CERI VINCENT, BRITISH GEOLOGICAL SURVEY

IEAGHG monitoring selection tool

British Geological Survey

Background

- The IEAGHG monitoring selection tool was first developed in 2005 - 2006
- Aim was to develop an interactive online monitoring selection tool that could be used by regulators project developers and the technical community
- BGS built a web-enabled decision support tool (DSS) to help users to select appropriate techniques to monitor a CO_2 plume at a storage site
- Tool has been regularly updated (every 2 – 3 years) to keep the content current

IEAGHG monitoring selection tool link.
Please use the ‘Start tool without logging in’ option

MONITORING SELECTION TOOL

WELCOME TO THE MONITORING SELECTION TOOL.

HIDE PANEL | You are not logged-in | LOGIN | Enter scenario name here ... | NEW | HELP | RUN

Reservoir location	Reservoir depth	Reservoir type	Landuse at site	Monitoring phase	Monitoring aims		Tool package
○ Onshore	◉ 0.5-1.5 km	◉ Aquifer	○ Settled	◉ Pre-injection	☐ Plume	☐ Calibrate	◉ Core
◉ Offshore	○ 1.5-2.5 km	○ Oil	○ Agricultural	○ Injection	☐ Top-seal	☐ Detect	○ Extra
○ Both	○ 2.5-4 km	○ Gas	○ Wooded	○ Post-injection	☐ Overburden	☐ Quantify	○ All
	○ >4 km	○ Coal	○ Arid	○ Closure	☐ Processes	☐ Seismicity	
			○ Protected			☐ Wellbores	

0 Injection rate (Mt/year) | 0 Duration (years) | TOOL CATALOGUE | BENCHMARK | SITES | COSTS | EXPORT | PRINT

Welcome

Interactive Design of Monitoring Programmes for the Geological Storage of CO_2

This Monitoring Selection Tool has been developed to help identify appropriate techniques for monitoring CO_2 that has been injected into a geological storage reservoir.

Getting Started

The CO_2 Monitoring DSS comprises a separate control panel and results window. The user interface allows you to modify your storage scenario and run the tool from within a single web page. Buttons on the control panel allow you to run your scenario, produce a print-friendly page of the results window contents and download a CSV file containing the ranked monitoring techniques.

Using the Monitoring Selection Tool

1. Using the control panel you can define the basic site characteristics of your storage project, in terms of location, reservoir depth, reservoir type and injection rate and duration. Depending on your choice of monitoring package [see point 4 below] it is also possible to select the dominant landuse in the vicinity of the storage site and the stage of project evolution for which monitoring is being considered.

2. The control panel also allows you to define a set of monitoring aims designed to improve site understanding, predictive modelling and public acceptance. These include CO_2 plume imaging, model calibration, and surface leak detection [more]. Most monitoring aims require baseline datasets to be available

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Current update (1)

- An update is currently underway focused on adding new references to the bibliography and case studies in the tool catalogue

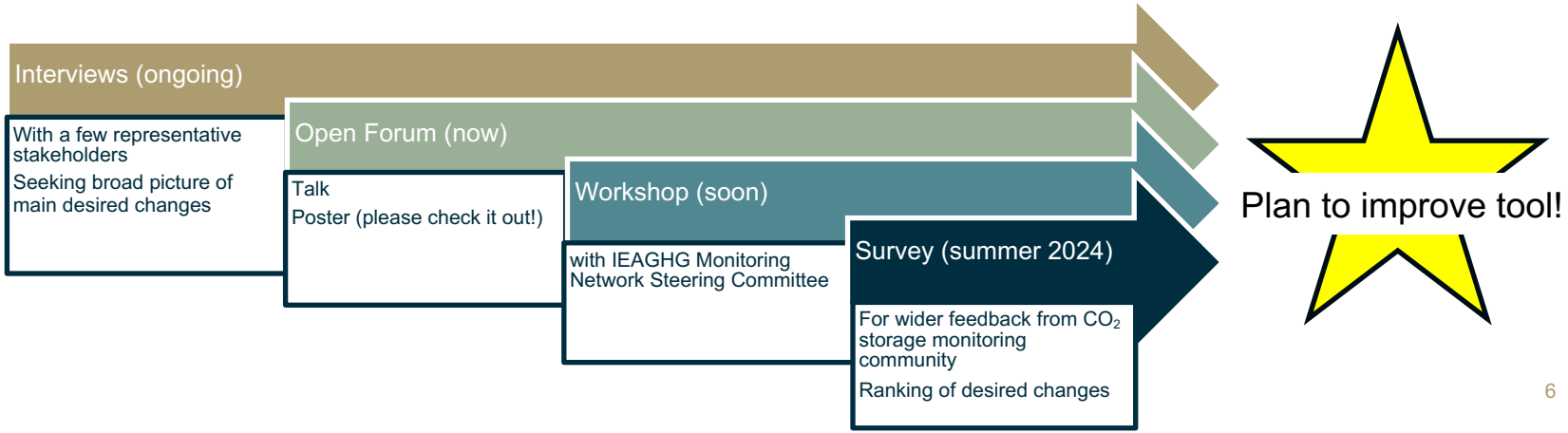
Monitoring Technique Catalogue

This catalogue lists all monitoring techniques with entries in the CO_2 Monitoring Tool database. The table is in alphabetical order (by row) of technique name. Click on the tool names below to see a description including an indication of the maturity of the technique for CO_2 storage monitoring and indicative costs of deployment. Case studies are also included where available. To see which storage sites have tool case study descriptions click here. Click your browser's Back button or the TOOL CATALOGUE button in the control panel above to return to this page.

2D surface seismic	3D surface seismic
Above-zone pulse testing	Acoustic tomography bubble detection
Airborne EM	Airborne spectral imaging
Atmospheric gas concentration	Biomarkers
Borehole EM	Borehole ERT
Borehole gravimetry	Borehole seismic
Bubble stream chemistry	Deep fluid chemistry
Downhole pressure/temperature	Ecosystems studies
Electric Spontaneous Potential	Geophysical logs
Ground penetrating radar	Inelastic neutron scattering
Integrated tools: behind casing	Land ERT
Microseismic monitoring	Multicomponent surface seismic
Muon tomography	Satellite interferometry / GPS
Sea/lake bed mapping with echosounding	Seismic interferometry
Shallow seismic profiling (P-cable)	Shallow seismic profiling (pinger, boomer, chirp)
Shallow subsurface geochemistry	Soil gas concentrations
Sonar bubble stream detection	Surface EM
Surface gravimetry	Surface water chemistry
Surface-atmospheric gas flux	Tiltmeters
Tracers	Water bottom sediment gas sampling

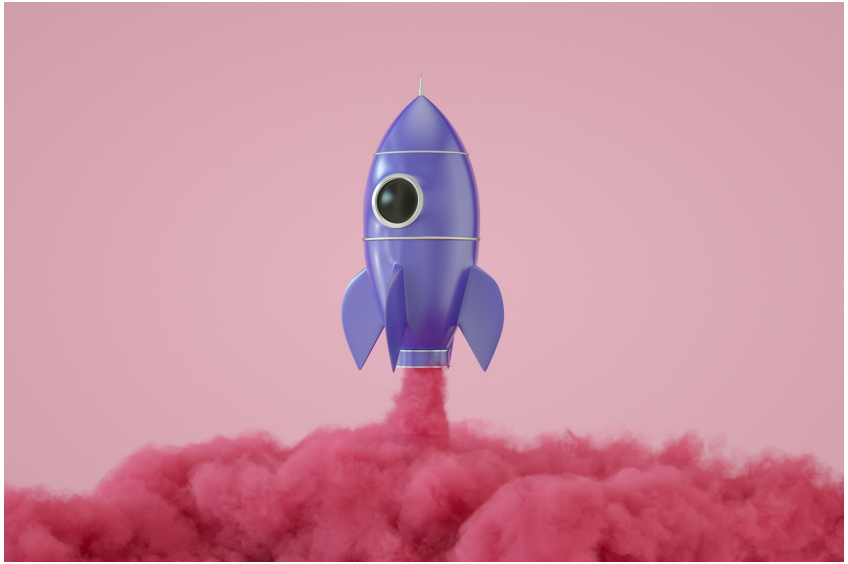
Current update (2)

- A wealth of new learnings from regulation-complaint MMV programmes are expected over the next few years – this seems like an opportune time to consider a more extensive update to the monitoring selection tool
- The current update includes seeking feedback from the CO_2 storage monitoring community on what improvements they would like to see in this proposed update



Future proposed update

- Based on the feedback from the current update phase, BGS will propose improvements to the tool for implementation the medium-term (funding tbc)



Initial feedback from interviews

Questions asked at interviews

Technical content
How and how often do you use the tool within projects?
What are your expectations for the tool?
Which aspects of the current tool do you use?
Does the tool provide all info that you are looking for? Is there any additional info that you are looking at? Should anything be removed?
Should tools from the complete Technology Readiness Level range be included, or should focus be on tools already used at full scale storage sites?
Do you need more explanations for the terminologies used in the tool?
Does the approach of the tool need to be modified (eg current version starts with storage site physical conditions and then monitoring aims)
Any other comments on technical content?

User experience questions
Did you have any difficulties while using the tool?
When you are starting a new search, what are the main criteria you would use?
Have you ever used a product similar to this one? What could we learn that might improve a future version of the monitoring tool?
Do you need an option to save the current scenario that you are creating inside the tool?
What sort of device (PC/Laptop, mobile phone or tablet) would you expect to use when using the monitoring tool?

Who uses the tool and for what?

- Audience: who is using the tool?

- Technical background
- Universities – students use the monitoring selection tool and scenario generator
- Research institutes – see what the latest is on monitoring tool use and development opportunities (esp bibliography)
- Project developers – see latest developments in new tools (and new project developers can see what is tried and tested) (sense check)

Overall comments

- Generally positive – tool is useful
- Approach should be more risk-led
- Tool catalogue and references great for all audiences
- Good to see which tools have been applied at which sites/scales
- Content needs updating – more case studies and references
- Include tools of all maturity/technology readiness level = yes

What to change (1)

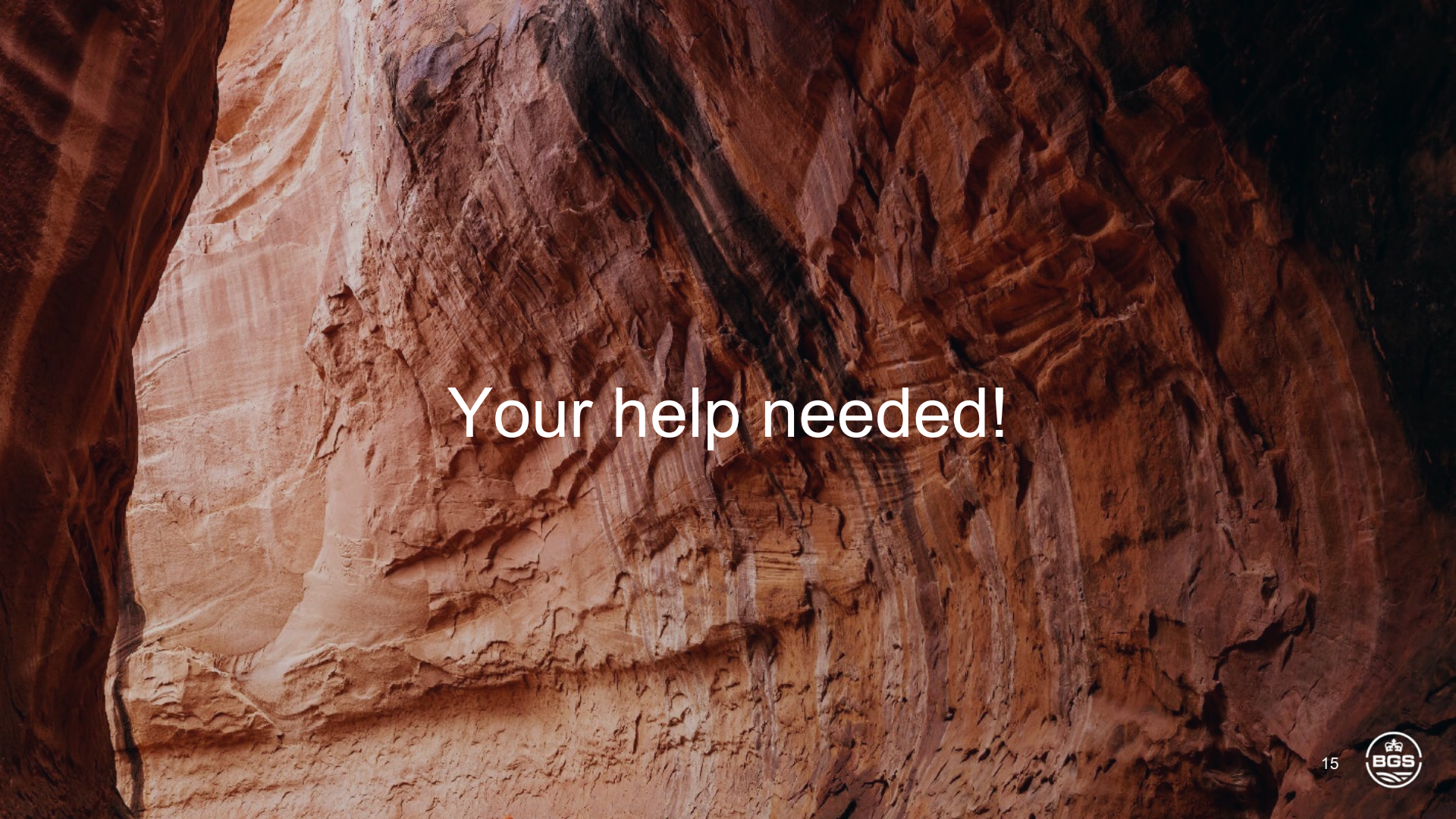
- More risk led approach – focus on eg wells, induced seismicity, pressure
- Aim of monitoring usually either containment, assurance, performance. Think about who uses info; operator, regulator. Maybe break output into those three areas and give relative importance depending on their aims
- Can you explain more on why recommendation is high/low priority when you run the scenario?

What to change (2)

- Be clear about scale of site where tools have been used - tool maturity – want to understand if tools are tried and tested or more at research and development phase
- New operators want to find info about what other projects have used – ie what have other governments approved in terms of monitoring?
- What about tool packages – eg complementarity of tools instead of thinking about tools in isolation, strengths and weaknesses of techniques
- Include how often have to apply technique – impacts costs & therefore if will use tool
- More references – can you update bibliography every week?

What to change (3)

- Rather than saving scenario, have input/output file
- Make the tool more Google/search friendly, more marketing to improve visibility
- Consider how to link to external complementary resources – e.g. environmental monitoring tool (STEMM-CCS)


Your help needed!

Please provide your thoughts on how the online monitoring selection tool could be improved

A monitoring selection tool

Ceri Vincent, Shwetha Raveendran, Helen Taylor

British Geological Survey

BACKGROUND

The IEAGHG monitoring selection tool was first developed in 2005. The aim was to identify and prioritise techniques that could form part of a CO_2 storage site measurement, monitoring and verification (MMV) programme.

The approach taken was to enable the user the set out a monitoring scenario (e.g. depth, injection rate, location) and the scenario would then be run by the user and offer a prioritised list of "core" and "optional" tools.

The selection tool also contains an extensive monitoring tool catalogue, case studies where different monitoring tools have been used, and a list of sites where CO_2 has been injected or leakage has been studied.

The monitoring selection tool has been updated every few years to keep the content current.

The content is currently being updated to add new references and case studies in the tool catalogue.

FIND THE MONITORING SELECTION TOOL HERE:

https://ieaghg.net/ccs-resources/monitoring-selection-tool

Approach & user interface

FUTURE DEVELOPMENT

As the number of CO_2 storage projects is rapidly expanding, over the next few years new storage licences will be issued. This will bring a wealth of new case studies and new examples of regulation compliant MMV programmes for industrial CO_2 storage sites.

A more extensive update to the monitoring selection tool is therefore proposed. This would incorporate information on new CO_2 storage project MMV programmes as well as an update to the functionality and interface of the tool.

As part of the current study, we are seeking views from the CO_2 storage monitoring community on what improvements they would like to see.

YOUR HELP NEEDED!

A survey will shortly be released (summer 2024) seeking your views on how to improve the monitoring selection tool. If you'd be willing to contribute, please drop your business card or an email address in the folder below and we'll be in touch. Meanwhile, please use a post-it to tell us one thing you would improve around the following aspects:

- Approach of the tool
- User interface
- Benchmarking
- Tool prioritisation
- Tool catalogue
- Case studies & sites
- Technical content you would add/remove?

Tool prioritisation for user-provided scenario

Ceri Vincent cvi@bgs.ac.uk & Helen Taylor hraylor@bgs.ac.uk

www.bgs.ac.uk

Stick post-it notes to the poster with comments

Leave your business card/email address at the poster to be contacted about the online survey

Online survey coming soon! (summer 2024)

Panel session coming up – any immediate thoughts?!

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Thank you for your time