REGULATING THE KNOWN UNKNOWNS

HOW ENVIRONMENTAL UNCERTAINTY IS ADDRESSED IN THE REGULATION OF THE COAL SEAM GAS INDUSTRY IN QUEENSLAND AND NEW SOUTH WALES

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List of Acronyms

AGL	Australian Gas Light Company
BTEX	benzene, toluene, ethyl-benzene and xylene
CSG	coal seam gas
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CMA	cumulative management area
DEEDI	Department of Employment, Economic Development and Innovation
DERM	Department of Environment and Resource Management
DGRs	Director-General's requirements
DII	Department of Industry and Investment
DPI	Department of Primary Industries
DTIRIS	Department of Trade and Investment, Regional Infrastructure and Transport
EC	electrical conductivity
EIA	environmental impact assessment
EIS	environmental impact statement
ESD	ecologically sustainable development
EPL	environment protection license
GSP	Gross State Product
GHG	greenhouse gas
LNG	liquefied natural gas
NWC	National Water Commission
NSW	New South Wales
OEH	Office of Environment and Heritage
PAC	Planning Assessment Commission
POEO	Protection of the Environment Operations Act 1997
REF	review of environmental factors
SSD	State Significant Development
QWC	Queensland Water Commission

INTRODUCTION

Environmental regulation issues surrounding Australia's mining sector have received relatively little attention from environmental law scholars.[1] This neglect has meant there has not been a concerted attempt to draw lessons for environmental law and regulation from the experience of this sector. This thesis aims to contribute to that field of scholarship with an examination of the regulation of Australia's burgeoning coal seam gas (CSG) industry.

CSG activity has rapidly expanded in the last five years, with industry and governments extolling gas as essential for the transition from coal to renewable energy.[2] Approximately $80 billion will be invested in expanding CSG development in the coming years.[3] Industry activity has been most heavily concentrated in Queensland[4] with approximately 80 per cent of that State's consumer gas now

[1] But see Michael Briody and Tim Prenzler, 'The Enforcement of Environmental Protection Laws in Queensland: A Case of Regulatory Capture?' (1998) 15(1) *Environmental and Planning Law Journal* 54-71; Drew Hutton, 'Mining and the Environment in Queensland: Where the Law Begins and Enforcement Fails — Regulatory Capture and Implementation Failure' (1999) 6(2) *Australasian Journal of Natural Resources Law and Policy* 149-173; David Brereton, 'Self-Regulation of Environmental and Social Performance in the Australian Mining Industry (2003) 20(4) *Environmental and Planning Law Journal* 261-274.
[2] NSW Government, Submission No 642 to General Purpose Standing Committee No 5, *Inquiry into Coal Seam Gas*, 30 September 2011, 4; Queensland Government, Submission No 358 to Senate Standing Committee on Rural Affairs and Transport, *Inquiry into the Management of the Murray Darling Basin*, June 2011, 3.
[3] Paddy Manning, 'Energy Analyst Turns Up Heat On New Gas Projects', *The Sydney Morning Herald* (online) 28 October 2011 <http://www.smh.com.au/environment/water-issues/energy-analyst-turns-up-heat-on-new-gas-projects-20111027-1mm53.html>.
[4] G Barker and S Slater, 'The Increasing Significance of Coal Seam Gas in Eastern Australia' (Paper presented at PESA Eastern Australasian Basins Symposium III, Sydney, 14-17 September 2008) 1.

comprised of CSG.[5] The New South Wales (NSW) CSG industry is less advanced, but the State looks set to experience a similarly large boom.[6]

Confronting this growth, however, are serious environmental concerns. Recent studies have cast doubt on the view that gas-fired electricity carries significantly less global warming potential than coal.[7] CSG extraction also poses serious threats to groundwater. Scientists warn that these risks are uncertain, yet may be widespread and irreversible.[8] Relative to conventional natural gas, CSG extraction involves far more environmentally intrusive practices, including extraction of large amounts of groundwater and in some circumstances, deliberate disturbance of geological systems through hydraulic fracturing ('fraccing').[9] Fraccing involves pumping large amounts of water, sand and chemical fluid into gas wells at high pressure, causing fissures in the coal seam.[10] This allows trapped gas to move to the surface where it can be captured.[11]

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[5] Arif Syed et al, 'Australian Energy Projections to 2029-30' (Report, Australian Bureau of Agricultural and Resources Economics, 18 March 2011) 45.

[6] NSW Government, Submission No 642, above n 2, 7.

[7] This is because new industry practices for extracting gas are highly energy-intensive and create substantial fugitive emissions: Robert W Howarth, Renee Santoro and Anthony Ingraffen 'Methane and the Greenhouse-Gas Footprint of Natural Gas from Shale Formations' (2011) 106 *Climatic Change* 679-690; Tom M L Wigley, 'Coal to Gas: the Influence of Methane Leakage' (2011) 108 *Climatic Change* 601-608.

[8] National Water Commission (NWC), 'Coal Seam Gas and Water' (Position Statement, December 2010) 1-2; Commonwealth Scientific and Industrial Research Organisation (CSIRO), 'Coal Seam Gas: Challenges, Benefits and Risks of CSG Production' (Factsheet # 5, (July 2011) 1-2; University of Sydney Hydrology Research Laboratory, Submission No 553 to NSW Legislative Council, *Inquiry into Coal Seam Gas*, 14 September 2011, 1-3; Email from Gavin Mudd to Charlotte Hanson (11 September 2011). Mudd is an environmental engineer in the Department of Civil Engineering, Monash University.

[9] NWC, above n 8, 1; CSIRO, 'Coal Seam Gas Hydraulic Fracturing' (Factsheet # 3, July 2011) 1.

[10] CSIRO, 'Challenges, Benefits and Risks of CSG Production', above n 8, 1.

[11] Ibid.

Regulators and government officials defend the growth of the industry in the face of serious uncertainty with the asserted adoption of 'adaptive management' programs.[12] It is proposed that through the ongoing collection of data from existing projects, new information will be used to improve strategies for managing the uncertain environmental impacts of the industry.[13]

This thesis argues that despite the adoption of adaptive management to address regulatory concerns, much CSG activity in NSW and Queensland is taking place in a context of regulatory failure. That is, regulators appear to be serving industry purposes at the expense of the public interest in environmental protection.[14] Regulators have set aside the precautionary principle, a cardinal consideration in the regulation of environmental risks, and approved projects without thorough environmental impact assessment (EIA). Further, specific statutory provisions applying to CSG do not adequately address the environmental risks it poses.

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[12] An adaptive management regime has been introduced in Queensland: see, eg, Queensland Government, 'Adaptive Environmental Management Regime for the Coal Seam Gas Industry' (Factsheet, Department of Environment and Resource Management, 2011) 1-2. NSW has not followed suit with a State-wide adaptive management policy, however this seems likely to occur in the near future: a senior regulatory officer stated in interview that there is no other viable policy option: Interview with senior officer, Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) (Telephone Interview, 15 September 2011). The notion of adaptive management was also employed in NSW in February 2011 in the approval decision for a major CSG development at Gloucester: see below, Part Two(II:NSW).

[13] Queensland Government, *Adaptive Environmental Management Regime*, above n 12, 2.

[14] Martin Lodge, 'Competition, Innovation and Regulation: The Regulatory State and Policy Failure — Regulatory Regimes in Britain and Germany (Paper presented at 51st Political Studies Association Conference, London School of Economics, Manchester 10-12 April 2001).

It is also contended that adaptive management has been used by regulators and governments to falsely legitimate[15] the regulation of the industry. Adaptive management literature suggests it is an inappropriate regulatory technique where potentially irreversible impacts are involved.[16] Even aside from this threshold issue, regulators do not appear to be complying with adaptive management requirements.[17] When invoked in this way, adaptive management seems to be a politically convenient but legally and environmentally inadequate justification for allowing industry growth in the face of serious uncertainty.

This thesis therefore proposes that to ensure an adequate level of environmental protection, there is a critical need not only for law reform in relation to the CSG industry, but regulatory reform as well.

In exploring these issues, the existing legislative scheme that applies to CSG is considered. Although reviewing the legal framework provides insights into the normative principles with which regulatees are expected to comply, such as approach reveals little about how the law is implemented and the underlying political and institutional forces influencing its implementation.[18] Hence, this thesis is chiefly concerned with exposing the 'law in action';[19] that is, how regulatory agencies in two States have engaged with the CSG industry and the reasons for their approach.

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[15] Legitimate in the sense used by Jürgen Habermas, *Legitimation Crisis* (Beacon Press, 1975).
[16] C S Holling, *Adaptive Environmental Assessment and Management* (John Wiley & Sons, 1978) 8.
[17] See below, Part One(II:Adaptive Management).
[18] Tim Bonyhady, *Places Worth Keeping: Conservationists, Politics and Law* (Allen & Unwin, 1993) x.
[19] This term derives from the work of legal realists such as Roscoe Pound, 'Law in Books and Law in Action' (1910) 44 *American Law Review* 12-36.

I Contribution to the Research Field

At the time of writing, a thorough search revealed that no peer-reviewed articles on the regulation of Australia's CSG industry have been published. The regulation of a comparable industry in the United States — shale gas extraction — is discussed in several journal articles.[20] However, their focus is the laws applying to the industry, not institutional and political factors influencing regulation.[21]

The influence of political and institutional factors on the work of regulators is a vital consideration in the context of mining regulation in Australia, as studies have shown regulatory agencies tasked with overseeing this sector are often predisposed to serving industry interests at the cost of environmental protection.[22] This thesis contributes to the study of environmental regulation with original research into the political and institutional dynamics influencing the approach of those regulating the CSG industry. In contrast to some regulatory failure studies,[23] it considers regulation from an *ex ante* viewpoint,[24] before the possible outcomes of the alleged regulatory failure can be fully assessed. It is hoped that this forward-looking analysis identifies areas of

[20] See, eg, Hannah Wiseman, 'Untested Waters: the Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation' (2009) 20 *Fordham Environmental Law Review* 115-195; Emily C Powers, (2011) 19 'Fracking and Federalism: Support for an Adaptive Approach that Avoids the Tragedy of the Regulatory Commons' *Journal of Law and Policy* 913-971; Brian J Smith, 'Fracing the Environment?: An Examination of the Effects and Regulation of Hydraulic Fracturing' (2011) 18 *Texas Wesleyan Law Review* 129-148; Michelle L Kennedy, 'The Exercise of Local Control Over Gas Extraction' (2011) 22 *Fordham Environmental Law Review* 375-392.

[21] But see Wiseman, above n 22, 115, 169-181, who examines how industry and political influences have affected the federal regulation of fraccing in the United States.

[22] See, eg, Neil Gunningham, 'Negotiated Non-Compliance' (1987) 9 *Law and Policy* 69-95; Briody and Prenzler, above n 1, 54-71; Hutton, above n 1, 149-173; Public Accounts Committee, Parliament of NSW, *Report on the Forestry Commission* (1990) 126-8.

[23] See, eg, Thomas McGarity, 'MTBE: A Precautionary Tale' (2004) 28 *Harvard Environmental Law Review* 281, 282.

[24] Jon Stern, 'The Evaluation of Regulatory Agencies' in Robert Baldwin, Martin Cave and Martin Lodge (eds), *The Oxford Handbook of Regulation* (Oxford Univeristy Press, 2011) 223, 224.

weakness in the regulatory approach and legislation so that law and policy may be reformed to better protect the environment.

II Methodology

Primary research was required to gain insight into the regulatory approach and the political and institutional forces affecting it. Internal government documents, legislation and policy statements were reviewed. Interviews (11 in total) were conducted with a range of subjects, including state departmental officials, environmental NGOs, and industry and company representatives. These provided opportunities to explore and seek explanations for regulatory issues in greater depth than written correspondence would allow. There was a marked difference in the responsiveness of regulatory agencies in NSW and Queensland to interview requests. Queensland's environment authority required all questions to be submitted via email so that written responses could be prepared to questions, whereas NSW regulators were more willing to speak candidly about their work. The relative openness of NSW officials allowed deeper analysis with respect to some aspects of the research, particularly the institutional influences on the regulatory approach.

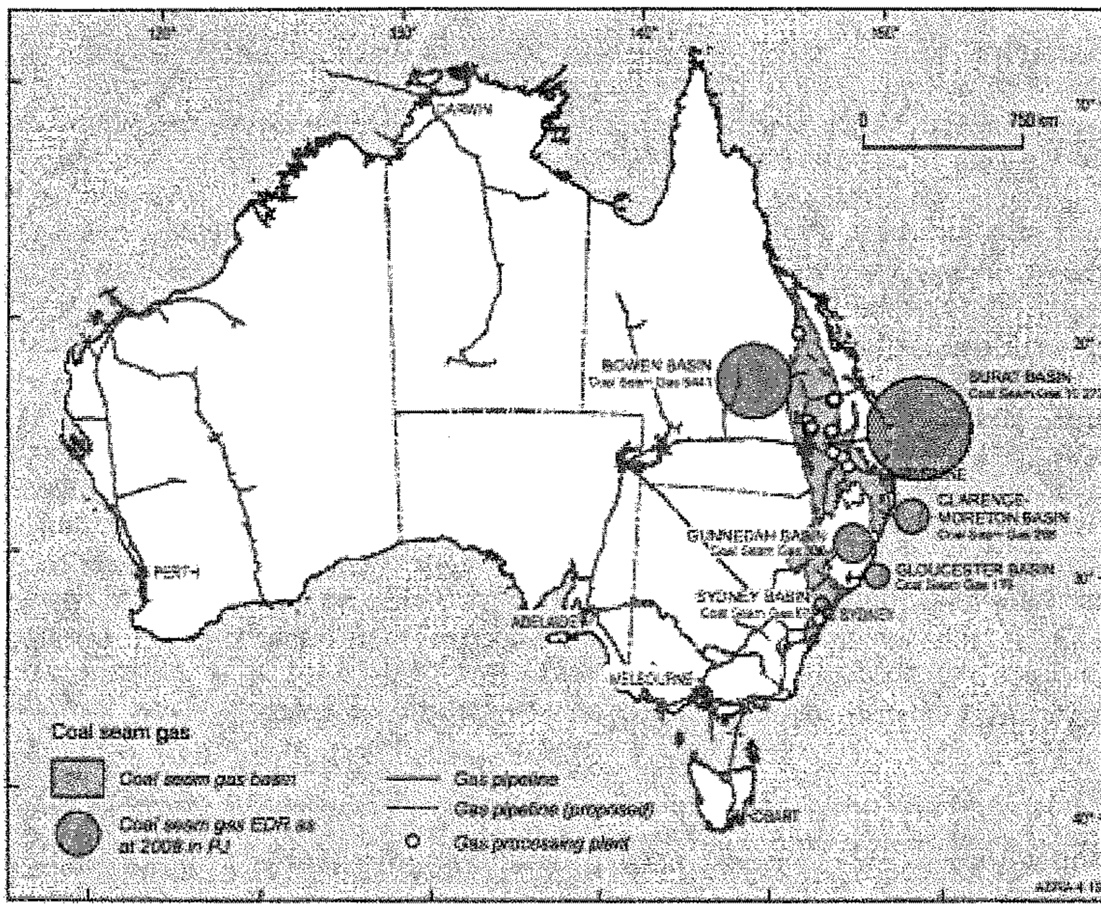
The author also undertook field research for three weeks in far Northern NSW (a CSG hotspot) in order to obtain a practical understanding of the environmental issues surrounding the industry. As well as engaging with stakeholders, time was spent on a participant observation basis in a community legal centre that provides advice to Northern Rivers residents regarding the legal issues arising from CSG activity.[25]

[25] This research was undertaken from 27 June 2011 to 18 July 2011 in Lismore NSW under the supervision of solicitor Sue Higginson.

III Scope

A Jurisdiction

CSG exploration has occurred in a number of Australian states and the Northern Territory, however because most activity is concentrated in Queensland and NSW, this thesis focuses on industry regulation in those States. The map below shows the location of CSG reserves and projects.[26]



The Commonwealth currently has a very limited role in CSG regulation, through the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ('*EPBC Act*'). Where a project has, will have, or is likely to have, a significant impact on one or

[26] Geoscience Australia, Department of Resources, Energy and Tourism and Australian Bureau of Agricultural and Resource Economics, 'Australian Energy Resource Assessment' (Report, 1 March 2010) 98. Note 'EDR' is an abbreviation of Economic Demonstrated Resources and 'PJ' denotes petajoules.

more prescribed matters of national environmental significance,[27] approval from the Commonwealth Environment Minister is required under Part 9 of the Act.[28] Commonwealth oversight of the industry[29] is an important issue, but is beyond this paper's ambit.

B *Environmental Impacts*

The environmental problems to which the CSG industry gives rise are wide-ranging.[30] The focus of this thesis is groundwater impacts, as these present the greatest level of uncertainty and the most intractable regulatory challenges. Key risks relate to aquifer diversion, depletion and contamination.

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[27] Matters of national environmental significance are listed in pt 3 div 1 of the *EPBC Act* and include, eg, World Heritage property (s 12) and threatened species and ecological communities (s 18).

[28] The Commonwealth has approved three major CSG projects in Queensland in the last year and several more projects are currently being assessed under the *EPBC Act*: see Department of Sustainability, Environment, Water, Population and Communities, *Public Notices: Referrals* (22 October 2011) <http://www.environment.gov.au/cgi-bin/epbc/epbc_ap.pl?name=public_notifications&limit=730&text_search=coal+seam+gas>.

[29] Independent and Greens parliamentarians have attempted to increase Commonwealth scrutiny of the CSG industry under the *EPBC Act* by providing for mining operations impacting on groundwater to be made a matter of national environmental significance: see Environment Protection and Biodiversity Conservation Amendment (Mining, Petroleum and Water Resources) Bill 2011 (Cth) s 24D, introduced by independent Tony Windsor, and Environment Protection and Biodiversity Conservation Amendment (Protecting Australia's Water Resources) Bill 2011 (Cth) s 24D, introduced by Larissa Waters of the Greens.

[30] These include contamination of waterways and land, biodiversity and heritage loss, land clearing and bushfire risks: Nari Sahukar, Environmental Defender's Office (EDO) NSW, Submission No 359 to NSW Legislative Council, *Inquiry into Coal Seam Gas*, 12 September 2011, 8. Fraccing has also been linked to earth tremors in the United Kingdom: Peter Ker, Phillip Wen and Ruth Williams, 'Fracking Shock Reignites Concern', *The Sydney Morning Herald* (online), November 5 2011 <http://www.smh.com.au/environment/fracking-shock-reignites-concern-20111104-1n02e.html>.

1 *Aquifer Diversion and Depletion*

To desorb CSG from coal, groundwater must first be pumped up from coal seams (a process called 'dewatering').[31] On average approximately 300 gigalitres of groundwater will be extracted in Australia each year by the industry for the next 25 years; in comparison, the total extraction from the Great Artesian Basin for all purposes (including agriculture) is 540 gigalitres per year.[32]

The National Water Commission (NWC) predicts that the extraction of water in these processes will affect the flow and water levels of connected surface and groundwater systems, including those of the Great Artesian Basin and the Murray Darling Basin.[33] This is because gas and water extraction depressurise coal seams, which can alter pressure in adjacent aquifers and diminish surface water flows.[34] The long-term effects of groundwater extraction are uncertain[35] and may be irreversible.[36]

2 *Aquifer Contamination*

Fraccing can also cause aquifer contamination. Some of the chemicals injected into coal seams for fraccing are highly toxic.[37] There is a risk that these chemicals may contaminate surrounding aquifers if, during drilling or fracturing, an aquifer becomes

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[31] National Water Commission, above n 8, 1.
[32] National Water Commission, above n 8, 1.
[33] Ibid.
[34] Ibid.
[35] Ibid; CSIRO, 'Challenges, Benefits and Risks of CSG Production', above n 8, 1.
[36] Email from Gavin Mudd to Charlotte Hanson (11 September 2011).
[37] Mariann Lloyd-Smith and Rye Senjen, 'Hydraulic Fracturing in Coal Seam Gas Mining: the Risks to Our Health, Communities, Environment and Climate' (Report, National Toxics Network, June 2011) 10-14.

connected with the coal seam into which chemicals have been injected.[38] Even if connectivity does not occur, the geological disturbance caused by fraccing can mobilise organic compounds already present in subsurface rocks, including hydrocarbons such as benzene, toluene, ethyl-benzene and xylene (BTEX).[39] If this occurs, there is a risk that these compounds could mix with groundwater.[40]

IV Structure

In light of these environmental threats, Part One explains how the precautionary principle applies to the CSG industry and explores the origins and uses of adaptive management techniques to address environmental uncertainty. Part Two describes and critiques the legislative framework that applies to the CSG industry and presents evidence of the regulatory approach in Queensland and NSW. Part Three integrates evidence from Part Two with regulatory theory to provide possible explanations for the regulatory approach to date. Recommendations for addressing some of the shortcomings in the regulatory approach and legislative framework are then provided.

[38] NWC, above n 8, 1; fraccing has caused connectivity between an aquifer and a coal seam in the Surat Basin, Queensland: see below Part Three(I:Reasons for the Approach).
[39] Lloyd-Smith and Senjen, 'Hydraulic Fracturing', above n 37, 5-6. BTEX has also been used as a drilling agent for CSG activity: at 5.
[40] A company operating an underground coal gasification project in Dalby, Queensland, recently reported BTEX contamination at six to 15 times higher than Australian drinking water standards in bores surrounding its activities, which has increased concerns over indirect contamination caused by fraccing. See National Toxics Network, 'Gas Industry Plays Down BTEX Levels in Groundwater' (Press Release, 29 August 2011) 1.

PART ONE: RECONCILING THE PRECAUTIONARY PRINCIPLE AND ADAPTIVE MANAGEMENT

I THE PRECAUTIONARY PRINCIPLE

The precautionary principle is a cardinal element of the overarching concept of ecologically sustainable development (ESD) that informs environmental law. The principle holds that '[w]here there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.'[41] Judicial interpretation of the principle emphasises that the level of precaution required is inversely proportionate to the likelihood of risk involved.[42] This means that where there is a high degree of potential damage, a low level of certainty about the threat will warrant precaution.[43]

The principle is widely incorporated as an objective and decision-making consideration in Acts applying to CSG activity.[44] However, if the precautionary principle is triggered with respect to a particular development, it does not have a prohibitory effect;[45] rather, it remains open for decision-makers to approve an activity

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[41] *Intergovernmental Agreement on the Environment* (1992) [3.5.1], as codified in legislation, eg, *Protection of the Environment Administration Act 1991* (NSW) s 6(2)(a): 'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'.
[42] *Telstra v Hornsby Shire Council* [2006] LEC 133 ('*Telstra v Hornsby Shire Council*') [146], [166]-[167].
[43] Ibid.
[44] ESD is the stated object of the environmental impact assessment law applying to CSG projects in Queensland, the *Environmental Planning Act 1994* (s 3). Section 5 of this Act requires decision-makers to exercise their power 'in the way that best achieves the objects of' the Act. In NSW, ESD is an object of the *Environmental Planning and Assessment Act 1979* (s 5(a)(vii)), under which environmental impacts of CSG projects are assessed in that State.
[45] *Telstra Corporation Limited v Hornsby Shire Council* [179]-[180].

based on economic imperatives.[46] For the CSG industry, the financial stakes are high: in Queensland the CSG to Liquefied Natural Gas (LNG) industry will add over $3 billion to Gross State Product (GSP) and provide $850 million in government royalties annually.[47] In NSW, CSG is estimated to increase GSP by $1 billion.[48]

This thesis accepts the scientific evidence indicating that the environmental risks to groundwater are serious and potentially irreversible.[49] Given the magnitude of potential environmental impacts, CSG activity warrants a high degree of precaution, despite the economic imperatives.[50] Evidence of the regulatory approach in Queensland and NSW presented in Part Two suggests that the principle has not been given adequate weight, since economic development has been unduly prioritised over environmental protection. Although this presents a prima facie situation of regulatory failure, the justification for rejecting the precautionary principle — that adaptive management will address the environmental threats posed by the industry —[51] must be considered to determine whether it provides a viable alternative to applying the precautionary principle.

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46 David Farrier and Elizabeth Fisher, 'Reconstituting Decision Making Process and Structures in Light of the Precautionary Principle' (Paper presented at the Precautionary Principle Conference, Institute of Environmental Studies, University of New South Wales, 20-21 September 1993) 1.
47 Queensland Government, Submission No 358, above n 2, 6.
48 NSW Government, above n 2, 7.
49 See above n 8.
50 *Telstra v Hornsby Shire Council* [146], [166]-[167].
51 See above n 12 and accompanying text.

II Adaptive Management

Adaptive management is an explicitly experimental technique[52] that has been applied to the management of replenishing natural resources such as fisheries and wildlife.[53] It involves close integration of scientists and policymakers in the development of environmental systems models that are adjusted in response to changing conditions.[54] Adaptive management reconceptualises environment regulation by incorporating scientists while activities are carried out, as opposed to merely in the initial EIA.[55]

The technique is theoretically consistent with the precautionary principle, because it is not intended for use in situations where environmental impacts of an activity are irreversible.[56] Given scientists' concerns over the irreversibility of CSG impacts,[57] it is arguable that the industry is an inappropriate subject for adaptive management ab initio. A thorough review of the literature revealed no examples of adaptive management being invoked in relation to new techniques of resource extraction that are known to cause potentially irreversible harm. The claims to be applying adaptive management to CSG extraction in Australia appear to be unprecedented in this way.

Invoking adaptive management to justify CSG project approvals is also legally problematic, as the policy may conflict with legislation. If a decision-maker applies a blanket policy that removes their discretion to consider project applications according

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[52] Kai N Lee, 'Appraising Adaptive Management' (1999) 3(2) *Ecology and Society* [13] <http://www.ecologyandsociety.org/vol3/iss2/art3/inline.html>.
[53] See, eg, Carl Walters, *Adaptive Management of Renewable Resources* (Blackburn Press, 1986); ibid [35].
[54] Holling, above n 16, 14-15.
[55] Ibid.
[56] Ibid, 8, 11; Carl Walters, 'Challenges in Adaptive Management of Riparian and Coastal Ecosystems' (1997) 1(2) *Ecology and Society* [45] <http://www.ecologyandsociety.org/vol1/iss2/art1/>.
[57] See above n 8.

to criteria prescribed by legislation, the decision may be invalid because it is inconsistent with the discretion permitted by the law.[58] Adaptive management does not have the status of an environmental law principle, on a par with the principles of ESD, including the precautionary principle. It is not provided for in EIA legislation applying to the CSG industry.[59] Since the precautionary principle is incorporated as a decision-making consideration into the legislative framework for the CSG industry,[60] if adaptive management is applied inconsistently with the precautionary principle to approve projects, there is an argument that such approvals may be invalid.[61]

Aside from these threshold problems with applying adaptive management to justify the CSG industry, it is necessary to consider how adaptive management should be implemented. A set of minimum requirements must be met: data collection must be comprehensive; new data must be entered into scientific models for predicting impacts so as to reduce uncertainties over time; and the experimenter should be responsive to new information that comes to hand.[62] Evidence presented in the next Part suggests that these requirements have not been consistently complied with in CSG regulation to date.

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[58] *Green v Daniels* (1977) 13 ALR 1 ('*Green v Daniels*'), 9.

[59] Adaptive management is incorporated as a principle into several environmental laws and regulations in Australia, eg, *Environment Protection and Biodiversity Conservation Regulation 2000* (Cth) sch 8, referring to International Union for Conservation of Nature reserve management, and *Water Management Act 2000* (NSW) ('*Water Management Act*') s5(2)(h). Some provisions of the *Water Management Act* apply to CSG activity in NSW, however much of the industry is exempt from its licensing requirements: see EDO (NSW), 'Mining Law in NSW' (Discussion Paper, June 2011) 26, 29-30.

[60] See above n 44 and accompanying text.

[61] *Green v Daniels*,1, 9.

[62] Alastair T Iles, 'Adaptive Management: Making Environmental Law and Policy more Dynamic, Experimentalist and Learning' (1996) 10 *Environmental Planning and Law Journal* 288, 290-2.

PART TWO: THE LAW IN ACTION

This Part evaluates the relevant environmental laws and their implementation in the studied jurisdictions in terms of project assessment, monitoring and enforcement. Since the extent of law reform addressing the unique environmental problems posed by the CSG industry varies between Queensland and NSW, the analyses for each State focus on different legal and regulatory issues within these broad areas. For Queensland, where the industry is larger and there is more specialist legislation for CSG activity, the provisions for monitoring of groundwater impacts are focused upon. For NSW, where applicable law is in a state of flux,[63] particular attention is given to regulators' approach to assessment of CSG projects and issues surrounding the regulatory role of the statutory Environmental Protection Authority (the Office of Environment and Heritage (OEH)).

I QUEENSLAND

CSG activity in Queensland requires authorisation under the State's EIA law, the *Environmental Protection Act 1994* (Qld) ('*EP Act*').[64]

The *EP Act* categorises CSG activities as either Level 1 or 2 depending on the risk of environmental harm.[65] The State's large-scale CSG projects and all projects involving fraccing are classified as Level 1 activities.[66] Since Queensland's CSG industry is

[63] See below, Part Two(II:NSW).
[64] A Resource Authority must also be obtained under the *Petroleum and Gas (Production and Safety) Act 2004* (Qld). Since more onerous environmental protection obligations are provided for in the *EP Act*, its provisions are considered here.
[65] *EP Act* s 309C.
[66] *EP Act* s 309C; *Environment Protection Regulation 2008* (Qld) cl 23(1), sch 5.

now dominated by large-scale production projects,[67] the focus here is Level 1 provisions.

A *Level 1 Environmental Authorities*

Applicants are required to complete an Environmental Impact Statement (EIS) for Level 1 activities if the administering authority (the Chief Executive of the Department of Environment and Resource Management (DERM))[68] forms the opinion that an EIS is required.[69] However, an EIS is not required under the *EP Act* if the Resource Authority[70] relating to the application is declared by the Coordinator-General of the Department of Employment, Economic Development and Innovation (DEEDI) to be a 'significant project'.[71] The Coordinator-General decides whether an EIS is required.[72] If it is (which is 'almost invariably' the case),[73] they determine the terms of reference for the EIS.[74] Based on this assessment, the Coordinator-General can stipulate conditions for the Environmental Authority,[75] and any conditions imposed by DERM must not be contrary to these.[76]

These EIA provisions create an institutional decision-making arrangement where environmental safeguards may be circumvented in favour of economic benefits. The overriding authority of the Coordinator-General in imposing conditions on major

[67] EDO Northern Queensland, 'Coal Seam Gas Production and Regulation: What You Should Know' (Factsheet, January 2011) 5.
[68] *EP Act* sch 4.
[69] *EP Act* s 310E (1).
[70] See above n 64 and accompanying text.
[71] *EP Act* s 310E(5).
[72] *State Development and Public Works Organisation Act 1971* (Qld) ('*State Development Act*') s 26(1).
[73] Interview with Lindsay Delzoppo, Director Environmental Impact Assessment, DERM (Telephone Interview, 31 October 2011).
[74] *State Development Act* s 30(1).
[75] *State Development Act* s 47C(1), *EP Act* s 310O(5)(a).
[76] *EP Act* s310O(5)(b).

CSG projects undermines DERM's authority as a regulator. The limitations of DERM's regulatory powers with respect to deemed significant projects are not, however, unique to the CSG industry or to Queensland. Rather, they reflect a common theme in Australian environmental law identified by Bonyhady and Macintosh *et al*, of the EIA process for major projects prioritising economic development.[77]

B *Groundwater Modelling*

Under amendments to the *Water Act 2000* (Qld) ('*Water Act*') introduced in December 2010,[78] the Queensland Water Commission (QWC) is now responsible for collecting data on groundwater impacts to be used for the development of a regional groundwater model.[79] The model covers the declared 'cumulative management area' (CMA)[80] of the Surat Basin.[81]

While the development of a regional groundwater model is necessary for achieving an adaptive management framework, it is very late in the overall life-span of the industry to be creating a model, considering CSG exploration began in Queensland in the 1980s.[82] An ex-energy industry hydrogeologist described the initiative as 'an afterthought', as it was introduced once the State's three largest CSG projects were approved last year.[83]

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[77] Tim Bonyhady and Andrew Macintosh (eds), *Mills, Mines and Other Controversies* (Federation Press, 2010).
[78] *Water and Other Legislation Amendment Act 2010* (Qld).
[79] *Water Act* s 370(1)(a); Explanatory Memorandum, Water and Other Legislation Amendment Bill 2010 (Qld), 12.
[80] *Water Act* ss 397, 400, 405, sch 4.
[81] QWC, 'Coal Seam Gas Groundwater Management' (Factsheet, 28 March 2011) 1.
[82] DEEDI, 'Queensland's Petroleum: Exploration and Development Potential' (Report, February 2011) 12.
[83] Manning, above n 3.

There are also problems with the rigour of data collection for the model. The QWC is only required to monitor impacts on groundwater quantity, not quality changes.[84] Given the risks that CSG activity poses to the quality of groundwater, particularly where fraccing is used,[85] monitoring water quality changes is critical.[86] CSG companies are also required to collect baseline data (for water quality and quantity) to be provided to the QWC,[87] but exploration activity does not trigger the requirement.[88] Considering that CSG exploration can involve extensive groundwater extraction through dewatering,[89] this means that modeling conducted with this data may not take into account true groundwater baselines.

There is some evidence that the CSG industry had a pivotal role in drafting the law for groundwater modeling. The Explanatory Memorandum for the *Water Act* amendments makes clear that industry successfully lobbied for exploration activities to be exempt from baseline assessments.[90] In a meeting in Toowoomba in October 2010, DERM officers acknowledged that Hopgood Ganim, one of the major firms representing the CSG industry in Queensland,[91] was involved throughout the drafting

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84 *Water Act* ss 371(a), 376.
85 CSIRO, 'Hydraulic Fracturing', above n 9, 2; Lloyd-Smith and Senjen, 'Hydraulic Fracturing', above n 37, 2-20.
86 Interview with Gavin Mudd (Telephone Interview, 1 November 2011).
87 *Water Act* s 394(a); QWC, above n 81, 2.
88 *Water Act* s 397; Explanatory Memorandum, Water and Other Legislation Amendment Bill 2010 (Qld) 47.
89 Interview with senior officer, Queensland Water Commission (Telephone Interview, 21 October 2011).
90 Explanatory Memorandum, Water and Other Legislation Amendment Bill 2010 (Qld) 47.
91 Hopgood Ganim, *Resources and Energy* (2011) <http://www.hopgoodganim.com.au/Expertise/Resources-and-Energy.aspx>.

of the *Water Act* amendments.[92] The Explanatory Memorandum states that select NGOs and local councils were consulted on the draft Bill, however it does not mention Hopgood Ganim's involvement.[93] In light of the concessions in the Act, this may suggest the firm had a less formalised but influential role in consultation.

In addition to these informational gaps, there is an institutional barrier to the successful implementation of adaptive management under this framework: the QWC has no decision-making role, including in the assessment of new projects.[94] This could mean scientific knowledge of impacts of the industry will carry limited weight in the regulation of the industry, and that management will not be appropriately adaptive.

C *Liability and Enforcement*

The *EP Act* contains a suite of traditional sanctions for addressing environmental harm, ranging from environmental protection orders, to offence provisions for causing pollution.[95]

It is arguable, though, that there is no appropriate sanction for what might become the industry's most damaging environmental legacy[96] — depletion and diversion of aquifers caused by depressurisation. There is not enough scientific knowledge to

[92] Email from Anne Bridle to Charlotte Hanson (4 November 2011). The meeting was held at DERM's office on 8 October 2010.
[93] Explanatory Memorandum, Water and Other Legislation Amendment Bill 2010 (Qld) 44.
[94] Interview with senior officer, QWC (Telephone Interview, 21 October 2011).
[95] *EP Act* chs 7, 8.
[96] Email from Gavin Mudd to Charlotte Hanson (11 September 2011).

know whether these impacts can be reversed.[97] Furthermore, if the impacts take decades or centuries to be realised,[98] the chances of liability being successfully imposed on responsible companies are slim, as many companies may have dissolved. Showing causation between a company's operations and diversion and depletion of groundwater is also likely to be problematic, because water is extracted from so many different points in major underground water sources such as the Great Artesian Basin.[99]

Additionally, existing enforcement provisions may prove inadequate in relation to contamination of aquifers. The Manager of Queensland's LNG Enforcement Unit has suggested that 'clean-up notices'[100] could be used when companies cause aquifer contamination.[101] Clean-up notices can be used to require operators to 'prevent or minimise contamination' or 'mitigate or remedy the effects of the incident'.[102] However, if an aquifer is contaminated through mobilisation of hydrocarbons or connectivity caused by fraccing, clean up directions may be impossible to fulfill. The preferred method for addressing connectivity is to fill gaps with cement,[103] but if toxic compounds have already entered an aquifer, controlling them may be impossible.[104]

In addition to these legislative problems, regulators have facilitated the CSG industry through a conciliatory approach to law enforcement. Comments from the Manager of

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[97] Email from Gavin Mudd to Charlotte Hanson (11 September 2011).
[98] NWC, above n 8, 3.
[99] Chris Moran and Sue Vink, 'Assessment of Impacts of the Proposed Coal Seam Gas Operations on Surface and Groundwater Systems in the Murray-Darling Basin' (Report, Centre for Water in the Minerals Industry, University of Queensland, 29 November 2010) 22.
[100] See *EP Act* ch 7 pt 5B.
[101] Steve Austin interview with Andrew Brier (Radio Interview, 30 June 2011).
[102] *EP Act* s 363H(1)(a),(b).
[103] Email from DERM to Charlotte Hanson (30 September 2011).
[104] Email from Mariann Lloyd-Smith to Charlotte Hanson (30 August 2011).

the LNG Enforcement Unit suggest that strict application of the law is not the regulatory objective. In discussing the use of sanctions for non-compliance by CSG operators, the officer referred to accidental breaches of Environmental Authorities as 'slap on the wrist sort of stuff'.[105] If companies can only expect a 'slap on the wrist' for breaching a license condition, the deterrent effect of environmental law[106] will be seriously impaired.

This liberal approach seems to extend to instances of unambiguous non-compliance. Auditing conducted from 1 January to 30 June 2011 revealed 21 incidents of non-compliance, which included several that appear to be deliberate: excessive vegetation clearance, controlled release of produced water to the environment, and exceeding water discharge quantity limits.[107] However each incident only attracted either a warning notice or no enforcement action at all.[108]

II NEW SOUTH WALES

The legislative framework under which gas exploration and production is regulated in NSW has remained largely unaltered despite growth of the CSG industry. However some reforms to CSG regulation were introduced in May 2011[109] and a broad

[105] Australian Broadcasting Corporation, 'Gas Enforcement', *Breakfast*, 15 September 2011 (Andrew Brier).
[106] In *Bentley v BGP Group* (2006) 145 LGERA 234, Preston CJ noted at [139]-[140] that sentencing for environment offences 'must serve the purpose of general or public deterrence' and that 'nominal' sanctions will not deter people from committing environmental offences. These considerations are relevant to regulators, since they play a part in environmental law enforcement.
[107] DERM, 'CSG/LNG Compliance Plan 2011 Update: January 2011 to June 2011' (Factsheet, October 2011) 3-4.
[108] Ibid 4.
[109] Brad Hazzard, 'NSW Government Adopts Rigorous Strategic Approach to Regional Land Use Planning' (Media Release, 21 May 2011) 1-2.

planning system review is underway with further changes anticipated for CSG regulation.[110]

A *Environmental Impact Assessment*

In NSW, CSG activity requires approval under the *Environmental Planning and Assessment Act 1979* (NSW) ('*EP& A Act*').[111]

1 *State Significant Development*

Until October 2011, different EIA requirements applied to exploration and production activities under the *EP&A Act*, as discussed below. However, all new CSG projects (exploration and production) with over five wells are classified as State Significant Development (SSD) under Part 4, Division 4.1.[112] Environmental assessment for SSD is undertaken by way of an EIS,[113] but since the regulation stipulating EIS requirements has not yet been exhibited, it remains to be seen how rigorous it will be.

The EIA process for exploration and production projects under the previous planning system is considered here because existing applications will be assessed under it.[114] Examining the EIA processes applied to CSG activity to date also helps illustrate underlying issues with the regulatory approach to the industry.

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[110] Brad Hazzard, 'Overhaul of the Planning System Heralds a New Era in NSW' (Media Release, 12 July 2011) 1; NSW Government, above n 2, 19.
[111] Licensing under the *Petroleum (Onshore) Act 1991* (NSW) is also required for CSG projects but as is the case with Queensland, the more onerous environmental protection provisions are contained in the NSW EIA law, the *EP&A Act*. For details of the EIA requirements contained in the *Petroleum Act*, see EDO NSW, above n 59, 32-33.
[112] See draft State Environmental Planning Policy (State and Regional Development) 2011 cl 8(1), sch 1 s 6.
[113] *EP&A Act* s 89G(a).
[114] EDO NSW, above n 59, 24.

2 *Exploration*

Applications for exploration activity made before October 2011 are generally assessed under Part 5 of the Act.[115] The determining authority (the Minister for Planning)[116] must consider likely environmental impacts, which are generally identified by applicants in a 'Review of Environmental Factors' (REF) in accordance with s 111.[117] If exploration is likely to significantly affect the environment, the applicant must complete a more rigorous EIS for review by the Minister.[118]

CSG exploration is considered by determining authorities not to involve significant environmental impacts, so EIA occurs by way of a REF.[119] However, the use of REFs for exploration seems to be based on assumptions about the significance of impacts that are not supported by evidence and that have not been tested in court.[120]

REF-based assessments are simpler for applicants to complete, but evidence suggests they are not necessarily thorough. The OEH notes that 'companies do not need to undertake comprehensive environmental assessments to determine what

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[115] Development consent under Part 3A of the *EP&A Act* is required for exploration activities within closely-settled local government areas: *State Environmental Planning Policy (Major Development) 2005* ('*SEPP (Major Development*') cl 6(1)(a), sch 1 (as repealed by *State Environmental Planning Policy (Major Development) Amendment Act 2011* (NSW).

[116] *EP&A Act* s 110

[117] The term 'review of environmental factors' is not used in s 111; REFs are a product of internal policy.

[118] *EP&A Act* s 112; see *Environmental Planning and Assessment Regulation 2000* (NSW) cl 72, sch 2 for EIS criteria.

[119] Interview with senior officer, DTIRIS (Telephone Interview, 18 September 2011). EDO NSW has found no instances of an EIS being required for CSG exploration activities: see Nari Sahukar, EDO, above n 30, Annexure 1, 5.

[120] In *Timbarra Protection Coalition Inc v Ross Mining NL* (1999) 102 LGERA 52, the failure to include a species impact statement with an application for development consent was held to be a jurisdictional fact capable of judicial review. Arguably, a failure to provide an EIS in an application for CSG exploration activity would also be reviewable as a jurisdictional fact.

environmental values are present on exploration or lease areas, or what impacts they will have on the environment.'[121] For instance, the REF for CSG drilling in the Sydney suburb of St Peters refers to serious risks of groundwater contamination due to the permeability of the alluvial sands in the area, but no further hydrogeological data to predict possible impacts of the project was included in the REF (Appendix I).[122] The Department of Industry and Investment ('DII')[123] approved the project despite its own finding that the resilience of aquifers to cope with the impacts of drilling was uncertain, as was the potential for reversing impacts (Appendix II).[124] The approval of the St Peters drilling demonstrates how the REF-based assessments can leave fundamental questions about environmental impacts unexamined.

Even when fraccing — which may pose considerable environmental risks—[125] occurs in exploration, EIA is completed by way of a REF. Metgasco's 2010 approval for fraccing[126] in the Clarence Moreton Basin demonstrates that REF-based assessments for fraccing, are not comprehensive. In August 2010, the company requested permission to amend its REF to allow fraccing.[127] In response, the DII sought information about groundwater impacts. It requested that the company '[d]iscus [sic] potential impacts to aquifers, [and] include mitigation measures to prevent aquifer contamination'.[128] The company's reply was '[s]ince any aquifers are behind the

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[121] Department of Environment and Climate Change (as OEH then was), Minute for Executive Meeting, EPRG Coal Mining Project (28 May 2008) 39.
[122] Macquarie Energy, *Review of Environmental Factors* (February 2010) 30, 38 .
[123] DII is now the Department of Trade and Investment, Regional Infrastructure and Transport.
[124] DII, *Part 5: Analysis of the Extent of the Impacts During Construction and Operation* (24 March 2010) 3.
[125] CSIRO, 'Hydraulic Fracturing', above n 9, 1.
[126] This approval pertained to fraccing for conventional gas, not CSG.
[127] Email from Todd Goebel to Catherine Karpiel (3 August 2011).
[128] Email from Catherine Karpiel to Todd Goebel (3 August 2011).

cemented steel casing, there is no perceivable impact to groundwater [as] a result of the fracture stimulation'.[129] No information was provided about the hydrogeology of the area where the fraccing was to take place. Additionally, the amount of fraccing fluid to be used in the operations and the amount of water that would be extracted from the coal seam were not disclosed (Appendix III).

Despite these oversights, permission to fracture the well was granted within two days of the DII receiving from the company responses to the questions posed, and without any consultation with the OEH.[130] The email correspondence points to a lack of precaution in EIA and heavy reliance on industry to act responsibly.

3 *Production*

Applications for CSG production made before October 2011 are assessed under Part 3A of the *EP&A Act*.[131] The EIA criteria for assessing such projects were developed on a case-by-case basis in Director-General's Requirements (DGRs),[132] and the Minister for Planning was the final decision-maker.[133] As is the case for Level 1 CSG activities in Queensland, there was no automatic legislative requirement for an EIS.

The lack of rigour in regulators' approach to EIA for CSG activities appears to extend to production projects. The recent approval for Australian Gas Light Company

[129] Email from Todd Goebel to Catherine Karpiel (3 August 2011).
[130] Interview with senior officer, OEH (Telephone Interview, 26 September 2011).
[131] *EP&A Act* s 75B(1)(a) (as repealed by *Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011* sch 1), *State Environmental Planning Policy (Major Development) 2005* (*SEPP (Major Development)* cl 6(1)(a), sch 1 (as repealed by *SEPP (Major Development) Amendment Act*).
[132] *EP&A Act* s 75F(2). Ministerial guidelines could be issued under s 76F(1) but none were in place for CSG projects: see EDO NSW, above n 59, 24.
[133] *EP&A Act* s 75D.

(AGL)'s Gloucester gas field is a case in point. The Planning Assessment Commission (PAC) oversaw this assessment because AGL made political donations during the NSW election.[134] Part of the assessment was a hydrogeology study designed to aid design of a groundwater monitoring network to determine potential impacts of the development.[135]

That study highlights a series of information gaps and notes the need for a numerical model to better determine the project's impacts.[136] Nevertheless, the PAC recommended the project be approved.[137] It acknowledged that the company failed to do all it could to assess environmental impacts:[138]

> Some geological uncertainty is, of course, inevitable in underground gas extraction and mining operations. But, a greater degree of definition of the geology and groundwater modelling in the Environmental Assessment and supporting documents would have given a greater degree of assurance that risks [to groundwater] were negligible...The Commission nevertheless accepts the position, implicit in the Department's recommendation for approval, that it is possible to develop the gas field by adaptive management.

The PAC's decision is currently subject to judicial review in the NSW Land and Environment Court.[139] The case raises issues with the approval being granted when essential matters of consideration were deferred.[140]

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[134] Leonie Lamont, 'Court Challenge for AGL Project', *The Sydney Morning Herald* (online) 18 October 2011 <http://www.smh.com.au/business/court-challenge-for-agl-project-20111017-1ltcy.html>.
[135] Sylvie Ogier-Halim, 'Gloucester Basin Stage 1 Gas Field Development Project: Prelimary Groundwater Assessment and Initial Conceptual Hydrogeological Model' (Report, SRK Consulting, July 2010) 1.
[136] Ibid 46-48.
[137] NSW PAC, 'Concept and Project Application for Gloucester Gas Project' (22 February 2011) 6.
[138] Ibid 13.
[139] *Barrington-Gloucester-Stroud Preservation Alliance Inc v Planning Assessment Commission* (Land and Environment Court, Proceeding Number 11/40144, Pain J).

The approval of the Gloucester gas field, in the face of recognised significant uncertainties and inadequate modeling, is illustrative of how adaptive management can be misused to justify the industry's expansion. Since adaptive management models require comprehensive data input to properly predict environmental impacts,[141] approving a project without first collating this data into a model undermines a basic requirement of the technique.

B *Groundwater*

Unlike in Queensland, the NSW Water Resources Commission is not involved in overseeing the CSG industry[142] and no regional groundwater modeling to monitor CSG impacts is reported to have been undertaken.

C *The Role of the OEH*

The *Protection of the Environment Operations Act 1997* (NSW) (*POEO Act*) provides that the OEH is the regulatory authority for pollution control in NSW.[143] However, despite the potential groundwater and other pollution caused by the CSG activity,[144] in practice the Office has a very limited regulatory role. This is because internal policy dictates that the OEH's regulatory ambit only extends to CSG projects for which an environment protection license (EPL) has been issued under the *POEO*

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[140] Barrington-Gloucester-Stroud Preservation Alliance Inc, 'Points of Claim', in *Barrington-Gloucester-Stroud Preservation Alliance Inc v Minister for Planning and Infrastructure*, Proceeding Number 11/40144, filed 5 July 2011 5-14.
[141] Iles, above n 62, 291.
[142] Manning, above n 3, 81.
[143] *POEO Act* s 6(1).
[144] See above n 30 and accompanying text.

Act.[145] For CSG projects, an EPL is only required if more than five petajoules of methane or 100 tonnes of petroleum products or fuel are produced per year.[146]

The high threshold for *POEO* licensing means that AGL's Camden Gas Project is the only CSG operation in NSW holding an EPL.[147] Yet projects below this threshold may give rise to significant environmental impacts. A CSG project in the Pilliga State Forest, for example, encompasses 92 wells, 32 kilometres of buried gas flowline, a small power station, 13 uncovered water impoundments, a reverse osmosis unit, and a permit to discharge up to one megalitre of treated water per day to an ephemeral waterway.[148] However there is no EPL for the project,[149] and so the OEH does not regulate the activity.[150]

Internal emails obtained through a call for papers in the NSW Parliament in 2011 starkly illustrate the circular reasoning that informs the OEH's involvement in CSG activities. In September 2010, the Director of the North West Branch of the OEH acknowledged in relation to a query about the contents of fraccing fluid, the '[OEH] has very limited experience and involvement'.[151] In another email, the same Director

[145] Interview with senior officer, OEH (Telephone Interview, 26 September 2011). An EPL cannot be refused where it is required for carrying out an approved Part 3A project or SSD: *EP&A Act* s 75V(e) (as repealed by *Environmental Planning & Assessment Amendment (Part 3A Repeal) Act 2011* sch 1); *EP&A Act* s 89K(1)(e). This is a broader issue with pollution control licensing that could not be explored in depth here.
[146] *POEO Act* ss 5, 43, 48, sch 1 cl 31.
[147] Interview with senior officer, OEH (Telephone Interview, 26 September 2011).
[148] Warwick Jordan, Pepe Clarke and Carmel Flint, 'Under the Radar: How Coal Seam Gas Mining in the Pilliga is Impacting Matters of National Environmental Significance' (Report, The Wilderness Society, Nature Conservation Council of NSW and Northern Inland Council for the Environment, June 2011) 44-46.
[149] OEH, *List of Licenses* (9 May 2011) <http://www.environment.nsw.gov.au/prpoeo/licences.htm>.
[150] Interview with senior officer, OEH (Telephone Interview, 26 September 2011).
[151] Email from Joshua Gilroy to Alison Cochrane (27 September 2010).

noted that the OEH 'won't know [what the sum total of pollution incidents to date resulting from CSG projects is] because the majority of activity is under exploration licenses'.[152]

Thus, the OEH is not heavily involved in regulating CSG activity because the environmental consequences are not considered to exceed a certain magnitude. However, there is no statutory requirement for determining authorities to consult with the OEH over a CSG approval, even though the OEH has more specialist environmental expertise.[153] However, since January 2011 internal policy has provided that OEH has an advisory role in the assessment of CSG projects.[154] The OEH can request further information about any aspect of a project,[155] but its influence over decisions about the environmental significance of impacts and the scale of assessment appears limited. An OEH officer acknowledged in interview that the environmental assessment for CSG projects is conducted well before the OEH considers the activity.[156]

OEH's lack of involvement in regulating CSG projects means that compliance and enforcement functions are left to the agencies that provide approvals. These agencies take a conciliatory approach to enforcement, as discussed below.[157] Furthermore, the resources devoted by other departments to monitor compliance are minimal. For instance, the Department of Primary Industries (DPI), which is responsible for regulating most major developments in the State, has six staff dedicated to

[152] Email from Joshua Gilroy to Alison Cochrane (28 September 2010).
[153] Interview with senior officer, DPI (Telephone Interview, 12 September 2011).
[154] Interview with senior officer, OEH (Telephone Interview, 26 September 2011).
[155] Ibid.
[156] Ibid.
[157] See below, II(D: Enforcement).

compliance, three of whom are responsible for monitoring all of the Department's projects except coal mining in the Hunter Valley (to which the other three compliance staff are dedicated).[158]

D *Enforcement*

The *EP&A Act* contains a wide range of enforcement measures.[159] However the same problems arise as in Queensland with the apparent inability of existing legislation to address the unique environmental impacts posed by the industry. As these issues have been discussed, a case study of the regulatory response to alleged non-compliance by one CSG company is considered here.

The DII was notified on 17 August 2010 of an eyewitness report of AGL dumping water into pasture close to a waterway in the Hunter Valley.[160] The eyewitness took samples of the water and had them independently tested, with results showing that the water contained a number of contaminants.[161] These results were sent to the DII.[162]

The Incident Investigation Report (Appendix IV) reveals that DII attended the scene of the incident but despite the pool of dumped water still lying in the paddock,[163] did not take its own water samples. The Report suggests that the DII relied on the company's previous water analysis, which only tested for salinity:[164]

[158] Interview with senior officer, DPI (DPI Office, Sydney, 9 September 2011).
[159] *EP&A Act* pt 6.
[160] DII, 'Complaint of Hunter Valley Protection Alliance: Summary of Findings of Incident investigation — AGL Energy: PEL267' (September 2010) [1.1].
[161] Ibid [3.2].
[162] Ibid [3.1].
[163] Ibid [2.2].
[164] Ibid [2.5].

> AGL's consultants had monitored water quality on the lucerne paddock and took samples from the pool in the creek. Analytical results obtained by [DII] of samples taken on the 23rd and 24th July 2010 confirmed the high electrical conductivity (EC) of the water.

It is unclear whether the DII even relied on water samples taken from the site of the incident: the report goes on to state that 'the water sample dates [for testing of water captured by the witness] were the 30th July and 2nd August, *at least three days after the water was released into the paddock*'.[165] The DII was not aware of when the incident occurred,[166] but if it was only three days before 30 July, then the results it obtained (from the consultant's samples taken on 23 and 24 July 2010) may not have been from the same water source as that which was dumped — there was no way for the DII to be sure.

The DII was more doubtful of the witness's integrity than that of the company, deciding not to pursue the matter of other contaminants in the water, '[d]ue to potential contention arising from the integrity of sampling, sample containment, source of the contaminants and the chain of custody of the samples'.[167] According to the report, the samples went from the eyewitness, to the HVPA, and then to two water testing laboratories.[168]

The report does acknowledge that 'a volume of approximately 120,000 litres of highly saline water was air lifted from the aquifers from the water bore constructed and that

165 Ibid [3.3].
166 Ibid [1.2].
167 Ibid [3.2].
168 Ibid [3.3].

discharged [sic] did occur onto lands by AGL'.[169] No punitive action was taken, even though AGL's petroleum exploration license prohibits activities that 'cause or aggravate…soil contamination'.[170] Instead, AGL was ordered to 'undertake remediation of the site' which involved 'ripping by agricultural tyne of the affected area for aeration and infiltration' —[171] an order which also effectively destroyed evidence of the incident.

It seems incongruous that the DII refused to trust the NGO and eyewitness and instead relied on AGL's results, which the Department had no way of knowing actually pertained to the dumped water. The DII's response to the incident demonstrates how close relations between companies and regulators can result in unwillingness on the part of regulators to truly serve the public interest by rigourously enforcing the law.

III Concluding Remarks

There is sufficient evidence to conclude that, to date, the CSG industry in both NSW and Queensland has enjoyed a highly facilitative regulatory environment. The precautionary principle has not been given substantive effect since the industry has continued to expand without environmental uncertainties being resolved. Instead, evidence of CSG project approvals suggests that regulators are unwilling to impose onerous EIA requirements on proponents to better measure environmental impacts. Adaptive management programs, where they are used, do not appear to adequately

[169] Ibid [3.5].
[170] *Instrument of Renewal of Exploration License No 267: AGL Gas Developments (Hunter) Pty Ltd* (15 June 2006) cl 2.
[171] Ibid 3 [5].

address these informational gaps, because they do not provide for comprehensive modeling.

This evidence of under-regulation suggests that regulators and legislatures have served industry purposes at the expense of the public's interest in environmental protection. The CSG industry's involvement in the law reform process for the Queensland *Water Act* amendments illustrates how powerful interest groups can influence regulation. The problem of policy-makers becoming 'captured' by industry in this way is a pervasive issue identified in Australian case studies of the mining industry.[172] When considered in light of the unique environmental harm posed by CSG activity and the long-term nature of environmental harm it presents, this regulatory failure is particularly concerning.

[172] See, eg, Briody and Prenzler, above n 1, 54-71; Hutton, above n 1, 149-173; Gunningham, above n 22, 85-87.

Part Three: Explaining the Approach and Reforms

This Part is divided into two sections, the first exploring possible explanations for the highly facilitative regulatory approach towards the industry in the study jurisdictions, and the second detailing some broad recommendations for regulatory and legislative reform to address the problems identified in the thesis.

I Reasons for the Approach

A *Institutional Factors*

In the regulation of the industry in NSW, institutional factors may have limited the weight given to precaution in approvals and the policies informing CSG expansion. The preclusion of the OEH from assessment procedures for exploration until January 2011[173] and the current weak advisory role of the Office, have meant officers with specialist environmental expertise have been prevented from strongly influencing the development of the industry.

These arrangements are partly attributable to legislative provisions, but if internal policy can dictate that OEH is to have an advisory role once the industry has securely launched itself in the State, what was to prevent the OEH from being engaged in policy development for CSG from the outset? The strong possibility is that, as Wilson and Rachal point out, a regulatory agency is unwilling to concede authority to 'rival' agencies for fear that this would 'alter or degrade [the first] agency's mission'.[174] Thus, DPI and DRE may perceive increased input from OEH as a threat to their mandate of promoting economic development in the NSW resources sector.

[173] Interview with senior officer, OEH (26 September 2011).
[174] James Q Wilson and Patricia Rachal, 'Can the Government Regulate Itself?' (1977) 46 (Winter) *Public Interest* 3, 10.

The same explanation may apply to institutional arrangements in Queensland that limit the authority of specialist environmental regulators. The QWC has no decision-making authority at all, even though it, as the developer of groundwater models, would have the most knowledge of groundwater impacts caused by CSG activity. Additionally, DERM's subordination to DEEDI in relation to approval conditions is likely to contribute to the prioritisation of economic development over environmental protection in that State.

B *Agency Mission*

Where agencies perceive their institutional purpose as facilitating primary industries such as mining, they are unlikely to prioritise environmental protection objectives.[175] Although proving that regulators are captured by industry is not possible in this study, there is evidence of close relations between CSG companies and agencies, which may increase the potential for capture.[176] The informal nature of EIA via email for the Metgasco Kingfisher fracture in 2010 points to a familiar dynamic between the DII and the company. Another indicator of close involvement of the industry with regulators is in legislative drafting. In addition to Hopgood Ganim's connection to the drafting of the Queensland *Water Act* amendments, the CSG industry body, the Australian Petroleum and Production Association (APPEA), is involved in developing policy that applies to the industry generally.[177] Such close and concentrated

[175] Briody and Prenzler, above n 1, 54-71; Hutton, above n 1, 150-1, 156-162.
[176] See, for example, Briody and Prenzler, above n 1, 54, 67. Grabosky and Braithwaite found strong evidence of a causal link between relational distance and conciliatory regulatory approaches in their study of Australian regulatory agencies: see Peter Grabosky and John Braithwaite, *Of Manners Gentle: Enforcement Strategies of Australian Business Regulatory Agencies* (Oxford University Press, 1986) 214-215.
[177] Interview with staff member, Australian Petroleum Production and Exploration Association policy (Telephone Interview, 19 September 2011).

involvement of other stakeholders in law reform for CSG does not appear to have occurred to date. It is arguable, therefore, that industry interests are disproportionately represented and served through their close relations with regulators, relative to other stakeholders.

C *Mutual Interests*

There is a perception amongst regulators that they and industry share common interests and therefore operate on 'the same side of the fence'.[178] The rationale for the belief is that since companies seek licensing from authorities, they are motivated to maintain strong compliance records so that their future ventures are not jeopardised by dissatisfied regulators.[179] This perception may contribute to a more accommodating regulatory approach as companies are relied upon to behave responsibly towards the environment.

This reliance on mutual interests may, however, be inappropriate in the CSG industry for a number of reasons. First, a pattern of takeovers has emerged, whereby small (sometimes foreign) CSG shelf companies conduct exploration activities and then sell out to larger companies, at times leaving very poor environmental records in their wake.[180] This means that a strategy of reliance by regulators on the reputational concerns of companies may be ineffective for anything other than larger production ventures that intend to operate well into the future.

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[178] Roger Cotterrell, *The Sociology of Law* (Butterworths, 2nd ed, 1992) 266.
[179] Interview with senior officer, DPI (DPI Office, Sydney, 9 September 2011).
[180] Jordan, Clarke and Flint, above n 148, 26.

Second, even if companies share a mutual interest with regulators in legal compliance, this does not necessarily mean they are concerned with the wider public interest, which regulators are ultimately tasked with serving.[181] If environmental protection legislation is inadequate, legal compliance does not necessarily equate to protection of the public interest — that is, environmental laws may be easily complied with because they are inconsequential. The inadequacy of legislation becomes a problem when private business interests do not coincide with those of the public, because companies will not 'self-regulate' to serve the public interest.[182]

Companies are particularly unlikely to be concerned with the long-term public interest because of the low likelihood of liability being successfully imposed on them for harm they cause in the long-term. Given that many of the industry's most serious environmental impacts may only be realised in the long-term future,[183] reliance on companies to act responsibly towards the environment with respect to long-term impacts may be imprudent.

D *Expertise and Resources*

Accommodating policies are not necessarily adopted solely because of close relations or perceived mutual interests between industry and regulators. Rather, regulators may lack the expertise and resources to effectively manage CSG activity, and so take a back seat, placing considerable trust in companies.[184] As Cotterrell has noted in the context of regulation more broadly, when new technologies and industry practices

[181] Lodge, above n 14.
[182] Neil Gunningham and Joseph Rees, 'Industry Self-Regulation: an Institutional Perspective' (1997) 19(4) *Law and Policy* 363, 390, 406.
[183] NWC, above n 9, 3.
[184] Cotterrell, above n 178, 269.

emerge, there may be insufficient expertise for 'determining issues of causation, of allocation of responsibility, and of culpability'.[185] These problems can be manifested in a lack of proactive law reform to address the new problems posed by the industry. An example is DERM's response to an accidental connectivity between the Springbok Aquifer and the Walloon Coal Measures in Queensland caused by fraccing.[186] The company involved failed to inform DERM of the incident for over a year, yet due to a lack of appropriate law, DERM has to date been unable to identify a legal breach.[187]

In relation to understaffing, a departmental officer from NSW's DRE suggested that limited resources within OEH were the primary factor for it not taking a greater role in CSG regulation.[188] However, since agencies depend heavily on government support to fulfill their mandate,[189] the underlying cause of poor resourcing may be political.

E *Political Influence*

The widespread political support for the CSG industry is possibly the most important factor in the facilitative approach of regulators and the lack of comprehensive law reform to address environmental uncertainties. The CSG industry has the strong political backing of both major parties in NSW and Queensland. Political leaders have also taken an active role in defending its reputation. In August 2011, the Queensland Premier downplayed the seriousness of the detection of benzene at six to 15 times

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[185] Ibid.
[186] Email from DERM to Charlotte Hanson (30 September 2011)
[187] Ibid. Licensing conditions for CSG Environmental Authorities now include a requirement for operators to take immediate rectification measures if fraccing causes connectivity between an aquifer and a coal seam: see, eg, *Environmental Authority: DERM Permit Number PEN101253210 — QGC Pty Ltd* (11 July 2011) cl I10.
[188] Interview with senior officer, DTIRIS (Telephone Interview, 15 September 2011).
[189] Wilson and Rachal, above n 174, 8.

Australian safe drinking water levels in bores surrounding Arrow Energy's CSG operations, referring to the quantities as 'minute'.[190] In the same month in NSW, the Minister for Resources and Energy claimed that a leaking gas pipe in Eastern Star Gas's Pilliga operations was caused by an outsider's tampering.[191] There was no evidence for the claim; it was based solely on the advice of the company.[192] Given the willingness of politicians to speak out for the industry, regulators most likely lack the political support to take a strict regulatory approach towards the industry.

II Recommendations for Reform

It would be futile to make recommendations for improving the regulation of the CSG industry that are divorced from political and economic realities. Conversely, there is an urgent need for politicians and bureaucrats to reconceptualise their role if the public's interest in environmental protection is to be served. Given these considerations, this section suggests that the precautionary principle should be given substantive force in the regulation of the industry, but if CSG development is to continue despite environmental uncertainty, the application of adaptive management must be improved.

A *Apply the Precautionary Principle*

[190] Chris O'Brian and Siobhan Barry, 'Bligh Downplays Carcinogens Find at CSG Site', *Australian Broadcasting Corporation*, 29 August 2011 <http://www.abc.net.au/news/2011-08-29/bligh-downplays-carcinogens-found-in-csg-site/2860144>.
[191] NSW, *Parliamentary Debates*, Legislative Council, 2 August 2011, 3357 (Duncan Gay).
[192] Ibid.

The most serious regulatory failure in the development of the CSG industry is the rejection of the precautionary principle. Regulators should give the principle substantive effect by limiting CSG development until it is proved safe.

B *Legislate for Baseline Assessment*

Effective adaptive management hinges on the existence of thorough baseline assessments. As Holling notes, because 'the duration of a dynamic system depends on its starting conditions — different starting conditions lead to different outcomes — we need data that give a complete description of all variables at some specific moment'.[193] Baseline assessment of hydrogeological conditions is needed for all projects in NSW and Queensland. Assessment must occur prior to extraction of any water. Data must also be comprehensive; the Queensland *Water Act*'s provisions for baseline assessment include both groundwater quality and quantity criteria,[194] and NSW should follow suit in this regard.

C *Develop and Monitor Groundwater Models*

Comprehensive groundwater modeling and maintenance of models should occur in both States. The involvement of the QWC in developing a regional groundwater model for CSG activity in Queensland is an important first step towards better adaptive management, but it must be built upon. First, given the seriousness of potential environmental impacts that CSG projects can cause, the Commission's modeling should not be confined to the Surat Basin — it should extend to all areas of CSG activity. Second, groundwater impact monitoring requirements that apply for

[193] Holling, above n 16, 63.
[194] *Water Act* s 394(a).

quantity changes should extend to quality, as there is a need for information about how quality changes might occur. If NSW is to invoke adaptive management to justify individual projects, as was the case for Gloucester, it should develop regional models so that cumulative impacts can be properly measured.

D *Establish an Effective Independent Authority*

Due to the level of risk posed by CSG activity and the industry's highly politicised nature, there is an urgent need for an independent institution with decision-making authority to oversee the adaptive management process. Institutions tasked with adaptive management 'should be committed to actively learning about the environment, rather than merely to a particular strategy that may fail.'[195] Considering the propensity for approval authorities to serve industry interests, existing institutional arrangements, such as the preclusion of the QWC from decision-making, may mean decisions opposing industry expansion will not be taken. The need for independent regulation is particularly pressing when the level of investment by industry is high, because regulators with closer ties to industry may be subject to overwhelming pressure from companies.

The proposed independent authority should have authority to reject projects in the interests of environmental protection. The research undertaken shows that the label 'adaptive management' has served as a convenient excuse for avoiding difficult decisions over developments involving serious risks of environmental harm. However, if the public interest is to be served, the harm contemplated must not be

[195] Iles, above n 62, 291.

limitless. An example of a limiting provision is in the s 74B of the *EPBC Act*, which allows the Federal Environment Minister to reject a proposal that is considered 'clearly unacceptable'. If a similar provision could be invoked by an independent authority, projects or activities that pose too high a risk could be identified and rejected from the outset.

E *Reform the Liability Regime*

Environmental performance bonds should be mandatory and reflect, as accurately as possible, the economic value of potential environmental harm of projects.[196] In both NSW and Queensland bonds are required at the discretion of decision-makers.[197] A security of $20,000 was held by the DII for Macquarie Energy's drilling work in St Peters discussed in Part Two. However this may not reflect the economic cost of potential groundwater harm. The University of Sydney's Hydrology Research Laboratory has called for 'high value (in dollar terms) and long term (50 years minimum)' securities to be required for all CSG projects.[198] To accurately ascertain appropriate liabilities, those responsible for developing impact models should collaborate with actuarial experts to determine appropriate securities.

These reforms would improve environmental outcomes by ensuring that the industry's potentially serious and irreversible environmental impacts are limited, and that CSG companies are held accountable for the environmental risks they take.

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[196] Nari Sahukar, above n 30, 11; University of Sydney Hydrology Research Laboratory, above n 8, 1.
[197] *EP Act* s 312(2); *EP&A Act* s 80A(6).
[198] University of Sydney Hydrology Research Laboratory, above n 8, 1.

CONCLUSION

This study shows that regulation of CSG activity in NSW and Queensland to date has not adequately addressed the environmental threats posed by the industry. The regulatory failures described above bring into focus how broad problems in the operation of environmental law can give rise to unacceptable environmental risks.

These problems are caused partly by the way environmental law is codified, but also the implementation of law by decision-makers. The precautionary principle is widely incorporated into environmental and planning legislation in Australia, however it is a broad consideration that does not mandate absolute precaution where it applies. Thus, decision-makers, in approving CSG projects on a wide scale across Queensland and NSW, do not appear to have been constrained by it.

The notional adoption of adaptive management may, however, suggest that the precautionary principle still carries some substantive weight, as regulators have been compelled to justify CSG industry expansion in disregard of precaution.

However, adaptive management is an insufficient answer to the legal and environmental problems. Legally, it has the weaker status of a policy, which means that it must not be applied inconsistently with the law.[199] Since the precautionary principle generally has the stronger status of a decision-making consideration, the use of adaptive management to justify project approvals without due precaution may not be a valid approach. The judicial review of the Gloucester gas field approval presently

[199] *Green v Daniels*, 1, 9.

underway in the NSW Land and Environment Court will clarify the legality of adopting adaptive management in this way.

Evidence presented above indicates that adaptive management has been invoked for the purposes of legitimating the CSG industry rather than comprehensively addressing and accounting for its impacts. Invoking adaptive management to justify potentially irreversible environmental harm is an unprecedented strategy that is not supported by proponents of the technique. Further, politicians and regulators have appropriated the term without adequate concern for what is needed to implement it. In particular, the lack of authority granted to experts involved in groundwater impact modelling in Queensland suggests that present policy-makers are unwilling to comprehensively address the environmental risks posed by CSG activity by allowing science to play a more prominent role in regulation.

Political support for CSG industry growth has likely contributed to, or even caused, the facilitative approach taken by regulators. Given the close relations between some agencies and the industry, regulators also seem to perceive their mandate as serving industry over the public interest. Case studies of the Australian mining sector more generally have revealed that capture of regulators in this way is an ongoing trend.

Given the problems with under-regulation of mining activity explored in this thesis, a useful area of further study is the law enforcement policies adopted by regulators in relation to the CSG industry and the mining industry at large. Grabosky and

Braithwaite's study of enforcement actions[200] is limited in its depth of analysis of specific regulatory subjects — in the words of the authors it is a 'broad-brush' account.[201] Their inquiry into what informs enforcement approaches could be focused onto a particular regulatory subject — the mining sector — and built upon to determine how the regulatory approach affects the conduct of regulated subjects. In particular, the question of how under-regulation and regulators' reliance on industry self-regulation affects environmental outcomes could be explored in greater depth.

Another possible area of further study specific to the CSG industry is the Commonwealth's role as an approval authority for certain CSG projects. An inquiry into the application of the *EPBC Act* to the industry could address the question of whether Commonwealth law has been appropriately implemented.

These inquiries, and the ones examined in this thesis, ultimately raise the fundamental question of whether, given the economic dependence of governments on mining royalties, law and policy can be reformed to mandate better environmental protection standards.

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[200] Grabosky and Braithwaie, above n 176.
[201] Ibid 8.

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