Inquiry into Glencore's Proposed Carbon Capture and Storage Project

This submission is in response to the inquiry referred by the Senate into Glencore's proposed carbon capture and storage (CCS) project in the Great Artesian Basin. It refers to the project's potential risks and impacts on water quality, the potential socioeconomic impacts on agriculture and communities in an area dependent on agriculture, and the robustness of the environmental impact assessment (EIA) process.

As a member-owned industry body that strives to create a positive impact for humans, animals, and the environment, Australian Organic Ltd (AOL) is strongly against Glencore's proposed carbon capture and storage in the Great Artesian Basin. AOL firmly believes the proposal to inject and store liquefied carbon dioxide—essentially CO_2 waste—into a Great Artesian Basin aquifer located in Queensland poses an unacceptable risk to humans, the environment, and the agricultural sector for the reasons outlined below:

1. Risks to long-term water and food security;
2. Limitations with carbon capture and storage technologies;
3. Limitations around Glencore's simulation modelling;
4. The need to safeguard our Priority Agricultural Areas (PAAs);
5. Economic consequences to organic producers and the national economy; and
6. Negative externalities: biodiversity loss and wider ecosystem consequences

The Great Artesian Basin is the Nation's Lifeblood

The Great Artesian Basin (the Basin) is Australia's largest groundwater system, spanning over one-fifth of the country. This vast resource generates an estimated $13 billion annually and serves as a lifeline for 180,000 individuals, 7,600 businesses, and 120 towns. With approximately 65 million gigalitres of groundwater, there's enough water in the Basin to fill the Sydney Harbour 130,000 times over[1]. It provides the only reliable freshwater source for much of arid inland Australia[2]; and accordingly, it is a finite and slowly replenished source that is of extreme importance to Australian agricultural productivity, especially during extensive dry periods. Moreover, Aboriginal and Torres Strait Islander communities have relied on Basin water for over 60,000 years to sustain living in Australia's arid inland regions. These communities maintain deep connections with the springs[3], upholding significant cultural values for First Nations peoples.

[1] https://www.dcceew.gov.au/water/policy/national/great-artesian-basinn
[2] Habermehl, M. A. (2006). The Great Artesian Basin, Australia. Into the well from which you drink do not throw stones, 82.
[3] https://www.dcceew.gov.au/water/policy/national/great-artesian-basinn

The Basin sustains a variety of ecosystems reliant on groundwater. It plays a vital role in sustaining agricultural activities, which form the backbone of the Australian economy—providing extensive sustenance, employment, and export opportunities. Many farmers, who know our lands the best, are gravely concerned about the potentially disastrous impacts of the proposed project on the entire agricultural sector.

Given that the Basin spans the majority of Queensland, the project's potential impact extends to the 18.5 million hectares of organic land and over 700 organic operators within the state. This could have ripple effects on organic food production, the financial stability of organic businesses, and the overall GDP of Australia's agricultural industry.

The Issues with Glencore's Proposed CCS Project

1. Risks to long-term water and food security

Underground carbon storage poses considerable risks of leakage and various forms of water contamination, including the potential for saline water to be pushed up towards groundwater levels due to elevated underground pressure.

When compressed carbon is stored in underground reservoirs, there is always a risk of possible CO_2 leakage which could lead to catastrophic consequences for the environment, communities, and entire ecosystems. If leakage occurs, this largely negates the intended sustainability benefits and represents an unacceptable risk of diverse environmental externalities.

A hydrogeologist has emphasised the danger of injecting corrosive liquefied CO_2, which could quickly cause a 10,000-fold increase in groundwater acidity, altering pH levels from 8.35 down to 4[4]. This heightened acidity poses a severe risk of dissolving aquifer rock and releasing carcinogenic heavy metals like arsenic, cadmium, and lead towards aquifers, threatening the quality of water essential for agriculture and endangering the water supply for numerous towns reliant on it[5]. Once heavy metals infiltrate water sources, the potential contamination risks to agriculture become irreversible. This is despite the availability of high-end filtration equipment to address such contamination, which would be a financially unfeasible tactic given the vast amount of water utilised.

The University of Queensland released a report highlighting the potential mobilisation of lead and arsenic in groundwater at the project site[6]; their modelling showed that the injected CO_2 and

[4] https://www.abc.net.au/news/2023-02-16/glencore-carbon-capture-project-targets-great-artesian-basin/1019358744
[5] https://www.abc.net.au/news/rural/2023-11-23/great-artesian-basin-carbon-capture-project-opposition/103080402
[6] https://www.ctsco.com.au/.rest/api/v1/documents/51feb01deb76398374a67860426f1ccf/Appendix+9C+ANLEC+Project+7-0320-C323+Dawson+et+al+2022+%28final+231013%29.pdf

associated 10-000-fold acidification could significantly elevate groundwater metal concentrations (including lead, arsenic, and cadmium) to levels unsafe for human and animal consumption for more than 100 years[7].

Regarding Glencore's assertion that food-grade CO_2 will be injected—it's important to note that while CO_2 is harmless in carbonated beverages, it is classified as a hazardous liquid when transported via pipelines, with the greatest risk associated through inhalation. These pipelines operate under intense pressure conditions, amplifying the danger in case of a leak or rupture, as exemplified by a mass poisoning incident in Mississippi in February 2020[8] caused by a ruptured carbon dioxide pipeline.

These risks pose serious and irreversible threats to Australia's agricultural lands, drinking water supplies, and aquatic ecosystems. Colin Boyce MP, Federal Member for Flynn, an electorate that relies on water from the Basin, said it well:

> "*Why on earth would you compromise a potable water source in Australia, the world's driest habitable continent?*"[9]

2. Limitations with CCS technologies

CCS has consistently demonstrated lacklustre performance, as evidenced by numerous projects worldwide failing to meet their emission reduction targets[10]. These shortcomings reflect a pattern of overpromising and underdelivering, highlighting CCS's inefficiency as a viable solution for carbon emissions reduction. CCS is expensive, energy-intensive, slow to implement, and unproven at scale. These factors collectively underscore its ineffectiveness as a strategy for reducing carbon emissions.

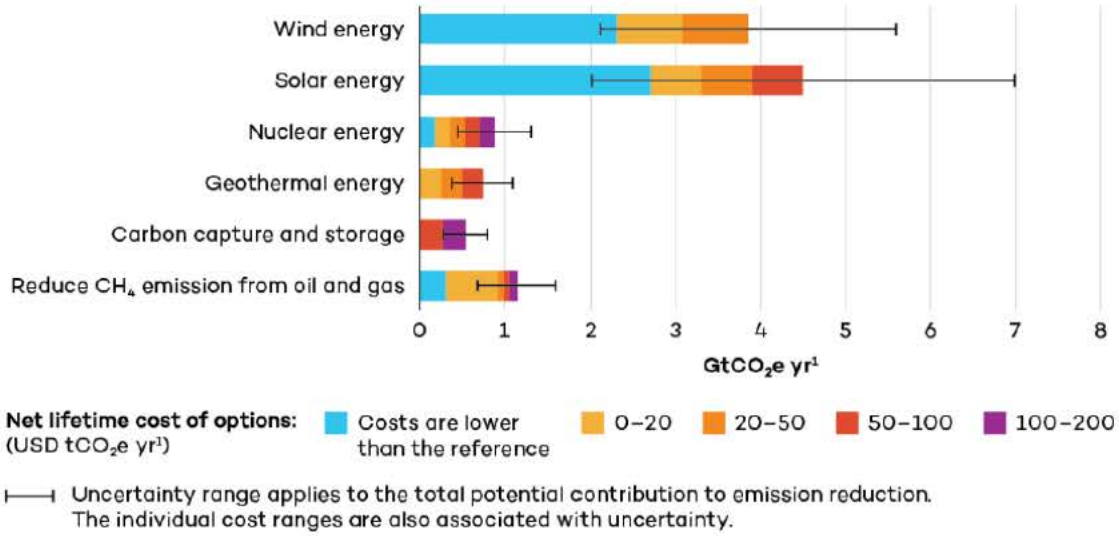
Currently, existing CCS facilities capture only a miniscule fraction—0.1%—of emissions annually. Moreover, of this captured fraction, a mere 19% is being utilised for geological sequestration, with the remaining bulk being used for enhanced oil recovery[11]. In addition, CCS is highly energy inefficient, and often results in the generating of additional emissions rather than achieving the intended reductions. The capture and compression processes alone (not counting transport and storage) demand between 330 to 420 kWh per tonne of CO_2 captured[12]. On average, CCS projects

[7] https://www.ctsco.com.au/.rest/api/v1/documents/51feb01deb76398374a67860426f1ccf/Appendix+9C+ANLEC+Project+7-0320-C323+Dawson+et+al+2022+%28final+231013%29.pdf
[8] https://www.huffpost.com/entry/gassing-satartia-mississippi-co2-pipeline_n_60ddea9fe4b0ddef8b0ddc8f
[9] https://www.abc.net.au/news/2023-02-21/glencore-leaked-briefing-note-reveals-government-lobbying/1019845700
[10] https://ieefa.org/resources/carbon-capture-crux-lessons-learned
[11] https://www.ciel.org/wp-content/uploads/2021/07/Confronting-the-Myth-of-Carbon-Free-Fossil-Fuels.pdf
[12] Jackson, S., & Brodal, E. (2019). Optimization of the Energy Consumption of a Carbon Capture and Sequestration Related Carbon Dioxide Compression Processes. *Energies, 12*(9), 1603. https://doi.org/10.3390/en12091603

increase the energy demand of the facility they capture carbon from by 15-25%[13], often leading to a net increase in emissions, especially considering the reliance on natural gas-powered electricity for CO_2 capture[14].

Figure 1 below shows how CCS is considerably more expensive yet much less effective than other emission reduction methods:

Figure 1: *cost and potential efficacy of CCS and emissions reduction options*[15]



A report from the Institute for Energy Economics and Financial Analysis sheds light on the dismal performance of many CCS projects worldwide, where a majority have failed to meet expectations. Out of 13 large-scale CCS projects examined, seven underperformed, two failed outright, and one was "mothballed."[16] This critique is reinforced by experts who argue that CCS technology, while theoretically capable of capturing a small percentage of total emissions, is often used as a pretext for justifying the opening of new gas fields, which ultimately increases emissions[17].

To date, CCS technology has yet to prove its economic viability or scalability at a meaningful level. Despite substantial government subsidies and decades of existence, CCS technology struggles with scalability, effectiveness, and cost-effectiveness. While CCS holds theoretical promise, its practical

[13] https://www.eea.europa.eu/highlights/carbon-capture-and-storage-could
[14] Howarth, R. W., & Jacobson, M. Z. (2021). How green is blue hydrogen? *Energy Science & Engineering, 9*(10), 1676-1687. https://doi.org/10.1002/ese3.956
[15] Babiker, M., Sugiyama, M., Cohen, B., Toribio Ramirez, D., & Blok, K. (2022). Data for Figure SPM.7—Summary for policymakers of the Working Group III Contribution to the IPCC Sixth Assessment Report. https://ipcc-browser.ipcc-data.org/browser/dataset?id=447
[16] https://www.abc.net.au/news/2022-09-01/report-casts-doubt-on-carbon-capture-and-storage/14039792
[17] https://www.abc.net.au/news/2022-09-01/report-casts-doubt-on-carbon-capture-and-storage/14039792

application falls short of expectations, making it a costly and ineffective strategy for meaningful carbon emission reduction.

3. Limitations around Glencore's simulation modelling

The self-funded modelling conducted by Glencore to support its proposal raises concerns about potential biases and self-interests influencing the results. A hydrogeologist has highlighted issues regarding the underlying assumptions and assertions of inputs in Glencore's modelling[18], noting a lack of clarity in the model inputs and how the reliability of models hinges on the quality of field data. To ensure accuracy, independent pumping tests should be conducted on the aquifer over an extended period, aligning with the project's proposed scale—as this would provide a more precise assessment of the aquifer's behaviour under similar conditions.

Additionally, Glencore has labelled the water at the project site as "saline" and "non-potable"[19], implying that it may be unsuitable for livestock and human use. However, Glencore's own water testing has indicated that the salinity levels fall within safe limits for livestock use. Official guidelines confirm that the water quality meets standards acceptable for cattle, pigs, and sheep[20]. This contradiction raises concerns about the potential to mislead stakeholders regarding the suitability of the water for agricultural purposes.

4. Prioritising and protecting Priority Agricultural Areas over industrial practices

Priority Agricultural Areas (PAAs) represent strategic regions characterised by significant clusters of high-value, intensive agricultural activities[21]. These areas include regionally critical water sources[22] like the Great Artesian Basin, which serves as the only reliable source of fresh water across much of inland Australia. The Basin is indispensable to sustaining life on the world's driest inhabited continent.

However, despite the critical importance of PAAs, existing legislation including the Regional Planning Act 2014[23] falls short in adequately safeguarding these areas and their inherent natural capital from incompatible resource activities, reflecting a broader issue where economic interests often overshadow environmental considerations.

[18] https://www.abc.net.au/news/rural/2023-11-23/great-artesian-basin-carbon-capture-project-opposition/103080402
[19] https://www.ctsco.com.au/.rest/api/v1/documents/5b164836c8c8fbd54012333009679c10/00+Executive+Summary+%28final+221124%29.pdf
[20] https://www.abc.net.au/news/2023-02-16/glencore-carbon-capture-project-targets-great-artesian-basin/101935874
[21] https://qldspatial.information.qld.gov.au/catalogue/custom/detail.page?fid={260D1607-DE59-0DE5-DB65-0CE503D24A41}
[22] https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-2014-011
[23] https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-2014-011

The guiding principles of the Great Artesian Basin Strategic Management Plan[24] were agreed to by governments, community, and industry representatives. These principles include:

- *a healthy resource;*
- *Aboriginal and Torres Strait Islander values, cultural heritage, and other community values;*
- *secure and managed access; and*
- *judicious use of groundwater*.

Neglecting these principles risks adverse impacts on the economic, environmental, cultural, and social outcomes for the Basin. Unified opposition from farmers, environmental stakeholders, experts, and concerned citizens underscores the project's unpredictability and environmental risks, emphasising just how important the Basin is for agriculture and the future of hundreds of communities.

While Geoscience Australia reports that none of the 30 active commercial CCS facilities worldwide have reported incidents of CO_2 migration beyond their intended storage areas, it's crucial to note a significant differentiation with the Glencore project. Unlike other CCS projects that typically target depleted oil and gas reservoirs or deep isolated saline formations, Glencore's project aims to inject CO_2 into a water resource aquifer. This distinction raises significant concerns about the feasibility of ensuring containment within the intended storage complex[25].

The difference lies in the nature of the storage reservoirs. Depleted oil and gas reservoirs or deep saline formations are inherently more stable and less permeable, offering a relatively secure environment for carbon storage. In contrast, a water resource aquifer is an active and interconnected system that sustains critical water sources. The presence of ongoing natural processes and potential pathways for fluid movement within such aquifers presents complexities and uncertainties regarding the containment of injected CO_2.

Furthermore, approving the project may incentivise further CCS in the Basin, providing justification for continued coal development and enabling further emissions and environmental degradation. Alternative proactive measures towards emission reduction should be prioritised over greenlighting such ventures. Agricultural industry bodies in New South Wales and South Australia have made public calls to reject the project, citing the large possibility of CCS expanding into the Basin in their states should the project be approved. The Basin cannot serve as a mere testing ground for experimentation; the stakes are too high to gamble with this crucial water resource.

The Government's final decision on this proposal will have significant and irreversible ramifications for future generations. It's imperative for Government to consider the long-term risks to food and

[24] https://www.dcceew.gov.au/water/policy/national/great-artesian-basin/strategic-management-plan
[25] https://www.abc.net.au/news/rural/2023-11-23/great-artesian-basin-carbon-capture-project-opposition/103080402

water security and to reject Glencore's proposal, thereby safeguarding agricultural productivity and ensuring future food security.

5. Economic consequences to organic producers and broader Australia

The introduction of CCS in the Basin presents significant economic risks, particularly for the organic industry in Queensland. With direct contributions of $190 million and a flow-on value of $548.8 million to the Queensland economy, the organic sector represents substantial economic value[26]. However, this sector operates under stringent certification standards, and any potential contamination from CCS activities could result in regulatory and compliance challenges for certified organic farmers.

Should the project proceed, proving compliance with organic requirements and preventing contamination would likely become even more difficult and costly for producers, directly impacting their competitiveness and their overall ability to remain profitable.

Clean water and healthy soil are fundamental for maintaining the integrity of organic crops. Organic farms strictly adhere to regulations, allowing only 10% of the FSANZ Maximum Residue Limits guidelines for water and other agricultural inputs and commodities[27]. Water contamination from CCS activities could lead to the loss of organic certification for affected farms and surrounding areas, potentially lasting for an extended period. Such instances may also damage the reputation and marketability of the organic industry, not to mention incur significant costs to producers.

Even if it can be guaranteed that CCS exploration will not have any impact on the Basin, there is still no clear understanding of the costs organic operators may incur to protect their lands from the proposed exploration. This lack of clarity, coupled with the substantial time and effort required to convert land to certified organic status, creates uncertainty for the organic industry and also increases barriers for those interested in entering the industry.

This absence of certainty also extends to investor confidence, as the ability to secure investment is likely to suffer for those reliant on the Basin while seeking to transition to organic practices.

6. Externalities: biodiversity loss and wider ecosystem consequences

Ensuring the preservation of hydrological features is crucial for the sustainable management of water resources, especially within the Basin, where unique and fragile ecosystems thrive. It is an

[26] ACIL Allen, Mobium Group, & NielsenIQ. (2023). Australian Organic Market Report 2023. Australian Organic Limited.
[27] https://www.agriculture.gov.au/biosecurity-trade/export/controlled-goods/organic-bio-dynamic/national-standard

ecologically sensitive region where water quality and availability directly impact the survival of hundreds of communities and diverse plant and animal species.

The potential heavy metal contamination stemming from CCS activities risks detrimental ripple effects on biodiversity and the broader ecosystem. Disruption of local biodiversity could have far-reaching consequences, affecting pollinators, native species, and critical ecological processes integral to agricultural practices. Recognising these intricate dynamics is important since externalities not factored range from biodiversity loss to costly rehabilitation and degradation of natural capital.

Preserving the full array of key processes and functions within the Basin is essential for ensuring the long-term sustainability of the ecosystems it supports. These ecosystems not only sustain local communities but also support the Australian agricultural industry. The Basin is part of Australia's rich ecological heritage; and its diverse environmental attributes—including geomorphic processes, riparian functions, and wildlife corridors—all have significant implications for long-term food security and environmental sustainability.

It is evident that approving Glencore's project comes with a range of potentially detrimental impacts. The associated risks pose substantial threats to the agricultural industry and local ecosystems, ultimately jeopardising Australia's long-term sustainability. The grave risks outweigh any perceived benefits, rendering the project untenable from a variety of perspectives.

Conclusion

Whilst AOL acknowledges that reducing emissions remains a national priority, the risks associated with the proposed CCS activity in the Great Artesian Basin cannot be overlooked. The project poses significant threats to water quality, agricultural viability, and environmental sustainability. Not only does CCS lack a proven track record in delivering substantial emissions reductions, but it also presents serious environmental and socioeconomic risks, including water and soil contamination, agricultural disruption, and increased emissions, which could have far-reaching implications for the entire Australian agricultural industry.

The Great Artesian Basin holds immense ecological and cultural significance, serving as a vital water source for agriculture and diverse ecosystems. Any activity that impacts its integrity jeopardises the livelihoods of countless communities and compromises the long-term sustainability of Australia's agricultural industry. Australia's agricultural sector is deeply ingrained in the nation's cultural identity. Prioritising the long-term agricultural interests of the country necessitates the safeguarding

of sustainable land use practices, the protection of precious water resources, and ensuring that agricultural land remains fertile and viable for generations to come.

AOL implores the government to reject Glencore's proposal in order to secure Australia's water and food security for future generations.

About AOL

Australian Organic Limited (AOL) is a member-owned industry body that strives to create a positive impact for humans, animals, and the environment, now and into the future. AOL is led by an experienced team committed to progressing the interests of the organic sector and delivering a world where organics is recognised for its environmental, social, and economic benefits.