

SECURE factsheets - participatory monitoring

SECURE has gathered unbiased, impartial scientific evidence for risk mitigation and monitoring for environmental protection to support subsurface geology development. Our main research outputs underpin recommendations, which we have collated as nine factsheets.

The risk framework developed by SECURE identified four principal hazards associated with geological CO₂ storage and five associated with unconventional hydrocarbons extraction.

Our recommendations seek to provide a pragmatic and reasonable response to these concerns: they can be used to inform site development and management strategies from the perspective of multiple stakeholders (operators, regulators, legislators and the general public). Each headline recommendation is underpinned by project technical reports, available [here](#)

The project employed the “Bow Tie” risk assessment approach, which identifies a series of barriers that prevent a principal hazard (“top event”) from occurring. Each factsheet addresses a single top event, which can occur if control of a hazard is lost, and provides recommendations to help mitigate them.

The top events were identified through a literature review of hazards, threats, consequences and barriers associated with CO₂ storage. The recommendations can be considered to inform preventative (e.g. a limit on operations) or mitigative (e.g. a technical measure that limits the chain of consequence arising from the top event) strategies for risk management.

Overall recommendations

- ▶ A detailed recognition of the storage reservoir and confinement needs to be established, including identification of all existing faults in the possible injection operations’ influenced zone (see SECURE reports [D3.7](#) and [D3.8](#)). A cost-effective and timely environmental baseline should always be established prior to any CCS activities commencing, supported by early site appraisals. Monitoring programmes demonstrate to stakeholders that sites are evolving as expected, or deviations in behaviour can help to identify anomalies.
- ▶ Methodologies that can attribute the source of CO₂ will also be needed. The baseline defines the environmental conditions prior to CCS activities and needs to account for natural and external anthropogenic temporal variation. Therefore, the use of continuous sampling methodologies for at least one year prior to the start of operations is recommended ([D3.6](#)).
- ▶ In onshore storage operations, the sampling network for environmental baseline monitoring, ongoing monitoring throughout operation and post-operation monitoring should ensure that sampling is undertaken in all major hydrogeological units at suitable depths to protect groundwater from potential contamination. Existing relevant boreholes should be utilised and bespoke boreholes drilled, where necessary.

Gaining community trust: benefits of participatory monitoring

Participatory monitoring formed a key element of SECURE's research. The value of participatory monitoring approaches was captured and embedded within each Bow Tie risk assessment. At the same time, the recommendations relating to participatory monitoring have broad relevance to CO₂ storage, unconventional hydrocarbons extraction and other subsurface low-carbon geoenergy activities. Ethical research approaches underpin these activities and should be considered an important part of understanding how a broad range of stakeholders perceives subsurface geoenergy activities.

Why do we need to monitor a storage site?

- ▶ As CO₂ storage occurs at significant depths, monitoring data and the knowledge developed from these observations require significant expertise to aid their interpretation and make value judgements about the safety and efficiency of the storage processes.
- ▶ Developing innovative monitoring tools and participative monitoring methods can support the understanding of the subsurface by non-expert stakeholders and give them more insight into the impact of the activities on the environment and the way potential risks are being managed.
- ▶ SECURE has developed improved participatory monitoring tools that, although focused on CCS and shale gas activities, are also relevant for other subsurface activities, such as geothermal projects or the storage of heat and gases (for example, hydrogen).

What are the potential benefits of supporting local communities in participatory monitoring?

- ▶ Involving local stakeholders at all stages of the design and implementation of a project, including decisions on what is monitored and the monitoring approach itself, can improve trust in the proposed activities and risk management strategies.
- ▶ The cost of setting up a participatory monitoring programme is small compared with losing the social licence to operate due to a lack of public acceptance.

How can CO₂ storage projects enable local community engagement?

- ▶ To create legitimacy, a stakeholder participation process should be open to new information and insights to allow for (re)positioning and enrichment of viewpoints, including minority opinion.
- ▶ To create and implement a technological design, thinking beyond the technology itself is needed, iteratively including institutions and stakeholder interactions to genuinely embed it in a societal context.
- ▶ Research undertaken in SECURE indicates that geoenergy expert opinion is currently divided on the benefits of participatory monitoring, particularly around procedural justice values. Given the often pivotal role geoenergy experts can play in projects, further work is needed to build "expert acceptance" to improve societal acceptance of innovative geoenergy projects.

Gaining community trust: benefits of participatory monitoring (cont.)

How should participatory monitoring be managed within the project?

- ▶ One of the challenges identified in our research is successfully aligning the different speeds of progress, for example gaining permits versus developing new participatory monitoring programmes.
- ▶ We recommend a process management approach to address societal requirements rather than a project management approach. Investing effort at the beginning of the project to evaluate and develop a participatory monitoring programme may require additional time within project development. However, a successful programme can greatly speed up subsequent activities (such as obtaining planning permits and avoiding judicial process).

RECOMMENDATIONS

- ▶ Project teams should be multidisciplinary.
- ▶ Engagement should start early in project formulation, with investment of appropriate resources.
- ▶ The benefits of participatory monitoring should be highlighted to gain more acceptance from experts.
- ▶ Project transparency should be ensured; dialogues should be based on equality with everyone's concerns taken seriously.
- ▶ Stakeholders should jointly explore their potential roles in a project's monitoring efforts.

