



IMPROVING REGULATION OF CARBON CAPTURE AND STORAGE IN QUEENSLAND

Projects involving carbon capture and storage (CCS) are regulated by a complex range of Acts that have not been drafted to address the unique characteristics of CCS activities. Given the risks posed by CCS in hindering efforts to reduce greenhouse gas emissions, there is a need for the regulatory framework to be amended to ensure that the assessment and decision-making process prevents CCS being approved where it would hinder greenhouse gas emissions reductions efforts.

Queensland was one of the first jurisdictions in the world to establish a comprehensive legislative framework for CO₂ storage, through the introduction of the *Greenhouse Gas Storage Act 2009* (Qld) and later the *Greenhouse Gas Storage Regulation 2021* (Qld). However, this legislation has not been well-integrated into the wider environmental regulatory framework. This lack of targeted CCS regulation in Queensland has led to significant uncertainty, both for proponents and members of the wider community, and risk with respect to how the unique impacts of these activities on the environment and agriculture will be avoided and managed.

This paper addresses the following key issues with the currently regulatory framework for CCS:

1. The assessment criteria for CCS must be amended to ensure that CCS proposals do not jeopardise efforts to reduce greenhouse gas emissions;
2. There is no requirement to conduct long-term monitoring of GHG stream migration;
3. It is unclear whether a water licence is needed for carbon injection and storage;
4. Enhanced Oil Recovery is not regulated under the *Greenhouse Gas Storage Act 2009* (Qld) and is considered a minor amendment under the *Environmental Protection Act 1994* (Qld);
5. Waste regulation is not drafted to suit carbon injection and storage activities.

Given the reliance being placed on CCS as a technology that will enable humanity to reach key global energy and climate goals, it is essential that it be appropriately regulated.

EDO recommends the following changes be made to the existing regulatory framework:

- **Recommendation 1:** Provide assessment criteria which ensure that CCS functions effectively and does not jeopardise efforts to reduce greenhouse gas emissions.
- **Recommendation 2:** Draft environmentally relevant activity (ERA) standards for GHG injection and storage which include mandatory standard conditions requiring the proponent to monitor and report the long-term impacts of these activities.
- **Recommendation 3:** Amend the *Water Act 2000* (Qld) to clarify whether carbon injection and storage activities will require a water licence, and how the unique impacts of those activities on water will be regulated.
- **Recommendation 4:** Amend the EP Act to clarify that EA amendment applications to conduct EOR will be considered a 'major amendment' requiring public notification.
- **Recommendation 5:** Amend the EP Act to clarify that a GHG stream is to be considered a waste where the stream will contaminate an aquifer, and review whether current regulation of waste under the EP Act and Regulation is appropriate to manage CCS activities.

Current regulatory framework

Projects that involve the capture, injection and storage of carbon in aquifers in Queensland will generally require the following permits, licences and authorities:

- A GHG exploration permit under the *Greenhouse Gas Storage Act 2009* (Qld);¹
- A GHG injection and storage lease under the *Greenhouse Gas Storage Act 2009* (Qld);²
- An Environmental Authority that authorises GHG injection and storage under the *Environmental Protection Act 1994* (Qld) (**EP Act**);
- A water licence under the *Water Act 2000* (Qld).

The criteria for assessing and deciding whether to grant the above permits, licences and authorities for CCS activities are listed in **Appendix A**.

Critique of regulatory framework

There is currently significant uncertainty regarding the application of this legislation to CCS activities, including how different types of CCS activities will be regulated. In addition, there is a need for more specificity in the assessment and decision-making requirements to ensure that CCS is properly assessed, and is not allowed to go ahead where it would jeopardise emissions reductions efforts. These issues with the regulatory framework for CCS are set out in further detail below.

- 1) *Assessment criteria must be provided to ensure CCS does not jeopardise emissions reductions efforts*

CCS technology is new and potentially high risk, requiring unique analysis and specialist skills in assessment to ensure that CCS projects are properly assessed and cannot be approved where they may jeopardise emissions reductions efforts – particularly where the main purpose of these projects is the reduction of carbon emissions.

The EDO have put together a number of questions which should be considered as part of the assessment and decision-making criteria for CCS. These questions could form the basis of new relevant regulatory requirements for CCS assessment in the *Environmental Protection Regulation 2019* (Qld). We have provided these questions in **Appendix B**.

Recommendation 1: Provide assessment criteria which ensure that CCS functions effectively and does not jeopardise efforts to reduce greenhouse gas emissions.

- 2) *There is no requirement to conduct long-term monitoring of GHG stream migration*

The holder of a GHG injection and storage lease is only responsible for the monitoring of the GHG stream during the term of the lease. Once the GHG lease is surrendered, the GHG stream becomes the property of the State.³ This means that the proponent responsible for GHG injection and storage is not required to monitor the long-term effects of such activities beyond the monitoring requirements throughout the term of the lease.⁴

¹ *Greenhouse Gas Storage Act 2009* (Qld) s 30.

² *Greenhouse Gas Storage Act 2009* (Qld) s 110.

³ *Greenhouse Gas Storage Act 2009* (Qld) s 181(2).

⁴ For the monitoring requirements during the GHG lease, see *Greenhouse Gas Storage Act 2009* (Qld) ss 141(1)(c)(iii); 145; 254; 177(2)

While an EA may include conditions for monitoring before, during and post injection, there are no eligibility criteria or standard conditions associated with GHG storage.⁵ As a result, there is no guidance for Departmental officers assessing an EA application, meaning they may be guided by the conditions proposed by the proponent, which will likely not suggest rigorous long-term monitoring obligations.⁶

This is particularly concerning given that CCS technology is being relied upon to offset fossil fuel emissions from polluting industries. For example, the proposed Galilee Power Station Project is reliant on CCS to support its claim to be 'a net-zero power producer operating at base load'.⁷ If the injected GHG stream migrates in the long-term and is released into the atmosphere, then those offsets will be rendered ineffectual. Long-term monitoring is therefore essential to properly regulating CCS, and should be the responsibility of the GHG lease holder and not the State.

Recommendation 2: Draft ERA standards for GHG injection and storage which include conditions requiring the proponent to monitor the long-term effects of these activities.

3) *It is unclear whether a water licence is needed for carbon injection and storage*

The holder of a GHG permit or a GHG lease must also apply for a water licence under the *Water Act 2000* (Qld) if the relevant activities would involve the taking or interference with water.⁸ However, the Water Act does not provide any guidance as to whether injection of a GHG stream into an aquifer is considered 'interference' with water.

Bowskill J found recently in respect of the impacts of coal mining that the word interference 'bears its ordinary meaning, which in this context is a broad one meaning to obstruct, hinder, get in the way of or prevent the flow of water'.⁹ It is arguable that GHG injection and storage would involve an interference or obstruction, as it would cause the movement of underground water, but this has not been established at law. It is therefore unclear whether a water licence will be required for CCS activities.

It is clear that the *Water Act 2000* (Qld) was drafted with extractive activities in mind, and not GHG injection activities, leading to significant uncertainty about how the impacts of carbon injection and storage on water will be regulated.¹⁰

Recommendation 3: Amend the *Water Act 2000* (Qld) to clarify whether carbon injection and storage activities will require a water licence, and how the unique impacts of those activities on water will be regulated.

4) *Enhanced Oil Recovery is not adequately regulated*

Another form of CCS is Enhanced Oil Recovery (EOR), which involves injection of a GHG stream for the purpose of extending oil recovery while also sequestering the injected CO₂. Existing

⁵ *Environmental Protection Regulation 2019* (Qld) Sch 7.

⁶ For example, for the Surat Basin Carbon Capture and Storage Project, CTSCo only proposes to undertake monitoring until the GHG stream plume has stabilised and reached quasi-equilibrium conditions plus two seismic surveys at a 6-monthly interval after the plume as ceased to expand, or 2 years, whichever is longer: CTSCo, *Surat Basin Carbon Capture and Storage Project Environmental Impact Statement*, Ch 9 p 59.

⁷ Waratah Coal, Response to Ministerial Information Request, Revision: A (27 June 2022) section 4.1.2.

⁸ *Greenhouse Gas Storage Act 2009* (Qld) ss 84 and 165; *Water Act 2000* (Qld) ss 105, 808

⁹ Bowskill J in *New Acland Coal Pty Ltd v Smith & Ors* (2018) 230 LGERA 88.

¹⁰ 'Interfering' with water 'bears its ordinary meaning, which in this context [of a mining lease] is a broad one, meaning to obstruct, hinder, get in the way of or prevent the flow of water': *New Acland Coal Pty Ltd v Smith & Ors* [2018] QSC 088 at [200] per Bowskill J.

environmental legislation in Queensland does not adequately regulate this activity, leading to uncertainty regarding the approvals process and the risk that impacts of the activity will not be appropriately managed.

Firstly, EOR is not considered GHG stream storage under the GHG Storage Act, meaning a GHG exploration permit and GHG lease are not required for EOR activities.¹¹ The reason for this is unclear, as EOR also involves both the injection and storage of CO₂, albeit for the purpose of extracting further hydrocarbons.

Further, if an EA amendment application is made to allow EOR activities as part of an approved petroleum activity, it appears to be considered only a 'minor' amendment, which would not attract extensive public consultation processes under the EP Act.¹² This is highly concerning given that EOR still involves carbon injection and storage, a new and risky activity needing proper assessment, and arguably it should attract the same level of public consultation as any other CCS activity.

Environmental legislation in Queensland has clearly not been drafted to specifically regulate EOR, leading to significant uncertainty about how such activities will be regulated and the impacts and risks managed.

Recommendation 4: Amend the EP Act to clarify that EA amendment applications to conduct EOR will be considered a 'major amendment' requiring public notification.

5) *Waste regulation is not drafted to suit carbon injection and storage activities*

Environmental legislation in Queensland that regulates waste has not been drafted to suit carbon injection and storage activities, creating uncertainties about how it will be regulated under these provisions.

A GHG stream, which is a stream of carbon dioxide captured for injection and storage or utilisation, appears to come within the definition of waste under the *Environmental Protection Act 1994* (Qld) (**EP Regulation**), being 'a left over, or an unwanted by-product, from an industrial, commercial, domestic or other activity'.¹³ This means it is regulated under the EP Act and Regulation as a waste, even though the provisions relating to waste were not drafted with CCS in mind.

For example, if a captured GHG stream is considered waste, then an EA application involving injection of a GHG stream into an aquifer would be regulated by s 41(2)(c) of the EP Regulation. This provision requires the administering authority assessing an EA application to refuse an application involving the release of waste directly to groundwater if it considers the waste is likely to result in a deterioration in the environmental values of the receiving groundwater.¹⁴ This provision of the EP Regulation was drafted with injection of CSG water in mind, and not injection of captured carbon.¹⁵

In order to comply with this provision, the administering authority will need to immediately refuse any EA application on the basis injection of significant levels of CO₂ into an aquifer will cause a

¹¹ *Greenhouse Gas Storage Act 2009* (Qld) s 14(2).

¹² See e.g., Bridgeport Energy's EA Amendment Application for the Moonie Oil Field CO₂ EOR Project, which seeks a minor amendment to commence EOR activities.

¹³ *Environmental Protection Act 1994* (Qld) s 13(1).

¹⁴ *Environmental Protection Regulation 2019* (Qld) s 41(2)(c). Environmental value is defined as 'a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety' or a 'quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation': EP Reg s 9. The environmental values for waters are set out in s 6 of the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (Qld).

¹⁵ Explanatory Notes to the Environmental Protection Amendment Regulation (No. 1) 2011, p 4.

deterioration of the environmental values of the receiving groundwater system. In the alternative, the applicant will need to characterise the aquifer as having no environmental value to be deteriorated, as done by CTSCo for the Surat Basin Carbon Capture and Storage Project,¹⁶ which runs counter-intuitive to the purpose of the EP Act, being to protect Queensland's environment.¹⁷

It is also currently unclear whether a GHG stream could be considered an 'end of waste resource'. This is because there is currently no 'end of waste code' relating to GHG streams, and no end of waste approval has been applied for to trial whether a GHG stream is suitable to be used as a resource.¹⁸ Even if an end of waste approval was applied for, there are significant uncertainties regarding whether such an application could be approved, as arguably the injection of a GHG stream into an aquifer is likely to cause serious environmental harm, material environmental harm or environmental nuisance.¹⁹

Where CCS activities could contaminate an aquifer, it should be clarified that EP Regulation s 41(2) does apply to CCS activities to prevent this contamination from occurring.

Recommendation 5: Amend the EP Act to clarify that a GHG stream is to be considered a waste where the stream will contaminate an aquifer, and review whether current regulation of waste under the EP Act and Regulation is appropriate to manage CCS activities.

¹⁶ CTSCo, *Surat Basin Carbon Capture and Storage Project Environmental Impact Statement*, Ch 9 p 41.

¹⁷ *Environmental Protection Act 1994* (Qld) s 3.

¹⁸ *Waste Reduction and Recycling Act 2011* (Qld) s 173I.

¹⁹ *Waste Reduction and Recycling Act 2011* (Qld) s 173J(1)(a). See also, J Robertson and A Garnett, 'Discussion document - A regulatory review of greenhouse gas storage - governance of pressure impacts in the GAB, Queensland' (31 December 2018) 8-10.

APPENDIX A – CRITERIA FOR CCS PERMITS, LICENCES AND AUTHORITIES

Permit, Licence or Authority	Legislation	Criteria
GHG exploration permit	<i>Greenhouse Gas Storage Act 2009 (Qld) s 42</i>	<p><u>Criteria for GHG permits</u></p> <p>In deciding whether to grant a GHG permit or deciding its provisions the Minister must consider:</p> <ul style="list-style-type: none"> (a) any special criteria proposed to be used to decide whether to grant the GHG permit or to decide its provisions; and (b) the applicant's proposed initial work program; and (c) the capability criteria, being the extent to which the Minister is of the opinion that the tenderer is capable of carrying out authorised activities for the GHG permit, having regard to the tenderer's— <ul style="list-style-type: none"> (i) financial and technical resources; and (ii) ability to manage GHG storage exploration.
GHG injection and storage lease	<i>Greenhouse Gas Storage Act 2009 (Qld) s 118</i>	<p><u>Requirements for grant of GHG lease</u></p> <p>The Minister may grant a GHG lease applied for under a permit-related application only if the Minister is satisfied the requirements mentioned below have been complied with.</p> <p>The application must be refused if the Minister is not satisfied any requirement for grant has been complied with, other than the requirement that the conditions of the relevant GHG permit have been substantially complied with.</p> <p>The requirements for grant are each of the following—</p> <ul style="list-style-type: none"> (a) the applicant is an eligible person; (b) the proposed area of the proposed GHG lease— <ul style="list-style-type: none"> (i) is appropriate for the authorised activities proposed to be carried out; and (ii) contains an adequately identified GHG stream storage site that is adequate for the proposed purpose of the GHG lease;

	<p><i>Greenhouse Gas Storage Act 2009 (Qld) s 132</i></p>	<p>(c) the conditions of the relevant GHG permit have been substantially complied with;</p> <p>(d) the Minister has approved the applicant's proposed initial development plan for the GHG lease;</p> <p>(e) a relevant environmental authority has been issued;</p> <p>(f) the applicant has established that—</p> <ul style="list-style-type: none"> (i) GHG stream storage in the GHG lease's area is or is likely to happen within 5 years after the lease is to take effect; or (ii) the applicant has entered into a contract, GHG coordination arrangement or other arrangement for GHG stream storage in the GHG lease's area (a relevant arrangement); <p>(g) the applicant has paid the annual rent for the first year of the proposed GHG lease;</p> <p>(h) the applicant has given under section 271, security for the GHG lease;</p> <p>(i) the Minister is of the opinion that the applicant is capable of carrying out authorised activities for the GHG lease having regard to the applicant's—</p> <ul style="list-style-type: none"> (i) financial and technical resources; and (ii) ability to carry out GHG stream storage. <p>In considering whether to grant a GHG lease or its provisions the Minister must consider the development plan criteria, capability criteria and any special criteria. The Minister may give the weight to each of the development plan, capability and special criteria that the Minister considers appropriate in the circumstances.</p>
<p>Environmental Authority</p>	<p><i>Environmental Protection Act 1994 (Qld) s 176</i></p>	<p>In deciding a site-specific EA application, the administering authority must:</p> <ul style="list-style-type: none"> (a) comply with any relevant regulatory requirement; and (b) subject to paragraph (a), have regard to each of the following— <ul style="list-style-type: none"> (i) the application; (ii) any standard conditions for the relevant activity or authority; (iii) any response given for an information request; (iv) the standard criteria. <p>There are no standard conditions for CCS activities.</p>

		<p>The standard criteria include:</p> <ul style="list-style-type: none">(a) the following principles of environmental policy as set out in the Intergovernmental Agreement on the Environment—<ul style="list-style-type: none">(i) the precautionary principle;(ii) intergenerational equity;(iii) conservation of biological diversity and ecological integrity; and(b) any Commonwealth or State government plans, standards, agreements or requirements about environmental protection or ecologically sustainable development; and(d) any relevant environmental impact study, assessment or report; and(e) the character, resilience and values of the receiving environment; and(f) all submissions made by the applicant and submitters; and(g) the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows—<ul style="list-style-type: none">(i) an environmental authority;(ii) a transitional environmental program;(iii) an environmental protection order;(iv) a disposal permit;(v) a development approval; and(h) the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument; and(i) the public interest; and(j) any relevant site management plan; and(k) any relevant integrated environmental management system or proposed integrated environmental management system; and(l) any other matter prescribed under a regulation.
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	<p><i>Environmental Protection Regulation 2019 (Qld) s 35(1)</i></p> <p><i>Environmental Protection Regulation 2019 (Qld) s 41(2)</i></p>	<p>For more detail on these criteria, see the Guidelines for Assessing applications prepared by the Department of Environment and Science.</p> <p><u>Regulatory requirements</u></p> <p>The administering authority must, for making an environmental management decision relating to an environmentally relevant activity, other than a prescribed ERA:</p> <ul style="list-style-type: none"> (a) carry out an environmental objective assessment against the environmental objective and performance outcomes mentioned in schedule 8, part 3, divisions 1 and 2; and (b) consider the environmental values declared under this regulation; and (c) if the activity is to be carried out in a strategic environmental area—consider the impacts of the activity on the environmental attributes for the area under the Regional Planning Interests Act 2014; and (d) consider each of the following under any relevant environmental protection policies— <ul style="list-style-type: none"> (i) the management hierarchy; (ii) environmental values; (iii) quality objectives; (iv) the management intent; and (v) if a bilateral agreement requires the matters of national environmental significance to be considered—consider those matters. <p>When making an environmental management decision relating to an activity that involves, or may involve, the release of waste directly to groundwater, the administering authority must refuse to grant the application if the authority considers:</p> <ul style="list-style-type: none"> (a) for an application other than an application relating to an environmental authority for a petroleum activity—the waste is not being, or may not be, released entirely within a confined aquifer; or (b) the release of the waste is affecting adversely, or may affect adversely, a surface ecological system; or
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		(c) the waste is likely to result in a deterioration in the environmental values of the receiving groundwater.
Water licence	<p><i>Water Act 2000 (Qld) s 105</i></p> <p><i>Water Act 2000 (Qld) s 113</i></p>	<p>The chief executive may grant water licences for taking water and interfering with the flow of water.</p> <p>In deciding whether to grant or refuse the application for a water licence, the chief executive must consider the application together with:</p> <ul style="list-style-type: none"> (a) if a water plan would apply to any water licence granted—the water plan; and (b) if the application relates to the Murray-Darling Basin—the long-term average sustainable diversion limits included in the Basin Plan; and (c) if additional information has been given to the chief executive under section 111—the additional information; and (d) if notice of the application has been published under section 112—all properly made submissions about the application; and (e) if a water plan would not apply to any water licence granted— <ul style="list-style-type: none"> (i) existing water entitlements and authorities to take or interfere with water; and (ii) any information about the effects of taking, or interfering with, water on natural ecosystems; and (iii) any information about the effects of taking, or interfering with, water on the physical integrity of watercourses, lakes, springs or aquifers; and (iv) strategies and policies for water resource management in the area to which the application relates; and (v) the public interest.

APPENDIX B - QUESTIONS TO ASK WHEN ASSESSING CCS ACTIVITIES

Will the Project contribute meaningfully to emissions reductions?

- 1) Has the project been designed with indefinite CO₂ sequestration as the one and only goal?
- 2) Is the CCS activity relevant at climate-change scale?
- 3) Are other toxic/noxious by-product gases (e.g. H₂S, NO_x) released to the atmosphere during the carbon capture? Does the application include rigorous examination of such fugitive GHG emissions at all steps, including:
 - a) the carbon-capture stage,
 - b) the compression and transport stages, and
 - c) the injection stage?
- 4) Is this CCS project for an industry that is especially hard to decarbonize (e.g., the cement and iron and steel industries)?

Does the Project make sense economically?

- 1) What are the operational costs of installing CCS at a power plant or for resource generation?
- 2) Will the future revenue stream be sufficient to cover all of the investment in the upfront drilling and infra-structure, the injection phase operations and the continuance of monitoring during the post-injection phase?
- 3) Is the CCS activity economically viable without subsidies?
- 4) Is there sufficient supply of CO₂ over many years?

Is the site suitable for storage?

- 1) What means is used to convey the CO₂ to the injection site?
 - a) If it is a former natural-gas pipeline, have the risks of leaks or rupture been critically evaluated regarding length, age and state of pipeline, number of compression stages, incidental damage (including seismic events—esp. subsea pipelines) and human error?
 - b) Is the CO₂ to be thoroughly dried if it is to be transported by pipe to mitigate corrosion?
- 2) If geosequestration is to be used as the storage means, have the geological strata or feature/s been validly proven for long-term retention (centuries to millennia)?
- 3) Has rigorous risk assessment been made of the likelihood of contamination of intervening aquifers during injection or subsequent storage, including indirect mobilisation of toxicants?
- 4) Has evaluation of induced seismicity and the potential of pressurisation/depressurisation to cause caprock fracture been made as a result of CO₂ injection?
- 5) Has an assessment of the possibility of geohazards (e.g. earthquakes) been made as to the integrity of CO₂ storage in the long term?
- 6) If a depleted hydrocarbon reservoir is to be used for CO₂ sequestration, how is well integrity to be guaranteed and monitored in the long term?

Is the monitoring sufficient to ensure containment of CO₂?

- 1) Will the transport stage/s be actively monitored for leaks or inadvertent releases of CO₂?
- 2) Will it be monitored for at least 40 years?
- 3) What are the consequences for long-term landuse?
- 4) Who is financially responsible for monitoring if the company is no longer solvent?

- 5) What is the management plan if leaks are discovered?

What are the consequences of a leak?

Sudden leaks may produce fatalities. Concentrations of CO₂ over 10%, even in the presence of oxygen, can be fatal (IPCC, 2005: 392). Leaks may also change the geochemistry of the groundwater, impacting water quality or taste.

Is there public acceptance of the project? (Social license)

- 1) Have the public been provided with adequate information with respect to the proposed project, and meaningful opportunities to have any concerns or helpful information heard?
- 2) Have the common public fears been adequately addressed, such as the risks of seismicity, leaks and costs?

Is there adequate planning to evaluate whether this project contributes meaningfully to state/national emissions goals?

- 1) Are the organisations validating CCS truly independent, objective and scientifically credible?
- 2) What are the remedial actions and consequential penalties if a CCS activity does not meet its targets?