



Northern Territory Low Emission Carbon Capture Storage and Utilisation Hub CCUS hub concept specification

CSIRO in collaboration with the Northern Territory Government has developed a concept level overview for the CCUS hub that outlines potential components and requirements.

This report has been delivered as part of the Northern Territory Low Emission Carbon Capture Storage and Utilisation (CCUS) Hub Business Case project.

The report builds understanding of the concept level design for the CCUS hub, including infrastructure elements within the Middle Arm Sustainable Development Precinct (MASDP); CO₂ import facilities; pipeline system; and storage locations.

It also provides indicative costs for a range of phased development scenarios.

The low-emission opportunity in the Northern Territory

The Northern Territory's abundant natural gas, solar resources, and CO₂ storage potential, along with its proximity to international markets, make it a key player in energy exports and decarbonisation in Australia and the region.

The NT Government has adopted a 2050 net-zero emissions target and is seeking ways to rapidly decarbonise existing energy supplies and attract future zero-emission industries.

Capital city Darwin, a gateway to South-East Asia and the location of globally significant liquid natural gas (LNG) export and industrial activity, is the proposed site for a large-scale Low Emission CCUS Hub. Led by CSIRO, a collaboration is underway on a business case project assessing the Hub's viability on the Middle Arm Peninsula.

If realised, the NT CCUS Hub could be one of the world's largest multi-user, multi-access hubs. One of the aims of the business case project is to identify transition pathways for industry in the region by sharing knowledge and experience that will help improve the likelihood of success. By taking a collaborative and regional view, an accelerated and sustainable industry transition can be explored.

The Northern Territory CCUS business case project

- CSIRO is working to identify decarbonisation and transition pathways for existing and potential future industries that may be established in a Low Emissions Hub in the Darwin region of the NT.
- We are working collaboratively with the NT Government and industry on the business case project to assess the viability of a large-scale low-emission CCUS Hub on the Middle Arm of Darwin Harbour.
- This project is also investigating other decarbonisation opportunities as well as CCUS. These include including sector coupling and renewable electrification.
- Task 6 of this project was to provide a 'concept level' overview of the components and requirements of a potential CCUS Hub that could be used as a basis for future, more detailed studies.
- This report builds on the work undertaken for Task 0, which developed a technical definition basis and reference case for the CCUS hub in consultation with industry and government stakeholders.

Developing a concept level design

Developing a concept level overview of the components and requirements of the potential NT Low-Emission CCUS Hub is an essential step that builds understanding of system boundaries, shared infrastructure needs, and high-level costs.

This Task 6 report serves as an intermediate step that builds on the technical definitions and reference case developed in Task 0, and provides a broad understanding of the system-level considerations that will be required during detailed design and development.

This includes: a high-level scan of the main design codes and standards, a discussion of CO₂ quality and specifications, a system overview, a breakdown of the major elements of the CCUS hub, and high-level cost estimations.

Its purpose is to provide a starting point for the more intensive and thorough investigations into design, risks and costs that will follow.

The report draws heavily on data that provided to CSIRO by the Northern Territory Government, in particular the Wood and GHD studies commissioned by the Department of Infrastructure, Planning and Logistics. Data from industry stakeholders has also been incorporated where available.

Key findings

The concept level design of a CCUS hub requires an understanding of the inclusions of sources and sinks of CO₂, as well as the connective infrastructure such as export pipelines and a liquid CO₂ receiving and storage terminal.

For the purposes of this study, researchers used the NT Government's 'Balanced' industrial development scenario, which represents the widest mix of anticipated industries situated in the Middle Arm Sustainable Development Precinct. From this range of industries, the CCUS infrastructure demand could be derived.

For each of the industries included within the Balanced Scenario – which include LNG, hydrogen, methanol, ammonia, urea, ethylene, CCUS and critical minerals processing – the maximum volumes of CO₂ required for transport and storage were assessed. This identified a maximum projected capacity requirement of around 9.1 Mtpa of CO₂ from MASDP industries.

There is potential for additional CO₂ to be imported to the CCUS hub through a liquid CO₂ receiving and storage terminal: starting with an initial processing capacity of 0.5 to 1 Mtpa and expanding progressively to 5–6 Mtpa to align with forecast demand growth.

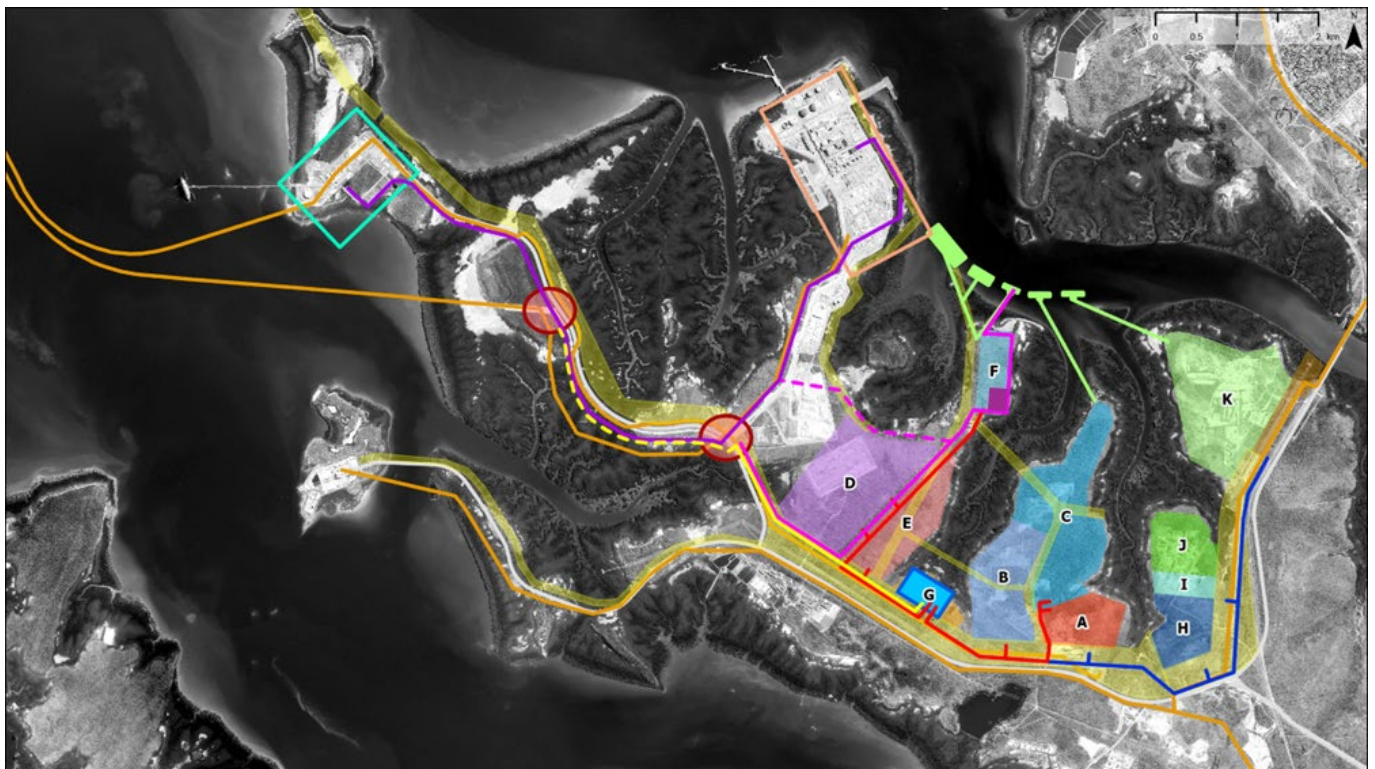


Figure 1: MASDP map adapted from Wood and GHD (2023) Wood and GHD (2024) and INPEX. The MASDP header pipelines are shown in red and blue. The centralised high pressure compression hub is in area G. The MASDP hub CO₂ export pipeline is shown in yellow with an alternative export pipeline route shown as a dotted yellow line. Tie-in points into the CO₂ interface pipeline are shown as orange circles. The LCO₂ receiving and storage terminal location is shown as a purple box within common user facility in area F and associated transfer and export pipelines lines are shown as magenta lines.

In the work undertaken by Wood and GHD for the Northern Territory Government no engineering or technology barriers were identified, with designs and cost estimates based on global examples of existing engineering approaches and technologies.

While both the capital and operating cost estimates in the report are subject to uncertainties, there are important, high-level findings:

- The largest component of costs for the CCUS Hub development are those associated with capital equipment.
- When the capital costs are collated across the MASDP capture, compression, LCO₂ and CO₂ export line elements of the CCUS system, these total \$7.4 billion.
- However, over 70% of these capital costs are associated with industry capture facilities, and a critical consideration in the

overall development of the CCUS system will be establishing the proportion of industry facility cost that are embedded in industry processes and which are additional.

- Around 20–22% of the costs are for ‘shared’ infrastructure, including the header pipelines, compression hub, export pipeline and the LCO₂ import terminal.
- The shared infrastructure costs start at \$307 million and rise to \$1.4 billion, with each 1 Mtpa capacity costing roughly \$100 million.

Importantly, the report highlights the opportunity for the MASDP CCUS hub development to occur in phases as the MASDP industries establish – maximising system flexibility while minimising upfront costs.



Figure 2: Phased MASDP CCUS hub development capital cost options.

The CCUS business case project includes inputs from the wider Northern Territory Low Emissions Hub (NT LEH) collaboration group, whose current members include the Northern Territory Government, Xodus, INPEX, Santos, Woodside Energy, Eni, Total Energies, SK E&S and Tamboran Resources. CSIRO has sought feedback from government and industry on the technical content of the report, CSIRO has sole discretion on including such feedback.

More information

[Read the report](#)

Learn more about the [NT Low Emission Hub Research](#)

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