Global Resources Strategy Commodity Report: Liquefied Natural Gas

The Australian LNG industry

The Australian LNG industry is a key part of the Australian economy.

In 2020–21, LNG was Australia's third-largest commodity export by value. Australia exported 77.7 Mt of LNG in 2020–21 with a value of $30.5 billion (DISER 2021a).

The oil and gas extraction industry also directly employed 22,900 Australians in November 2021 (ABS 2021).

Australia is committed to achieving net zero emissions by 2050 while continuing to serve our traditional export markets. The Australian Government's Long-Term Emissions Reduction Plan (/web/20220609174328/https://www.industry.gov.au/data-and-publications/australias-long-term-emissions-reduction-plan) focuses on innovation, enterprise and technology to lower the costs of clean energy.

The Plan sees an enabling role for government to guide investments in new industries. At its core, it recognises that reducing the costs of low emissions technologies is key to unlocking widespread deployment, and that global technology trends will drive demand shifts at home and abroad.

Global changes in demand will create many new opportunities for Australia.

Under the Technology Investment Roadmap (/web/20220609174328/https://www.industry.gov.au/data-and-publications/technology-investment-roadmap), the government will invest at least $21 billion in the next generation of low emissions technologies in the decade to 2030, driving over $84 billion in total public and private investment. The Roadmap prioritises technologies based on their abatement potential, Australia's comparative advantage, potential economic benefit, and government ability to make a difference.

Clean hydrogen and carbon capture and storage (CCS), among others, are identified as priority technologies in the Roadmap. Development of Australia's clean hydrogen industry may create new opportunities for Australia's LNG industry when coupled with CCS.

For LNG and according to customer preferences, Australia's technology-led approach to emissions reductions could mean:

- decarbonising Australia's natural gas industry to produce lower emissions LNG in the near term
- pivoting Australia's LNG industry to clean hydrogen in the medium to long term, according to customer preferences
- working with international partners, both exporters and importers of LNG, to share information, advance low emissions innovations, and consider common accounting standards.

Japan-Australia Partnership on Decarbonisation Through Technology

Japan and Australia consider a technology-led response as critical to reducing greenhouse gas emissions while also ensuring economic growth and job creation. We share an ambition to accelerate the development and commercialisation of low and zero emissions technologies as soon as possible, as achieving cost parity with high emitting alternatives is vital for decarbonisation efforts.

To this end, Japan and Australia committed in July 2021 to jointly support initiatives that will contribute to net zero emissions, including lower emissions LNG production, transport and use; clean fuel ammonia, clean hydrogen; and carbon capture utilisation and storage.

This partnership builds on Australia's strong trade relationship with Japan, and cooperation through initiatives and statements such as the Hydrogen Energy Supply Chain (HESC), the Japan-Australia Energy and Resources Dialogue (JAERD) and the Australia-Japan Joint Statement of Cooperation on Hydrogen and Fuel Cells.

Quad working together on methane abatement in the natural-gas sector

On 24 September 2021, leaders of Quad countries (the United States, Australia, India and Japan) announced they would work together to reduce methane emissions from the natural gas sector.

Carbon Capture and Storage (CCS)

Effective greenhouse gas emissions management will be key to a successful LNG sector in the future. CCS will play an important role in the LNG sector's emissions management through approaches like direct capture, sequestration at the source of production, separation of CO_2 and storage for transport.

Australia is blessed with a natural abundance of potential CO_2 storage sites and released a suite of greenhouse gas storage sites in 2021. Australia is currently developing a National CCUS Technology Emissions Abatement Strategy to improve policy frameworks and help coordinate the deployment of CCUS, including the importation of CO_2 to Australia.

Chevron Australia's Gorgon Project

The Gorgon emissions reduction system is demonstrating the vital role of CCS technology in advancing Australia's pursuit of a lower carbon future. As of November 2021, the Gorgon CO_2 Injection Project had sequestered approximately 5.5 million tonnes of CO_2. At full capacity the facility will sequester up to 4 million tonnes of CO_2 per year, which is equivalent to removing more than 1 million cars from the road each year.

Australia's gas resources and LNG capacity

According to Geoscience Australia's report *Australia's Energy Commodity Resources*, Australia's total demonstrated resources for all conventional and unconventional gas in 2019 are estimated at 269,206 PJ.[1] (#footnote-1)

Australia's gas reserves are located throughout the country. Offshore conventional reserves make up the majority of them, with the largest reserves in Western Australia and the Northern Territory.

Onshore conventional reserves are mostly located in the Cooper Basin in South Australia. Queensland has large onshore unconventional gas reserves and is home to the world's only projects producing LNG from coal seam gas.

This distribution of reserves corresponds with the locations of Australia's LNG capacity. Western Australia's capacity is 49.9 Mtpa across its 5 LNG projects[2] (#footnote-2), which represents 57% of Australia's total LNG capacity. Queensland has 25.3 Mtpa across 3 projects while the Northern Territory's 2 projects have a capacity of 12.6 Mtpa.

Figure 4: Australia's remaining gas reserves (2P), contingent resources (2C), cumulative production and undiscovered unconventional prospective gas resources, end 2019. Source: Geoscience Australia. Offshore data provided by NOPTA to year-end 2019. Onshore data is sourced from government statistics and company estimates reported at various dates between June 2019 and June 2020.

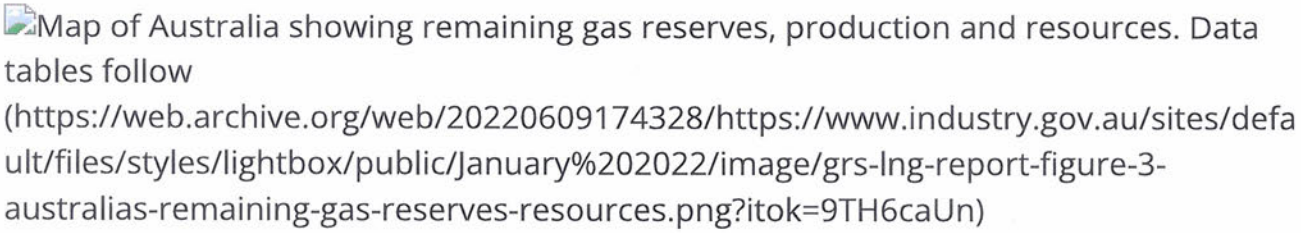
Map of Australia showing remaining gas reserves, production and resources. Data tables follow (https://web.archive.org/web/20220609174328/https://www.industry.gov.au/sites/default/files/styles/lightbox/public/January%202022/image/grs-lng-report-figure-3-australias-remaining-gas-reserves-resources.png?itok=9TH6caUn)

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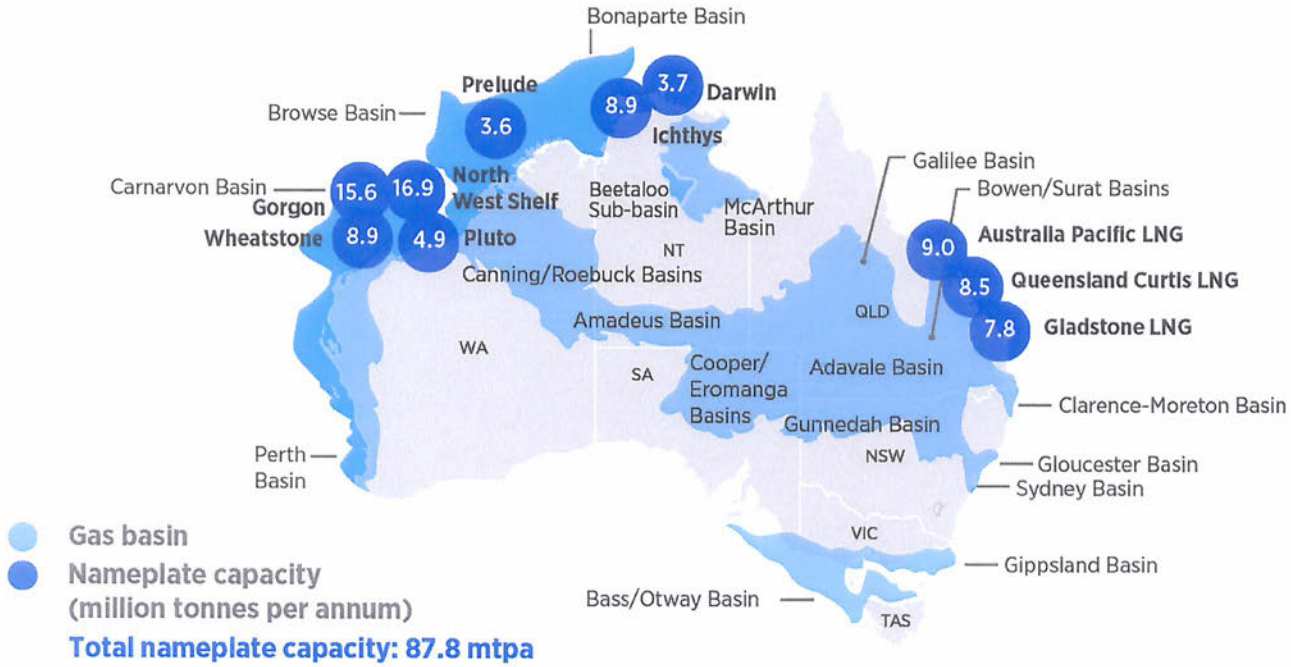
Figure 5: Australia's LNG projects and gas basins.[3] (#footnote-3) Source: DISER Resources and Energy Quarterly



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Australia's domestic gas consumption

In 2019–20, natural gas accounted for about a quarter (1,647 petajoules) of energy consumption in Australia (DISER 2021b).

Its main uses are:

- electricity generation (36%)
- mining (25%)
- manufacturing (23%)
- residential applications, like gas heating and cooking (11%).

Australia's competitive advantages

Australia can improve its position as a major LNG exporter and investment destination by responding to global demand now.

Our competitive advantages are based around being reliable, responsible, and ready for the future.

We are reliable

- Australia has a stable, low-risk investment environment and a business culture of delivering as agreed.
- Australia is a strong advocate for free trade in a rules-based international order.
- Australia has large gas reserves and demonstrated experience in large scale LNG production.
- Choosing Australian LNG guarantees energy security for our customers.
- Backing Australian projects means lower risk for our investors.

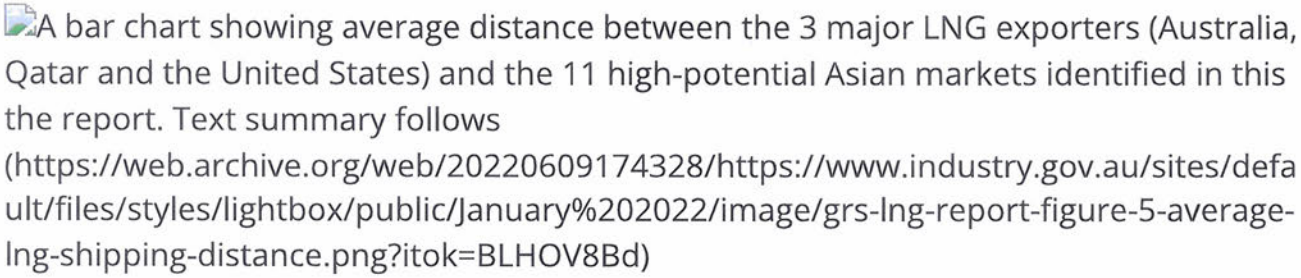
We are responsible

- Australia's gas industry is renowned for its best-practice health and safety solutions that support productivity.
- Australia is a world leader in sustainable resource development. We have effective environmental regulations and industry-led voluntary codes of practice.
- Australia's emissions measurement and management approaches are world-leading.
- Our resources sector engages meaningfully with Traditional Owners and local communities to create jobs and share the industry's benefits.

We are ready for the future

- Australia's LNG industry is technologically advanced and a rich environment for further research, development and innovation.
- Australia has excellent relations and a history of close cooperation with Asian markets.
- Australia's proximity to emerging and established markets in Asia means cheaper and faster transport.

Figure 6: Average LNG shipping distance between the 3 major LNG exporters and identified high potential Asian markets. Source: Wood Mackenzie (December 2021)


A bar chart showing average distance between the 3 major LNG exporters (Australia, Qatar and the United States) and the 11 high-potential Asian markets identified in this the report. Text summary follows (https://web.archive.org/web/20220609174328/https://www.industry.gov.au/sites/default/files/styles/lightbox/public/January%202022/image/grs-lng-report-figure-5-average-lng-shipping-distance.png?itok=BLHOV8Bd)

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Australian coal seam gas (CSG) – a responsible choice

Hydraulic fracturing (fracking) is a widely used technique for extracting oil and gas resources including shale gas and CSG. Hydraulic fracturing has come under scrutiny for its potential adverse environmental impacts.

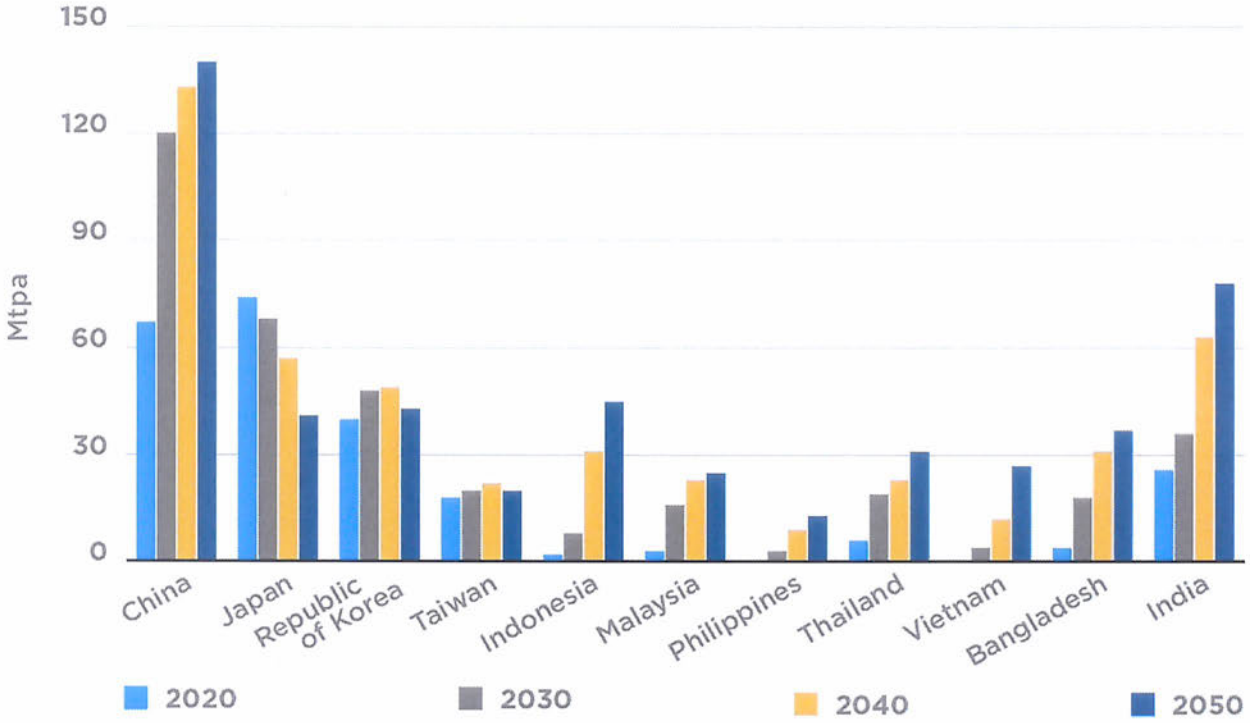
Australia's CSG extraction processes are world leading and an example of Australia's competitive advantages for LNG. Australia's national scientific organisation, CSIRO, investigated hydraulic fracturing operations at 6 gas wells in Queensland to assess effects on air quality, soils, groundwater and waterways. CSIRO found that air quality was not impacted, water treatment was successful in removing chemicals and other pollution caused by fracturing, and some chemicals left in soil samples completely degraded within 2 to 3 days.

Australia's LNG trade opportunities to 2050

We have identified 11 markets as Australia's greatest opportunities for LNG trade between now and 2050.

In addition to these markets, we see opportunities for spot trades with European buyers looking to diversify supply sources and build supply chains for renewable gases in the future.

Figure 7: Forecasted LNG demand for the 11 identified high potential markets by decade to 2050. Source: Wood Mackenzie (December 2021)



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Australia is well placed to grow trade relationships with 7 emerging regional LNG markets:

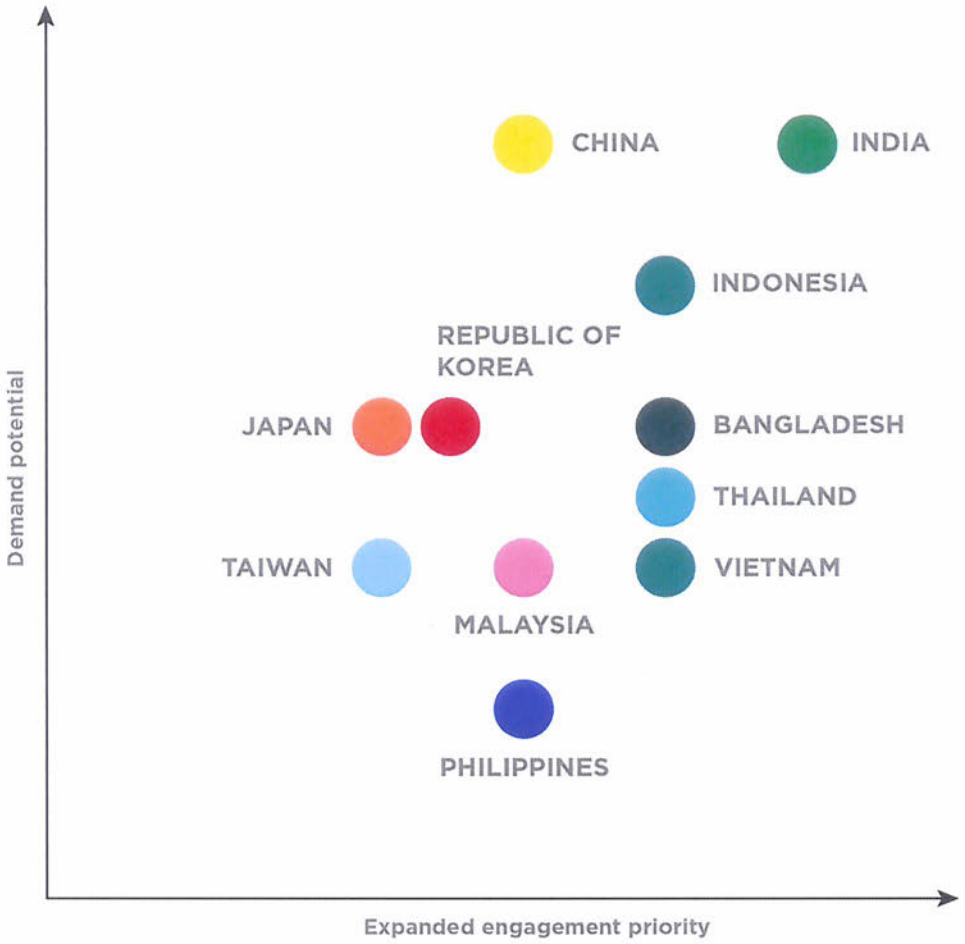
- India
- Indonesia
- Bangladesh
- Thailand
- Malaysia
- Vietnam
- the Philippines.

We are equally well placed to maintain our 4 established markets, which will remain large sources of regional demand:

- China
- Korea

- Japan
- Taiwan.

Figure 8: Demand potential v. expanded engagement priority in Australia's 11 high potential LNG markets



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Australia has existing engagement channels with its established markets (China, Japan, Korea and Taiwan). These should be maintained, but additional engagement efforts are likely not required.

In contrast, Australia should step up its engagement efforts with emerging LNG markets. This is especially true for emerging markets with high demand potential in the future (India, Indonesia and Bangladesh).

Think LNG, think Australia

A message from the Australian Petroleum Production & Exploration Association

The Australian LNG industry has expanded significantly since the start of the 20th century. We are a global power and now compete with Qatar as the top global exporter.

This is a result of significant investment in the industry. In the past decade we have seen:

- a range of LNG projects in Western Australia and the Northern Territory
- a world first CSG-to-LNG industry in Queensland
- a commercial-scale floating LNG facility in Commonwealth waters off Western Australia.

Since 2009, the oil and gas industry has invested around $475 billion in Australia — around $305 billion of that investment in the LNG industry. The industry has developed and built new projects while paying more than $75 billion in taxes to state and federal governments to fund hospitals, schools, roads and services.

Looking forward to 2050, there are 3 key reasons why Australia will remain a major LNG exporter.

1. Geographical proximity to Asia

Australia is located very favourably on the doorstep of the Asian markets that will continue to drive LNG demand growth in coming decades.

Australian LNG has held its share of demand from established customers like Japan and Korea and benefited significantly from the rise of China as a significant importer of LNG. Australia's LNG exports to China have increased fivefold in the last 5 years, and China is now our largest LNG customer.

Australia also benefits from being in the same region as other emerging LNG importers like India, Bangladesh and the ASEAN countries. We are well placed to capitalise on the opportunity these countries' growth and demand for cleaner energy presents.

2. Stable investment destination

Australia has well-established regulatory processes that govern operations, environmental standards, taxation policies and regulatory approvals processes for LNG developments. We are also blessed with world-class natural gas resources.

This makes Australia a relatively stable destination for LNG investment. Maintaining and enhancing the competitiveness of Australia as an investment destination, and a stable regulatory and risk regime will be vital to seeing Australia continue to attract investment as global oil and gas companies focus on smaller, incremental projects in mature gas basins rather than the greenfield mega-projects that have been a characteristic of the past few decades.

3. A key role in a cleaner energy through lower carbon or carbon neutral LNG and as a clean hydrogen supplier

As part of the broader Australian oil and gas industry, LNG producers are committed to reaching net zero emissions by 2050. This will require various innovations to lower greenhouse gas emissions from LNG operations.

Innovations being examined include:

- using carbon capture and storage (CCS) in production
- using renewable energy on site
- environmental offsets that can lead to carbon-neutral LNG cargo.

Australia has been at the forefront of carbon-neutral LNG trade, with the first carbon-neutral cargo shipping in 2020.

The LNG industry will also help develop an industry to export hydrogen (produced from natural gas with CCS) to Asian markets as they transition to a lower carbon world. The LNG industry will do this by using its:

- knowledge and experience of liquefying natural gas
- existing commercial relationships with Asian customers.

Looking ahead

Over more than 30 years, the Australian LNG industry has distinguished itself as a safe and reliable provider of LNG. It operates under rigorous safety, health and environmental standards and strict regulatory approvals processes and standards.

The Australian LNG industry has been a significant part of the Australian economy since the first LNG shipment was sent to Japan in 1989. The industry has contributed significantly to Australia's economic strength for many decades and continues to play a major role in providing jobs, taxes, royalties and export income.

Given the ongoing demand for LNG from Asia, Australia must enhance its ability to attract global capital investment in LNG projects. Capital is more mobile than ever, and the competition among our competitors is fierce.

Attracting long-term investment to grow Australia's LNG industry in the coming decades will be critical to:

- create local jobs
- support local communities
- ensure competitive energy prices
- generate government revenue.

Capital-intensive projects like LNG represent an ongoing opportunity to create well-paying jobs. LNG projects can take more than 6 years from investment decision to complete, while jobs are created almost immediately after investment decisions are made.

Getting the investment settings right could provide a critical boost to the economy for many decades to come. A strong and successful LNG industry – as part of a strong and successful oil and gas industry – is essential to Australia's ongoing economic recovery and meeting our emissions reductions goals.

Recent estimates have found that if the right investment settings are implemented and a new phase of long term investment is triggered — under what the authors call a 'high growth scenario' — national economic output could be boosted by more than $350 billion. This would help create more than 220,000 jobs over the next 2 decades.

The opportunity for Australia is huge, but so is the appetite of our competitors to snatch it from us.

The following sections explore each of these emerging and established LNG markets. We identify the barriers to trade growth in each market and suggest how they can be overcome.

Footnotes

1. This text was updated on 2 March 2022 due to an error in the original publication. Total demonstrated resources of gas refers to the sum of 2P reserves and 2C contingent resources. ↲ (#footnote-1-ref)
2. This text was updated on 29 April 2022 due to an error in the original publication. ↲ (#footnote-2-ref)
3. This figure was updated on 29 April 2022 due to an error in the original publication. ↲ (#footnote-3-ref)