

**Between the cracks: Water governance in Queensland, Australia
and potential cumulative impacts from mining coal seam gas**

Author

Comino, Maria, Tan, Poh-Ling, George, David

Published

2014

Journal Title

Journal of Water Law

Downloaded from

<http://hdl.handle.net/10072/63131>

Link to published version

<http://www.lawtext.com/lawtextweb/default.jsp?PageID=2>

Griffith Research Online

<https://research-repository.griffith.edu.au>

BETWEEN THE CRACKS: WATER GOVERNANCE IN QUEENSLAND, AUSTRALIA AND POTENTIAL CUMULATIVE IMPACTS FROM MINING COAL SEAM GAS

MARIA COMINO, POH-LING TAN AND DAVID GEORGE

Griffith University, Australia

1 INTRODUCTION*

The effects of coal seam gas (CSG) extraction on agriculture and water resources are subject to intense public debate over the potential nature and extent of those impacts. Threats to ground and surface water and loss of strategic agricultural land cut across political and traditional boundaries, with conservative rural groups and country women aligning themselves with 'city greenies'. One assessment into CSG and its impact on land and water finds that the Queensland legal framework is mature but ad hoc.¹ Some academics are of the opinion that the legal safeguards are 'adequate'.² Other literature questions whether the precautionary principle or adaptive management has been implemented in the CSG governance framework,³ and a major nationally commissioned assessment into mining generally finds a need for a risk-based approach.⁴

The note of caution sounded by the majority in academic literature is supported by the results of a recent survey conducted in three jurisdictions of 75 oil and gas private-sector professionals. Of the participants, 69 per cent considered that community concern

over the effect of CSG production in groundwater was valid, whilst 47 per cent thought that the real objection to CSG concerns property rights issues rather than the environment.⁵ Through an analysis of the legal framework for CSG mining and water allocation, from the perspective of sustainable agriculture, we examine the basis for these concerns in the regional case study of the Darling Downs, which lie at the top of the Murray-Darling Basin.⁶

The Darling Downs are an agricultural region where farmers have lobbied governments to improve regulation of the CSG industry. This rich farming region lies above some substantial CSG basins – the Surat, the Bowen and the Clarence-Moreton. The case study formed part of a national project to develop tools for engaging communities to improve transparency and confidence in water planning. Our research in water planning found that the farming community identifies the potential deleterious impacts of CSG mining on farmers' access to water and land, natural resources and ecosystems, as well as to people and the economy as a key threat to water resources and to the security of their entitlements.⁷

This article develops that analysis by considering the Queensland legal framework for assessing and managing cumulative risks in relation to CSG mining. Specifically, section 2 of this article provides the context of water governance in the Darling Downs, and section 3 outlines the legislative and policy frameworks regulating the impacts of CSG mining on agriculture. Section 4 examines the implications of the current governance frameworks and argues that a greatly strengthened cumulative risk assessment approach, supported by the legal framework, is required to address potential impacts of CSG extraction on water. In the absence of such an approach, it is suggested that systemic issues relating to potential cumulative impact, adaptive capacity and long term sustainability of landscape functions, water and agriculture are neglected.

* The laws relevant to this article are in a state of flux. Unless otherwise stated the laws and policies referred to are current as at 31 December 2013. The Commonwealth and Queensland Governments have announced a number of changes for 2014 but the argument in this article remains substantially the same.

1 J Williams and others *An Analysis of Coal Seam Gas Production and Natural Resource Management in Australia: A Report Prepared for the Australian Council of Environmental Deans and Directors* (John Williams Scientific Services Pty Ltd Canberra Australia 2012).

2 See eg L Letts 'Coal Seam Gas Production: friend or foe of Queensland's Water Resources?' (2012) 29 *Environmental and Planning Law Journal* 101–12; K Owens 'Strategic Regional Land Use Plans: Presenting the future for coal seam gas projects in New South Wales?' (2012) 29 *Environmental and Planning Law Journal* 113–27.

3 See eg N Swayne 'Regulating coal seam gas in Queensland: Lessons in an adaptive environmental management approach?' (2012) 29 *Environmental and Planning Law Journal* 163–85; Queensland Public Interest Law Clearing House Incorporated (QPILCH) 'Down to earth – coal seam gas: a case study for developing a new model for strategic land use governance and resource planning in Queensland' (2013) Discussion Paper; C Allen and others 'Adaptive management for a turbulent future' (2011) 92 *Journal of Environmental Management* 1339–45; T Poisel 'Coal seam gas exploration and production in New South Wales: The case for better strategic planning and more stringent regulation' (2012) 29 *Environmental and Planning Law Journal* 129–51; B K Williams 'Adaptive management and natural resources' (2011) 92 *Journal of Environmental Management* 1346–53.

4 Sinclair Knight Merz *Water Issues in Jurisdictional Planning for Mining: Waterlines Report No 29* (National Water Commission Canberra 2010) http://www.nwc.gov.au/resources/documents/update_Water_issues_in_jurisdictional_planning_for_mining.pdf.

5 D Kitney 'Coalition welcome but tape still cuts' *The Australian* (25 September 2013) 23 <http://resources.news.com.au/files/2013/09/24/1226726/313549-aus-bus-file-p2p-oilgas-graphs.pdf>. The sample comprised a mix of senior management with nearly half at CEO, CFO, managing director or director level.

6 For details of case study regions see P-L Tan, C Baldwin, I White and K Burry 'Water planning in the Condamine Alluvium, Queensland: sharing information and eliciting views in a context of overallocation' (2012) 474 *Journal of Hydrology* 38–46.

7 *ibid* 41, 45.

At a future date the analysis by the authors will be taken further by outlining a four-step risk management approach for trial in the Darling Downs at a landscape scale using a Geographic Information System to identify major impacts associated with mining. However, economic arguments of the costs and benefits of CSG and potential financial tools are beyond the scope of this article.

2 THE DARLING DOWNS CASE STUDY

The Darling Downs are south east Queensland's food bowl, accounting for around a quarter of the state's agricultural production. It is known for rich, volcanic soils, producing most of the state's wheat, oilseeds and approximately half of its maize. The region also has sheep, cattle and dairy farms and an intensive livestock industry. Mining is becoming increasingly important. Four international companies are developing the region's liquefied natural gas and CSG resources for domestic consumption and overseas exports.⁸

Both agriculture and mining impact on water, particularly the sustainable use of groundwater. Groundwater extraction in the Darling Downs started in the 1960s, resulting in a loss of stream flow and most of the main surface stream is now disconnected from the underlying aquifer.⁹ Water supply for the irrigated agriculture and towns comes from groundwater that is overallocated and displaying symptoms of declining water quality and quantity.¹⁰ This is an important regional issue: current groundwater use is unsustainable in seven of the twenty high-use groundwater areas in the MDB and will lead to major drawdowns in groundwater levels in the absence of management intervention.¹¹

Coal mining already occurs in the midst of rich cattle and wheat farming country. The Surat Basin covers about 110,000 km², spread across the Darling Downs and South East Queensland. It is one of Queensland's most energy-rich regions.¹² In 2010, there were four open cut mines in the Surat Basin, and another fifteen open-cut exploration tenements.

Besides coal mining, farmers in the Darling Downs are concerned about the burgeoning CSG industry.¹³ CSG production leapt from 4 petajoules in 1998–99 to

254 petajoules in 2011–12, and from 10 wells in the early 1990s to more than 720 in 2011–12.¹⁴ Over 4000 km of gas transmission pipelines traverse the state, with unspecified pipes planned or under construction for interstate and export markets.¹⁵

The Queensland Government supports CSG and its growth at the 'forefront of the petroleum industry'.¹⁶ CSG extraction has relatively short term prospects: individual gas wells have a life of 15 years, and the industry may only be viable for the next 50 years.¹⁷ With relatively less expensive shale gas production in the United States of America, the CSG industry in Australia may have a very short life span.¹⁸

Over 79 per cent of the total gas from the state is produced from the Bowen (Permian coal measures) and Surat (Jurassic to Cretaceous Walloon coal measures) Basins.¹⁹ The Surat Basin underlying the Darling Downs area has been the major source of CSG since 2005.²⁰ Reference to the Surat Basin often includes the Clarence-Moreton Basin (late Triassic to Jurassic) as the boundary between the two is difficult to establish.

The Surat Basin's Walloon coal measures comprise varying depths and thicknesses of shale, siltstone, sandstone, coal, mudstone and limestone. CSG, or methane gas, from these measures is typically from seams 300–6000m deep, in what are called 'unconventional deposits'. The gas is trapped in formations that occur between different aquifers and aquitards (beds of low permeability along an aquifer). In the Surat, seams are of high permeability, allowing easier commercialisation.²¹

2.1 Providing sustainable water use through water planning

The Darling Downs lie within the Condamine-Balonne catchment, at the head of the Murray-Darling River system. Irrigation relies on the Condamine River and its tributaries, as well as from the major groundwater source, the Condamine Alluvium. Rainfall is highly variable and seasonal within the catchment, with occasional periods of high intensity rain and run-off alternating with extended periods of severe drought

8 Queensland Government *Darling Downs* (24 November 2012) <http://www.business.qld.gov.au/invest/queenslands-regional-locations/south-queensland/business-in-south-queensland/darling-downs>.

9 Commonwealth Scientific and Industrial Research Organisation (CSIRO) *Water Availability in the Condamine-Balonne. A Report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project* (CSIRO Australia 2008).

10 D George and others 'Improving groundwater planning by needs analysis' (2009) 36(6) *Australian Water Association Journal* 73–78.

11 CSIRO *Water Availability in the Murray-Darling Basin. Summary of a Report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project* (CSIRO Australia 2008) 12. Based on a model, information shows that under a moderate scenario, groundwater management units are to be fully exploited by 2023; see Sinclair Knight Merz *Projections of Groundwater Extraction Rates and Implications for Future Demand and Competition for Surface Water* (Murray-Darling Basin Commission Canberra 2003) 155.

12 Queensland Government *Darling Downs* (n 8).

13 A Arnold 'Changing land: mining the Darling Downs' (2010) *Griffith Review* 28 at 38.

14 Department of Natural Resources and Mines (DNRM) 'Queensland's coal seam gas overview' (2013) <http://mines.industry.qld.gov.au/assets/coal-pdf/csg-update-2013.pdf>.

15 Queensland Government *Darling Downs* (n 8).

16 Queensland Government *Darling Downs* (n 8) 1.

17 Senate Rural and Regional Affairs and Transport References Committee (Senate Committee) *Management of the Murray-Darling Basin Interim Report: the Impact of Coal Seam Gas on the Management of the Murray-Darling Basin* at 4.

18 See for example analysis by M Chambers 'LNG exports at risk as US stakes claim' *The Australian* (14 January 2013) <http://www.theaustralian.com.au/business/mining-energy/lng-exports-at-risk-as-us-stakes-claim/story-e6frg9df-1226553137492>; M Chambers, R Wallace 'Gas glut slashes export prices' *The Australian* (10 December 2012) <http://www.theaustralian.com.au/business/mining-energy/gas-glut-slashes-export-prices/story-e6frg9df-1226533260080>.

19 DNRM (n 16).

20 J Williams, T Stubbs and A Milligan for John Williams Scientific Services Pty Ltd, Canberra 'An analysis of coal seam gas production and natural resource management in Australia' (2012) Report for the Australian Council of Environmental Deans and Directors pp 9–13.

21 *ibid*.

and low stream flow.²² Thus, agriculture is highly dependent on groundwater and on aquifers other than the Great Artesian Basin.²³

Implementing Australia's water reform agenda,²⁴ the Murray-Darling Basin (MDB) Plan will recover large quantities of surface and groundwater to meet the environmental needs in the Condamine-Balonne catchment. Great Artesian Basin water is excluded from the MDB plan. For surface water in the case study region, much of the 'recovered' water is likely to come from the lower Balonne. For groundwater, recovery will affect the Central Condamine Alluvium, which is the groundwater source of the Darling Downs. Current use is assessed at 81.4 GLpa (gigalitres per annum).²⁵

To achieve the MDB plan's sustainable diversion limit (SDL) of 46.0 GLpa for groundwater use in the Condamine Alliance, 43 per cent needs to be recovered through water planning.²⁶ This occurs under the state's water legislation, the Water Act 2000 (Qld) (Water Act), and under this Act the Queensland Department of Natural Resources and Mines (DNRM) finalised the Condamine-Balonne Water Resource Plan (Condamine-Balonne WRP) in 2004. The plan's outcomes included providing secure water to support economic activity, whilst recognising the social and cultural values of communities in the catchment and achieving numerous ecological outcomes for a healthier catchment.²⁷ However, the 2004 Condamine-Balonne WRP only provided for surface water.²⁸

Groundwater planning commenced in 2009 through amendments to the Condamine-Balonne WRP; however, water extracted as part of CSG was outside the scope of this process, much to the consternation of stakeholders.²⁹ An interim WRP for groundwater was declared in 2012 over the Upper Condamine Alluvium, enabling existing groundwater licensees to be eligible for water recovery programmes through purchases by the Australian Government.

22 R Preston and others *Landholder Practices, Attitudes, Constraints and Opportunities for Change in the Condamine Alliance Region* (Condamine Alliance and Department of Natural Resources and Water Toowoomba 2007).

23 The Great Artesian Basin (GAB) underlies 23% of Australia, and covers parts of Queensland, the Northern Territory, South Australia and New South Wales. This groundwater provides the only reliable source of freshwater through much of inland Australia. The GAB confined sandstone aquifers underlie the Condamine region, and form the primary source of groundwater resources in the mid-Condamine sub-catchment. See Note 9.

24 *National Water Initiative 2004* www.environment.gov.au/water/australia/nwi/index.html.

25 *Murray-Darling Basin Plan 2012* Schedule 4 item 76 <http://www.comlaw.gov.au/Details/F2012L02240>.

26 Murray-Darling Basin Authority (MDBA) *The Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report* MDBA Publication No 16/12 (MDBA Canberra 2012); MDBA *Addendum to the Proposed Groundwater Baseline and Sustainable Diversion Limits: Methods Report* (MDBA Canberra 2012).

27 Condamine-Balonne WRP 2004 s 9.

28 *ibid*; Department of Environment and Resources Management (DERM) *Condamine and Balonne Water Resource Plan: Draft Amendment Plan to Include Groundwater of the Condamine Area. Information Report* (August 2009) http://www.derm.qld.gov.au/wrp/pdf/condamine/wrp_amend_prop_info_report.pdf.

29 P-L Tan, C Baldwin, I White and K Burry 'Water planning in the Condamine Alluvium, Queensland' (n 6).

Peak organisations accept overallocation of groundwater as a critical problem that is addressed through water planning,³⁰ and in contrast to high community backlash in other parts of the MDB, irrigator and community concerns regarding cuts to water have not been as contentious in the Darling Downs, in part because of social learning engendered from water planning processes in the region.³¹

Water planning processes in the region will continue to be relevant and will need to take account of any leakage of groundwater resources caused by mining activities to comply with the MDB Plan's volumetric limits. To the extent that CSG projects seek to dispose of groundwater in surface water systems, states are also responsible for ensuring that activities are consistent with other aspects of the MDB Plan, including the Water Quality and Salinity Management Plan, and ensuring flows are consistent with environmental watering plans.

2.2 Potential deleterious impact of CSG mining

Undeniably, there are some economic and social benefits in regions where CSG is being produced, and increases in government revenues through royalties. However, strong concerns exist relating to the impact of CSG on water. In 2011, the Queensland Water Commission identified three main areas of impact on water resources from CSG mining activities:

- impacts on water levels in coal seams from the extraction of water during mining activity
- damage or pollution to an aquifer, as some degree of interconnectivity exists with coal seams and
- the release of 'produced water'.³²

Potential deleterious impacts fall into three broadly overlapping categories, including farmers' access to water and land, natural resources and ecosystems and their effects on people and the economy. Farmers' access to water and land has a number of consequences, including the following issues.

- A reduction in water use has short and long term effects on farm productivity, incomes and asset values. Hydrogeological assessment of the eastern part of the Darling Downs seems to support the view that the sustainable yield of relevant aquifers, such as the GAB, would be affected by CSG development, resulting in 'progressive storage depletion and head decline'.³³
- The present lack of knowledge relating to possible connectivity between CSG and groundwater, and aquifer connectivity means that water planning has inadequate information.³⁴

30 *ibid*; George and others 'Improving groundwater planning by needs analysis' (n 10).

31 P-L Tan, C Baldwin, I White and K Burry 'Water planning in the Condamine Alluvium, Queensland' (n 6).

32 Randall Cox *Coal Seam Gas Water: Role of the Queensland Water Commission* (Legalwise Seminars September 2011).

33 Department of Natural Resources Management (DNRM) *Hydrogeological Framework Report for the Great Artesian Basin Water Resource Plan Area* (DNRM Brisbane 2005) 146.

34 SKM Report (n 4).

- There are concerns over the highly saline nature (3,000 to 30,000 ppm) of 'associated water' currently disposed of or beneficially reused.
- Fracking chemicals are causing contamination of aquifers and land instability.³⁵ The main chemicals of concern (BTEX) were banned in Queensland in 2010.
- Pipelines and other infrastructure affect farmers' access to land.

Damage to natural resources and ecosystems also raise a number of concerns, including the following:

- loss of patches of vegetation through clearing, including ecosystem disturbance and loss of threatened plants
- fragmentation of populations of species, with loss of genetic variability
- interruption to food and territorial ranges
- improved access for predators and pest plants/animals and diseases
- restriction of normal adaptive behaviour in native species, including restricted access to vegetation corridors
- water quality impacts on aquatic ecosystems dependent on surface or groundwater, and terrestrial ecosystems
- leakage of methane into the air, with associated risk of fire and impacts on global greenhouse gas concentrations
- erosion and sedimentation associated with installing drilling rigs, pipelines and infrastructure to move the gas for consumption
- legacy issues relating to wells and wellheads.³⁶

These concerns in turn have consequential effects on the local population and the economy, including the following:

- contributing to increased health and financial stress³⁷ that may be partially offset by land access compensation payments
- associated noise, dust and increased human movement impacting on physical and emotional health³⁸
- reduced employment and economic opportunities in non-CSG industries and in other regions
- loss of income in rural communities through damage to or loss of access to land, and amenity and land values
- increased pressure on local infrastructure and increased costs of local services, particularly accommodation
- loss or contamination of water resources, including both surface and/or groundwater.

Whether concerns cited in relation to farmers' access to water and effects on land, natural resources and ecosystems are capable of being addressed by the

35 Senate Committee (n 18).

36 J Williams, J Pittock *Unconventional Gas Production and Water Resources: Lessons from the United States on Better Governance – a Workshop for Australian Government Officials* (Unpublished report 2012).

37 P-L Tan, C Baldwin, I White and K Burry 'Water planning in the Condamine Alluvium, Queensland' (n 6).

38 Senate Committee (n 18).

current regulatory CSG framework are discussed in the following section.

3 REGULATORY FRAMEWORK OF CSG MINING

Integrated water management requires that all issues that impact on water resources be considered in water planning processes.³⁹ However, under Queensland legislation, CSG exploration and production is regulated by petroleum, gas and mining legislation, whilst the environmental impacts of CSG are regulated under other legislation which is not integrated into water planning processes. Hence, water extracted as part of CSG was outside the scope of amendments to the Condamine-Balonne WRP.⁴⁰

3.1 Authorities to mine for CSG

In Queensland, CSG production is regulated by the Petroleum and Gas (Production and Safety) Act 2004 (Qld) (P & G Act) and must be considered in conjunction with the Mineral Resources Act 1989 (Qld), which seeks to address broader issues across various extraction or mining activities. The Petroleum Act 1923 (Qld) is also relevant to CSG regulation. Mineral resources are owned by the state and a miner's rights to use extracted resources are subject to the payment of royalties, usually 10 per cent of the value of the resources obtained⁴¹ but which may vary, depending on the type of authority.⁴²

A resource authority is required to extract CSG and provides the conditions for proposed activities. These may be stated in the authority itself from the start, imposed from time to time, or are obligations derived from the Act.⁴³ The type of authority required depends on the activity to be carried out, including: petroleum authorities (data acquisition authority, water monitoring authority); petroleum tenure (authority to prospect, petroleum lease); various licences (survey, pipeline, petroleum facility) and gas work authorisations or licences.⁴⁴

Regulatory reform of the CSG industry in Queensland is expected in 2014. The Queensland Competition Authority (QCA) was directed to investigate in particular 'reducing any duplication, consolidating and rationalising regulatory effort, simplifying fee structures and identifying alternative approaches for achievement of similar outcomes'.⁴⁵ Far-ranging administrative reform is recommended in the draft report, although there is little that addresses cumulative impact.

39 B Mitchell (ed) *Integrated Water Management: International Experiences and Perspectives* (Belhaven London and New York 1990); R Lenton, M Muller (eds) *Integrated Water Resources Management in Practice: Better Water Management for Development* (Earthscan London 2009).

40 Note 27.

41 P & G Act s 137.

42 *ibid* s 147.

43 *ibid* chs 3, 4.

44 *ibid* s 18(2).

45 QCA *Draft Report: Coal Seam Gas Review* (November 2013) <http://www.qca.org.au/getattachment/e6f8351a-af87-46e6-a183-d90dd3a6e530/CSG-investigation.aspx>. This report was open for comment and a final report is due, although it has not yet been released.

3.2 Project Specific Environmental Impact Assessment: the role of the state

Under the state's planning legislation, a new CSG project requires development approval to address the impacts of the proposal. However, the initial consideration and assessment of a project's impacts may be coordinated under the provisions of the State Development and Public Works Organisation Act 1971 (Qld) (SDPWO Act). A proponent can apply to the Co-ordinator General for a declaration of the project as a 'co-ordinated project'. If so declared, then the Co-ordinator General will state whether or not an environmental impact statement (EIS) is required. If an EIS is not required under a declaration, it may nevertheless be required under the environmental protection or sustainable planning legislation.

Other assessments may be required. Social impact assessments (SIAs) are required for coordinated projects or projects assessed under the environment protection legislation.⁴⁶ If a project occurs on land identified as potential strategic cropping land, assessment needs to consider additional issues under the Strategic Cropping Land Act 2011 (Qld) and its related policies, with the potential for further conditions to be imposed through that process. The 2011 Act was recently repealed and strategic cropping land is now protected by the Regional Planning Interests Act 2014.⁴⁷ The Darling Downs area is one of the two strategic areas protected under the 2014 Act, and future implications of this new legislation are as yet unclear.

CSG projects involve petroleum activities that require environmental authorities under the Environment Protection Act 1994 (Qld) (EPA), as amended in 2012 to streamline the application and assessment process for those authorities.⁴⁸ Typically, conditions are imposed on the proposed infrastructure along with other environmentally relevant activities (ERAs) associated with the project that can relate, amongst other things, to waste disposal and water treatment. These authorities are part of an environmental management regime that is moving towards greater scrutiny of CSG water management. Other environmental legislation, including the Nature Conservation Act 1992 (Qld), the Forestry Act 1959 (Qld) and the contaminated land provisions of the EPA, may also be relevant and affect a project's management of particular environmental impacts.

While environmental regulation is growing for CSG, and indeed for the petroleum industry, assessment of these activities still does not support an adaptive management approach and assessment of the cumulative impacts of projects at a regional or sub-regional scale. The regulatory framework is based on project

specific assessments with limited consideration of the cumulative impacts of a project or projects on water resources, or catchments and the environment more generally.

3.3 Project Specific Environmental Impact Assessment: the role of the Commonwealth

Whilst the responsibility for land use planning lies primarily with the state and territory governments, the Commonwealth Government has jurisdiction where a development will have a significant impact on matters of national environmental significance. Since October 2012, the Commonwealth Government has committed A\$200 million towards, among other things, establishing an eight member Independent Expert Scientific Committee (IESC) to provide advice to the Commonwealth, State and Territory Governments on the impact of CSG and mining on surface and groundwater resources. This commitment is in response to the Senate Standing Committee's Inquiry into Management of the Murray-Darling Basin.⁴⁹

All applications for CSG or large scale coal mining development that are likely to have a significant impact on water resources, colloquially referred to as the 'water trigger', must now be referred by the state to the IESC as required by amendments to the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).⁵⁰ A protocol identifies how states determine whether or not to refer a project to the IESC.⁵¹ For example, the Queensland Co-ordinator General may seek advice on draft terms of reference, or on a submitted EIS as it relates to information on impacts on water resources or the adequacy of management measures. If a project is so referred, its EIS must include information complying with the IESC's Information Guidelines. In October 2013 the Queensland and Commonwealth Governments signed a Memorandum of Understanding (MoU) accrediting the state's approvals processes under the EPBC Act, thereby removing the need for separate environmental assessment and approval by the Commonwealth. A 12-month process is expected to implement the 'one-stop shop'.

Prior to the signing of the MoU, the IESC reviewed a Surat gas project in Queensland at the draft EIS stage, finding that the draft EIS did not adequately address potential impacts on matters of national environmental significance. It pointed to an inadequate preliminary aquatic survey of the project area and decided that cumulative surface water impacts were not sufficiently dealt with. Even more serious was that the project would significantly contribute to cumulative impacts associated with Condamine Alluvium groundwater and there was insufficient information in the EIS.⁵²

46 Department of State Development, Infrastructure and Planning Social Impact Assessment Fact Sheet (Queensland Government 2012).

47 The Regional Planning Interests Act 2014 (Qld) was passed on 20 March 2014. For the Darling Downs Regional Plan see <http://www.dsdp.qld.gov.au/resources/plan/darling-downs/dd-rp-chapters-1-to-6.pdf>.

48 Environment Protection (Greentape Reduction) and Other Legislation Amendment Act 2012 (Qld).

49 Senate Standing Committee on Rural Affairs & Transport (Senate Committee) *The Management of the Murray-Darling Basin* (Senate Committee Australia 2013).

50 EPBC Act (Cth) s 131AB.

51 IESC Guidelines 2013.

52 Arrow Surat Gas 'Final Advice to Decision-maker on CSG Project Expansion' 20 February 2013 for IESC Guidelines 2013 on CSG and Large Coal Mining Development.

Guidelines are now available as to what constitutes 'significant impact' on water resources.⁵³

The Water Act 2007 (Cth) is also relevant to the regulation of CSG mining activities as the aquifers potentially affected by CSG operations in the Darling Downs are within the Murray-Darling Basin resources. As discussed above, for surface and underground water there is an overarching requirement to manage the resources within the catchment's SDL. It is the Murray-Darling Basin Authority who will review whether Queensland's actions are in compliance with the MDB plan, although the compliance deadline is not until 2019, by which time a number of large CSG and other unconventional gas developments will have taken place.

Additionally, the Commonwealth Government is finalising a National Food Plan, its first ever blueprint for Australia's food future.⁵⁴ Among other things, this plan aims to address the impact of CSG mining on the use of prime agricultural land, including impacts of CSG and large coal mining developments on surface and groundwater resources. However, it is likely to be of strategic application only and not legally binding on states.

3.4 CSG miners' water rights and obligations

The overarching regulatory requirements described above relate to most mining development; however, as water is the primary by-product of CSG extraction, it is necessary to consider CSG water rights and management, first from the perspective of the CSG company and then from the perspective of the agricultural landholder.

For the CSG miner, rights and obligations to water are woven across the state's petroleum, water and environmental protection legislation. The most important of these statutes fall under the petroleum legislation umbrella, where CSG miners are given 'underground water rights' that allow the taking or interference with the underground water that 'happens during the course of, or results from, the carrying out of another authorised activity for the tenure'. No limit on the amount of water is imposed on underground water rights,⁵⁵ and the holder of the rights is subject to 'underground water obligations' identified under the Water Act and other obligations arising under the P & G Act.

Recent amendments to the Water Act attempt to consider the management of impacts on underground water⁵⁶ by requiring petroleum tenure holders:

- to monitor and assess the impact of the mining activity on water bores

53 Department of the Environment *Significant Impact Guidelines 1.3: Coal Seam Gas and Large Coal Mining Developments – Impacts on Water Resources* (Australian Government Canberra December 2013) <http://www.environment.gov.au/system/files/resources/d078caf3-3923-4416-a743-0988ac3f1ee1/files/sig-water-resources.pdf>.

54 Department of Agriculture 2012.

55 P & G Act s 185(3).

56 Water Act chs 3, 3A.

Table 1.
Timeline of obligations under the Water Act

<i>Period</i>	<i>Activity or obligation by CSG miner imposed by Water Act</i>
Before the start of the petroleum tenure	Prepare a baseline assessment plan, or if already started, within 30 business days of commencement unless otherwise agreed (s. 397)
Start of the tenure	Comply with plans' or reports' requirements and thereby avoid various offences and penalties
From start day until an underground water impact report	There is a basic obligation to negotiate a general agreement for each bore the petroleum tenure holder reasonably believes has an impaired capacity. The holder must use best endeavours to enter into an agreement with the bore owner on ensuring a reasonable quantity and quality of water, and compensation (monetary or otherwise) for impacts on the bore. An agreement entered in this way will be taken to be a 'make good' agreement for the bore, for the purposes of later parts. (ss 406–407)
14 months after the start of the tenure, (or earlier if required by the Chief Executive), and at three yearly or other intervals	Provide an underground water impact report that includes a summary of all water bores, a water monitoring strategy and spring impact management strategy, and other information regarding immediately affected areas and long term affected areas (ss 370 and 376)
After an underground water management report takes effect and identifies an immediately affected area, or if the miner is directed to comply with 'make good obligations'	Undertake a bore assessment to determine if a bore has or is likely to start having an impaired capacity, entering into a 'make good' agreement with a bore owner, complying with the agreement and negotiating a variation of the agreement if asked (s. 409)

Source: Department of Natural Resources and Mines (DNRM) 'Interactive maps of Queensland' <http://mines.industry.qld.gov.au/geoscience/interactive-resource-tenure-maps.htm>; <https://webgis.dme.qld.gov.au/webgis/webqmin/viewer.htm>.

- to enter into 'make good' agreements with the owners of the bores and
- to prepare underground water impact reports that establish underground water obligations, including obligations to monitor and manage impacts on aquifers and springs.

The principal protection given to individual bore owners who suffer impacts from CSG mining to their private bores is the CSG miners' 'make good' obligations. The scope of a 'make good' agreement is for the coal seam gas miner to restore the capacity of a bore to supply water or to provide an alternative water supply.

The Office of Groundwater Impact Assessment (OGIA) can also declare a cumulative impact area if the chief

executive officer considers that an area containing two or more petroleum tenures may be affected by the exercise of underground water rights. Within 14 months from the declaration, the OGIA must prepare an underground water impact report for the area.⁵⁷ The document must identify a proposed responsible tenure holder for each reported obligation, and the proposed holders must comply with 'make good' obligations for water bores within an immediately affected area.⁵⁸ However, significantly detailed consideration of the impacts of mining on water resources is deferred until after the mining activity has commenced or is about to commence, as described in Table 1.

3.5 Management of CSG water

CSG water falls within the meaning of 'waste' under the Environment Protection Act 1994, owing to its extremely variable water quality. In December 2012, in response to public concerns about the management of water quality, the Queensland Government developed an overarching policy entitled CSG Water Management Policy (CSG Water Policy).⁵⁹

Under the policy, the primary management priority is for CSG water to be used for one or more beneficial purposes, including for the environment. This includes using CSG water to meet 'make good' obligations. If that is not possible, it is to be treated and disposed of primarily to avoid and then subsequently to minimise impacts on environmental values. Beneficial uses of associated water include:

- injection into depleted aquifers for recharge purposes
- substitution for existing water entitlements
- supplementary water for existing or new irrigation uses
- livestock watering, and urban/industrial water supplies
- coal washing and dust suppression and
- release to the environment to improve local environmental values.

There are also legal provisions that address the use of CSG water in recycled water management schemes, for aquifer injection and urban water supply (Water Supply (Safety and Reliability) Act 2008). Plans must be prepared for such schemes and must manage the risks from variations in water source quality, as well as providing water quality data.

The use of CSG water can be approved under the miners' environmental authority as part of the authorised activities on the petroleum tenure, and is therefore integrated into the environmental approval process. Where the use is off-tenure a beneficial use approval is required under the Waste Reduction and Recycling Act 2011 (Qld) (Waste Act) in addition to other approvals required for the activity.

A CSG miner can release the CSG water for a beneficial use to a user who has certified in writing that it will use the resource for the stated types of uses.⁶⁰ Monitoring and reporting obligations exist to advise users of any non-compliance with water quality criteria.⁶¹ Obligations are also imposed on the users to minimise environmental harm and to maintain monitoring programmes and records where the resource is used for irrigation.⁶²

Various amendments were made in 2012 to the environment protection legislation to strengthen the environmental management planning and other requirements that implement the CSG Water Policy. Concentrated saline water (brine) is also a significant by-product of the water treatment processes and regulations attempt to address this. Frequent but minor incremental amendments for CSG water management are mirrored for brine or salt generated from that management. Some of the changes include the following provisions.

- Since May 2012, an applicant's environmental management plan is required to consider management options under the CSG Water Policy and provide reasons for not proposing Policy preferred management options.
- Since December 2012, the requirements were elevated to require an applicant to address the consistency of proposed CSG water management with the Policy preferred management options.
- The administering authority for the environmental authority is now required to consider the CSG Water Policy and also whether to impose conditions on the management of water, brine, monitoring and reporting.
- This included extending the circumstances when an environmental authority can be amended, to include for example when an underground water impact report identifies impacts on an environmental value.⁶³

These useful but painstakingly implemented changes do not strongly embrace the decision-making challenges presented for managing the underground water resources extracted through the CSG mining process. In addition to the present challenges, in the future these could include and will have to account for technological advances that may enable CSG companies to reap considerable profits from this 'wastewater', at the cost of impacts on groundwater levels, the environment and other third party landscape impacts.

3.6 The landholder

Consideration of landholder interests resulted from changes to the P & G Act in 2010. Although provisions now regulate landholder rights inside and outside petroleum tenure areas, landholders' rights are secondary to miners' right to explore for and produce CSG, and they operate to mitigate the impacts that

57 *ibid* s 370.

58 *ibid* s 376(h).

59 Department of Environment and Heritage Protection *Coal Seam Gas Water Management Policy* (Queensland Government Brisbane 2012).

60 Waste Act ch 14.

61 Waste Act ss 16–22.

62 *ibid* ss 24–27.

63 Environment Protection Act 1994 s 312E(1).

flow from the grant of a resource authority. These primarily relate to the matters in Table 2 below.

A Conduct and Compensation Agreement (CCA) is a critical part of the landholder's rights. As matched by the description, its purposes are to provide for how and when the miner's liability will be met by the agreement, by monetary or non-monetary recompense⁶⁴ and how it will conduct itself in entry onto

the land and in carrying out the authorised activities.⁶⁵ Table 3 below provides details on the content of and the process for reaching agreement.

In addition, the Land Access Code under the P & G Act aims to improve transparency and equity for land access for resource activities.⁶⁶ It includes guidelines for communication between authority holders and private landholders, and mandatory conditions for the conduct of authorised activities. These conditions include a requirement for giving notice orally in person unless impracticable to do so, and other conditions relating to mining staff induction, access points, roads, livestock and property, obligations to prevent the spread of declared pests, camps, items brought onto the land, gates and fences, amongst others.

The Act requires a petroleum authority holder and persons performing activities to comply with the mandatory provisions of the code.⁶⁷ Failure to comply with the mandatory provisions is a breach of the Act, although there is no statutory penalty available. The Department emphasises that compliance action can be taken for breaches of a mandatory condition of the code⁶⁸ without penalties, indicating that the code has an educative role identifying key obligations and principles to promote responsible conduct.

The code and other aspects of the Land Access Framework were reviewed by the Land Access Review Panel in 2012. The state government responded to the panel's recommendations with six priority actions to be supported by legislative amendments, including the following:

- to review the heads of compensation to ensure no cost or erosion of landholder rights, and expand the Land Court's jurisdiction to include conduct issues
- to integrate a single accredited form of alternative dispute resolution into the Land Court
- to note the CCA on title documents
- to allow parties to agree to opt out of the Land Access Framework
- to develop standard CCAs for mineral, coal and CSG industries in partnership with the resource and agricultural sectors and
- to review and rationalise information sources.⁶⁹

The government's response helps to highlight key concerns around compensation, and the need for further policy and implementation work on the current CCA: 'full impacts are often in excess of what has been initially imagined and agreed to, future liability and ability to claim, the changing nature of activities over the term of the agreement, and (the

Table 2. Landholder rights in relation to CSG mining

Category of landholders' rights	Details under the P and Gas Act
Advance notice of activities, and of completion	A written 'notice of entry' for 'preliminary activities', (s. 495) must be given at least 10 business days before entry, (subject to exemptions) unless there is a conduct and compensation agreement in place relating to the land, or the landholder has waived the notice requirement and again within 10 days of completing the activities. Different activities can include carrying out hydraulic fracturing, seismic surveys, and drilling. Notice can be given by publication by the Chief Executive of the Department if 'it is impracticable to give the owner or occupier the notice personally' and the publication is to happen 20 business days before entry. Notification entitles the CSG miner to entry onto the land for up to 6 months for an authority to prospect and up to a year for a petroleum authority (s. 496(3)).
A right to information about the mining activities	The landholder is to be given full information about the proposed entry with the notice to be accompanied by copies of the authority, the land access code, any relevant code of practice applying to the activities, and 'relevant environmental authority documentation'. Notice is not required if the landholders are party to a conduct and compensation agreement or in other circumstances.
Rights to negotiate and be compensated for impacts of the mining activities on their land	A CSG miner cannot carry out an advanced activity, being an activity having a significant impact on a landholder's land, on private land unless the landholder and the miner agrees to compensation for the effects of the mining on the landholder (s. 500). Exceptions apply to facilitate the mining process. A CSG miner must compensate affected landholders for any 'compensable effects' (s. 532(1)). These effects extend to deprivation of possession of its surface, diminution of its value, diminution of the use of the land or its improvement, severance of the land in any form, costs, damage or loss from the activity and consequential damages from any of these (s. 532(4)).

64 P & G Act ss 534(2)(b), 534(1)(c).

65 *ibid* s 533(1).

66 Department of Employment, Economic Development and Innovation (DEEDI) *Land Access Code* (Queensland Government 2010) and see *Guide to Queensland's New Land Access Laws* http://mines.industry.qld.gov.au/assets/land-tenure-pdf/6184_landaccesslaws_guide_print.pdf.

67 P & G Act s 557.

68 DEEDI (n 66) 5.

69 Department of Natural Resources and Mines (DNRM) *Queensland Government Response to the Report of the Land Access Review Panel* (2012) 4.

Table 3. Researching agreement between CSG miners and landholders – some process points

	<i>Nature of protection for landholder</i>
Conditions	An agreement must be consistent with the conditions of the miner's authority and mandatory conditions of the land access code, as well as the Act, (533(3)) and can extend to any renewal period for the authority (534(2)).
Guidance	Standard form Conduct and Compensation Agreement and Deferral Agreement developed by the former Department of Employment, Economic Development and Innovation (DEEDI, 2010).
Negotiation process	Detailed provisions apply e.g issue of a notice of intent to negotiate; requirement to negotiate an agreement or deferral agreement within the minimum negotiation period of twenty days.
Deferral of agreement	A landholder may agree to defer the requirement for an agreement until after entry onto the land, by entering a deferral agreement (s. 500B) or if there is an application to the Land Court to decide on the miner's compensation liability to the landholder (s. 537B). The preparation of a deferral agreement, like the exceptions for an entry notice, includes requirements for statements from the landholders that they understand they have no obligation to enter the agreements or to waive the entry notice and information about entry (ss. 500B and 498).
Alternative dispute resolution or Land Court decision	There are detailed provisions for alternative dispute resolution and failing that for decision by the Land Court on the miner's compensation liability to the landholder (s. 537B(3)).

need for) review periods ... there is no one size fits all approach to negotiation and compensation'.⁷⁰

Further work on the scope of 'compensable effects' and the panel's comments on landholder access to compensation for time spent dealing with resource companies and the diminution of lifestyle, as well as the need for clearer definition of 'diminution of land value', will also be important to any revisions to the Land Access Framework.

Another change to the regulatory framework affecting landholders is the establishment of the Gasfields Commission under the Gasfields Commission Act 2013 (Qld). It has advisory functions with the objective 'to manage and improve the sustainable coexistence of landholders, regional communities and the onshore gas industry'.⁷¹

⁷⁰ *ibid* 15.

⁷¹ Gasfields Commission Act (Qld) s 2.

4 DISCUSSION: WHY A NEW GOVERNANCE APPROACH IS NEEDED

The CSG regulatory regime in Queensland is considered to be mature by Williams and others⁷² and to be 'evolving rapidly on the basis of actual experience'.⁷³ Nevertheless, a major concern is the absence of a risk assessment and management approach that integrates water allocation and mining decision-making and considers the cumulative impacts of proposed and existing development at regional or sub-regional levels. The current assessment processes focus on specific projects with little opportunity for assessing development from a risk perspective or 'collectively' at a regional or sub-regional level. Protection of strategic cropping areas is a partial response to ongoing community concerns, although it does not address cumulative risks before a large mining project is approved.

The recent legislative mechanism for declaration of cumulative management areas, which is intended to provide for the assessment of cumulative impacts on petroleum tenure areas (discussed in section 3.2), is not as well developed or expansive as its description would suggest. For example, parts of the Surat and Bowen Basins are declared cumulative management areas requiring underground water impact reports.⁷⁴ However, reports are provided several years after the grant of the relevant petroleum authorities. Based on a groundwater model, the Surat report predicts the number of bores that will be affected or are likely to be affected by CSG activities. It includes a water monitoring strategy, reassuring landholders in the Condamine Alluvium that, although there will be leakage of water from the Alluvium, this will be below the 'threshold trigger of 2 meters' and therefore will not be classified as an immediately affected area needing attention. Apart from monitoring, it is unclear how the Surat report addresses potential/likely impacts before they occur. Further, it is unclear what essential intervention actions are capable of reversing leakage if impacts go beyond the expected thresholds.

The regulatory framework comprises at least seven key pieces of state and Commonwealth legislation, and imposes several layers of authorities or approvals to be obtained before the exercise of rights under the mining tenure. Administrative costs are high from the perspective of both government and miners, with at least five state agencies involved. Overall, the framework is geared towards providing the CSG miner with the certainty of a petroleum authority and at the same time confers rights to 'produced water' of unlimited quantity (Table 2).

In spite of the many regulatory layers, the current legal framework does not facilitate a strategic or global view of how the long term risks and cumulative impacts of mining activities can be addressed and water resources protected. There is also limited legal

⁷² J Williams and others *An Analysis of Coal Seam Gas Production and Natural Resource Management in Australia* (n 1).

⁷³ Senate Committee (n 18) 14.

⁷⁴ Queensland Water Commission *Surat Underground Water Impact Report* (2012) <http://dnrm.qld.gov.au/ogia/surat-underground-water-impact-report>.

and policy support for application of the precautionary principle, despite it being incorporated into many Queensland statutes including the Water Act (section 11) and which is implicit in and supportive of a risk management approach.

The key literature highlights the importance of a risk management approach: '[t]he cumulative impacts of multiple mining operations have stretched environmental, social, human and economic systems and rendered conventional mine-by-mine governance approaches ineffective'.⁷⁵ To begin to move away from the system stresses outlined above in section 2.2, a major step-change is needed – a proactive and future-oriented regional approach to ensure that planning and assessment support desired outcomes instead of the most likely ones.⁷⁶ Williams and others have concluded that an independent risk assessment is essential if policy is to respond appropriately to cumulative impacts of CSG exploration and production.⁷⁷

As a matter of practical application what this means is that, despite potential variations between risk management approaches, the risk management framework proposed for the benefit of sustainable groundwater use in the Condamine Alluvium can be applied immediately and its broad principles implemented.

5 CONCLUSION

Ostensibly, water issues related to CSG production are now, in response to community action, within the ambit of the state's governance framework. However, as we have seen, the regulatory framework for CSG mining in Queensland gives primacy to the state's petroleum and gas legislation. The priority given to underground water rights displaces the well developed public law procedures established by the water planning framework and its protections of broader hydrological and catchment systems. The CSG regime allows unlimited volumes of water to be extracted as a result of mining activity, whilst other water users'

access is capped by water planning. This undermines water planning outcomes and processes and subordinates the rights of existing water users, the rivers and the environment.

As other jurisdictions have found, the regulatory framework should place CSG proponents on the same footing as other water users. This is especially so given the high level of uncertainty of information used to construct models for estimating the production of underground water and its consequential effects on other water resources. Whilst risk assessment frameworks have been adopted in NSW and other parts of Australia, these have not yet been applied in a systematic fashion in Queensland, and application is unlikely unless made mandatory or facilitated through a suitable governance framework.

Policy-makers also have the opportunity to harness the political energy from the current CSG debate to reformulate the governance framework relating to land and water resources in relation to the cumulative impacts arising from other sectors or other use of natural resources. It is only then that we will be able to achieve more sustainable agriculture in this part of Australia. If this issue is ignored, intergenerational equity is threatened and the precautionary principle is made redundant.

Limited water resources have increasing demands from agriculture, mining and cities, whilst environmental concerns are growing. This is a challenge not only for Australia but also for other parts of the world, especially Africa, Asia, Latin America and the Pacific. Added to this are climate change concerns, population pressure and challenges of building and maintaining socio-economic and environmental development without jeopardising sustainable water resources. This article recommends an essential cumulative risk management approach that should be supported by the legal frameworks for resource management, and could be implemented in other countries facing these same issues.

75 D M Franks, D Brereton, C J Moran 'Managing the cumulative impacts of coal mining on regional communities and environments in Australia' DOI Impact assessment and project appraisal 28(4) 299–312 ISSN 1461-5517, 12/2010.

76 P N Duinker 'Give and take: the role of regulatory decision-makers in risk analyses for environmental impact assessment' in A P Grima, C D Fowle and R E Munn (eds) *The Application of Risk Management Principles to Environmental Impact Assessment in Canada* (Institute for Environmental Studies University of Toronto Canada 1989) 113–27; B Noble 'Strategic approaches to regional cumulative effects assessment: a case study of the Great Sand Hills, Canada' (2008) 26(2) *Impact Assessment and Project Appraisal* 78–90.

77 J Williams and others *An Analysis of Coal Seam Gas Production and Natural Resource Management in Australia* (n 1).