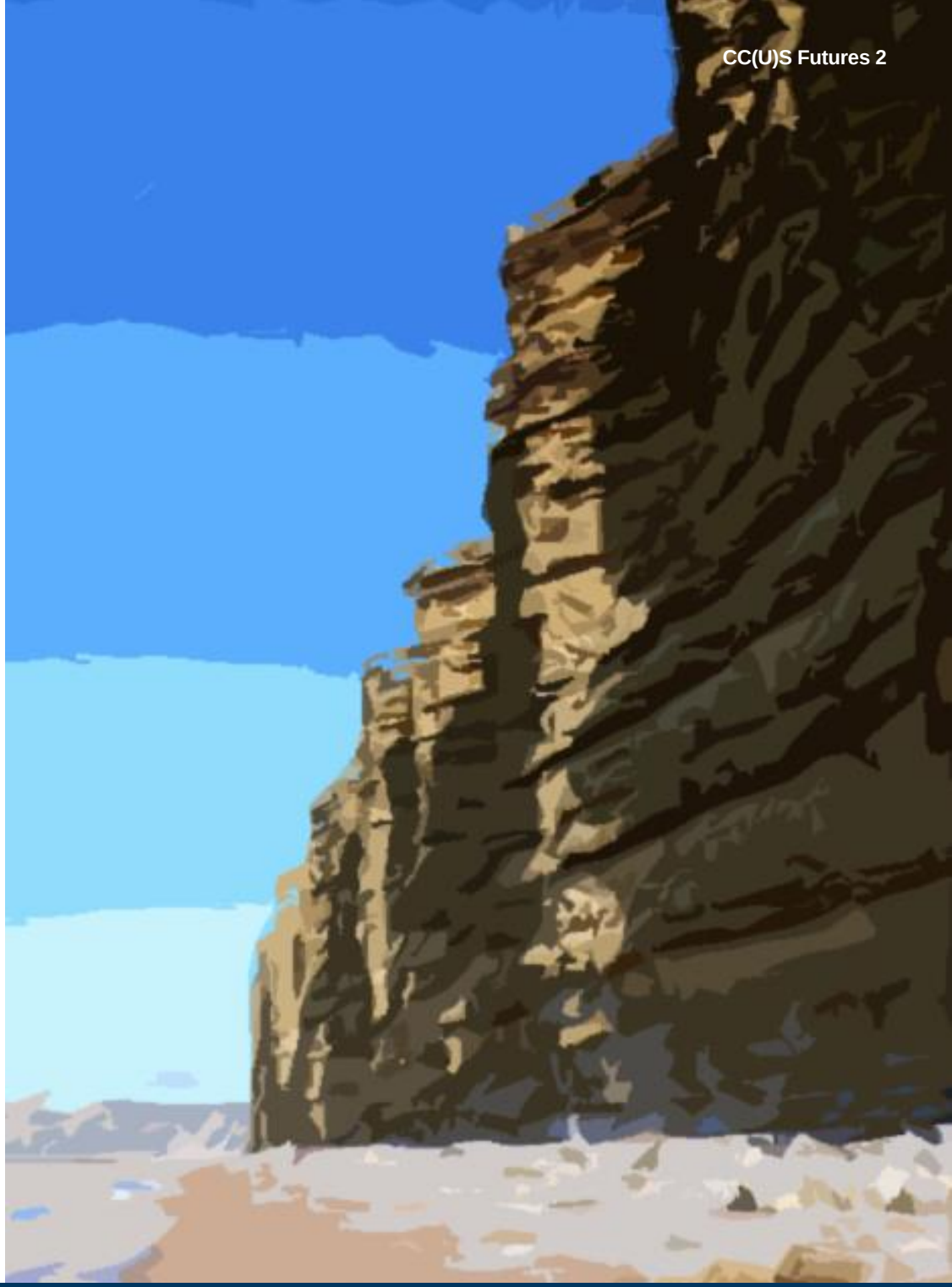

This story was written by Christian Laycock at a workshop in Wales in June 2024. We did not ask participants in this workshop to focus on CC(U)S, although we discussed it as a decarbonisation technology and the workshop had come about because we met Christian at the IDRIC conference in March 2024.

Apart from demonstrating Christian's faith in Burnley FC, this story is a very good example of several stories and responses we received that displayed a deep pessimism about our capacities to make sensible development and decarbonisation decisions, or to understand the environments we are working within.

*Image:* Derelict building, Calder Street, Burnley*, by Robert Wade, CC BY-NC-SA 2.0.*

# Nothing Changes in Burnley

Burnley has always been an extremely deprived part of England. There are rows of terraced houses, everywhere. There are many hills and a damp atmosphere, once crucial for the conditions needed for the dark derelict cotton industry.

Burnley is also a very proud place with a strong sense of community. That is, they are proud of the football club! In fact, Burnley Football Club is the only part of Burnley that is truly believed in by the people of Burnley. So much so that in 2124, Burnley Borough Council has been abolished, there is no mayor, no elected officials – just the football club, making all of the important decisions for the town.

Burnley FC had recently been taken over by a solar billionaire, and he decided he would make Burnley great again by turning it into a metropolis of solar buildings. Solar technology was built into all the terraced houses, all of the old cotton mills, even the football club! It was aesthetically very pleasing, and much to the approval of the people of Burnley, who were given hope of thriving in clean energy and excellent working conditions.

However, things have unfortunately taken a significant turn for the worse. With an incomprehensible lack of due diligence, no-one had thought that Burnley hardly gets any sunshine! To make matters worse, the long-anticipated collapse of the Gulf Stream has finally happened and like the rest of the northern hemisphere, Burnley is engulfed in perpetual storms. The old derelict cotton mills of Burnley have been replaced with old derelict solar panels.

Written in the form of a letter-to-the-editor, *Durham* has strong similarities with the story *T.H.E.M*. included in our previous collection of stories generated by participants who were not working within the sector. It is one of several stories and responses we received from both sets of participants that convey a sense that investment and development efforts are misdirected. It was written by BD during a workshop held at the UKCCSRC Early Career Researchers Away Day in Manchester in March 2024.

However, there are important differences between this story and the stories and responses represented by *T.H.E.M*.. The anger and resentment in *T.H.E.M*. was a response to the threat of change and perceptions that CC(U)S would ruin the landscape. In contrast, *Durham* is one of a small number of stories and responses where carbon capture is mentioned as a positive step. However, a detailed vision of what CCS looks like and how it has changed Teeside is absent.

*Image:* Durham city centre, *Newcastle Chronicle, December 2023.*

# Durham

To whom it may concern,

STOP! Just STOP!

Stop building so many damn tall buildings in Durham city centre.

At this rate, the Cathedral will be dwarfed by multiple Greggs stores.

Focus on the flood walls at the riverside so all those lovely restaurants don't get flooded every year. That Chinese buffet place can't go out of business; the food's too damn good.

You know what? Build a dam!

Get some industry back here again since that damnable Iron Lady closed it all down.

You never know, it might even help the environment, like that carbon capture place in Teeside.

Yours sincerely

A very concerned Durham resident

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*Mexico City and its CCS Future* was written by Roberto at a workshop held at the UKCCSRC Early Career Researchers Away Day in Manchester, March 2024.

*Mexico City and its CCS Future* is one of only a very small number of visions that describe a concrete, place-specific benefit. Although it shares a recognition that our efforts at development and progress may have unanticipated consequences and that people may thus resist them, it is also the only story generated in these workshops that imagined that the development of CCS might also be a solution to a problem other than decarbonisation.

*Image:* Subsidence in Mexico City*, by Ted McGrath. Used under licence, CC BY-NC-SA 2.0.*

# Mexico City and its CCS Future

Mexico City has always been known for its variety of culture, food and people. It is also very famous for the fact that it is a city built on top of a lake.

Since the time of the Spanish Inquisition, the lake has been drained to remove the water. Because of that, a lot of the historical buildings such as the main Cathedral, suffer from subsidence and liquefaction. In times of CCS, there has been some technological advancement in which $CO_2$ can be injected underground to help prevent subsidence.

Obviously, there are some risks associated with it, and some people are protesting because of the uncertainty of effectiveness of this technology.

But there is also some hope from researchers and industry professionals to use this technology in other parts of the world, too.

*Future Dollar* was written by Colin at an industry-based workshop in Central Scotland. It is perhaps the most optimistic CC(U)S Future generated in these workshops. It also presents a more detailed, specific vision of what a low-carbon future might look like, compared to the majority of stories of generic green futures. It is interesting to note the emphasis on low visual impact developments. Given the proximity of the location being described to the path of the Beaul-Denny powerline, and the regularity with which stories about local objections to powerlines and turbines feature in regional and national news, this may display a sensitivity to possible forms of resistance to change.

*Image:* Castle Campbell © *Tom Jervis, CC BY-NC-SA 2.0.*

# Future Dollar

CCS has been successfully deployed at Grangemouth, across Scotland and indeed the world. $CO_2$ emissions from industrial processes have been reduced massively, and there's negative emissions from capturing $CO_2$ from bio-feedstocks (wood, waste etc). CCS has led to the development of blue hydrogen (methane reforming with $CO_2$ capture) which itself established the 'hydrogen economy' – Scotland was then able to develop vast quantities of green hydrogen to feed into the new hydrogen distribution system. Hydrogen was also used to enable the electricity system to be built up on renewable power, especially wind.

But what has this meant for Dollar?

Well, all the roads were ripped up – first to lay larger power cables to homes and then (again) to lay new hydrogen pipes. Not many folks use hydrogen directly in their homes, but a few blocks of flats have a shared heating system on hydrogen.

The place is still quiet, in fact quieter, as all the cars are running on electricity, all charged at home (hence the new cables). There are a few buses/lorries on the A91, but they are also quiet – no more chugging diesel, they all run on hydrogen.

Best of all the train line has been re-opened, running on hydrogen as without the need for overhead cables it was both easier and had a lower visual impact.

Castle Campbell still looks over Dollar – glad to say the hills were saved from the wind turbines. These are all offshore now with energy coming via power cables/hydrogen transmission. Thank God. It would have been horrendous if the hills had been ruined with turbines.

A walk up to the castle is great. Looking south, Grangemouth is still visible in the distance, but different from the old industry. No flares. No smoke. Still a few plumes from cooling towers. The place is more productive than ever, with new industry borne out of CCS and the transport system to St Fergus, not just low carbon fuels but whole new industries …

We have chosen to make *No Electricity in the House* the last story in this report because it stands out from the other stories and responses we received in several ways.

It is the only story or response we received from across the workshops represented in this report and the research represented in our previous report [2] that entertains the possibility that installing the infrastructure needed to capture emissions from existing energy generation facilities might cause some disruption. While power cuts and disruptions to energy supply were imagined in some other stories, these were either linked to problems with renewables or not associated with an explicit cause.

It is also one of only two that imagined successful back-up or alternative systems that quickly swung into action when a power cut occurred.

*Image:* Sun empowers solar panels © *Onwuka Glory, CC BY-SA 4.0.*

# No Electricity in the House

My dad woke up irritable because there was no electricity in the house. This had not happened in years, because Nigeria had developed and the power generation and distribution system had improved.

However, recently the government realised they needed to incorporate CCS into these existing facilities. They had to shut down some facilities to make this happen.

My dad started to wonder why they waited so long to do this. They could have incorporated CCS when we were still struggling with generating power and we wouldn't now be in the dark, hot and upset. This is what made him angry.

But for me, I wish they incorporated CCS earlier to reduce what little emissions we produced. Same problem, but different perspective.

Five minutes after, the solar panel was switched on and this made me realise how all technologies were important for the world's decarbonisation journey so far.

# Learning from the stories

These stories capture key themes arising from our workshops with people who might be thought of as 'closer' to CC(U)S than those who contributed the stories and responses we reported on in CC(U)S Futures 1 [2]. Overall, they are informed by a higher level of awareness of decarbonisation solutions. However, they also reveal disconnects and absences.

Some of the participants who were at early career stages in industry knew very little about CC(U)S. They also shared some of the misconceptions we identified before, such as a conflation of CO2 removal with improved air quality. However, the majority of participants possessed scientific or technical knowledge and some awareness of plans and status of developments, at least in their local Clusters. This was, however, a generally partial and focused knowledge. The UKCCSRC ECRs indicated a lack of holistic awareness, as they are caught up in the fine detail of their own work. For example, hardly anyone in the room had seen a Direct Air Capture unit and one who had, described her surprise at their large size.

Perhaps it's this that leads to the absence of CC(U)S itself from most of stories, and a concomitant absence of change or disruption relating to roll-out of new infrastructure. Despite the prominence of $CO_2$ transport planning in current projects in the UK, only one story mentioned a pipeline, and that was for hydrogen.

The stories above also reveal broader sociocultural influences and dynamics. Some of these are:

- 'Generic Green Futures' stories conform to discourses that suggest we can somehow solve/reverse climate change without any kind of disruption or any substantial impact on our lives and landscapes.
- The absence of resistance may also reflect a widespread sense that nothing will ever happen, which can be traced to repeated unfulfilled promises and undelivered projects, not just about CC(U)S but also other public infrastructure, from the dualling of the A9 to new hospitals to HS2.
- The assumption that commercial actors and capitalist motives lead to greed that trumps environmental concerns was as strongly held by many of these participants as had been the case in our earlier research.
- There was, however, much greater awareness of why other people might resist CC(U)S, such as fears around safety/risks, gentrification and visual impact, all frequently-reported grounds given for objections to a range of decarbonisation and electrification projects, from pylons to battery farms.

Taken together, these stories suggest that there is a genuine need to build a coherent picture of what implementing CC(U)S and the other technological infrastructures it will allow will look like, and how it may affect lives and landscapes. There is nothing to be gained by pretending that nothing will change. The current government seems more willing to grapple with this challenge than has been the case in the past, and we hope our reports can help frame a new kind of public discussion.

## Who contributed to the creation of these stories?

These stories were created in and following three workshops held between March and June 2024: one at the UKCCSRC Early Career Researcher Away Day held the day before the UKCCSRC conference; one in Grangemouth and one at the University of South Wales. These followed earlier workshops and visits to locations in the Scottish Cluster by the project team that gave rise to the stories reported in CC(U)S Futures 1 [2]. The three workshops focused on in this report included around 40 participants, all of whom are currently working in either CC(U)S-related R&D in academia, or a commercial organisation that is expecting to implement CC(U)S. The participants ranged from early to mid/late career..

## Why do we use fiction?

We use Participatory Speculative Fiction because in fiction, there is:

- No pressure to be accurate or factual (i.e. no need to demonstrate expertise)
- No requirement to find solutions
- No sense that we are asking people to embrace or resist an intervention
- No bargaining dynamic (no sense that we are going to give what people ask for)
- The possibility of revealing conscious and subconscious influences and associations through narrative tropes and images.

## This resource

This resource is intended to highlight some of the factors that shape people's responses to and understandings of possible CC(U)S futures. It was created by Anna Wilson and George Robertson as part of the IDRIC-funded CC(U)S Futures project and the Leverhulme Trust-funded Waste Stories project.

Please cite as Wilson, A. and Robertson, G. (2024). *CC(U)S Futures 2: Visions from within the Sector, 2024*.

## CC(U)S Futures

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*Cover image:* Castle Campbell

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