



## In-Situ Laboratory Initiative: CCS technology demonstration site

Storing carbon dioxide in deep geological formations, known as Carbon Capture and Storage (CCS), can help reduce atmospheric emissions and support the transition to lower-emission industries. At the In-Situ Laboratory, CSIRO is investigating crucial CCS monitoring technology and systems to provide science-based evidence to support the development of cost-effective, reliable and safe CCS projects.

### Climate Dilemma

Decarbonising transport, energy, and hard-to-abate sectors is key to lower emissions to net zero while sustaining Australia's prosperity. For over 20 years, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) has led research into decarbonisation and emissions reduction technologies.

The storage of carbon dioxide at a commercial scale in deep geological formation is one of a range of options being considered to reduce atmospheric emissions while enabling a reliable and smooth transition to lower emissions industries and economy. Especially, CCUS can play a critical role in decarbonising unavoidable emissions generated from sectors with limited cost-effective options to reduce their emissions.

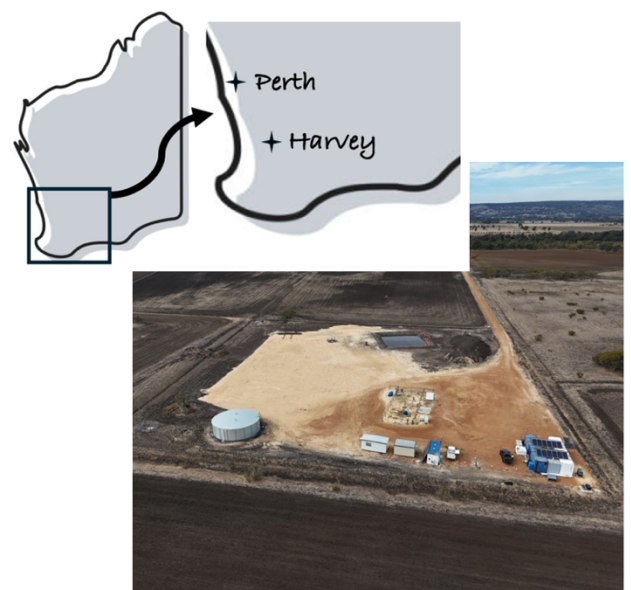
To advance the development of cost-effective, reliable and safe CCS projects, CSIRO explores crucial geological uncertainties and monitoring and verification technologies.

### In-Situ Laboratory Initiative

The ISL research facility plays a crucial role in understanding and addressing risks, communicating research, increasing science-based awareness with local landowners and regional communities, and informing the Government's policies towards CCUS development and deployment in Australia. The research facility also provides a long-term field site for domestic and international education and training, capacity development, and technology testing in the CCS environment.

The ISL research facility is located near the Harvey town, 120 km South of Perth. The facility is located above a major fault structure which has been intersected and characterized by the Harvey 2 well drilled in 2014.

The ISL initiative is a collaboration between CSIRO, Commonwealth Department of Industry, Innovation and Science (DIIS, CCS RDD fund CCS49360), the Western Australia Department of Energy, Mines, Industry Regulation and Safety (WA DEMIRS) and the Research Institute of Innovative Technology for the Earth (RIITE).



In Situ Laboratory, located in the Shire of Harvey, 140km south of Perth, Western Australia

## Carbon Capture and Storage near fault systems

At the outset, geological carbon storage projects typically focus on steering clear of fault systems to minimize potential migration risks.

However, as the number of such projects expands, the likelihood of the injected CO<sub>2</sub> encountering fault systems rises. This shift necessitates a deeper understanding of how CO<sub>2</sub> interacts with these geological features.

To address this challenge effectively, it is crucial to thoroughly characterise, forecast and monitor the potential impacts of these interactions on the integrity of storage sites. Developing advanced methodologies to address and mitigate associated uncertainties will become increasingly important.

Affordable and reliable monitoring systems to detect and manage residual risks will be essential for ensuring the long-term safety and success of geological carbon storage initiatives.

This comprehensive approach will help maintain the reliability of storage solutions and support broader efforts in reducing greenhouse gas emissions.



CSIRO team checking a wellhead at In Situ Laboratory

## Collaboration at the forefront

Our facility frequently welcomes an international audience, including industry organizations, research agencies, and government departments, to showcase technologies with global applications. These events and partnerships provide a platform to demonstrate innovations that are poised for deployment on an international scale, reflecting our commitment to advancing technological solutions that address the global challenge of lower emissions to net zero while sustaining prosperity.

In parallel, Australia and Japan are collaborating closely to achieve a net-zero emissions future through the Japan-Australia Partnership on Decarbonisation through Technology. This partnership aims to leverage the strengths of both nations in developing and implementing cutting-edge decarbonisation technologies, underscoring a shared commitment to reducing greenhouse gas emissions and fostering sustainable development on a global scale.

## Working with RITE

The Research Institute of Innovative Technology for the Earth (RITE) is a Japanese research organization focused on developing and promoting advanced technologies for environmental conservation and sustainable development, including carbon capture and storage.

The collaboration between CSIRO and RITE at the In-Situ Laboratory is pivotal for advancing carbon capture and storage technologies, with a particular focus on monitoring technologies, understanding fault systems and their impact on underground CO<sub>2</sub> storage. By working together, these esteemed organizations combine their expertise to investigate how faults and geological formations interact with injected CO<sub>2</sub> and demonstrate innovative monitoring technologies, a critical factor in ensuring the safety and efficacy of long-term carbon storage.

This joint effort enables more precise modelling and management of fault-related risks, leading to enhanced techniques for mitigating potential leakage and improving storage reliability. The insights gained from this research are essential for refining storage methods and developing robust monitoring systems, thereby contributing significantly to global efforts in reducing greenhouse gas emissions and achieving climate goals.

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