



GISERA | Gas Industry Social and Environmental Research Alliance

Putting land management knowledge into practice in the Northern Territory

CSIRO scientists have used modern data visualisation techniques to create a virtual landscape of an area within the Beetaloo Sub-basin, helping land managers and decision makers to understand potential environmental risks from onshore gas development.

Key points

- This project was designed to use knowledge gained from other GISERA projects and apply that to agricultural land management in the Northern Territory.
- One key component of the project was demonstrating the digital twin approach – creating a virtual landscape of a specific area – to help inform decision makers and land managers.
- A second component was using existing research communication tools – including reports, fact sheets and animations – for stakeholder engagement.
- This project developed a digital twin for a case study area of 256 km² to demonstrate the value of this approach for a region undergoing early gas exploration.
- The project demonstrated the effectiveness of modern digital tools for identifying and communicating risks within the landscape.

Understanding landscape processes in the Beetaloo Sub-basin can help land managers in agriculture and the gas industry to design and place infrastructure in a way that protects surface water and vegetation, and reduces erosion, soil damage, and dust.

Minimising potential surface impacts, including on wet season surface water flows and erosion, are important aspects of environmental management in the Northern Territory.

CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA) has recently completed a project to evaluate the research that has taken place for gas development elsewhere in Australia, and apply that to agricultural lands in the Northern Territory.

The project sought to develop and apply appropriate tools to support informed decision making by farmers, regulators and the gas industry in the Northern Territory.

Shale gas and the Northern Territory

The Beetaloo Sub-basin is around 180 km southeast of Katherine in the Northern Territory and spans approximately 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.

In 2018, GISERA partnered with the Northern Territory Government to deliver independent and transparent research on gas development. This included assisting Northern Territory communities through the provision of high-quality spatial data.

Header image: This high resolution terrain map shows how digital twin technology can map water flow paths over actual terrain in the Northern Territory.



Using digital twins to understand complex processes

A digital twin is a virtual model of a physical landscape. The use of digital twins in communicating issues arising on agricultural lands during gas development is well established.

Many landscape processes, including hydrology, soil loss and pasture dynamics, can be impacted by the development and construction of gas infrastructure.

Because these processes often occur over large scales in space or time, they can be hard to see with the naked eye and are not always easily understood.

Developing high quality spatial data and encouraging stakeholders to interact with that through a digital twin is one way to improve understanding of landscape processes and the best land management practices to mitigate risk.

In particular, this GISERA project sought to help land managers and gas developers to:

- understand wet season surface water flows so that erosion risks can be managed
- identify existing farm infrastructure and any existing environmental issues such as erosion threats or grazing pressures
- determine the locations of surface water features such as dams or watering points whose quality must be maintained
- determine pasture condition across a development area to highlight zones that may be vulnerable to disturbance
- understand variation in soil types and management requirements.

Research activities

This project developed a digital twin for a case study area of 256 km² to demonstrate the value of this approach for a region undergoing early gas exploration.

The case study included a range of environmental conditions (soils, vegetation, hydrology) in an area of proposed gas development.

Project methods built on research previously completed coal seam gas developments in Queensland.

It included techniques such as photogrammetry to derive high resolution soil surface elevation maps for the case study area; high resolution terrain analysis to map water flow processes and likely erosion risks; soil characterisation; and analysis of long-term satellite data to develop land condition scores – a standard measurement within the northern grazing industry.

The project demonstrated the effectiveness of modern digital tools for identifying and communicating risks within the landscape.

This approach is particularly helpful in remote locations such as the Beetaloo Sub-basin, as direct environmental observations are challenged by the scale of the region and the lack of wet season access.

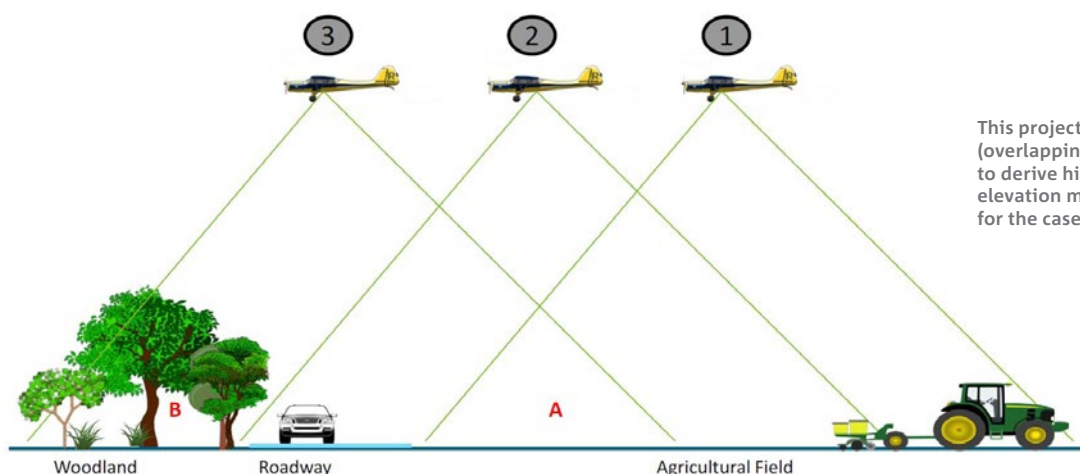
While the use of a small-scale case study was useful for demonstration purposes, the research team concluded that greater efficiency and quality may be possible using larger scale application of digital twin technology across an entire gas development.

In terms of a broader communication strategy and engagement with key agricultural stakeholders in the NT, the research team worked closely with the Northern Territory Cattleman's Association (NTCA) to develop a plan for using other relevant communications tools, including factsheets, videos and presentations.

More information

Read more [about this project](#)

Learn about [other GISERA studies in the Northern Territory](#)



This project used aerial photogrammetry (overlapping electronic images 1, 2, and 3) to derive high resolution soil surface elevation maps (A) and ground cover (B) for the case study area.

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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.