



LAND AND INFRASTRUCTURE

GISERA | Gas Industry Social and Environmental Research Alliance

# Analysing seismic activity in the Beetaloo Sub-basin

This project will characterise current seismic activity within the Beetaloo Sub-basin. The baseline can then be used to distinguish any potential increase in seismic activity caused by unconventional gas development in the region.

## Key points

- The project will establish a long-term baseline seismic monitoring catalogue.
- This will consider current natural seismic activity and existing cultural seismic noise sources such as quarry blasts.
- No new seismic station installations will take place; instead, the project will use existing seismic datasets from a range of sources.
- The project will provide important information to communities, industry and regulators.

CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA) is undertaking a project that will use existing data about seismic activity in the Beetaloo Sub-basin to build a baseline earthquake activity catalogue for the region.

This catalogue can then be used in future to identify any increases in seismic activity that result from gas development and operations in the region.

In addition, the project will use physics-based ground motion computations to predict the seismic hazard caused by any future natural and induced activities in the Beetaloo Sub-basin.

The resulting models will provide estimates of any ground shaking that might affect communities or infrastructure in various earthquake scenarios.

## The Beetaloo Sub-basin

The Beetaloo Sub-basin lies south-east of Katherine in the Northern Territory and spans an area of about 30,000 square kilometres.

The estimated gas resources for the Beetaloo Sub-basin are of similar size to other major gas producing basins in Australia, such as the Surat Basin in Queensland and the Bonaparte/Browse basins in Western Australia.

If an onshore gas industry is developed in the Beetaloo, it is expected that hydraulic fracturing technologies will be used.

The process is known to create weak seismicity as fluids are injected at high pressure into target rock formations.

## Establishing a baseline

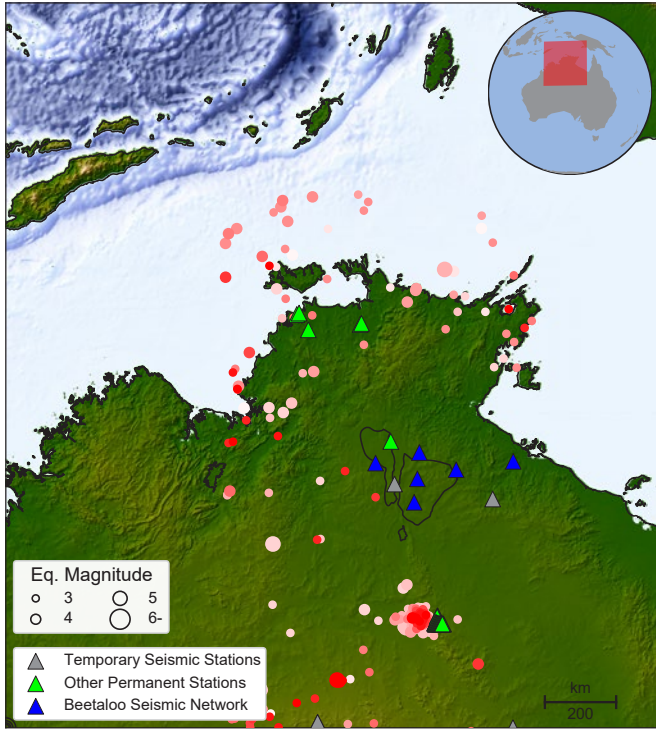
The background seismic activity of the Beetaloo Sub-basin is still largely unknown due to the lack of previous instrumentation coverage. GISERA's project aims to help close that knowledge gap.

Monitoring background seismicity at the early stages of development of the basin will provide a baseline that may allow seismicity induced by gas development to be distinguished from natural seismicity.

Establishing this baseline is the primary aim of the project.



## Seismicity & Monitoring Stations-Beetaloo Basin & Surroundings



## Using existing datasets

Since mid-2021, Geoscience Australia (GA) has been operating a seismic broadband array in the Beetaloo Sub-basin and the data from this array is publicly available.

Researchers will use the continuous seismic collected by GA data to create a background catalogue of natural earthquakes and other seismic activity such as quarry blasts in the region.

The project will use datasets from:

- current seismic stations
- previously operated seismic stations
- resource industry datasets collected by operators as part of hydraulic fracturing operations.

State-of-the-art techniques will be applied to detect much smaller earthquakes and seismic events that do not currently fall under the remit of GA's work.

## Estimating earthquake hazard

Because of the relatively sporadic seismic activity in Australia, and sparse station coverage across the continent, it is often not easy to estimate earthquake hazard.

The hazard is a combination of the earthquake's character (rupture mechanism, magnitude, depth and distance), the Earth's subsurface structure, and the condition of the surface infrastructure.

Earthquake hazard in the Beetaloo Sub-basin is another knowledge gap to be addressed by this research.

In addition to characterising the background seismicity of the region, researchers will use modelling to predict the effect of earthquakes that might be caused by hydraulic fracturing or natural events.

They will use the datasets to construct a subsurface physical model of the Beetaloo Sub-basin, before conducting physics-based ground motion characterisation.

These predictions of various earthquake scenarios will provide an overview of what kind of shaking could be felt by nearby communities, and whether there is potential for impacts on infrastructure.

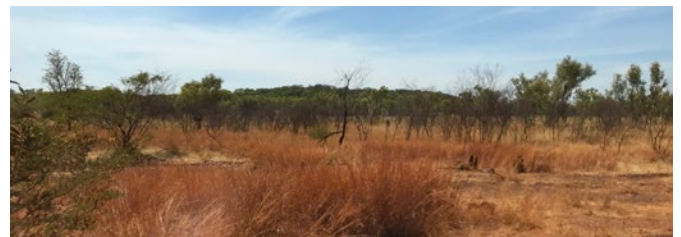
## Project outcomes

This project will provide important information to stakeholders in the Beetaloo Sub-basin, including communities, industry and regulators.

Baseline data about seismic activity in the region will enable easy identification of any potential increase in seismic activity due to future gas extraction activities.

Predictions of earthquake hazard will give insights into the expected impacts of natural and induced earthquakes, and can be used to help with future management and planning.

Researchers will make their findings publicly available.



## More information

- Find out more about the [Background Seismicity of Beetaloo Sub-basin project](#)
- Read about other [GISERA projects](#) in the Northern Territory
- Learn about other [Land and Infrastructure research](#)

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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.