

Public perceptions of Carbon Capture and Storage

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1 Executive summary

1.1 Aims and methods

Carbon capture and storage (CCS) is a way of reducing emissions by capturing the CO₂ produced by power generation or industrial activity, transporting it and permanently storing it deep underground. As CCS projects advance, evidence is accumulating on the importance of understanding public perceptions. At national level in the UK, public awareness is still low and opinions are ambivalent. This creates both opportunities for dialogue and a risk that public attitudes are malleable to misinformation. At a local level, unaddressed public concerns such as safety, and a general lack of public engagement can contribute to the failure of CCS projects.

Public perceptions are highly influenced by national and local contexts. In the Scottish context, the Acorn project is the most significant CCS development. It will capture emissions from major industrial sites and permanently store them deep beneath the North Sea seabed. As the Acorn project in Scotland progresses and the country advances CCS and carbon removals as part of its Climate Change Plan, it will be important to consider public perceptions. The aim of this research was to review existing evidence on public perceptions of CCS, the factors which shape it, and lessons for public engagement with local communities and the wider public. We conducted a literature review and interviewed 20 expert stakeholders from academia, governments, regulatory authorities, third sector, and industry (project developers and emitters). Stakeholders were selected based on their experience with CCS projects, in the UK and internationally. The literature reviewed included public perception surveys but a survey to assess current public perception in Scotland was outside of the scope of this project.

1.2 Findings

We found that the public generally knows little about CCS and is mostly neutral towards it. However, **perceptions can change quickly and vary** depending on the context in question and across the CCS value chain. There is a persistent belief that CCS is immature or unproven at scale, which can exacerbate public concerns. **Safety is a key concern**, particularly at local level. This is most prominently linked to the long-term integrity of storage sites, and can be amplified by a lack of understanding of the subsurface. Public concerns may also manifest around capture sites and include potential health risks from the use of amines in carbon capture units. Other important concerns include **fossil lock-in** (that CCS will be used to prolong the life of fossil energy production), **cost** (additional consumer costs imposed by CCS, trade-off between investing in CCS and in alternatives), and **disruption** (e.g., noise and congestion during construction, ongoing impacts during operation).

A “social licence to operate” (SLO) refers to the approval or acceptance granted by the public beyond formal consent. Addressing the public’s concerns in a meaningful and transparent way is the first step in obtaining a SLO for CCS. **Trust is one of the most vital precursors to an SLO** and once lost can be difficult to regain. For example, following the failure of a CCS project in the Netherlands widespread scepticism around CCS continued in the country, with its first commercial-scale project only launched 10 years later. The **equitable distribution of benefits** to local communities is another essential precursor to an SLO. At the same time, compensation can be perceived as bribery, particularly if it is purely financial. **Public perceptions of other infrastructure projects** such as fracking will also influence whether an SLO is granted or not.

A range of factors affect how the public ultimately perceives CCS, and whether an SLO can be granted. The specific project and technology are also factors. **Offshore CO₂ storage** is slightly preferred but depends significantly on the relationship communities have with the sea. Capturing **industrial and biogenic emissions** is perceived as slightly better than those from fossil-based energy production. **Imported CO₂** is generally less accepted for capture than CO₂ generated domestically. The **historical context of a community** is another key factor, including industrial heritage, previous experience with transition management, legacy incidents, and prior interactions with CCS actors.

The quality of public engagement itself is another key factor in how CCS will be perceived. Across the evidence base, **early, tailored, and sustained communication** from credible messengers is highlighted as vital for public confidence in CCS, both at national and project level. Although there is some disagreement on the ultimate impact of increased public awareness, it was found that at national level **CCS needs to be visible in the debate** around climate change mitigation and Just Transition. At a local level, **two-way communication** which treats communities as partners who can contribute to decision-making, rather than passive audiences, is the most effective. CCS communicators need to be **honest about all aspects of their projects**, including risks, and remain visible across the project lifecycle.

1.3 Lessons learned

Understanding current public opinion on CCS in Scotland, particularly in communities near the Acorn project, is an important precursor to successful public engagement and long-term trust. **Offshore storage should not be assumed to mean acceptance** of CCS, given the existing importance and use of the sea by local communities. A CCS SLO is reliant on public confidence that project risks will be managed, and is not fixed in time. As such, **current acceptance of the Acorn project does not mean acceptance of future projects** or new capture sites connecting to the SCO₂T pipeline. The SCO₂T pipeline is the onshore pipeline network that links industrial centres directly to the Acorn project. The prominence and importance of industry in local communities, while beneficial in ensuring familiarity with industrial development, also **does not automatically mean acceptance of CCS**. If past experiences with industry are negative, CCS may by association have a negative connotation. This also applies to experience with transition management and the perception of “unjust transitions”, such as Scotland’s coal pit closures in the 1970s.

Public engagement is very context-specific. However, there are several general lessons learned. **More frequent, visible debate around CCS**, as part of a broader discussion on Scotland’s climate targets, will be an important foundation for engagement. The subsequent local engagement needs to be **preceded by a deep understanding of the audience** (“social site characterisation”) and **appropriately resourced** for early and ongoing two-way engagement. **Following through on promised benefits** and providing a clear plan for **monitoring and disclosing project performance** will also be important for trust-building and ultimate acceptance. Taking public concerns seriously, even if they are misinformed, will be key. Evidence from Scotland itself shows that **the public does not want to be endlessly reassured on CCS**, but rather honestly told how risks will be mitigated if they materialise.

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2 Abbreviations table

CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilisation
CCUS	Carbon Capture, Utilisation, and Storage
CCP	Scotland's Climate Change Plan
CO ₂	Carbon dioxide
EU	European Union
Gt	Giga-tonnes (billion tonnes)
ICCS	Industrial carbon capture and storage
Mt	Mega-tonne (million tonnes)
NET	Negative Emissions Technology
NIMBY	Not-In-My-Backyard
SLO	Social Licence to Operate
t	Tonne
UK	United Kingdom

3 Introduction

3.1 Background

Carbon capture and storage (CCS) has the potential to be a key tool for decarbonising hard-to-abate industrial sectors and enabling negative emissions (International Energy Agency, 2022). Broadly, it involves a chain of technologies to capture carbon dioxide (CO₂) from emission sources (e.g., an industrial manufacturing plant) or from the atmosphere, transport it, and inject it deep under the subsurface for permanent geological storage. CO₂ can be transported through pipelines, as well as in trucks, trains, barges, or ships. It can be stored onshore or offshore (below the seabed). In either case storage happens at a minimum depth of 800m below the surface.

CCS has been deployed commercially since the 1970s, primarily to enhance oil and gas recovery (IEAGHG, no date). As a climate change mitigation tool, project development has only recently accelerated. The European Union (EU) sees CCS as a key component in its 2050 pathway to net zero (European Commission, 2024). It recently obligated oil and gas suppliers to prepare 50 million tonnes (Mt) of CO₂ storage capacity on its territory by 2030. The United Kingdom (UK) is advanced in CCS development, having awarded government subsidies to four projects, including the Acorn project in Scotland. These and other planned CCS projects in the UK all involve capturing CO₂ from industrial sources and storing it under the seabed: the HyNet project in the Irish Sea and the East Coast Cluster, Viking, Bacton, and Acorn projects in the North Sea. The Scottish North Sea, where Acorn will develop its CO₂ storage, is estimated to hold the majority of the UK's North Sea storage potential.

CCS is a relatively new technology in the context of climate change mitigation and has been less visible in the public debate compared to measures such as renewable energy and electrification. Public awareness of CCS is generally low, and its social acceptability is often assumed in studies estimating its deployment potential (Parliamentary Office of Science and Technology, 2017). However, a growing body of research and practical experience from frontrunner projects cautions against such assumptions. There have been challenges with social acceptability in projecting the rollout and impact of CCS, and in planning actual CCS projects. One of the most widely cited examples is the Barendrecht project in the Netherlands. This project was abandoned during the development stage in 2012, partially due to concerns around the local impact of onshore CO₂ storage and a lack of public engagement to address these concerns. Public confidence took a long time to recover, onshore CO₂ storage was banned, and the Netherlands is only now constructing its first commercial-scale CCS project (Carbon Gap, 2026). Other examples from Germany and the United States reinforce the potential impact of public resistance to CCS (Clean Air Taskforce, 2024; Oltra *et al.*, 2012; The Copenhagen Post, 2009).

The experience of public resistance offers lessons for future project development. For example, in the wake of the Barendrecht project, the Dutch ROAD project prioritised local stakeholder engagement and intensive public communications (Lockwood, 2017). However, there is still room for improvement. In many cases, public engagement continues to be top-down and one-sided, which risks undermining the credibility of CCS and public trust in the project developers and national governments promoting it (Clean Air Task Force and Lockwood, 2022). The fact that CCS is not well-known and involves subsurface storage which

is invisible to the public, creates a basis for concern, particularly around storage safety and environmental impact (Lambert *et al.*, 2025). In addition, despite being most effective as a climate solution for heavy industry (E3G, 2023), CCS can also be applied to fossil energy production, including coal and gas power. This has created a concern around CCS being used to prolong the use of fossil fuels, known as “fossil lock-in”. Finally, it has an association with the oil and gas industry as most CCS project developers in Europe are oil and gas companies, given their ownership of suitable storage sites and transferable skills. Perceptions of the oil and gas industry may therefore shape public response to CCS projects.

Scotland is in the early stages of CCS deployment. The country has no dedicated strategy on CCS but highlights it as a key opportunity in its Green Industrial Strategy (Scottish Government, 2024). In Scotland’s Climate Change Plan, carbon capture, utilisation, and storage (CCUS) is seen to have a key role in industrial decarbonisation (Scottish Government, 2025a). The broader-termed Negative Emissions Technologies (NETs) are also cited as key measures. This encompasses CCS where carbon is captured from the atmosphere or the combustion of biomass. According to Scotland’s draft Climate Change Plan (CCP), over the 2036-2040 period NETs would be avoiding 12.2 Mt of CO₂ emissions (Scottish Government, 2025b).

At the time of writing, Scotland’s only Government backed commercial-scale CCS project, the Acorn project, is still in the planning stage, with storage licenses granted but no infrastructure yet built. The project would involve CO₂ capture from several emitters, including a gas-fired power plant at Peterhead and industrial facilities in North-Eastern Scotland and the Central Belt. The CO₂ would be transported through a repurposed gas pipeline (the SCO₂T pipeline) to an export terminal at St Fergus, then piped offshore and stored in the Scottish North Sea. Scotland focuses on offshore CO₂ storage in the North Sea, with Acorn’s CO₂ storage site located 100 km off the coast of Aberdeenshire (The Acorn Project, 2026). Some near-shore basins have recently been explored as potential storage sites (Cavanagh *et al.*, 2024). The Scottish North Sea is a vast CO₂ storage resource, estimated at around 50 giga-tonnes (Crown Estate Scotland, no date). Given this, the potential for Scotland to become a CO₂ storage hub which imports emissions from abroad for storage has begun to permeate the public discussion (Optimat, 2025).

Beyond its potential contribution to climate change mitigation, CCS has been highlighted as a tool for safeguarding heavy industry, preventing economic downturn and job loss in industry-dependent areas. It has also been outlined as a measure to enable the Just Transition of the oil and gas sector. Workers could be reskilled to operate CO₂ storage facilities as hydrocarbon production is phased out in line with climate goals (Scottish Carbon Capture and Storage, 2019). Both these aspects are pertinent in the Scottish context, given its strong oil and gas employment base and its industrial heritage. This is particularly relevant in communities surrounding the Acorn project’s planned capture sites and export terminal in Aberdeenshire. At the same time, Scotland has significant maritime skills which can be leveraged for the development of CCS, but there are also potential conflicts of sea use with shipping, fishing, and offshore wind energy.

3.2 Research aims and methodology

A robust understanding of how the public perceives CCS and how they can be meaningfully engaged on the topic is an important component for project deployment. The broad aim of this research was to review the existing evidence base on public perception and engagement, and extract lessons learned for Scotland's CCS project pipeline. To do this, we collected evidence from the literature and stakeholders to answer the following questions:

- What evidence do we have on how the public perceives CCS?
- What are the main public concerns around CCS and precursors to its acceptability?
- What influence do technology and social factors have on public response?
- What are the opportunities, challenges, and risks of public engagement with CCS?
- How does the quality of communication affect public perception and response?
- What lessons can be learned from CCS public engagement in other jurisdictions?

We reviewed international literature on CCS perceptions and engagement. In total, we reviewed 58 academic articles and 69 grey literature items primarily reports from think tanks such as Clean Air Task Force, and project reports such as the Decatur project in the United States. The literature reviewed included public perception surveys but a survey to assess current public perception in Scotland was outside of the scope of this project. See Appendix A for more detail on our methodology.

We also interviewed stakeholders from academia, civil society, government, and project developers and emitters from industry in the UK or abroad. The interviews were based on the same research questions outlined above and tailored to each stakeholder. An aspect of particular focus in our stakeholder consultations was lessons on CCS perceptions and engagement from other jurisdictions, including England, Norway, Denmark, the Netherlands and France. We engaged a total of 20 stakeholders through virtual interviews or questionnaires.

This report presents the findings of our evidence review. It is structured into three main chapters, covering findings on public perceptions of CCS (Chapter 4), factors influencing public response (Chapter 5), and public engagement around CCS (Chapter 6). We close each chapter by outlining key lessons learned relevant to Scotland from the presented findings. The final section of this report summarises the evidence review findings and these key lessons learned, focusing on potential next steps for public engagement about CCS in Scotland.

4 Public perceptions of CCS

4.1 General public perceptions of CCS

The evidence review consistently indicates low levels of awareness of CCS in various countries (Anders, Liebe and Meyerhoff, 2024). This is similar in the UK, where polled publics display overall low public awareness and high ambivalence (Clean Air Task Force, 2023b). Some sources indicate there is slightly higher awareness in Scotland – 24% stating that they know at least “a fair amount” about CCS, compared to 20% at UK level

(Department for Energy Security and Net Zero, 2024a). Stakeholders highlight a persistent public belief that CCS technologies are immature or unproven at scale.

More generally, public perceptions of CCS are affected by a range of factors. Higher awareness can be a precursor to support and reduce perceived safety risks, but in some cases can generate negative perceptions (Department for Energy Security and Net Zero, 2024). Prior research using focus groups in the UK has found that people with lower levels of knowledge around CCS often rely on comparisons to other subsurface or industrial technologies, most commonly fracking (Mabon and Littlecott, 2016). Therefore, historic interactions with technology could be critical determinants of support for CCS projects.

Positive perceptions of CCS in the UK cluster around industrial employment, regional economic benefits, and climate necessity (Department for Energy Security and Net Zero, 2024b). In 2023, a survey of 363 Scottish participants showed more awareness of CCS than comparable regions in the UK (Wales and Northern Ireland), with higher shares both supporting and opposing it. By 2025, support had fallen slightly below these comparable regions (41%, compared to 43% and 45%, respectively), and the share of those opposing it had increased from 8% to 13% (Department for Energy Security and Net Zero, 2023; Department for Energy Security and Net Zero, 2025). This increase was driven by a rise in the share of those strongly opposing CCS. The increase in opposition mirrors the rest of the UK but is stronger in Scotland. Beyond these surveys, recent in-depth evidence on Scottish opinions of CCS is sparse. In a small focus group in Scotland, Brunsting et al. (2013) found positive attitudes towards CCS, including seeing CCS as a pathway to preserve existing jobs in industrial areas, and also highlighting the potential the benefits of being a global CCS leader.

The literature shows that when CCS is presented as an isolated technical solution, public reactions tend to be cautious or negative. However, several studies show that when CCS is presented as essential for climate mitigation and part of a broader low-carbon transition, public opinion becomes more favourable (Gough and Mander, 2022; Shah et al., 2022). Support is further impacted by perceived necessity. In a UK polling study, 45% of respondents stated that CCS should be used only if it is the cheapest decarbonisation option, and 28% thought it should be used only if it is the only available option (Clean Air Task Force, 2023b).

A raft of other factors affects public understanding and support of CCS. They include proximity to sites, which can cause both more positive and more negative attitudes (Große-Kreul et al., 2024; Sovacool et al., 2025). Trust in government and industry is a widely-cited key factor (Clean Air Task Force and Lockwood, 2022; Anders et al., 2024). Experience with past projects is also a significant factor. Spain's failed CASTOR CCS project, which generated seismic activity due to insufficient monitoring has caused local public opinion to turn negative (CCUS SET-Plan, 2024). In contrast, the Pycasso project in France had positive results due to early-stage public consultation and engagement addressing local concerns (Zero Emissions Platform, 2024). Two stakeholders also raised the role of the media in shaping public understanding of CCS. Media outlets and their associated storylines can play an influential role in shaping public discourse around trust, technology scepticism and awareness (Swain, 2025).

4.1.1 Public perception across the value chain and across levels of discussion

Public perception of CCS can also vary across the value chain. This is because the perception of risks and benefits changes depending on whether capture, transport, or storage is being proposed. It can also be varied because CCS value chains are long and involve different project developers interacting with different communities (Zero Emissions Platform, 2024). Capture is generally viewed as more beneficial, whereas storage raises safety concerns (CCUS SET-Plan, 2024; Clean Air Task Force and Gładysz, 2025).

Limited research is available on the differences in public perceptions between CCS at a socio-political level (e.g., CCS as part of a broader discussion on Scotland's net zero targets) and at a local level (e.g., a specific CCS project being debated). However, it is expected that a concrete CCS project will generate different perceptions of risks, challenges, and opportunities than a theoretical discussion about CCS technologies (Miu *et al.*, 2023). Stakeholders agreed that further research was needed on this topic. Some stakeholders maintain that practical concerns, particularly those around storage safety, are likely to be at the local/project level rather than the national/socio-political level. On the other hand, broader concerns such as the risk that CCS props up an unsustainable fossil fuel industry, may be more prevalent at national level.

4.1.2 Examples of public resistance

Public resistance is a persistent concern for CCS projects. Although 77 projects are live today (Global CCS Institute, 2025), resistance has stopped or delayed several projects. In many cases, public confidence in CCS technologies takes a long time to recover following these instances of public resistance. It is important to recognise that a lack of active protest does not indicate approval to develop CCS in any area and under any circumstance.

A widely quoted example of public resistance is the Barendrecht project in the Netherlands. This project provides key insights into why CCS projects may fail. Notably, engagement processes were not seen as open, and residents saw the project developer, Shell, and the national government as acting defensively about any concerns raised (Oltra *et al.*, 2012). The benefits of the project for local people were not clearly articulated (Kuijper, 2011). Campaign groups in collaboration with local politicians mobilised to share anti-CCS messages which had a high level of public penetration (Terwel, ter Mors and Daamen, 2012). Similar challenges emerged in the failed Beeskow project in Germany with residents believing engagement was tokenistic and biased to enable the project to move forward. Failure to address major health concerns around carbon leakage into aquifers exacerbated public concerns and opposition (Oltra *et al.*, 2012).

4.2 Main public concerns

4.2.1 Safety

The literature on CCS, as well as most stakeholders interviewed in this study, agree that long-term safety is one of the main public concerns around CCS. It is primarily related to CO₂ storage and to some extent transport, although CO₂ capture can also raise safety concerns (see Section 5.1). Safety concerns include leakage risk, induced seismicity,

groundwater contamination, and monitoring. There is strong evidence that acceptance improves where project designs clearly demonstrate robust governance and contingency planning (Stavrianakis, Nielsen and Morrison, 2023; Zero Emissions Platform, 2024; Global CCS Institute, 2025).

Safety concerns are typically more prominent at the local level, and can be driven by uncertainty or lack of trust in the mitigation of leakage. Stakeholders noted that safety concerns can also be affected by a fear of the unknown, due to a lack of familiarity with subsurface technology. Furthermore, safety concerns are not isolated just to the area of where a project is deployed: people will not support a project if the safety risks are moved elsewhere (Witte, 2021).

Stakeholders drew a clear line between unaddressed safety concerns and the fate of some CCS projects, including Barendrecht. However, many of them maintain that safety-related risks are elevated because the risks are unfamiliar, and publics with low awareness are susceptible to arguments from those opposing CCS. For example, some publics draw analogies to historic incidents such as the Lake Nyos gas release, even though these are not truly comparable (Baxter, Kapila and Mfonfu, 1989). In the US, despite intensive and early public engagement in the Illinois Decatur project, when the stored CO₂ migrated from its original subsurface position, it sparked public outrage. This happened even though the CO₂ migration did not affect the local groundwater – a major public concern in the US (Clean Air Taskforce, 2024). The state of Illinois subsequently banned CO₂ storage in 14 counties.

Safety concerns are present in the UK (Department for Energy Security and Net Zero, 2024a), and go back to the White Rose and Peterhead projects in the 2010s (White Rose, 2016; Peterhead CCS Project, 2015). Even earlier, Scottish CCS (2010) had identified earthquakes, landslides and water contamination as potential public concerns in Scotland. Project developers we consulted told us that safety is always under consideration as a public concern they may need to respond to, even when not yet manifested by the public (HyNet North West, 2020).

4.2.2 Fossil lock-in

Among climate-concerned publics and civil society groups, concerns can emerge around CCS as a moral hazard that allows governments and companies to defer more transformative change and enable further dependence on fossil fuels (Whitmarsh, Xenias and Jones, 2019; Merk, 2022; CCUS SET-Plan, 2024). This is termed “fossil lock-in”, and stakeholders note that those concerned with it may be more informed on CCS than the broader public. This may be more prominent at a socio-political level rather than as a pressing issue for local communities. However, this is not easily generalisable.

Fossil lock-in can also fuel anti-CCS NGO sentiments related to whether the technology is a valid use of taxpayer money, as noted by some stakeholders. They also note that there is a perception that CCS is a solution lobbied and funded by oil and gas industry, with likely vested interests to continue oil and gas production. Some stakeholders highlighted that these are valid arguments, and can significantly affect perceptions, particularly when NGO voices are highly trusted.

4.2.3 Cost and disruption

The concern that CCS is an extremely costly solution is an important barrier to public acceptance, including in the UK and Scotland (Department for Energy Security and Net Zero, 2024b). Public cost concerns can be around the additional costs for consumers due to CCS. For example, increased energy costs due to added cost of carbon capture on power plants, or that investment in CCS will reduce investment in other low carbon solutions (Gough and Mander, 2022; Tardin-Coelho, Bharadwaj and Ashworth, 2025; Clean Air Task Force and Gładysz, 2025). Stakeholders echoed these concerns, relating both to the viability of CCS and the belief that the taxpayer should not be the one to foot the bill for industry’s “clean-up”. The latter was highlighted as an ethical concern that could be used as a key argument by anti-CCS NGO groups. Views on costs are heterogenous across different demographics. Waring and Longo (2025) find that higher income, female gender, older age, and higher levels of environmental concern are linked to higher willingness to pay for CCS.

Multiple stakeholders point to the disruption caused by CCS as a public concern. They highlight that if a project is local to a community then construction noise, traffic and congestion effects, or visual impact from large capture units could lead to local opposition. One project developer estimated that up to 80% of the questions and feedback they had received related to outright opposition to CCS developments due to the locally disruptive effects of construction or traffic, or to concerns around this level of this disruption, e.g. how long local roads would close for. The UK government’s survey on public opinion of CCS has indicated a perception of CCS as locally disruptive and too expensive as one of the main drivers of opposition (Department for Energy Security and Net Zero, 2024b). A decline in quality of life or in property values may also raise public concern (Zero Emissions Platform, 2024; Clean Air Task Force and Gładysz, 2025; ACCESS Network, 2024).

4.2.4 Other concerns

Safety, fossil lock-in, and costs are widely-cited public concerns around CCS, but it is worth highlighting several less frequently mentioned ones including:

- Perceived **low effectiveness** in tackling climate change, highlighted in UK literature (Department for Energy Security and Net Zero, 2024a) (Traverse, 2021) and our stakeholder consultations. This includes perceived low investment efficiency compared to alternatives, exacerbated by the perception that the technology is unproven at scale.
- Specific **sectoral impacts** e.g., impacts on agriculture and tourism (Zero Emissions Platform, 2024; Clean Air Taskforce, 2024). Land use and marine life are concerns in the UK (UK Government, 2025). In Scotland, the impact on fisheries and wildlife was flagged as a potential concern in the past (Peterhead CCS Project, 2015).

4.3 Main precursors to a Social License to Operate

A “social licence to operate” (SLO) refers to the level of acceptance or approval granted by local communities and wider publics to a project or sector, beyond formal consent. Addressing public concerns is a necessary precursor to obtaining an SLO, but it is also shaped by trust, awareness, and how the benefits of CCS are distributed.

A CCS SLO is not just generated at a local level, but rather is shaped by regional, national and international perspectives on CCS (Witte, 2021). Ultimately, it is dependent on whether CCS seems consistent with a credible national net zero strategy, particularly for storage (Gough and Mander, 2022). Several stakeholders also suggest that maintaining an SLO is a multi-actor process, involving project developers, local authorities, and national government, with flexible roles to match the local context of a project.

It is also important to note that an SLO is not fixed and can be “revoked” by newly emerging concerns. Managing this risk involves maintaining trust and transparent engagement, as well as a good safety record, across the project’s lifetime (Clean Air Task Force and Gładysz, 2025). It should also not be assumed that acceptance of one development will translate into acceptance of another, or of expanding the current one. The SLO also depends on the scale at which benefits and risks accrue. For example, a proposed coal-fired power plant with CCS in Ayr, Scotland, faced significant opposition due to fears around local pollution risks, despite the climate benefits (CCUS Projects Network, Parmiter and Bell, 2020). Some international sources suggest the differentiation of local-scale SLOs, which include demonstrating safety and providing proof-of-concept, and wider public engagement, which should focus on connecting with the bigger picture (Greenberg, 2020).

4.3.1 Trust in CCS actors

Trust in industry and government is one of the most important precursors of CCS SLO (Terwel et al., 2009; Clean Air Task Force and Lockwood, 2022). When it is low, acceptance of CCS is low, higher local risks are perceived (Gough and Mander, 2022). Critically, the provision of additional information does not increase levels of support (Terwel *et al.*, 2009).

Trust is built through partnership, transparency, and procedural justice ((Nielsen, Stavrianakis and Morrison, 2022; Tardin-Coelho, Bharadwaj and Ashworth, 2025). The public must feel that their concerns are being taken on board, that they will not be bypassed in decision-making, that their input will have real effect, and that the actors they trust can influence decision-making (CCUS SET-Plan, 2024; Miu *et al.*, 2023). If communities are treated as partners rather than passive audiences, positive perceptions of CCS can increase (Clean Air Task Force and Gładysz, 2025; Bellona Europa, 2023; Traverse, 2021).

Procedural injustice, with communities feeling like concerns are ignored and projects are imposed against local wishes, has been an important factor in the failure of some CCS projects, most prominently Barendrecht (ACCESS Network, 2024). Trust is easily lost when people feel excluded or misled (Gough, Cunningham and Mander, 2018), or when they perceive that information is being withheld, that concerns are not being taken seriously, and/or that risks are not thoroughly assessed (Scottish CCS, 2010). Once lost, trust from local communities can be difficult to regain (Miu *et al.*, 2023) even if using high-quality information and engagement. Older research in Scotland shows that such engagement can be viewed as biased propaganda if it supports the standpoint of a project developer in which trust has been lost (Scottish CCS, 2010).

Process transparency is also important. A perception of vested commercial interests, especially if projects are publicly funded, is a further barrier to trust (CCUS Projects Network, Parmiter and Bell, 2020). The UK CCUS Public Dialogue highlights that the public wants contracts to be transparently awarded to “ethical” companies with good track record

(Traverse, 2021). One stakeholder noted that industry-government cooperation is good for trust-building, preventing CCS being perceived as an industry-led profit-making tool.

4.3.2 Awareness and experience

Evidence around the influence of awareness on CCS perceptions is mixed (see Section 5.2). Stakeholders suggested that trust can also be garnered through general exposure to the term “CCS”. They raised that embedding CCS in the wider discourse is a precursor for local acceptance. Integrating education on the subsoil into the national curriculum could support an increased understanding of technology processes and risks, as well as potentially increasing skills and knowledge for future generations of employees in the CCS industry.

Stakeholders stressed the importance of raising awareness of CCS within a “toolkit” of other solutions without overplaying it, including showing that CCS can be applied immediately, compared to longer-term solutions. Insight from an interview with a Danish stakeholder shows that Denmark’s cross-party agreement on CCS was key to securing an SLO, as was ensuring that it is applied in a targeted way and accompanied by investments in other solutions, e.g., renewables.

The CCS SLO is also influenced by experience with other infrastructure projects seen to be similar to CCS, as well as general past experiences with industry (Linzenich, Arning and Ziefle, 2021). Stakeholders corroborated this, raising that local history is particularly important for an SLO, specifically prior local experiences with industry. Section 5.2 provides detail on how local history and experiences might affect public perception of CCS.

4.3.3 Compensation and benefits distribution

SLO will also depend on the provision of meaningful benefits, clearly articulated to communities impacted by CCS. The role of compensation and benefits redistribution is still an emerging research area, and there is no centrally agreed way to provide compensation.

Broadly, the literature shows that communities are more likely to support projects when there is appropriate compensation for the impacts in the area (Boomsma et al., 2020; Anders, Liebe and Meyerhoff, 2024). However, in some communities, particularly historically disenfranchised ones, financial compensation can be perceived as community bribery especially if there is pre-existing distrust (Miu *et al.*, 2023). Most stakeholders agreed and noted the risk of the public perceiving they were being “paid off”, as this would suggest that CCS is a bad thing. Therefore, some communities may need financial compensation to be coupled with a long-term trust-building process (Boomsma et al., 2020).

CCS projects must have a coherent narrative around the benefits enabled by CCS, which go beyond compliance or profit-making (Zero Emissions Platform, 2024). Benefits should be balanced with project risks and tailored to relevant local conditions, creating local value for money (NORSAR *et al.*, 2024). This can be through direct financial benefits, e.g., Danish ringfencing of local taxes for community funds, or indirect, through the provision of employment or other socio-economic or environmental benefits. Project developers can consider the remediation of existing problems to improve acceptance, for example removal of obsolete infrastructure (CCUS Projects Network; Parmiter and Bell, 2020).

In a Just Transition context, the social benefits of CCS, including industrial revival, employment and reskilling, are pertinent (Global CCS Institute, 2025). Jobs are consistently highlighted as a key benefit to be returned to local communities through creation of new jobs or safeguarding existing (Zero Emissions Platform, 2024; Department for Energy Security & Net Zero, 2024; Traverse, 2021). Some stakeholders noted examples of US upskilling programmes to enable local communities to work on the CCS project. The communication of job-related benefits should transparently indicate which of these will be temporary or permanent, and which will be local or further afield.

Other perceived benefits of CCS in the UK may include technological leadership and redefining regional identities (Department for Energy Security and Net Zero, 2024; Traverse, 2021). Stakeholders also note benefits to the local environment as potentially relevant in the UK. Early dialogue with local populations may indicate the most relevant benefits, with the understanding that the benefits desired by local communities may be biased towards short-term benefits (CCUS SET-Plan, 2024; Clean Air Task Force and Gładysz, 2025). As early as 2015, the Peterhead public engagement strategy suggested co-creating benefits with local communities (Peterhead CCS Project, 2015).

Finally, CCS benefits should be distributed justly (Clean Air Task Force and Gładysz, 2025; Sovacool et al., 2025). This is pertinent to long CCS value chains, which can span multiple communities, with benefits accruing at certain points along the value chain which may not reflect proximity to project risks. Stakeholders noted that employment is a contributing factor to positive perceptions, but only if jobs are marketed as available for the local community, rather than prioritising or promoting out-of-region talent.

There are some concrete examples of the role of benefits. For example, the mayor of Jurançon in southern France became supportive of the Total-Lacq CCS project after Total agreed to give €1.5M for environmental and social benefits (CCUS Projects Network, Parmiter and Bell, 2020). In Port Talbot, residents have expressed cautious support for CCUS, conditioned by investments in areas in need of regeneration (Sovacool *et al.*, 2025).

4.4 Key lessons for Scotland

Like in other countries, Scotland's attitudes towards CCS remain uninformed and ambivalent, in part due to a lack of public discourse. This ambivalence is a potential opportunity to create informed dialogue, as well as a risk given the malleability of attitudes to anti-CCS narratives. Understanding public perceptions is a precursor to developing CCS projects. One Danish stakeholder highlighted that even early-stage prospecting phases involve significant operations, and as such communities must be deeply understood even in the earliest stages of the project. Questions from the public will become more specific if projects progress and more companies are granted storage licenses, as would be in line with Scotland's ambition to build a CO₂ storage hub in the Scottish North Sea. Key public concerns to address in the early stages are safety and environmental impact around CO₂ storage and transport (including offshore operations), fossil lock-in, and disruption.

There is near universal agreement that public concerns and SLO will vary significantly depending on the context, and public support will be shaped by various factors (see Chapter 5). This further reinforces that an understanding of local perceptions, preferences, and concerns in Scotland will be required to establish coherent narratives around CCS. Although strong climate change and net zero narratives will play a role in strengthening the national

debate on CCS, economic and Just Transition benefits also will be key to the SLO for Scottish CCS projects. As one stakeholder highlighted, some Scottish communities have a very real lived experience of a Just Transition narrative and are inherently more interested in knowing how not to repeat the mistakes of the past in terms of transition management. The distribution of economic and environmental benefits to affected communities will be key, and any compensation mechanism may run the risk of being perceived as bribery.

5 Factors influencing public response to CCS

Chapter 4 has already introduced some of the factors affecting public perceptions of CCS. In this chapter, we review in more detail how these factors influence public perceptions, both in terms of concerns around CCS and the precursors to its SLO, based on a review of the literature and consultation with stakeholders.

5.1 Technology and design choices

Evidence is varied around how the public responds to different CCS technologies and project designs. Some sources suggest that the primary driver will be the perceived risks and benefits, which can indirectly be affected by technology and design specificities.

A frequently debated but still underexplored determinant of CCS perception is whether CO₂ storage is onshore or offshore (Boomsma et al., 2020). As highlighted in Section 4.1.1, CO₂ storage generally raises safety concerns. A certain level of risk is perceived regardless, and perceptions are context-specific. However, generally offshore projects have been more readily accepted; a recent Danish case study emphasised this by highlighting a greater willingness to pay for offshore storage (Kim and Ladenburg, 2024; Zuch, 2025). “Not-In-My-Backyard” (NIMBY) attitudes are regularly cited in the grey literature (NORSAR et al., 2024), although some academic literature finds that stronger support for CCS is often observed amongst local communities than distant ones (Whitmarsh, Xenias and Jones, 2019).

Although generally more acceptable, offshore storage can be opposed if it is perceived to negatively impact coastal communities and livelihoods (CCUS Projects Network, Parmiter and Bell, 2020). Stakeholders corroborated this. If a community depends on the sea for its economy, public resistance may be more likely. The notion of compensation also becomes more nuanced with offshore sites, where it is more challenging to identify impacted communities (Boomsma et al., 2020).

Project experience shared by stakeholders shows similar variation. For example, offshore CO₂ storage in Denmark has faced little opposition, but CCS has been more negatively framed in the media since the launch of onshore storage sites. In the Netherlands, the 2012 ROAD project faced less negative attention than Barendrecht, attributed in part to its offshore storage plans. A decade down the line, the Dutch Porthos project, also involving offshore storage, has higher levels of acceptance, although public engagement was also much improved following Barendrecht (CCUS SET-Plan, 2024).

There is limited research on how the type of CO₂ transport influences public response, although it is also linked to safety and disruption concerns (see Sections 4.2.1 and 4.2.3). Some sources suggest a preference for barge, truck, or tank-based CO₂ transport over

pipelines (Bellona Foundation, 2022). Others find the opposite. They postulate that this is due to familiarity with pipelines, and a perception of disruption caused by traffic from road transport (von Rothkirch and Ejderyan, 2021; Große-Kreul et al., 2024; Stavrianakis, Nielsen and Morrison, 2023). Additionally, CO₂ pipelines can be long and span multiple communities (see Section 4.3.3). As such, the distribution of pipeline benefits needs to be addressed, as communities which are disrupted by pipeline development will likely not receive the opportunities CCS presents (von Rothkirch and Ejderyan, 2021). This could be important for Scotland, given the planned use of onshore pipelines in the Acorn project.

The perceived risks of pipelines can also be proactively managed. The Dutch Porthos project, where the onshore pipeline ran near a village, added a safeguard to the project design specifically to quell public safety concerns around mitigating leakage. This was done despite modelling showing that effects would be negligible even in the event of a leak and was a “no-regret” option that helped gain public trust and acceptance of the technology itself.

Although most public concerns and SLO precursors relate to the storage and transport part of the value chain, the choice of technology for CO₂ capture may also generate safety concerns, for example, the carcinogenic effects of amine solvents used in capture units (ACCESS Network, 2024). This was also cited by the Peterhead CCS Project (2015) as a public concern emerging around the planned capture facility at the time. Most consulted stakeholders were unconcerned with public perceptions of the safety of CO₂ capture, but one raised the example of Norway’s Mongstad project, where public concerns around amine health risks were seen as a potential “showstopper”.

In general, in almost all cases, energy efficiency and renewables remain preferred solutions over CCS, with the public generally seeing a trade-off between CCS and other technologies (Linzenich, Arning and Ziefle, 2021; Kim and Ladenburg, 2024; Vögele et al., 2018). Once again, these factors are highly contextual. Support for CCS also varies based on whether CCS involves industrial emissions, fossil energy, or carbon removals. Industrial CCS (ICCS) and carbon removals have tended to be more readily accepted than fossil energy CCS, linked to concerns around fossil lock-in (see Section 4.2.2) (Arning et al., 2019; Whitmarsh, Xenias and Jones, 2019; Witte, 2021). However, there are technology specific tensions including concerns for the cost of products where ICCS is used, pathways for long term storage in carbon removals, and perceived impact on land use (Buck, 2021; Tardin-Coelho, Bharadwaj and Ashworth, 2025).

There is also limited evidence on whether the public prefers CCS clusters over isolated (single-source-single-sink) projects. Some sources emphasise that hub-and-cluster models are perceived as more credible than standalone projects, as they signal long-term commitment and shared infrastructure (Greenberg, 2020; CCUS SET-Plan, 2024). Stakeholders highlighted that cluster projects also tend to be built out in areas with pre-existing industrial experience, which can enable an SLO (Section 4.3.2). However, cluster-only CCS developments would likely exclude the cement industry, which is typically located in more rural areas because of necessary land space for quarries.

Finally, there are differences in perception between whether stored CO₂ is imported or domestic. Imported CO₂ is consistently less accepted than domestic storage (Merk et al., 2022; Anders et al., 2024; Mohammed *et al.*, 2024) unless tied to clear local benefits, strict liability frameworks, and port safety (Gough and Mander, 2022). This applies to countries

advanced in CCS as well. For example, in Norway, support for storage is 81%, for domestic CO₂ and 40% for imports (Zero Emissions Platform, 2024). Some sources go as far as suggesting that CO₂ should be captured locally to incentivise public acceptance (Reinhold Poulsen, 2021).

The UK's CCUS Dialogue finds mixed perceptions. The typical concern on whether importing CO₂ is equivalent to importing waste is reflected in queries of whether this would make the UK a "dumping ground". In the small Scottish focus group for this study, some participants cited the potential economic benefit of charging other countries for CO₂ storage, while others expressed that only Scottish CO₂ should be stored in Scotland (Traverse, 2021). Older research has indicated some recognition of the role of Scotland as a carbon importer and the associated economic benefits, within a small Scottish focus group (Brunsting *et al.*, 2013). However, this would need to be retested on a larger sample and considering current narratives around climate change and decarbonisation.

Stakeholders corroborate this variation in perceptions noting the challenge of perceptions around CO₂ as waste. One project developer told us that even CO₂ from England could face lower acceptability compared to Scottish CO₂. Another suggested that people may be concerned about imports from abroad based on what is known about fracking. On the other hand, there are potential positive narratives around imported CO₂, such as "powering" their own country with the stored CO₂, or solidarity and meeting collective climate goals. The latter is an important narrative in Denmark, but may not work in all countries, as quoted by a Danish stakeholder. Several stakeholders noted that acceptance of imports would depend on local benefits or compensation, including job creation.

5.2 Historical, industrial and social contexts

The literature and stakeholders were in broad agreement that local context is one of the strongest mediating factors in public responses. Support varies between countries and within countries, depending significantly on local priorities, including resource protection and competing economic activities.

As indicated in Section 4.3.2, proximity to industry or historic industrial experience can affect the SLO of CCS. Prior experience and familiarity with industry often increases the likelihood of support for a CCS project (von Rothkirch and Ejderyan, 2021). Stakeholders corroborated this, sharing the example of the industrialised Teesside area, where the population is familiar with industrial development and understand the inherent risks. In these cases, the involvement of industry in CCS is seen as a good thing, as a narrative of "cleaning up their own emissions" - but trust is only generated if industry is funding the intervention. Communities with historic exposure to industry or a longstanding presence of hydrocarbon producers may also accept CO₂ storage more readily (Witte, 2021; CCUS SET-Plan, 2024). The visibility of infrastructure and its perceived fit with existing industrial landscapes also matter.

On the other hand, positive perceptions can be undermined where communities have historically seen projects fail to materialise. In the UK, areas with histories of environmental injustice or unmet infrastructure promises exhibit higher baseline scepticism, regardless of project design (Department for Energy Security and Net Zero, 2024a). The UK CCUS Dialogue also found public concerns such as "promises being broken" (Traverse, 2021, p. 26).

Perceptions of CCS can also be negatively affected in communities which have experienced accidents or hazards (Sovacool *et al.*, 2025).

Another key determinant is experience with legacy incidents. In Spain, the failed CASTOR CCS project cost €4.7 billion and has driven lower public acceptance, coupled with the lack of a clear CCS policy framework (CCUS SET-Plan, 2024). Some stakeholders suggest that high trust in government can mitigate the persistence of legacy incidents in the collective memory. For example, the overall success of Norwegian CCS is broadly attributed to the political culture with high levels of support for CCS, and a recognition of the oil and gas industry as a driver of wealth and national pride.

The effect of experience is not restricted to CCS experience. People interpret CCS using familiar technologies which they perceive to be similar to CCS, although there may be little to no real similarity. One area which may require monitoring is the public reaction to fossil fuel-related incidents, e.g. pipeline accidents, which have in the past been seen as adjacent to CCS (McLaughlin *et al.*, 2023). Judgements have also been made based on historical incidents perceived to be similar, for example in Lancashire, where residents drew on previous experiences with fracking to inform their mistrust of future CCS projects (Gough, Cunningham and Mander, 2017a). Recent climate effects may increase support for CCS - for example, support for CCS rose in Spain shortly after a major drought (von Rothkirch and Ejderyan, 2021). However, recent evidence from the US shows that this is more ambiguous, and influenced by the political context of the time (Shah *et al.*, 2022). Whether or not the above interpretations still hold today and apply to Scotland, is less clear than the overall finding that public perception of CCS is susceptible to past experiences with other technologies, incidents, and events.

The literature identifies demographic characteristics which may affect local support. Some studies note that men are more likely to report higher levels of CCS awareness than (Anders, Liebe and Meyerhoff, 2024; Whitmarsh, Xenias and Jones, 2019; Zuch and Ladenburg, 2023). This contrasts with the finding that women are more willing to pay for CCS than men, highlighting a potential gap between awareness and support (Waring and Longo, 2025). Those concerned for the climate are also more likely to support CCS deployment (Anders, Liebe and Meyerhoff, 2024; Zuch, 2025). Similarly, higher-educated individuals are more aware of CCS. However, the impact on public response of increasing CCS knowledge is nebulous. Research on this is limited, but some older sources find that familiarity leads to acceptance (Arning *et al.*, 2019), while others that it amplifies perceived risk (Braun, 2017). Stakeholders consulted for this study noted that familiarity is a key precursor for acceptance on a local level and can be boosted through education and increased communications around subsurface operations.

5.3 Communication source and timing

5.3.1 Message framing and narratives

How a CCS message is framed in communications influences public perception. Messaging that is accessible, evidence-based, and non-persuasive tends to generate more trust and engagement than communications perceived as promotional or controlling (Shackley *et al.*, 2013). Climate and economic-focused frames raise acceptance, while overly risk-focused or overly reassuring messages both reduce credibility potentially eroding trust (von Rothkirch

and Ejderyan, 2021). Framing CCS as part of the wider strategy for tackling climate change, including pairing it with bioenergy or CCU, increases CCS support; while mentioning even very modest costs can reduce it (Whitmarsh, Xenias and Jones, 2019). At the same time, technocratic communication often fails to resonate with publics, particularly where values-based concerns, such as fairness and long-term responsibility, are not acknowledged (Macgillivray and Livesey, 2021). Similarly, Sovacool *et al.* (2025) argue that framing CCS purely in terms of efficiency or cost-effectiveness undermines legitimacy, and rather framings that address justice, accountability, and governance are more effective. Some sources highlight that CCS could be more supported if it is framed as innovative (Clean Air Task Force, 2023a). On the other hand, providing distinct examples of successful CCS projects, grounded in tangible local contexts, may alleviate the perception of risk from CCS as an “unproven technology” (Traverse, 2021).

Behind the message framing itself, the coherence of narratives and message framing between communicators is a driver of credibility and public response. Coherent narratives around benefits are particularly important (see Section 4.3.3). Stakeholders exemplified Denmark, which has a written mandate that citizens, municipalities and regions must be involved with this narrative development. Such involvement may prove useful for understanding which communities would not be receptive to CCS, as highlighted by one stakeholder. Other actors’ role in narrative development, such as the media, should also be considered (Energy Policy Group, 2022b). Finally, CCS narratives can shift if wider narratives around climate change or Just Transition wax and wane, which can in turn affect the SLO.

5.3.2 Communication source

The credibility of CCS is highly shaped by the messenger who communicates on it (CCUS Projects Network, Parmiter and Bell, 2020). This is particularly key as CCS is a technology which the public is less aware of and so is more liable to be treated with suspicion (Energy Policy Group, 2022a, NORSAR *et al.*, 2024). This suspicion has also been flagged as a specific concern in the UK, including in terms of “shifting” from a focus on proven technologies (UK Government, 2025).

How the choice of communication source impacts public perceptions of CCS is modulated by trust in that communicator (see Section 4.3.1). NGOs, universities, and independent experts are regularly noted as more trusted communication sources than industry or government (Eberenz *et al.*, 2024; Große-Kreul *et al.*, 2024). This also holds for the UK specifically but ultimately varies between local contexts (Traverse, 2021). The wider political context also matters. One stakeholder highlighted that since Brexit, and exacerbated by the Covid-19 pandemic, there has been a general distrust of “expertise” amongst the public.

Whoever the trusted actors are in a particular context, public trust increases if they are coordinated by “local champions” and supported by independent analysis (Zero Emissions Platform, 2024, Energy Policy Group, 2021, NORSAR *et al.*, 2024). Key allies for CCS communication are suggested to be scientists, NGOs, and politicians, media experts, journalists, and respected community members. Opinion formers and community leaders are also essential to building local acceptance of projects (Scottish CCS, 2010). Support from environmental NGOs was also essential for the Porthos project in the Netherlands in gaining public acceptance (CCUS SET-Plan, 2024).

The importance of local stakeholders or champions as CCS messengers was stressed by consulted stakeholders, to “humanise” the industrial development which CCS projects bring. One stakeholder emphasised that best practice engagement would firstly identify who local community figureheads are and ensure their buy-in as a first port-of-call. Examples given included local sports club owners, vocal residents on community social media pages and pub owners. It was highlighted that this was very specific to the local context.

Involving multiple agencies in communicating on CCS can be helpful in balancing information but this must be done coherently (CCUS Projects Network, Parmiter and Bell, 2020). Cross-industry groups can also play a role, with one stakeholder pointing to the Humber Energy Board as a good-practice example. As highlighted above, coherent messaging between national and local levels is key. One stakeholder observed public suspicion of CCS could rise if CCS had not previously been part of national dialogue.

5.3.3 Communication timing

There is near-universal agreement across the literature and consulted stakeholders that public communication and engagement must start early and be sustained across the project lifecycle (Global CCS Institute, 2025; CCUS Projects Network, Parmiter and Bell, 2020). Early-stage communication, before key decisions are perceived as fixed, is essential for building trust (Shackley, Mabon and Evar, 2013).

A lack of early engagement is often cited as a driver of project failure, for example at Barendrecht (Zero Emissions Platform, 2024), alongside other factors cited earlier in this study. On the other hand, the Getica CCS demonstrator in Romania conducted educational and information activities as early as feasibility study stage (Energy Policy Group, 2021). In the UK, the CCUS public dialogue also highlights that communities are more receptive when CCS is introduced during agenda-setting phases, whilst engagement after key siting or design decisions have been made is perceived as procedural tokenism (Traverse, 2021). Macgillivray and Livesey (2021) point out that late-stage engagement often shifts public focus from substantive risk questions to issues of fairness and trust.

International evidence and feedback from consulted stakeholders reinforce the essential nature of early engagement. Stakeholders pinpointed that early engagement must focus on clear communication of costs and benefits. Caveats should be considered; one stakeholder highlighted that early engagement may open the project up to questions that might not be able to be answered.

Continuous, iterative engagement over a CCS project lifetime is essential. Stakeholders emphasised that communities should know where to voice concerns throughout the project lifecycle. Some noted that continuous engagement would also be necessary to ensure future project buy-in, mitigate potential negative attention from the media or vested interests, and secure trust in messengers. If the same messengers keep showing up consistently, over a long period of time, they are more likely to be trusted.

5.4 Key lessons for Scotland

Of the significant range of factors influencing public perceptions of CCS, several will be more relevant to Scotland and the country's upcoming CCS project pipeline.

Possibly the most important lesson for Scotland, given the impending launch of the Acorn project, is the need for early, sustained, and credible engagement. Timing and continuity are critical success factors for public buy-in. In Denmark, engagement began five years before any project license were awarded, to lay foundational knowledge on the importance of CCS. The most credible communicator will depend on the particularities of the local context. Regardless of who they are, they will need to remain approachable and consistently visible across the project lifecycle. Their communication must be two-way, honest and balanced to avoid over-provision of information. Continuous transparency will be at the heart of public acceptance, including a recognition that CCS projects are learning by doing, do not have all the answers, and may face factors outside of their control.

Even though CO₂ storage in Scotland will predominantly be offshore, safety concerns are likely to play a prominent role in public discussions, given the relative novelty of CCS technologies in Scotland's net zero portfolio. Furthermore, given the importance to Scots of the marine habitats and renewable energy potential of Scotland's seas (Scottish Government, 2019), the ability of CCS projects to safeguard marine life and renewable energy projects is likely to influence public perception around project safety. Finally, concerns around safety, but also around cost and fossil lock-in, are susceptible to return if they are not managed long-term, through continuous public engagement (see Chapter 6).

Public response will be influenced by Scotland's history and familiarity with industry and oil and gas. In general, CCS may face less public opposition at a local level if projects are built in areas familiar with industrial activity and involve repurposed infrastructure. This is a positive starting point in Scotland, where the Acorn project transects areas with a rich industrial history and uses legacy gas infrastructure. However, this should not be assumed to automatically generate a positive response. Trust in Scottish industry, particularly the oil and gas sector, is variable, and lived experiences of poor transition management by industry and government will further raise concerns on CCS becoming a "broken promise". These may be particularly sensitive, as some communities, such as in Scotland's Central Belt and Fife regions, may still be grappling with the effects of "unjust" transitions in the 1970s and 1980s surrounding the closure of Scotland's coal mining industry. Early engagement of communities in industrial areas is essential to identify current attitudes towards CCS and the actors involved in project deployment.

This early, place-specific engagement and assessment of perceptions, "social site characterisation", as defined by Brunsting et al. (2013), can also distinguish perceptions influenced by technology and design factors. Given that the Acorn project plans to involve capture from fossil energy production and industrial sites, perceptions may vary between the project's capture sites, with a possible preference for industrial CCS. Perceptions, and the ultimate SLO of Scottish CCS, may also vary depending on the planned role of CO₂ imports as part of building out Scotland's North Sea storage hub. On the one hand, narratives around CO₂ imports may boost positive perceptions around leadership, but on the other they risk creating associations with waste dumping. This may be a particularly sensitive subject in the broader context of perceptions of fairness by Scots, including a belief

that emissions should be dealt with by those responsible (Sovacool *et al.*, 2025, University of Glasgow, 2024) Transparent communication around plans to import CO₂ are best received if they include a clear presentation of economic benefits, safeguards around storage integrity, and regulatory mechanisms to preventing the acceptance of imports propping up fossil fuel use abroad.

Scotland's wider political environment and current national debate will also influence perceptions of CCS. For example, cost concerns and doubts about the perceived effectiveness of CCS may be amplified by recent budgetary constraints and funding announcements, with many actors concerned about their expense. This is particularly important given the UK's reliance on a Regulated Asset Base model for CO₂ transport and storage infrastructure, involving significant subsidies and financial safeguards to project developers. Stakeholders point out that these cost concerns often do not consider potential future savings once the CCS market matures, which can be addressed through awareness-raising. Other concerns can be much more related to Scotland's control over CCS funding, for example whether it is reserved to the British Government. Scepticism of a Westminster-managed transition may also extend to the language used in CCS communications, with one stakeholder highlighting that terms such as "levelling up" can be seen as political buzzwords.

An understanding of public perceptions and the factors shaping them will drive the design of public engagement on CCS. In the next chapter, we draw on literature findings and stakeholder inputs to present lessons learned on public engagement with CCS.

6 Public engagement with CCS

6.1 Opportunities and challenges of public engagement with CCS

Public engagement can be seen as an opportunity that benefits CCS projects, stakeholders, and the public. Good public engagement can raise awareness, build trust, secure public buy-in, and even establish a talent pipeline for a skilled CCUS workforce (Zero Emissions Platform, 2024; Sovacool *et al.*, 2025). Consulted stakeholders highlighted the chance to highlight the benefits and economic potential of CCS, build genuine relationships in communities, and address public concerns head-on, including those of stakeholders with competing interests. In the Scottish context, the permitting process already requires consideration of alternative developments, and an engagement strategy to pre-empt undue issues with other users of the seabed. If such engagement is early and genuine, it can generate trust throughout the consultation process, and potentially secure political backing for future CCS projects.

There are several key challenges to public engagement with CCS. Stakeholders noted a general lack of public understanding both of CCS and its potential, which can lead to ambivalent, disinterested attitudes, low response rates in consultations and other engagement activities. Project developers generally quoted low response rates, such as less than 0.1% attendance at town hall meetings. Response rates have been slightly higher where storage sites are located closer to shore, such as the HyNet project. Others pointed to the risk of anti-CCS agendas being more readily received by publics with limited

knowledge of CCS, particularly if these agendas are communicated with high levels of emotional content.

Other challenges highlighted by stakeholders include legal challenges by organised groups, such as the HyNOT group protesting the HyNet project. These can garner media attention and transform public ambivalence into discontent. Another prominent challenge is combating misinformation without adversarial messaging, and managing pre-existing negative bias against CCS, requiring collaboration with trusted actors to stop continuous opposition. In some cases referenced by stakeholders, success was simply to stop anti-CCS actors from publicly opposing development at every step in the consultation process, rather than to change the minds of the adamant voices against CCS as a concept.

Delivering public engagement around CCS also poses risks if it is not perceived as genuine (Terwel, ter Mors and Daamen, 2012). Even when there are pathways to share local views, if participants believe that their opinions will not lead to genuine change, trust can be damaged (ibid.). To address this risk, engagement should be transparent, two-way, proactive, and place specific. It should leverage local networks, take place early, provide clear pathways for communities, and respect the time scarcity of local residents by providing a variety of different ways to engage.

There is disagreement on the importance of general information and education of the public on CCS. Some literature sources consider it to be vital, to reduce the amplification of perceived risks and the susceptibility to influence by misinformation and controversy (Clean Air Task Force and Gładysz, 2025; Zero Emissions Platform, 2024). Some stakeholders agree that broader societal engagement is very important and not yet happening in the UK. Such engagement necessarily includes communicating the costs and benefits, which technologies are important and how they will be deployed. Not doing this broader engagement risks that the first time that communities hear about CCS as a concept is when a project is being developed in their locality. One stakeholder noted a “bad practice” example where the first interaction of local homeowners with a CCS project was to be asked by land agents about the mortgage position on their properties, with little context given. The stakeholder perceived that this prompted fear at the outset. Another stakeholder noted that this can damage trust surrounding the technology, working on the logic that if the technology was so important, it would be better-known. It was suggested that strengthening national-level dialogue whilst remaining consistent with current messaging around the economic and climate potential is key. This could be devolved regionally, with more specific dialogue on why certain regions have been selected for CCS.

In contrast, stakeholders also warn about risk of over-provision of information and point out that there is a limit to how transparent public engagement should be. One stakeholder noted a risk that being fully transparent can lead to opposition. For example, open-access information on pipeline leaks can be used to provoke fear. Others noted that despite the importance of transparency, the public may have specific questions for which there are no answers yet. In this case, it is important to communicate clearly a timeline of key dates and phases indicating what information will be available and when.

Some stakeholders consider that rather than a general education effort, CCS simply needs to be more visible as part of the UK’s national debate on climate and energy. One noted that the educational aspect of engagement has typically been left to project developers, rather

than being more widely delivered in a national dialogue. Enabling more visibility of CCS in national discourse can also mitigate misinformed reporting driven by anti-CCS agendas.

6.2 Main public engagement models

Public engagement models exist on a spectrum from non-participation to citizen power (Arnstein, 1969). The method employed will depend on the rationale for the engagement. This can be simply for instrumental (aiming to achieve a set outcome, persuasion-focused “manipulation”), normative (aiming to do the right thing), or substantive purposes (aiming to co-create the outcome powers, where the local community has the final say) (European Environment Agency, 2023; Scottish CCS, 2010). The less the opportunity for public input, the higher the likelihood of opposition. Conversely, at higher levels of participation, the trade-offs include longer timelines, higher effort required from project actors, and the risk of project alteration to the public’s preference rather than the best choice for the project to be tenable. Table 1 sets out the main types of public engagement and their implications for CCS.

Table 1: Main types of public engagement and their implications for CCS.

Engagement Description	Implications for CCS	References
One-way information provision/ collection (e.g., websites, leaflets, polling)	Information provision is essential for inclusive engagement, however if the information comes from a sole untrusted source it may exacerbate fear or suspicion. Appropriate only as a supplement or where trust levels are extremely high.	(L’Orange Seigo, Dohle and Siegrist, 2014)
Two-way processes (e.g. formal consultation, listening exercises, public meetings)	Effective when early, tailored to local context, and visibly influences decisions. Still limited if perceived as pseudo-voice.	(von Rothkirch and Ejderyan, 2021)
Participatory processes (e.g., workshops, citizen juries, community advisory boards)	Strongest for building trust, and long-term SLO. Allows genuine influence, supports transparent decision-making, responds to local identities and concerns (e.g. through stakeholder networks).	(Gough, Cunningham and Mander, 2018)

The literature and stakeholders highlight the essential nature of appropriately resourced, two-way communication tailored to the specific audience being engaged (NORSAR *et al.*, 2024; CCUS Projects Network, Parmiter and Bell, 2020; European Commission, 2024). High-quality public engagement includes specific measures to engage “hard-to-reach” groups and meets residents through local approaches in coffee shops, schools and community spaces (Süsser *et al.*, 2024; Zero Emissions Platform, 2024). They also provide a diverse range of methods for participants to engage, prioritising face-to-face approaches and interactive messaging where possible. In some cases, citizen juries could improve awareness of CCS, as well as offer an opportunity to test and refine communication strategies (Zero Emissions Platform, 2024). Visible safety monitoring is highlighted as an important way to prove to citizens that their concerns are being taken seriously (Clean Air Task Force and Gładysz, 2025; CCUS Projects Network, Parmiter and Bell 2020). Some CCS projects have even

involved citizens in these monitoring efforts, which is an example of participatory engagement (CCUS Projects Network, Parmiter and Bell, 2020).

Despite the higher effort required, many sources insist on the essential nature of sustained two-way public engagement on CCS, given the risks outlined in Section 6.1. Engagement should happen across the project lifecycle, starting with a solid understanding of pre-existing attitudes, perceptions, and preferences, including the “societal readiness level” for CCS (NORSAR *et al.*, 2024). Based on this understanding, inclusive engagement plans can be developed at broad and project-specific levels, providing all relevant stakeholders with the opportunity to participate in discussions on CCS. At project level, tailoring communication to the issues of importance to different communities, involving communities in decision-making, and ongoing transparency including data-sharing and incident reporting are key (Clean Air Taskforce, 2024). One stakeholder defined “engaging well” as sticking to the facts, having answers in place to respond to concerns, and communicating clearly how any public opinions will be considered in the planning process. This included being clear on the degrees of permissible public involvement and the reasons behind this (Scottish CCS, 2010).

6.3 Lessons from other jurisdictions

In this section, we present additional lessons from other jurisdictions on public engagement with CCS, at national and project level. These are distinct lessons learned from those presented earlier in Chapter 6, or they reinforce them with specific examples on the ground.

6.3.1 Jurisdiction-level findings

At EU level, evidence emerges on the potential for mandating public engagement. The EU Innovation Fund, which funds CCUS projects, includes requirements for knowledge dissemination meant to increase peer-to-peer discussions at local level (Bellona Europa, 2025). In the United States developers seeking funding for CCS projects are obliged to develop a Community Benefit Plan including plans for community engagement, environmental justice, and workforce development (Bellona Europa, 2023). The requirements on public engagement for CO₂ storage are more extensive than those for similar injection activities (US Environmental Protection Agency, 2010). In Victoria, Australia, publishing detailed project information and consulting communities first is a regulatory requirement (International Energy Agency, 2022).

National-level findings from other jurisdictions also reinforce the importance of committing to meaningful public engagement, as highlighted in Section 6.2. In the Netherlands, despite the failure of the Barendrecht project, the engagement framework of the 2019 Dutch Climate Agreement set a precedent for involving civil society on CCS strategy development (Clean Air Task Force, 2022). In our consultations, stakeholders from Denmark, one of the EU’s most advanced countries in CCS, reiterated the importance of public meetings, close dialogue, information campaigns, readily available expertise to answer questions and concerns, and obligations on project developers to keep communities informed. They added that at the local level, project developers should be preceded by public body representatives to set the scene and local messengers are essential to collaborate with. Other stakeholders with experience in Denmark and the UK pointed out that even a local accent can improve credibility.

6.3.2 Project-level examples

Concrete CCS projects reinforce some of our findings on public engagement, for example the importance of consistent visibility and transparency to the public (see Section 6.2). In Canada’s Shell Quest project, the set-up of a Community Advisory Panel improved public trust in the project (International Energy Agency, 2022). The project offered groundwater sampling services to locals for two years to monitor CO₂ storage integrity, until asked to cease by landowners (CCUS Projects Network, Parmiter and Bell, 2020). In the US, the Decatur project in Illinois adopted a range of public engagement activities including a roadshow, media partnerships, and working with a community college including an outreach centre (CCUS Projects Network, Parmiter and Bell, 2020). Being public facing is also a feature of Norway’s Longship project, which hosts a visitor centre for public engagement and knowledge sharing (Clean Air Task Force and Gładysz, 2025).

The Tomakomai project in Japan is an example of successful public engagement which offers direct evidence for the importance of identifying local concerns early, conducting participatory engagement, and continuous transparency. The project developers conducted social site characterisation and established a CCS Promotion Association reflecting all key stakeholder groups in the region. They also set up a public information centre, offered site tours, openly published monitoring data, developed tailored communication materials and organised annual open fora (Sawada and Tanaka, 2020). A key aspect was the continuous focus on monitoring, with ongoing public disclosure and the receipt of continuous feedback (Mabon, Kita and Xue, 2017). Importantly, the project also reacted quickly to potential threats to public approval. After an earthquake struck the area, the developer commissioned an independent expert panel to assess whether CO₂ injection had generated any seismic activity, pre-empting speculation (Kawabata, 2023).

Examples of failure in public engagement are also important to learn from. As mentioned throughout this report, the Barendrecht project has been extensively studied in this sense. Other projects also reinforce lessons on public engagement such as the risk of over-provision of information (see Section 6.1). For example, despite working to understand local concerns and build tailored solutions, the Carbfix project in Iceland published seismicity data without methods for communities to interpret it, increasing public concern. In this case, concerns only stabilised once an independent expert panel and coordinated communication protocol were introduced (Thorsteinsson and Gunnarsson, 2014; Andrić *et al.*, 2018). Alongside over-informing, over-promising can also be risky. Australia’s Gorgon project failed to meet its CO₂ storage targets, which undermined public confidence (Clean Air Task Force and Gładysz, 2025).

6.4 Key lessons for Scotland

Lessons on public engagement from the literature and stakeholders apply to national-level debate on CCS in Scotland, and to interacting with communities local to the Acorn and future projects. At national level, lessons learned on public engagement can be mapped to the “Understand, Participate, Act” pillars of Scotland’s Net Zero Nation public engagement strategy (Scottish Government, 2021). Such a streamlined approach to CCS communication could improve social engagement and unpick which of the lessons learned are CCS-specific, and which can be applied to wider infrastructure or net zero projects (Table 6-2).

Table 2: Selected lessons learned on public engagement with CCS

Engagement pillar of Net Zero Nation strategy	Lessons learned for public engagement (CCS-specific)	Lessons learned for public engagement (general)
<p>Understand: Increase knowledge and awareness of CCS in Scotland</p>	<ul style="list-style-type: none"> • Strong national dialogue embedding CCS clearly in net zero and Just Transition strategies precedes local engagement • The UK’s maturity and leadership in CCS can serve as a foundation for answering public concerns, if accompanied by credible plans • Assumption that offshore storage is more acceptable in Scotland will depend on the social relationship with the marine environment • Safety, cost, disruption, fossil lock-in, and “waste dumping” narrative are key public concerns to be addressed in national dialogue, including pre-empting anti-CCS narratives 	<ul style="list-style-type: none"> • Declining popularity of UK net zero narrative shows that arguments for new climate projects will evolve over time • Aligning national debate on industrial decarbonisation with a narrative around safeguarding industry and jobs, which will be key in Scotland • Public communications which transparently communicate risks and mitigation are more credible
<p>Participate: Offer public the chance to input into CCS strategies, ensuring procedural justice</p>	<ul style="list-style-type: none"> • Given the relative novelty of CCS, requests for input which go beyond simple public notice will improve trust • Low initial public participation is to be expected, given awareness levels, and may be lower in populations with a history of “broken promises” on participatory decision-making • Tailored approaches for participation improve effectiveness, e.g., NGO fora 	<ul style="list-style-type: none"> • Prolonged one-way engagement focused on persuasion can jeopardise public buy-in, but there are resource trade-offs with two-way and participatory engagement • There are limits to the permissible levels of public influence, which should be clearly communicated
<p>Act: Effectively respond to public concerns through long-term engagement</p>	<ul style="list-style-type: none"> • Successful public engagement on CCS is a long-term effort, requiring resources to be committed over several decades • One-way responses to public concerns are insufficient to generate public buy-in – responses to concerns should be dynamic • If concerns are taken seriously, public acceptance can improve; the Dutch SDE++ subsidy scheme built in yearly independent research on the need for CCS, driven by NGO concerns; the QICS research project in Scotland, involving a controlled seabed release of carbon dioxide, demonstrated that the public does not want to be told there is no risk, but rather what mitigation is in place (CCUS Projects Network, Parmiter and Bell, 2020). 	<ul style="list-style-type: none"> • The success of early projects is important to build trust, by providing case studies on effective deployment with appropriate public scrutiny • Coherent messaging between the government, participating industry, and local “champions” can improve credibility • Good public engagement can enable benefits to national governments, including improved general levels of trust and models for public engagement in other emerging industries

The lessons outlined in Table 2 are umbrella issues within which project-specific public engagement will need to develop at specific sites. Similarly, it is useful to map findings onto project-specific public engagement of a typical CCS project lifecycle, focusing on the stages most relevant for Scotland. Table 3 charts the main lessons learned on public engagement against the appraisal, planning, construction and operation phases of a CCS project. More detail is provided in Appendix C (Table 4).

Table 3: Key lessons learned for public engagement across a CCS project lifecycle

CCS lifecycle stage	Appraisal and planning before Final Investment Decision	Development and construction including mandatory public consultation	Operation including potential new capture sites
Lessons learned	<ul style="list-style-type: none"> • "Social site characterisation" of local communities • Engagement of trusted local messengers • Bidirectional communication of risks and benefits • Transparency on amount of information available • Alignment of engagement with national dialogue 	<ul style="list-style-type: none"> • Meeting local communities in familiar locations • Community advisory group, including local residents • Visibility of industry throughout project • Engagement with local opposition • Learning from previous experiences 	<ul style="list-style-type: none"> • Following through with CCS projects and promised benefits • Citizen monitoring of environmental performance • Acknowledgment that SLO for future CCS projects is not automatic • Publishing lessons learned and sharing knowledge

Although less relevant for Scotland's current project pipeline, successful public engagement continues in the final CCS project stage of decommissioning, storage site closure, and post-closure monitoring. In this stage, a clear assignment of monitoring responsibilities, coupled with continuous and accessible information on the behaviour of the sealed CO₂ storage site, will be an essential part of maintaining long-term public trust.

7 Conclusions and lessons learned

There is a growing body of academic research on public perceptions of CCS, increasingly supplemented by valuable lessons from the deployment of CCS projects. They broadly indicate that:

- Scotland, as many other countries, displays **low awareness of CCS** in the general population, with ambivalent opinions susceptible to change.
- Among the **key public concerns around CCS**, safety, cost, fossil lock-in, and disruption are likely to be present in any forthcoming debate on CCS.
- **Scotland's rich industrial heritage** may boost positive baseline perceptions of CCS.
- Past experiences with transition management, concern for the marine environment, and a general lack of public dialogue on CCS may **hinder its SLO**.
- **Key precursors to acceptability** will be confidence in project developers, reassurance regarding storage risk mitigation, and genuine bidirectional public **engagement** which delivers coherent messages early on and continuously across project lifecycles.
- **Benefits redistribution to affected communities** will be key. Employment benefits in Just Transition areas are likely to be essential, alongside environmental co-benefits.

Despite the challenges and risks associated with it, public engagement on CCS can increase awareness and improve trust, if done well. Research and project experience indicates several key findings for Scotland:

- **Public engagement starts with enabling more visibility of CCS** in the public debate on net-zero and Just Transition, in parallel with **social site characterisation by project developers** at the appraisal stage of CCS projects
- **Two-way engagement methods** in which trusted actors communicate benefits, risks, and mitigation measures have the highest chance of fostering meaningful dialogue with local communities and improving acceptability of CCS projects. They can be deployed at key decision points in the project.
- **Continued public engagement using a range of methods** will be required across project construction, operation, and decommissioning. Particularly in the operation stage, robust monitoring of project performance, including the behaviour of CO₂ being transported and injected, can significantly improve trust in the project if results are disclosed transparently and well-explained.
- **Successful examples of public engagement** include the Porthos and Northern Lights projects in Europe, as well as projects in the US, Japan, and Canada. Lessons learned from these projects can be leveraged as part of Scotland's existing public engagement strategy on net zero. This strategy and its associated "Understand, Participate, Act" framework for public engagement with climate change is a potential enabler for CCS engagement, although not entirely transferable.

Even if public engagement is exemplary in the short to medium term, as Scotland moves forward with its net zero transition, it is important to acknowledge that the SLO of CCS is neither guaranteed nor fixed in the long term. If Scotland expands its CCS project portfolio and utilisation of its North Sea storage capacity, acceptability may need to be revisited as

more communities find themselves hosting CCS projects or CO₂ begins to be imported. Conversely, some jurisdictions with a history of strong opposition to CCS are now some of the most advanced in project deployment, such as Denmark and the Netherlands. The key differentiators are learning from previous experiences, attending to public concerns early, and respecting local community contexts. These actions will influence how the public ultimately perceives, reacts, and ultimately accepts or rejects CCS.

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9 Appendices

Appendix A Additional detail on research methods

Our literature review encompassed academic literature as well as “grey literature” such as reports from think tanks and non-governmental organisations, non-academic research institutes, governments, and industry. We used relevant keyword combinations on Google Scholar, Scopus, and Web of Science (for academic articles) and via Google searches and relevant organisation websites (for grey literature). We screened article summaries for relevance, and logged articles into a common Excel spreadsheet, summarising whether and how each article answered the above research questions.

Keywords used in academic and grey literature searches

("carbon capture and storage" OR "carbon capture and sequestration" OR “CO2 storage” OR “CCS” OR “CCUS”) AND ("social license to operate" OR "social license" OR "social licence" OR “public perception” OR "public acceptance" OR "community acceptance" OR "social legitimacy" OR “public response” OR stakeholder engagement” OR “public engagement”) AND ("CO2 imports" OR "carbon dioxide imports" OR "cross-border CO2 transport" OR "transboundary CO2 transport")

Grey literature sources reviewed

1. Policy documents (e.g., strategies, action plans) & government/Parliament reports (EU, UK, Denmark, Norway, Netherlands), with a focus on North Sea countries
2. Reports/policy papers from think tanks and NGOs with concerted research activity on CCS (e.g., Clean Air Task Force, Bellona Europa, Energy Policy Group)
3. Reports/policy papers from CCS associations and networks: Scottish CCS, CCS Association, Global CCS Institute, Zero Emissions Platform, European Commission SET-Plan IWG9
4. Project-specific literature (e.g., site closure reports for unsuccessful projects, progress reports, research investigations by competent authorities), covering European countries e.g. Barendrecht (Netherlands), Belchatow (Poland), Northern Lights (Norway), Porthos (Netherlands), Greensand (Denmark), and specific examples of public engagement from non-EU projects: Tomakomai (Japan), Decatur (USA), Quest (Canada).

Appendix B Guiding questions for stakeholder interviews

Public perceptions and concerns around CCS

- In your work so far, what have you found to be the **main public concerns around CCS?**
- Conversely, what have you found to be the **precursors to a Social License to Operate (SLO)** for CCS projects (i.e., continued acceptance of CCS technologies and projects)?
- Do public concerns and SLO precursors change depending on whether the CO₂ is **imported from a different jurisdiction** or is from the UK?

- Have you observed any role for **compensation/project benefits redistribution** to local communities in obtaining and maintaining a CCS SLO?
- Are there differences between **acceptance of CCS across multiple levels** and **across the CCS value chain**?

Interviewer's note: multiple levels could mean, for example, at "socio-political level" (general acceptance of CCS as a solution) and "local level" (acceptance of a specific CCS project); across the value chain could mean, for example, acceptance of capture technologies, transport infrastructure, storage sites.

- What do you think must be done to **maintain acceptance** across levels and the value chain, and whose responsibility is it?
- What do you think is the role of **industrial clusters** in influencing public opinion on CCS?

Public engagement with CCS

- Public engagement with CCS will likely be a key component of project pipelines, as well as securing a strategic place for CCS in national transition pathways. What **opportunities and challenges** do you see for public engagement programmes at project level and conversely at broad, topical level (e.g., general communication of climate change mitigation)?
- Similarly, what **risks** does engaging the public with CCS bring, and how can these be mitigated? How might risks and their mitigation measures differ between project-specific and broad, topical levels?
- In your work so far, what have you found to be the effect of **communication source** (i.e., the messenger), **timing**, and **format** of public engagement on public perception and response to CCS? *(please also feel free to draw on lessons from public engagement with other large-scale infrastructure or subsurface projects in the UK or Scotland, if relevant)*
- Similarly, what influence have you found **technology and design choices** to exert on public perception and response to CCS?
- *Interviewer's note: for example, the choice of capture technology or industrial application, the choice of transport method, the project financial design (proportion of public funding), liability and insurance, monitoring and verification of storage sites.*
- Similarly, what influence have you found **historical, industrial, and socio-economic contexts** exert on public perception and response?
- *Interviewer's note: for example, local community experience with subsurface projects, importance of industry in local economy, and level of poverty or unemployment, respectively.*
- Do you have **any examples** of where the above contexts have impacted perception of CCS?

Lessons from other jurisdictions

- We are looking for **key lessons from other jurisdictions** that could provide lessons for Scotland's future public engagement with CCS. What **lessons do you think can be learned** from public engagement in other jurisdictions' CCS projects? *(please feel*

free to refer to specific projects or larger engagement efforts at regional, national, or international scale)

- Based on your knowledge of the Scottish and UK context, what do you think are **aspects of particular interest or concern** regarding public perception and engagement around CCS?
- Are there any additional lessons you think are relevant from public perception and engagement around other **large-scale infrastructure or subsurface projects** in Scotland and the UK (e.g., natural gas pipelines, mining)

Appendix C Additional detail on key lessons for public engagement across the project life-cycle

Table 4: Key lessons for public engagement in main stages of the CCS project life-cycle.

Appraisal and planning (before Final Investment Decision)
<ul style="list-style-type: none"> • "Social site characterisation" of local communities is essential during appraisal, including historically disenfranchised groups • This includes identifying and engaging trusted potential local messengers, and crucially local authorities and politicians • Successful public engagement starts in the planning stage, is bidirectional, and honestly communicates risks and benefits • Transparency around amount of information available and permissible to communicate improves credibility at an early stage • Public engagement strategies should be aligned with national dialogue
Development and construction (including mandatory public consultation)
<ul style="list-style-type: none"> • Meeting local communities in locations where they feel comfortable, such as local community spaces and coffee shops, improves openness to dialogue • Creating a community advisory group or panel, including local representatives and residents, is a key measure for procedural justice and increases acceptance • Even if trusted messengers are not industry representatives, participating industry should be present throughout public engagement to avoid perception of "hiding" vested interests • Engagement with local opposition (e.g., NGOs) can pre-empt future challenges • Learning from previous experiences with industry/infrastructure development can support effective engagement, as some concerns may be similar (e.g., disruption)
Operation (including potential connection of new capture sites to backbone infrastructure)
<ul style="list-style-type: none"> • Following through with CCS projects and promised benefits, while managing negative media or stakeholder attention, will be essential for long-term credibility, particularly given the prior failure of the Peterhead project, UK government backtracking on CCS funding, and historical examples of "unjust transitions" • Citizen monitoring of project environmental performance, including CO₂ leakage risk, can improve credibility and reassurance • SLO for subsequent CCS projects, including new capture sites, is not automatically assumed, with further social site characterisation required in new appraisals • Publishing lessons learned is an essential component of enabling future CCS projects

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