



GREENHOUSE GASES AND AIR QUALITY

GISERA | Gas Industry Social and Environmental Research Alliance

Understanding what controls and contributes to methane emissions from coal seam gas water holding ponds in the Surat Basin, Queensland

CSIRO scientists are studying the various roles that methane-producing and methane-consuming microbes, algae, brine and sediment play in the methane emission contributions of water holding ponds in the Surat Basin.

Little is known about what controls or contributes to methane emissions from coal seam gas (CSG) water holding ponds. In this study, CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA) will fill critical knowledge gaps, and help improve the community's understanding of the potential greenhouse gas (GHG) emissions from CSG activities.

Research objectives

This study aims to:

- understand the microbes that produce and consume methane in CSG water holding ponds and brine ponds
- understand the different forms of carbon pools that are present in CSG water holding ponds
- understand whether algae may play a role in increasing methane emissions in holding ponds
- share results from this and related studies with the public.

The Surat Basin, southern Queensland

South-east Queensland hosts the largest CSG producing fields in Australia. The number of wells in Queensland is expected to reach 22,000 by 2050. The Surat Basin is one of two key reservoirs, and the focus area for this study.

Key points

- Communities in the Surat Basin are concerned about GHG emissions from CSG operations.
- More than 80 CSG water holding ponds are operating in Queensland.
- There are critical knowledge gaps about what increases or decreases the methane emissions from these ponds.
- CSIRO scientists will study the role that methane-producing and methane-consuming microbes, algae, brine and sediment play in methane emissions from CSG water holding ponds in the Surat Basin.
- Understanding the whole lifecycle of methane emissions from CSG water holding ponds will help find ways to manage emissions.
- This project runs in parallel with another related GISERA project which will directly measure methane emissions from CSG water holding ponds.



CSG water holding ponds and methane

CSG water holding ponds are small, constructed ponds. The CSG industry uses these ponds to hold water from various stages of water management during CSG production. A brine pond is a type of CSG water holding pond that has high concentrations of dissolved salts and other minerals.

In Queensland, there are more than 80 operational CSG water holding ponds. Water holding ponds produce methane. But there is little data on the processes that control or contribute to methane levels in these ponds.



A CSG water holding pond and treatment facility in Queensland.

What controls or contributes to methane?

Microbes (small organisms) live in CSG water holding ponds. Some microbes break down complex carbon-containing compounds to smaller compounds. And, in airless environments – called ‘anoxic zones’ – these smaller compounds accumulate in the ponds as methane.

Methane produced in anoxic zones makes its way through the water column and into the atmosphere as bubbles or as methane dissolved in the water. But certain microbes can ‘eat’ this methane before it escapes – in some instances, microbes can virtually eliminate methane from waterbodies. This project will examine the balance between microbes that produce and consume methane in CSG water holding ponds and brine ponds.

Scientists will investigate where carbon is pooling in the water holding ponds. Sediments may be a large source of carbon for methane-producing microbes.

Scientists will also study whether algae in CSG water holding ponds contribute to methane emissions.

Study results will improve understanding of how carbon is mobilised by various microbes and algae in CSG water holding ponds to generate methane emissions.

Building on previous studies

The 2023 GISERA Phase 1 desktop study project ‘[Methane contributions from holding ponds](#)’ indicated that CSG water holding ponds in the Surat Basin may be a source of GHG emissions.

But limited data is available on emissions from holding ponds in CSG regions, and there is currently no data on the presence of methane-producing or methane-consuming microbes in CSG water holding ponds.

This project is one of two GISERA Phase 2 projects exploring GHG emissions from CSG water holding ponds. The other Phase 2 project focuses on [direct measurement of methane emissions](#) from CSG water holding ponds.

Research activities

CSIRO scientists will:

- consult with CSG companies to select and provide access to one CSG water holding pond and one brine pond
- collect samples from the selected ponds, including samples for water chemistry, microbial profiling, algae and sediment studies, and the identification of carbon pools. Water will be collected at the surface, middle and bottom of the ponds
- extract the DNA of the water and sediment samples, providing the first set of microbial and algal community data from CSG water holding ponds
- use specialist techniques to identify carbon pools, characterise sediments from the ponds, and investigate the extent to which algae contribute to GHG emissions
- liaise with regional community and government stakeholders to discuss implications of the results of this study.

More information

[Read more about this study](#), the companion project [investigating methane fluxes](#), and the original [Phase 1 desktop study](#).

Find out more about [other GISERA research projects in Queensland](#).

Further information | 1300 363 400 | gisera@csiro.org.au | gisera.csiro.au

GISERA is a collaboration between CSIRO, Commonwealth and state governments and industry established to undertake publicly-reported independent research. The purpose of GISERA is to provide quality assured scientific research and information to communities living in gas development regions focusing on social and environmental topics including: groundwater and surface water, greenhouse gas emissions, biodiversity, land management, the marine environment, and socio-economic impacts. The governance structure for GISERA is designed to provide for and protect research independence and transparency of research.