Australia's National Science Agency

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**GISERA** | Gas Industry Social and Environmental Research Alliance

# Drones and satellites to monitor habitat in the Northern Territory

CSIRO scientists will use drones (UAVs) fitted with LiDAR sensors to map key areas of the Beetaloo Sub-basin over repeated intervals. This will show any changes in habitat structure over time, and help calibrate satellite-based assessments of change.

Community concerns about gas development in the Beetaloo Sub-basin include the potential for long-term impacts on biodiversity. Through the CSIRO's Gas Industry Social and Environmental Research Alliance (GISERA) this research will produce high-quality 3D LiDAR datasets to help estimate any changes in the area's habitat over time.

## Key points

- The Beetaloo Sub-basin contains large shale gas resources and has been identified as a potential area for onshore gas production.
- The community has concerns about the potential for long-term impacts of gas development on the biodiversity of the Beetaloo Sub-basin, including degradation, fragmentation and habitat loss.
- Accurate and scalable tools are needed to monitor the habitat so that landowners, regulators, and other stakeholders have confidence that important characteristics of the ecosystem are being preserved.
- CSIRO scientists will use drones (UAVs) fitted with LiDAR sensors ('UAV-LiDAR') to map the habitat of key areas of the Sub-basin over repeated intervals.
- The study will develop a scalable approach for monitoring the structural condition of vegetation.
- These data provide an important baseline prior to resource development, and improve the satellite monitoring of the Beetaloo Sub-basin.

## Research objectives

This project aims to develop a scalable approach to monitor changes in the structural condition of vegetation.

The project will focus on two key areas of interest:

- Trends in the vegetation status in critical habitats (e.g., ground water dependant ecosystems, threatened species habitat, bullwaddy patches); and
- Trends in vegetation along newly established edges (e.g., the perimeter of well-pads and access roads).

Beyond providing these local-scale assessments around well pads or other infrastructure, scientists will also test the potential for upscaling this method to cover larger areas, via satellite-based remote sensing platforms.

The ability to monitor vegetation change over time using remote sensing techniques will improve biodiversity management throughout the Beetaloo Sub-basin.

## Beetaloo Sub-basin and gas production

The Beetaloo Sub-basin lies southeast of Katherine in the Northern Territory. Covering 28,000km$^2$, it is identified as a potential area for onshore gas production.

The development of a gas industry in the Beetaloo Sub-basin has potential to impact on terrestrial biodiversity, ecosystem function and landscape amenity. Communities have raised concerns about these impacts.

CSIRO | Australian Government Department of Industry, Science and Resources | NSW Government | Supported by Government of South Australia | Queensland Government | Northern Territory Government | origin | Australia Pacific LNG | QGC | Santos

## How do you measure habitat change?

Habitat is a place where plants and animals live. Habitats that are more complex (for example, with plants of different heights and ages) are often associated with a greater abundance and diversity of animals.

A reliable estimate of habitat change is critical to monitor the effects of resource development and to minimise adverse consequences for biodiversity.

Scientists have used several ways to measure the health or 'condition' of habitat at a specific point in time. Traditional monitoring approaches rely on field-based estimates of habitat condition. But these approaches are limited in the area and time period that they cover. LiDAR overcomes these limitations by accurately monitoring habitat condition over large areas, and over longer time periods.

## Using UAV-LiDAR and remote sensing

LiDAR (Light Detection and Ranging) refers to a method of capturing 3D survey data. A LiDAR sensor sends out laser pulses which reflect off objects such plants, creating a precise, accurate point cloud 'map' of an area.

This study will use a high-precision LiDAR sensor attached to an aerial drone: a UAV (Uncrewed Aerial Vehicle). UAV-LiDAR technology can now enable the 3D reconstruction of landscapes and vegetation (habitat) in fine detail, over large spatial areas.

UAV-LiDAR also provides a bridge between what can be collected in the field, and what can be estimated from space. It provides a robust snapshot of habitat condition at a point in time. This can then be used to help calibrate and validate satellite remote sensing products.

## Building on previous studies

The 2021 Geological and Bioregional Assessment (GBA) for the Beetaloo region noted that habitat degradation, fragmentation and loss have the potential to impact on a broad range of environmental values.

The 2022 Strategic Regional Environmental and Baseline Assessment (SREBA) for the Beetaloo Sub-basin collected extensive new baseline data. It provides a reference point for ongoing monitoring, and cited the need for a regional monitoring framework for the Beetaloo Sub-basin. This project has been developed to partly fill this key gap.

To date there have been limited UAV-LiDAR surveys undertaken in the Beetaloo Sub-basin to characterise its habitat condition.

This project will leverage the extensive field data collection undertaken by the NT Government and other partners under SREBA, as well as new insights gained into fragmentation patterns from recent CSIRO GISERA projects.

**Sky-high science: CSIRO researchers will use drones fitted with high-precision LiDAR sensors to measure habitat condition**

## How will the research be conducted?

Over 2023 and 2024, CSIRO scientists will:

- Choose sites in two settings: undisturbed habitat subject to seasonal changes, and habitat surrounding sites that have been cleared for development.
- Use high-precision UAV-LiDAR remote sensing to map these sites of interest at repeated time intervals (approximately every three months). This will be used to assess changes in habitat structure through time.
- Use these 3D temporal datasets to test the sensitivity of different satellite sensors for detecting patterns of system dynamics and to develop a scalable method to monitor habitat change over larger spatial areas.

By combining high-quality 3D data at a local scale and well-calibrated satellite data over larger scales, this study will provide a method that could be used to help determine the effectiveness of mitigation measures and regulatory controls on vegetation management leading to biodiversity benefits over large scales.

## More information

Find out more about this project

Read about other GISERA projects in the NT

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



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