Co-creation and CCS: the experience of the ENCASE Project

Background

The net-zero transition is now a priority for over 100 countries [1], yet governments often struggle to implement related policies due to limited public support [2, 3, 4], shaped by differing perceptions of transition costs and benefits [5, 6, 7]. Because of this, community involvement is widely recognised—across academic literature [8] and climate policy guidance [9, 10]—as essential for achieving a just and effective transition. Understanding processes that encourage meaningful engagement is therefore crucial.

Although scholars have examined collaborations addressing social inequalities [11, 12], few have focused specifically on the green transition [13]. Within this field, collaborative governance—where diverse actors jointly define problems and design solutions [14, 15, 16]—is seen as a promising approach for a more equitable future [17, 18, 19]. However, gaps remain regarding how and under what conditions such processes produce outcomes, impact, and public value [14, 19, 20].

Co-creation, a form of collaborative governance, brings together scientists, private actors, and citizens to share ideas and resources, enabling mutual learning and bottom-up innovation [21]. While co-creation has potential for green transitions, existing studies are limited: many are theoretical [22, 23, 24], narrow in scope [25, 26, 27, 28], or lack evidence of resulting change [20, 29]. The Horizon Europe funded project "*A European Network of Research Infrastructures for CO_2 Transport and Injection*" (ENCASE) seeks to address these gaps by examining how co-creation can strengthen community engagement in green transition topics across five research infrastructures. Through implementing co-creation activities in diverse contexts, the project explores whether and how these processes support community impact, foster green transition practices, and build awareness of Carbon Capture and Storage (CCS). This abstract focuses on one of these co-creation processes.

Methodology

Between June 2024 and September 2025, the five Research Infrastructure (RI) designed and implemented the co-creation activities. Each RI team had complete flexibility and responsibility to decide on all aspects of the activity, including which social problem to address, who to involve and how, and how to spend the allocated funding and time. There were no restrictions on the potential use of resources except for religious and political purposes. The deadline for the co-creation activity was identified in August 2025.

During that time, Author 1 and 3 activities focused on (1) supporting RIs through providing advice or practical help on their projects via regular team meetings and email exchanges, and (2) evaluating the co-creation activities by collecting and analysing the data about each project. The collected data included individual interviews, team meeting notes, notes taken during observations of events and associated materials developed by each RI, such as photographs, books or presentations.

Individual interviews with RI teams and their stakeholders were conducted in rounds as the projects progressed. Each of the five projects had its own development trajectory and number of engagements with its stakeholders, and OU conducted a different number of interviews around stakeholder engagement or significant changes in the project course. OU interviewed the RIs' teams and external stakeholders, such as teachers, who were involved in the activity. In total, OU conducted 60 interviews with a total duration of 2,299 minutes (38 hours 19 minutes), among which 46 were with the RIs team members and 14 with stakeholders. The interviews focused on understanding how the interviewees perceived the goals of their co-creation activities, their own roles and the roles of their teammates in the process, their views on decisions made during the process, enablers and barriers that favour or not the co-creation processes, and the impacts of the activity. The recordings were then transcribed using a built-in transcription tool in MS Teams and manually when the automatic transcription was incorrect.

Findings

This abstract presents the experience of one Research Infrastructure (RI), TÜV SÜD National Engineering Laboratory (NEL). The team—initially three members—identified three social issues to address through their co-creation activity: limited public awareness of TÜV SÜD's work, low understanding of CCS, and local decline linked to deindustrialisation. They quickly decided to involve external stakeholders, including local universities, CCS facilities in Scotland, and policymakers, and proposed combining art and engineering to raise awareness of CCS.

One engineer suggested creating a children's book on CCS, inspired by a Japanese comic explaining engineering concepts to young readers. This idea evolved into plans for an illustrated story for primary school children focused on environmental sustainability. In October 2024, the team presented the concept to stakeholders, who supported the idea but expressed concerns about the project timeline and workload alignment.

An initial draft of the story, *Choose It, Use It, and Put It Away!*, was developed and shared for feedback with children at a local primary school and with a former primary school teacher who joined the project team as a consultant (hereafter, the Consultant). Between January and February 2025, the team shaped the final co-creation plan: engaging local primary schools in co-creating the CCS book.

Working through existing contacts, the Consultant invited local teachers to participate, and a teacher from Kirkhill Primary School agreed. Together, they designed an activity involving:

- A visit by TÜV SÜD engineers to introduce pupils to engineering and CCS.
- A school visit to the TÜV SÜD site, including a tour and book-illustration session.
- A book-reading activity in which older pupils read the story to younger pupils to gather feedback.
- Integration of children's illustrations and comments into the final book for free distribution across Glasgow or Scotland.

Three in-person engagements were scheduled: the school visit in March 2025, the site visit in May, and a reading session in late May or June, with book finalisation planned for September 2025. The school visit on 12 March 2025 involved around 180 pupils across six classes. Engineers discussed their work, demonstrated an experiment, and explained CO_2, its impacts, and the CCS process.

Figure 1 Visit of one of the TÜV SÜD engineers to a local primary school on 12 March 2025.

Between March and May 2025, the team was planning a visit for the primary school children to the TÜV SÜD site. The site visit took place in May 2025 and included a brief introduction from TÜV SÜD engineers, a facility tour led by two engineers, followed by a book reading and illustration session led by the Consultant. The tour included a mix of interactive exercises, where the children could see and touch basic pieces of equipment and listen to explanations from the engineers (see Figure 2). After the tour, the children returned to the conference room for the book reading and illustration. The children were then divided into pairs, and each pair was given a page from the book to illustrate (see Figure 3 for some examples of the illustrations children produced).

Figure 2 Visit of the Kirkhill Climate Crew to the TÜV SÜD site in East Kilbride on 9 May 2025.

Figure 1 Examples of illustrations that children produced during the site visit.

At the end of May 2025, the Consultant and an OU employee, author 1, revisited Kirkhill Primary to facilitate the process of older primary school children reading the story to younger kids. The visit aimed to facilitate the process of book reading and gather children's feedback on the story. For the book reading, the Primary 6 children were grouped in pairs and visited classes from Primary 1 (5-6 years old) to Primary 5 (8-9 years old) to read the book and collect the feedback of the younger children involved. The older children reading the story asked the younger children to highlight what they liked, what they got from the story, and what could be changed and fill a form based on the responses. The children suggested several changes to the story, including the appearance of characters, story development and book design. Between June and August 2025, the team finalised the story, incorporating the feedback and suggestions from the children. They also involved a proofreader and an illustrator to prepare the book for printing and wider free The launch of the book is planned for 2026, with free distribution to primary schools in Scotland. See Figure 4 for the book characters as suggested by the children and designed by the illustrator.

Figure 2 Book front page (left) and a selected page of the book (right), illustrating the inclusion of one of the children's drawings (see Figure 3) in the final publication. Book illustrations and design by Sarah-Leigh Wills (2025).

Conclusions and lessons for the future

Co-creation enables organisations to work collaboratively with stakeholders to address shared problems. The experience of the five Research Infrastructure of the EU Horizon Europe funded project ENCASE highlights several key lessons.

1. **Benefits for technical teams:** Even when initial goals seem unrelated to technical work, co-creation offers significant advantages, including stronger internal relationships, improved community engagement, increased stakeholder trust, and enhanced visibility.
2. **Core stages of co-creation:** Effective processes involve identifying a relevant problem, mapping and involving stakeholders, jointly designing solutions, and implementing them. Understanding community needs through formal or informal research helps select the right focus and partners.
3. **Skills and capacities:** Limited prior experience is not a barrier. Teams successfully used existing skills - such as planning, communication, and stakeholder management - while developing new creative abilities. Co-creation can be time-limited, allowing teams to experiment and build confidence.
4. **Team qualities:** Empathy, openness, communication, enthusiasm, and willingness to step outside comfort zones are essential. Learning from mistakes is part of the process.
5. **Resourcing:** Adequate time and financial capacity are necessary, and community engagement should be recognised as core work from technical team facing with green transition.
6. **Stakeholder engagement:** Effective engagement requires understanding diverse perspectives and creating space for meaningful contributions, avoiding tokenism.
7. **Communication:** Teams need to translate technical information for non-experts. Intermediaries such as teachers or community engagement managers can help bridge different knowledge bases.
8. **Alignment:** Motivations, expectations, and timelines must be clarified early to support smooth collaboration.
9. **Leadership:** Each project benefits from a designated coordinator who connects stakeholders, mobilises expertise, and maintains momentum.
10. **Adaptability:** Successful co-creation requires flexibility, resilience, and openness to feedback, including reflecting on biases and challenges to ensure genuine inclusion.

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