



GREENHOUSE GASES AND AIR QUALITY

GISERA | Gas Industry Social and Environmental Research Alliance

Understanding the sources of methane emissions from the Western Downs Region in the Surat Basin, Queensland

This project will determine the potential sources of methane in air samples collected in the Western Downs Region of Queensland by using innovative sampling and analytical methods developed by CSIRO.

Methane is the main component of coal seam gas (CSG). In the CSG-rich Western Downs region of Queensland, there are gaps in our knowledge about the various sources of methane.

CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA) will undertake research designed to fill these gaps.

Key points

- The Surat Basin in Queensland hosts some of Australia's largest CSG fields. Methane, a greenhouse gas, is the main component of CSG.
- Communities in the Western Downs region of the Surat Basin are concerned about methane emissions and associated environmental impacts.
- There are knowledge gaps about the different sources of methane in the region.
- CSIRO scientists will collect air samples from methane emitting sites and facilities in the study area.
- They will use cutting-edge science (carbon and hydrogen isotopic fingerprinting) to identify the sources of methane.
- Understanding and managing methane emissions is important to a broad range of stakeholders, including local communities, regulators and CSG operators.

Research objectives

In this project CSIRO scientists will collect air samples at selected sites and facilities in the study area, and then determine the different sources (both human-made and natural) of methane. This will be done by using carbon and hydrogen isotopic signatures.

To survey the concentration of methane in the study area, scientists will take measurements close to a range of sources. The project will pinpoint known and previously unidentified sources of methane.

CSIRO scientists will improve sampling strategies by combining ground-based mobile survey techniques with aerial (drone) sampling, using air canisters for capturing samples.

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 hosts significant CSG reserves in Queensland, and is the focus area for this study.





This study will use isotopic analysis to identify sources of methane emissions, such as CSG processing operations, cattle grazing, feedlots, wastewater treatment and landfill operations, and natural sources such as wetlands and seeps.

Methane and where it comes from

Methane is an odorless, colorless, flammable greenhouse gas. It has a global warming potential 30 times greater than carbon dioxide over a 100-year period.

Methane is generated by a range of sources, including human activity (e.g., from the gas industry, agriculture, or landfill systems) and natural sources (e.g., wetlands).

Methane is the main component of coal seam gas. But cattle grazing land and feedlots are often located near CSG facilities, so we need highly-accurate ways to identify various methane sources.

Scientists use 'isotopic fingerprinting' to help track and trace sources of methane. Different sources of methane have different isotopic signatures – in other words, distinct ratios of carbon and hydrogen isotopes. (An isotope is an atom with a different number of neutrons.) These isotopic signatures can be used as fingerprints to determine the source of gas.

Site selection and field surveys

CSIRO scientists will work with representatives from industry and local communities in the Western Downs region to select specific sites and facilities which potentially represent different sources of methane emissions. Sites will include facilities and infrastructure associated with the gas industry, agriculture and livestock activities, and wastewater treatment, swamps, natural methane seeps, and landfills.

With the sites selected, scientists will conduct field surveys from late 2024 to early 2025.

Scientists will carry out ground-based mobile surveys at the selected sites and facilities using a vehicle fitted with sensitive gas detection equipment. This instrument monitors methane concentrations in real time.

If the scientists detect methane plumes at this time, they will also collect air samples in canisters. They will take air samples at ground level and at 30 meters above ground level, using a drone. These samples are for isotope analyses. Collection of samples in high integrity air canisters will ensure extended storage times without alteration of the gas components.

Scientists will then compile methane measurement data from past CSIRO surveys conducted in the study area.

Finally, scientists will analyse the collected air samples. Together, this will provide the isotopic fingerprints of methane in the air samples on a custom-built instrument at CSIRO laboratories. The analysis of methane in air (typically only a few ppm) is challenging for normal isotope ratio instruments due to detection sensitivity limits which are overcome by the unique instrument design.

Building on previous studies

This study aims to build on results of previous CSIRO studies of atmospheric methane in the Western Downs region.

One study for example, [Characterisation of Regional Fluxes of Methane in the Surat Basin, Queensland](#), found that sources of methane in the Western Downs region were cattle grazing (54%), feedlots (24%), CSG processing operations (8.4%) and other sources (13.6%) (Luhar et al, 2018).

This project will adopt new and improved methods for sample collection at or close to the methane source, which will involve liaison with CSG operators and landholders to gain access. Data collected in this project will also allow scientists to use and reinterpret data from previous studies.

In summary, this project aims to provide an improved scientific understanding of the source of methane emissions through a comprehensive sampling strategy coupled with methane isotopic fingerprinting.

More information

Find out more [about this study](#)

Learn more about other [GISERA studies in Queensland](#)

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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.