ARTICLES

KEY LEGAL AND REGULATORY CONSIDERATIONS FOR THE GEOSEQUESTRATION OF CARBON DIOXIDE IN AUSTRALIA

James McLaren[*] and James Fahey[**]

Geosequestration involves the capture (from power stations and other facilities) and storage of carbon dioxide for very long periods of time in underground geological formations. Although commercially viable and proven geosequestration technology is not yet available, the Federal Government's continued commitment to fossil fuel resources as the mainstay of energy production has increased interest in, and raised the profile of, using geosequestration as a greenhouse gas abatement measure in Australia.

Aside from the Barrow Island Act 2003 (WA) (which was enacted in respect of the Gorgon project off the northwest coast of Western Australia), there is no legislation in Australia that specifically governs geosequestration of carbon dioxide and the issues of responsibility and liability for sequestered gas. The States, Territories and the Commonwealth have been working on these issues through the Ministerial Council on Mineral and Petroleum Resources and in international fora, but the position is uncertain and evolving.

In the absence of legislative reform, there are many regulations that are likely impact on a geosequestration project in Australia. The main sources of responsibility in relation to geosequestration will be environmental legislation and duties and standards of care imposed by the common law. However, a variety of other legislation and international laws are relevant.

Any reform proposals will require careful consideration (with appropriate input from industry, community groups and others) to ensure that they are aimed not only at protecting the public but also at striking the right balance between encouraging investment in geosequestration technologies on the one hand while not hindering investment in other methods of reducing carbon dioxide emissions on the other.

In order to get the balance right, those involved in any reform process will need to clearly understand the existing sources of liability and responsibility associated with geosequestration.

[*] Solicitor, Mallesons Stephen Jaques

[**] Partner, Mallesons Stephen Jaques.

The views and opinions expressed in this paper are the authors' and not necessarily those of Mallesons Stephen Jaques. The paper is a general overview and is not intended as legal advice.

1. INTRODUCTION

Science has for many years considered the possibilities of separating carbon dioxide from emissions streams and then compressing and injecting it into suitable geological formations for long term storage. In recent years, an impetus has grown among governments, industry and consumers to develop geosequestration theory into a commercially viable method of abating the increase in atmospheric concentrations of carbon dioxide released from stationary energy sources.

In September 2003, the Australian Government and State and Territory Governments jointly established a Carbon Dioxide Geosequestration Regulatory Working Group ('Regulatory Working Group') under the auspices of the Ministerial Council on Mineral and Petroleum Resources ('Ministerial Council')[1] to develop agreed principles for a nationally consistent regulatory framework for carbon dioxide geosequestration projects. The need to do so arose from the absence of uniform legislation or regulatory controls over geosequestration projects in Australia.[2]

In October last year, the Regulatory Working Group, in consultation with industry and research organisations,[3] released its draft guiding regulatory framework for carbon dioxide geosequestration projects in Australia ('Draft Guiding Regulatory Framework') together with an associated regulatory impact statement ('Regulatory Impact Statement').[4] The Draft Guiding Regulatory Framework identified seven key issues which would need to be addressed in a carbon dioxide geosequestration regulatory framework, namely:

- access and property rights;
- long term responsibilities;
- environmental issues;
- authorisation and compliance;
- monitoring and verification;
- transportation issues; and
- financial issues.

This paper provides a general overview of geosequestration technology, identifies key existing regulations that are likely to impact on Australian geosequestration projects and discusses possible legislative reform in the context of the work that has been conducted by the Ministerial Council through the Regulatory Working Group.

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1 The Ministerial Council consists of the Australian Minister for Industry, Tourism and Resources and State and Territory ministers with responsibility for minerals and petroleum.

2 We note, however, that there exists some State based legislation that specifically regulates one or more of the capture, transport, injection and long-term storage of carbon dioxide. This legislation is discussed further in section 3.2 of this paper.

3 The Regulatory Working Group together with the relevant industry and research organisation representatives formed the 'Carbon Dioxide Geosequestration Regulatory Reference Group'.

4 Both the Draft Guiding Regulatory Framework and the Regulatory Impact Statement are available at <http://www.industry.gov.au/ccs>.

2. GEOSEQUESTRATION TECHNOLOGY IN AUSTRALIA

2.1 Overview

Geosequestration involves the capture (from power stations and other facilities) and storage of carbon dioxide for very long periods of time in underground geological formations. The Regulatory Working Group identified four broad stages which characterise a carbon dioxide geosequestration project, being:

- capture and separation of carbon dioxide contained in emission streams;
- compression of the separated carbon dioxide into liquid form and transportation under pressure, by pipeline (or possibly road, rail or ship) to a site where it can be injected;
- injection of the compressed liquid carbon dioxide into underground storage spaces naturally created below layers of impervious rock;[5] and
- long term storage of injected carbon dioxide following relinquishment of the site by the project proponent.[6]

While the technology to enable the capture and injection of substances into geological formations has been used widely and successfully overseas and in Australia for many years (for example in relation to the reinjection of petroleum and natural gas for storage in depleted cavities and reservoirs),7 commercially viable and proven carbon dioxide geosequestration technology is not yet available in Australia. One of the key reasons for this is that many of the available technologies for separating and capturing carbon dioxide are costly and of limited effectiveness.[8] However, broader political concerns involving issues of public acceptance and the place of geosequestration within the wider greenhouse debate are also significant.

2.2 Recent developments

Despite unanswered technical and political questions, geosequestration has recently been placed squarely on the national agenda in Australia by the release of the Federal Government's eight year plan for Australia's future energy strategy. It came as no great surprise (although as a major blow to renewable energy advocates) that the White Paper, *Securing Australia's Energy Future* ('Energy White Paper'), confirmed that Australia's abundant fossil fuel resources will remain the mainstay of energy production in this country for the foreseeable future. However, as part of a suite of initiatives aimed at reducing the levels of carbon dioxide emissions, the Government announced that it was prepared to invest A$500 million to promote the development of

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5 The Regulatory Working Group has identified that this stage will require not only the injection of the carbon dioxide, but also the decommissioning of infrastructure, rehabilitation of disturbed sites, ongoing monitoring, verification and maintenance of the storage site and the demonstration by the project proponent that the storage site is stable: see Draft Regulatory Guiding Framework, p 2.

6 Draft Regulatory Guiding Framework, p 2.

7 See Thomas Kennedy, 'Filling Cavities: Storing Natural Gas Naturally' [1999] AMPLA Yearbook 521.

8 Victorian Department of Primary Industries, 'Geosequestration: Putting the Carbon Back: A paper to discuss current issues and opportunities to reduce greenhouse gas emissions through geosequestration' (September 2004) 6, available at <http://www.dpi.vic.gov.au/minpet>.

commercially viable, low cost abatement technologies including the use of coal-fired generation with geosequestration.[9]

Indeed, even prior to the release of the Energy White Paper, the Federal Government had already committed significant resources to programmes and initiatives to promote the research and development of geosequestration technology. The most significant of these include:

- the Co-operative Research Centre for Greenhouse Gas Technologies ('CO2CRC') which was established in July 2003 with the aim of bringing government, industry and research bodies together to develop and apply innovative greenhouse gas technologies (including geosequestration);[10]
- the COAL21 initiative which was established in March 2003 as a partnership between the Federal and State Governments, the coal and electricity industries, technology developers and the research community to advance technology developments (including geosequestration) that demonstrate potential for significantly reduced greenhouse gas emissions;[11]
- the 'Energy Transformed' project recently launched and being conducted by the Commonwealth Scientific and Industrial Research Organisation ('CSRIO') involving, among other things, research into geosequestration technology;[12] and
- the Australian Research Council ('ARC') which administers Federal Government funding of research at Australia's universities.[13]

Further, in recognition that the key technical, regulatory and policy issues associated with geosequestration are not particular to Australia, the Federal Government has demonstrated its eagerness to explore the viability of geosequestration technology at an international level, including by taking lead roles in two significant international collaborative projects, namely:

- the Carbon Sequestration Leadership Forum ('CSLF'), a ministerial-level international climate change initiative which focuses on the development and deployment of technologies for carbon capture and storage;[14] and

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9 The Federal Government is undoubtedly encouraged by the findings of a report prepared by the Australian Bureau of Agricultural and Resource Economics and released in January this year which concluded, among other things, that: '[Carbon capture and storage] technologies are shown to have the potential to form an important option for substantially reducing carbon dioxide released into the atmosphere. The impact of the carbon dioxide constraint on global real GDP when the electricity industry has access to [carbon capture and storage] technologies is projected to be approximately a quarter of the impact in the absence of [carbon capture and storage] technologies. [Carbon capture and storage] technologies are not projected to be economic until around 2015, but by 2050 are projected to account for over a third of the cumulative abatement of global carbon dioxide emissions': A Matysek, M Ford, G Jakeman, R Curtotti, K Schneider, H Ahammad and BS Fisher, 'Near Zero Emissions Technologies', ABARE eReport 05.1 (January 2005) prepared for the Commonwealth Department of Industry, Tourism and Resources.

10 See <http://www.co2crc.com.au>.

11 See <http://www.coal21.com.au>.

12 See <http://www.csiro.gov.au/index.asp?type=blank&id=EnergyTransformed>.

13 See <http://www.arc.gov.au. Several Australian universities are currently involved in the research and development of geosequestration technologies, including Curtin University of Technology, Perth, Monash University, the University of Adelaide, the University of New South Wales, the University of Melbourne and the University of Queensland, Brisbane.

- the preparation by the Intergovernmental Panel on Climate Change ('IPCC') of a report on the feasibility and state of development of carbon capture and storage technology.[15]

In addition, the Federal Government is using its numerous bilateral partnerships on climate change to explore solutions with other governments to technical and policy issues associated with geosequestration technologies.[16]

The State Governments have also shown that they are keen to explore the viability of using geosequestration as a means of reducing greenhouse gas emissions by releasing discussion papers[17] and through their support of various initiatives (in addition to their involvement in the COAL21 initiative referred to above), including the establishment of significant research centres to facilitate the research and development of economically viable greenhouse gas abatement technologies (including technologies for the geosequestration of carbon dioxide).[18]

2.3 Existing and planned geosequestration projects

A number of pilot and commercially operational carbon dioxide geosequestration projects are under way or proposed. To date, most operating or planned projects which use geosequestration technology are associated with either:

- large natural gas production facilities, where carbon dioxide that needs to be removed to meet commercial specifications is separated from gas streams and injected underground for indefinite storage; or

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14 See <http://www.cslforum.org>. The CSLF's most recent ministerial level meeting was held in Melbourne in September 2004.

15 See <http://www.ipcc.ch/>. Australia is providing the 'Co-ordinating Lead Author' for the chapter of the IPCC Special Report on Carbon Dioxide Capture and Storage dealing with geological storage of carbon dioxide. The 'Second Order Draft' of the report was released for government and expert review on 10 January 2005. The final report is scheduled to be released later this year. A copy of the Second Order Draft has been made available by the Federal Government for public comment at http://www.greenhouse.gov.au/international/ccs.html.

16 These partnerships include: The Australia-US Climate Action Partnership; The Japan-Australia Practical Collaboration on Climate Change; The New Zealand-Australia Climate Change Partnership; The Australia-European Union Co-operation on Climate Change; and the Australia-China Joint Declaration on Bilateral Co-operation on Climate Change: See <http://www.greenhouse.gov.au/international/partnerships/index.html>.

17 See, for example, the Victorian Department of Primary Industries discussion paper 'Geosequestration: Putting the carbon back', which was released by the Victorian Government in February 2004; and 'Geo-sequestration of carbon dioxide – Key Technical, Legislative and Policy Issues' which was released by the Western Australian Government in October 2003.

18 These initiatives include the Victorian Government's Centre for Energy and Greenhouse Technologies which provides funding for the development of new sustainable energy and greenhouse gas reduction technologies (including geosequestration): see <http://www.cegt.com.au>; and the Queensland Centre for Low Emission Technology, a partnership between the CSIRO and the Queensland Government, which seeks to facilitate research, development and demonstration of key technologies (including geosequestration) that will lower greenhouse gas emissions for coal-based power generation: see <http://www.sd.qld.gov.au/innovation/research/low_emission.asp>.

- the injection of carbon dioxide into underground structures to enhance oil recovery.[19]

Of the projects associated with natural gas production facilities, the earliest and most significant to date is linked to the Sleipner offshore natural gas field in the North Sea halfway between Norway and Scotland where nearly one million tonnes each year of carbon dioxide has been successfully injected since 1996.[20] An even larger geosequestration project, which is linked to a gas production facility in Salah, in the central Saharan region of Algeria, commenced operations in April 2004.[21]

It is this kind of project that has been proposed by ChevronTexaco (in partnership with Shell and ExxonMobil) in relation to the Gorgon area gas fields, 130 kilometres off the north-west coast of Western Australia. The joint venture partners plan to commence construction later this year on the necessary infrastructure to enable the injection and storage of up to 125 million tonnes of carbon dioxide (which will be stripped from the natural gas produced from the reserve) over the life of the project into the Dupuy Formation located at Barrow Island. The joint venturers intend for the Gorgon project to commence commercial operations in 2008.[22]

Various other projects associated with natural gas production facilities have also been proposed, including for the Snohvit gas field in the Norwegian Barents Sea (expected on stream in 2006).[23]

As noted by the Regulatory Working Group, a significant number of enhanced oil recovery projects are currently in operation, and have been for a number of decades, particularly in the United States and Canada.[24] From a geosequestration perspective, the most important of these is the Weyburn monitoring and storage project located in Southern Saskatchewan in Canada. This project combines enhanced oil recovery with a comprehensive monitoring programme to evaluate carbon dioxide storage.[25]

Other experimental and commercial geosequestration projects have been identified and proposed both overseas and in Australia. Locally, the most advanced of these is the proposal by Australian Power and Energy Limited ('Apel') to geosequester about 10 million tonnes of carbon dioxide each year in the La Trobe Valley in Victoria in connection with a power and coal-to-liquids project using brown coal in order to produce high quality sulphur free diesel fuel and electricity.[26]

2.4 Key risks associated with geosequestration

The risks of capturing and separating, compressing and transporting, injecting and storing carbon dioxide for long periods of time fall into two broad categories:

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19 We note, however, that enhanced oil recovery projects are not specifically designed for the purpose of carbon dioxide storage. Nevertheless, as noted by the Regulatory Working Group, they provide a useful analogue to monitor the sequestration of carbon dioxide in geological formations: Regulatory Impact Statement, p 7.

20 For further information on this project, see <http://www.statoil.com>.

21 For further information on this project, see <http://www.bp.com/>.

22 For further information on this project, see <http://www.gorgon.com.au/>.

23 For further information on this project, see <http://www.statoil.com>.

24 Regulatory Impact Statement, page 7.

25 For further information on this project, see <http://www.ieagreen.org.uk/>.

26 For further information on this project, see <http://www.apel.com.au/vic/>.

- local risks which may cause loss and damage in the vicinity of the injection site and the infrastructure connected with a geosequestration project ('Local Risks'); and
- global risks associated with the release of stored carbon dioxide into the atmosphere ('Global Risks').[27]

2.4.1 Local Risks

The Regulatory Working Group identified the following two kinds of Local Risks which have the potential to cause local harm to the environment, property and humans:

- escape of carbon dioxide at the surface ('Leakage Risk'); and
- migration of carbon dioxide into surrounding geological formations and water resources ('Migration Risk').

Unlike Migration Risk (which only arises when carbon dioxide is stored underground), Leakage Risk has the potential to occur and cause local harm to plants, animals and humans at all stages of a geosequestration project (particularly if elevated levels[28] of carbon dioxide are allowed to accumulate in confined spaces).[29]

The Regulatory Working Group considered that the local risks associated with carbon dioxide capture, transport and injection are comparable to those posed by similar industrial processes presently in operation that are already effectively managed.[30] In relation to these stages, the only issues that the Regulatory Working Group identified as requiring further investigation are:

- any novel risks posed by leaks at the capture point;
- the effect of mixing gases at the capture point and the impact of chemicals used during capture (and presumably separation);
- whether there is a heightened level of risk in light of the scale of the capture and separation phase of a geosequestration project compared to comparable processes already in use for other purposes; and
- the extent that additional monitoring will be required at the injection stage in light of the particular characteristics of carbon dioxide.[31]

At the storage stage, the Regulatory Working Group found that the most significant local Leakage Risk relates to the leakage of carbon dioxide over long periods of time. This leakage, which some commentators have suggested might be up to 10 per cent of the stored carbon dioxide over a 1,000

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27 Appropriately, the Regulatory Working Group sought to identify the key physical risks associated with geosequestration technology at each stage of a geosequestration project as a prerequisite to formulating its Draft Regulatory Guiding Framework: Regulatory Impact Statement, p 6.

28 A concentration of greater than about 5% of carbon dioxide in air will cause immediate damage to human life and health: Regulatory Impact Statement, p 32.

29 See the Regulatory Impact Statement, p 30.

30 See the Regulatory Impact Statement, p 30-31.

31 See the Regulatory Impact Statement, p 31.

year period,[32] could have a diverse number of causes, including errors in design or operation of the geosequestration project or a variance in the geological characteristics of the site.[33]

The Regulatory Working Group found that Migration Risk includes 'horizontal' migration of carbon dioxide into one or more surrounding geological formations and 'vertical' migration of carbon dioxide into underground water reserves. Migration Risk has the potential to cause:

- contamination and/or interference with sub-surface neighbours causing losses to, and devaluation of, the interests of surrounding rights holders (such as holders of hydrocarbon exploration or production rights); and
- contamination of freshwater aquifers (either directly by contaminating drinking or irrigation supplies or indirectly by decreasing pH levels and causing the mobilisation of heavy metals and/or the leaching of nutrients).[34]

Understandably, the Regulatory Working Group reported only on the Local Risks that arise from the unintended release or migration of carbon dioxide. However, it is worth noting that other risks that are not related to the effects of carbon dioxide are likely to form part of the overall risk profile of a geosequestration project. These risks include those arising from, for example:

- land clearing;
- decreased air quality and affected water and vegetation as a result of drilling, moving of earth and grading; and
- the occupational health and safety risks arising from the use of plant and machinery associated with geosequestration technology.

2.4.2 Global risks

The Global Risks associated with geosequestration relate to the long term adverse climate change consequences of the unintended release of carbon dioxide (particularly the continuous leakage of small quantities of stored carbon dioxide over an extended period of time which, if happening on a large scale, has the potential to become a significant, dispersed and difficult to control emission source).[35]

3. EXISTING REGULATION OF GEOSEQUESTRATION

A large number of regulations exist which are relevant, or in some cases directly applicable, to geosequestration projects in Australia. These arise both under domestic law (under legislation and at common law), as well as at international law, and are driven by the key risks associated with each stage of a geosequestration project (discussed above in section 2.4).

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32 'Carbon Dioxide Capture and Storage in Australia - a Carbon Management Technology Option', Report of a DTI Global Watch Mission, February 2004.

33 See the Regulatory Impact Statement, p 31.

34 See the Regulatory Impact Statement, p 31.

35 The Regulatory Working Group noted the climate change impacts of unintended release of carbon dioxide: See the Regulatory Impact Statement, p 30.

In this section we have sought to identify the key sources of existing potential legal liability (that is, in the absence of further regulation) relevant to geosequestration projects in Australia and provide selective examples that demonstrate how these sources might apply.

3.1 Environmental regulation

3.1.1 Overview

Australia has over 300 Acts (in addition to numerous regulations under those Acts) relating to environmental matters and more than 80 associated agencies or authorities at both Federal and State level. Many of these will be relevant to geosequestration projects in this country.

In recent years, there has been a drive to simplify and streamline environmental regulation both between the State and Federal Governments and within each State jurisdiction. At the Federal level, this has involved the consolidation of various Federal statutes into one principal governing Act which provides for:

- State accreditation of assessment processes and inter-governmental agreements relating to matters of national environmental significance; and
- matters which are not of national environmental significance are regulated under the laws of the relevant State.[36]

The Federal regime allows the States (and local governments by delegation) to take responsibility for the general regulation of all activities with regard to their impact on the environment. Generally, State environmental laws provide for:

- the establishment of various standards relating to the environment (for example, noise, air and water etc);
- the granting of environmental licences and authorisations to conduct various activities;
- the creation of offences (including the imposition of strict liability for certain offences, personal liability of directors and managers and the retrospective liability for the cleanup of contaminated land); and
- the establishment of an Environment Protection Authority ('EPA') or agency to administer and enforce the environmental regulatory framework.[37]

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[36] The Federal Government exercises its broad legislative power over the environment predominantly under the *Environmental Protection and Biodiversity Conservation Act* 1999 (Cth).

[37] The States have also sought to consolidate various specific Acts into single broad environmental protection legislation. The relevant Acts are: in New South Wales, the *Protection of the Environment Operations Act* 1997 (NSW); in South Australia, the *Environment Protection Act* 1993 (SA); in Victoria, the *Environment Protection Act* 1970 (Vic); in Tasmania, the *Environmental Management and Pollution Control Act* 1994 (Tas); in Western Australia, the *Environmental Protection Act* 1986 (WA); in the Australian Capital Territory, the Environmental Protection Act 1997 (ACT); and in Queensland, the *Environment Protection Act* 1994 (Qld).

There are, however, often significant differences between the actual regulatory requirements of each State as well as the extent to which the relevant regulatory authorities actually enforce State legislation. Consequently, those proposing to establish geosequestration projects in Australia will need to carefully consider the environmental legislative regime particular to the jurisdiction within which the project is proposed.

By way of a general overview, set out below are some of the considerations for geosequestration projects that arise under key environmental legislation.

3.1.2 Environmental harm generally

State legislation generally makes it an offence to cause 'environmental harm'.[38] Environmental harm may be described as any direct or indirect alteration of or impact on the environment which has an adverse effect on or degrades the environment, of whatever degree or duration.[39]

This general duty not to harm the environment will extend to many of the risks associated with a geosequestration project discussed in section 2.4, above.

3.1.3 Pollution and waste

All States and Territories in Australia have environmental legislation addressing:

- the pollution of air, land and waters (surface, marine and groundwater);[40] and
- the generation, transport and depositing of 'waste'.[41]

The nature of the controls and penalties vary from jurisdiction to jurisdiction, but in essence, the basic aim is to include anything that may cause:

- a detrimental change in the quality of the surrounding environment;
- affect the safety or health of human beings; or
- harm wildlife.[42]

Carbon dioxide that inadvertently escapes as part of a geosequestration project and causes any of the harms described above is likely to be considered a 'pollutant'[43] as well as 'waste'[44] for the purposes of the relevant legislation.

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38 See, for example, *Protection of the Environment Operations Act* 1997 (NSW), s 116(1).

39 *Protection of the Environment Operations Act* 1997 (NSW), Dictionary 'harm'; *Environmental Protection Act* 1993 (SA) s 5; *Environmental Protection Act* 1994 (Qld) ss 9 and 14(1); *Environmental Protection Act* 1997 (ACT), s 4; *Environmental Management and Pollution Control Act* 1994 (Tas) s 5.

40 See, for example, *Environment Protection Act* 1993 (SA); *Environmental Protection Act* 1994 (Qld); *Environment Protection Act* 1993 (SA) s 3; *Environmental Management and Pollution Control Act* 1994 (Tas); *Environment Protection Act* 1997 (ACT).

41 See, for example, *Environment Protection Act* 1970 (Vic) ss 4, 39(1), 41(1), 45(1); *Waste Minimisation and Management Act* 1995 (NSW) s 5.

42 See Zada Lipman and Gerry Bates, *Pollution Law in Australia* (2002) 8.

43 A pollutant or contaminant may be gas, liquid, solid, odour, an organism, energy or a combination of these: *Environmental Protection Act* 1994 (Qld) s 11, 'contaminant'; *Environment Protection Act* 1993

3.1.4 Contaminated land

While the general duty not to harm the environment, referred to above, extends to contamination, most Australian jurisdictions have specific statutory provisions or separate regimes dealing with land contamination.[45] Land may be deemed to be contaminated when a substance is present at a concentration above that at which the substance is normally present in or under land in the same locality, and which presents a risk of harm to human health or the environment.[46]

In many cases, liability for contaminated land can extend not only to the person who has 'principal responsibility' for the contamination of the land, but in certain circumstance also to the landowner or other persons who have rights in relation to the land (whether or not those persons had any responsibility for the contamination).[47]

In addition to any liabilities that may arise from the inadvertent leakage or migration of carbon dioxide as part of a geosequestration project, it is possible that the injection of carbon dioxide into an underground aquifer (in the absence of lawful authority to do so) could result in the land above being classified as a 'contaminated site'. If so, remediation obligations could arise under relevant contaminated land legislation.[48]

3.1.5 Environmental licences and authorisations

In general, activities that have the potential to cause environmental harm (whether from pollution, as a result of waste, by contamination of land or other ways) require some form of environmental licence or authority to be conducted.[49]

For example, the *Environmental Protection Act* 1970 (Vic) identifies six types of premises from which activities must be licensed, including premises from which waste is likely to be discharged to the atmosphere, land or waters and where activities might require rehabilitation of such magnitude that the EPA requires that prior financial assurance be given.[50]

(SA) s 3; *Environmental Management and Pollution Control Act* 1994 (Tas) s 3; *Environment Protection Act* 1997 (ACT) s 3, 'pollutant'.

44 'Waste' includes any substance which causes an alteration in the environment; discarded or unwanted matter, and any other substance as prescribed: *Environment Protection Act* 1970 (Vic) ss 4, 39(1), 41(1), 45(1); *Waste Minimisation and Management Act* 1995 (NSW) s 5; *Waste Minimisation and Management Regulation* 1996 (NSW) reg 3(1).

45 See, for example, the *Contaminated Land Management Act* 1997 (NSW); *Environmental Protection Act* 1994 (Qld) Chapter 7, Part 8; *Environmental Protection Act* 1970 (Vic) ss 45 and 62A.

46 See, for example, the *Contaminated Land Management Act* 1997 (NSW) s 5 ('contamination').

47 See, for example, the *Contaminated Land Management Act* 1997 (NSW) s 12.

48 See, for example, the *Contaminated Land Management Act* 1997 (NSW) ss 21-25.

49 The various State environmental regimes provide that activities of 'environmental significance' may not be undertaken without a licence or environmental authorisation: *Protection of the Environment Operations Act* 1997 (NSW), Ch 3; *Environmental Protection Act* 1993 (SA), Pt 6; *Environmental Protection Act* 1994 (Qld), ss 426,427; *Environmental Protection Act* 1970 (Vic), s 19A-20; *Environmental Protection Act* 1997 (ACT), Pt 8; *Environmental Protection Act* 1986 (WA), ss 53-58.

50 *Environmental Protection Act* 1970 (Vic) s 20; *Environmental Protection (Scheduled Premises and Exemption) Regulations* 1996 (Vic).

It is likely that the various activities associated with a geosequestration project will require an appropriate environmental licence and/or authorisation. Licence conditions may include those requiring compliance with environmental standards and also longer-term obligations such as the preparation of an environmental management system or ongoing monitoring. In general, licensing authorities are given wide discretion to determine licence applications and conditions.

In all jurisdictions, it is an offence to carry out a regulated activity without the appropriate environmental licences or authorisations, and will result in penalties being imposed on either the company or individuals responsible.[51] In addition, contravention of conditions imposed under a licence or authorisation will also constitute an offence.

3.1.6 Land use and development

The establishment of a geosequestration project (whether by the expansion of an existing facility that produces carbon dioxide or as a new operation) is likely to require development approval and an environmental impact assessment under separate development and planning legislation in each State and Territory.[52]

A geosequestration project proponent may also be subject to a works approval system under which the relevant EPA or other authority will stipulate what equipment or technical requirements must be met to achieve prescribed environmental standards before construction begins on the project.[53] Works approvals, which permit the construction and installation of new works and changes to the operation of licensed premises, are separate requirements to the environmental licences and authorities (discussed above) which permit activities which have the potential to harm the environment.

3.1.7 Native title and heritage protection

In the development of a geosequestration project, consideration will also need to be given to Federal and State regulation that seeks to protect world heritage, national estate, cultural heritage and aboriginal heritage.

The manner in which these rights and interests may be protected is complex. Among others, there are procedural mechanisms created by the *Native Title Act* 1993 (Cth) and the statutory schemes in each Australian jurisdiction designed to protect Aboriginal cultural values and cultural heritage.[54] These mechanisms and schemes give rise to the following material risks for geosequestration projects:

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51 See, for example, the *Environmental Protection Act* 1993 (SA) s 36.

52 The principal planning Acts are the *Environmental Planning and Assessment Act* 1979 (NSW); the *Integrated Planning Act 1997* (Qld); the *Development Act* 1993 (SA); the *Planning and Environment Act* 1987 (Vic); the *Land (Planning and Environment) Act* 1991 (ACT); the *Town Planning and Development Act* 1928 (WA); and the *Australian Capital Territory (Planning and Land) Management Act* 1988 (Cth).

53 See, for example, the *Environment Protection Act* 1993 (SA) s 35; the *Environment Protection Act* 1970 (Vic) s 19A.

54 These rights are also protected under the common law: See DE Fisher, *Australian Environmental Law* (2003) 150.

- possible invalidity of real property interests and other State issued rights (for example, pipeline and water licences);
- cost and delay risks if the relevant approval procedures have to be complied with to procure valid entitlements (as well as possible injunctive action by native title holders and claimants); and
- compensation obligations (by agreement, as a consequence of the operation of relevant legislation or by way of damages for unlawful interference with rights or interests).

3.1.8 Regulation of foreign investment

For reasons outlined above, the majority of environmental regulation of geosequestration projects is likely to be at the State and Territory level, rather than the Federal level. However, Federal environmental controls may operate where a proposed geosequestration project involves significant foreign investment into Australia by foreign companies. Foreign investment into Australia is regulated by the *Foreign Acquisition and Takeovers Act* 1975 (Cth) and by the Australian Federal Government's Foreign Investment Policy, which seeks to encourage foreign investment into Australia in a manner that is consistent with the needs of Australia.

Foreign investment approvals may be subject to a threshold environmental assessment of the proposed project. This threshold assessment, which is in addition to the more operational environmental regulation at State level, may result in foreign investment approvals being made subject to certain environmental protection conditions or an undertaking to conduct some level of environmental impact assessment. In extreme cases, where the relevant foreign investment is found not to be in the national interest, approvals may be denied.

3.2 Geosequestration specific legislation

In limited circumstances, existing Australian legislation expressly regulates all or a component of a geosequestration project. For example, South Australian petroleum legislation specifically provides for the:

- transportation of carbon dioxide by licensed transmission pipeline;[55] and
- grant of a licence to store carbon dioxide underground.[56]

Queensland has also very recently introduced legislation which creates rights to store a 'prescribed storage gas' (which includes carbon dioxide) in natural underground reservoirs.[57]

However, the most comprehensive regime that regulates geosequestration is contained in the *Barrow Island Act* 2003 (WA) ('Barrow Island Act') to specifically facilitate the proposed Gorgon Project (discussed above in section 2.3). Section 13 of the Barrow Island Act deals with disposal of carbon dioxide underground. The section:

- prohibits disposal of carbon dioxide without ministerial approval;

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55 *Petroleum Act* 2000 (SA) s 4, definitions of 'regulated substance' and 'pipeline' and s 10(1)(g).
56 *Petroleum Act* 2000 (SA) s 10(1)(d).
57 *Petroleum and Gas (Production and Safety) Act* 2004 (Qld).

- sets out the process to apply for approval, including the information and materials that must accompany an application; and
- provides for consultation by the relevant minister with other government officials and third parties.

Under the provisions of the Barrow Island Act, approvals to dispose of carbon dioxide underground may be granted subject to any restriction or condition, including (without limitation):

- the payment of money to the State;
- indemnification of the State; and
- the transferability or otherwise of the approval.[58]

In addition, the Barrow Island Act has effectively amended the definitions of 'petroleum' and 'pipeline' in section 4 of the *Petroleum Pipelines Act* 1969 (WA) to allow the transport of carbon dioxide by pipeline to a place on Barrow Island for the purposes of disposing of the carbon dioxide in an underground reservoir or other sub-surface formation.[59]

In order to further clarify the duties and responsibilities of parties associated with the Barrow Island Project, the relevant joint venturers have entered into a specific agreement with the State of Western Australia ('Gorgon State Agreement').[60] In essence, the Gorgon State Agreement sets out a framework of processes and obligations through which the Gorgon joint venturers must pursue the Gorgon Project. This framework includes:

- a requirement for the joint venturers to lodge detailed proposals by December 2008 for the establishment of the first phase of the project and then, if the proposals are approved, to construct the project in accordance with the proposals;[61]
- general requirements to report to, and consult and cooperate, with the State;[62]
- a requirement to minimise environmental disturbance and impact on conservation values and comply with relevant environmental legislation;[63] and
- an indemnity to the State against third party claims as provided for in the Barrow Island Act.[64]

As a consequence of the Gorgon State Agreement, the Western Australian Government has contractual rights to claim against the relevant joint venturers in respect of the Barrow Island Project in addition to the statutory rights that exist under the Barrow Island Act.

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58 *Barrow Island Act* 2003 (WA) s 13(6).

59 *Barrow Island Act* 2003 (WA) s 11.

60 State Agreements have been common methods for development of resource projects in Western Australia. The Gorgon State Agreement was entered into on 9 September 2003 and was ratified by the Western Australian State Parliament under the Barrow Island Act, which came into effect on 20 November 2003. The Gorgon State Agreement is contained in Schedule 1 of the Barrow Island Act.

61 Clause 7.

62 Clauses 4 and 31.

63 Clauses 5 and 14.

64 Clause 27(1) of the Gorgon State Agreement provides that: 'Unless the Minister and the Joint Venturers otherwise agree in writing, the Joint Venturers shall indemnify and keep indemnified the State and its servants agents and contractors in respect of all actions suits claims demands or costs of third parties arising out of or in connection with any work carried out by or on behalf of the Joint Venturers pursuant to this Agreement or relating to their activities hereunder.'

3.3 Other relevant legislation

In addition to those surveyed above, there is a range of other legislation that may impact on a geosequestration project in Australia. As part of its participation in the CSLF (discussed in section 2.2, above), the Federal Government has undertaken a 'gap analysis' in order to produce a list of relevant legislation that might apply at one or more stages of a geosequestration project.[65] The results of this review are summarised in the following table:

Potentially relevant category of existing legislation	Stage 1: Capture	Stage 2: Transport	Stage 3: Injection	Stage 4: Long-term storage
• Occupational health and safety	✓	✓	✓	✓
• Environment	✓	✓	✓	✓
• Petroleum	✓		✓	✓
• Petroleum safety			✓	✓
• Mineral resources	✓	✓	✓	✓
• Mineral resources development			✓	✓
• Explosives and dangerous goods	✓	✓	✓	✓
• Coal mining safety and health	✓		✓	✓
• Offshore activities	✓			
• Land lease and land administration	✓	✓	✓	✓
• Pipelines	✓	✓	✓	✓
• Planning			✓	

3.4 Regulation of geosequestration under Australian common law

As discussed below, the Australian common law establishes duties and standards of care that, if breached by a geosequestration project proponent, could result in liability for trespass, nuisance and negligence for which the following remedies may be claimed:

- damages for any loss or injury; and
- an injunction to put a stop to, or prevent, such unlawful activities.

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65 Carbon Sequestration Leadership Forum, Legal, Regulatory & Financial Issues Task Force: Gap Analysis Responses, 15 April 2004. This document was provided to delegates to the Carbon Sequestration Leadership Forum's Second Ministerial Meeting held in Melbourne on 13-15 September 2004. A copy is held by the authors.

3.4.1 Trespass

Trespass involves a 'direct assault' on another's land. That is, it is the intentional or negligent act of an individual which directly interferes with another person's possession of land without lawful justification.[66] Unlike nuisance (where actual damage must be proved), a trespass is actionable without proof of harm.[67]

A claim of trespass can arise, for example where:

- there is interference which infringes the use of land above, below[68] or on the surface of that land;[69] or
- a person causes an object or substance to make contact with the land.[70]

To bring a successful claim for trespass, the plaintiff must have exclusive possession of the relevant land.[71] It is arguable that a minerals or petroleum tenement holder who suffers harm as a result of an intentional or negligent act relating to a geosequestration project (for example, as a result of the subsurface migration of carbon dioxide into a neighbouring petroleum tenement) has a sufficient basis for an action in trespass.[72]

3.4.2 Nuisance

While trespass occurs when there is a *direct* intentional interference with land, nuisance involves the *indirect* interference with a person's land or enjoyment of it. Nuisance is categorised as either private or public, depending on whether private landowners or the public at large are affected (although the basic elements of liability for public and private nuisance are the same).[73]

A successful claim for nuisance requires:

- an act or omission that results in some 'material' injury[74] or affects the reasonable enjoyment of some recognised rights in or over property that emanates from outside the bounds of that property;[75]

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66 Butterworth's Encyclopaedic Australian Legal Dictionary.

67 Practically, however, the common law will not issue a remedy unless some material harm has actually occurred or is threatened: Zada Lipman and Gerry Bates, *Pollution Law in Australia* (2002) 101.

68 *Cox v Glue* (1848) 5 C.B. 533. See also *Bulli Coal Mining Co v Osborne* [1899] AC 351*; Stoneman v Lyons* (1975) 133 CLR 550.

69 *Stoneman v Lyons* (1975) 133 CLR 550.

70 See, for example, *Watson v Cowen* [1959] Tas SR 194.

71 *Stoneman v Lyons* (1975) 133 CLR 550.

72 This argument is based on the following premises: (a) a profit a prendre has been held to be a sufficient basis for an action in trespass: see *Mason v Clarke* [1955] AC 778; and (b) various commentators have argument that, at least in certain circumstances, a minerals or petroleum tenement constitutes a profit a prendre: see, for example, GLJ Ryan, 'Petroleum Royalties' [1985] AMPLA Yearbook 328, 349.

73 The advantage of bringing an action for public nuisance is that, not being limited to infringements of private rights, it is unfettered by notions of possession of land or other proprietary interests, and thus anyone who is affected may complain: Zada Lipman and Gerry Bates, *Pollution Law in Australia* (2002) 104.

74 *Young v Bankier Distillery* [1893] AC 691; *Don Brass Foundry Pty Ltd v Stead* (1948) 48 SR (NSW) 482.

- the wrongdoer to have created, continued or adopted the nuisance;[76] and
- the absence of legislation that expressly or by necessary implication authorises the conduct which would otherwise amount to nuisance.[77]

Both the person who causes the nuisance and anyone who authorises the action or inaction resulting in the nuisance can be liable.[78]

Established examples of nuisance are interference or physical injury caused by smoke and fumes, water, smell, gas, noise and vibration.[79] By analogy, it is not difficult to imagine a number of ways that the Local Risks identified in section 2.4, above, may give rise to successful claims in nuisance (particularly, for example, where a Migration Risk devalues or otherwise harms another's property which neighbours a geosequestration storage site).

3.4.3 Negligence

Liability arises for negligence when:

- a duty of care is owed to a third party;
- there is a breach of that duty of care;
- the third party suffers damage caused by the breach; and
- the damage is not too remote.[80]

A duty of care arises when damage to a third party is reasonably foreseeable and there is a relationship of proximity with that third party.[81]

The standard of care required depends on all the circumstances and factors of a particular case.[82] Any applicable legislative or industry standard can be a guide as to the standard of care required

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75 *McKell v Rider* (1908) 5 CLR 480; *Field v South Australian Soccer Association* [1953] SASR 224; *Pride of Derby Angling Association v British Celanese Ltd* [1953] 1 Ch 149.

76 *Sedleigh-Denfield v O'Callaghan* [1940] 3 All ER 349 at 361. A person who acquires land following the commission of a nuisance will only be liable if the nuisance is continued or adopted: see, for example, *The Proprietors of Strata Plan No 14198 v Cowell* [1991] Aust Torts Reports 68,686.

77 Allen v Gulf Oil Refinery [1981] AC 1001; Lester-Travers v City of Frankston [1970] VR 2.

78 *Fennell v Robson Excavations Pty Ltd* [1977] 2 NSWLR 486.

79 *Sedleigh-Denfield v O'Callaghan* [1940] 3 All ER 349. A useful summary, and further illustrative examples and case references, of actions for nuisance is contained in Zada Lipman and Gerry Bates, *Pollution Law in Australia* (2002) 101-108.

80 The tort of negligence was settled in its modern form by the House of Lords in *Donoghue v Stevenson* [1932] AC 562. See also, *Grant v Australian Knitting Mills* [1936] AC 85; *Bull v Rover Mowers (Aust)* [1984] 2 QdR 489 and *Suosaari v Steinhart* [1989] 2 QdR 477.

81 *Jaensch v Coffey* (1984) 155 CLR 549 at 553-554; *San Sebastian Pty Ltd v Minister Administering the Environmental Planning and Assessment Act 1979* (1986) 162 CLR 341, 354.

82 Traditionally, companies could be held strictly liable for damage they caused by introducing dangerous substances or carrying out dangerous activities on land they own or occupy based upon the rule in *Rylands v Fletcher* (1866) CR 1 EX 265. This is no longer the case. In *Burnie Port Authority v General Jones Pty Ltd* (1994) 120 ALR 24 the High Court abandoned the *Rylands v Fletcher* rule holding instead that the normal principles of negligence apply so that a landowner has a duty of care to avoid a reasonable foreseeable risk to a third party.

but is not definitive.[83] Failure to act (including failure to warn of environmental dangers) may ground liability in negligence.[84]

To prove causation, the injured party must establish, on the balance of probabilities, that the fault of the alleged negligent party caused, or materially contributed to, the harm. In other words, the injured party must establish that the damage would not have occurred 'but for' the act or omission of the alleged negligent party.[85]

Remoteness turns on whether the kind, type or class of damage suffered is reasonably foreseeable.[86]

In practice, it seems more likely that a party who is injured as a result of a geosequestration project will pursue an action in nuisance rather than in negligence. This is because nuisance does not require the injured party to establish that the geosequestration project proponent owed, and was in breach of, a duty of care. However, negligence will figure where establishing a breach of duty is not an issue (for example, geosequestration owners will undoubtedly owe a duty of care to workers who are injured, through exposure to high levels of carbon dioxide or otherwise, while working on a geosequestration project) and the injured party wishes to claim damages for personal injury or economic loss (damages that are not generally available in an action for nuisance or trespass).[87]

3.4.4 Liability arising from Global Risks

It has been suggested that the Global Risks (those that may lead to long term adverse climate change consequences) associated with a geosequestration project may give rise to a successful claim under Australian tort law.[88]

At this time, it is unlikely that liability could arise to the general population by allowing carbon dioxide into the atmosphere, although allegations of such liability have already been made against greenhouse gas emitting companies in Australia[89] and overseas[90] and it is not possible to predict how the law may develop in the future.

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83 *F v R* (1983) 33 SASR 189, 194. See also *Thompson v Johnson & Johnson Pty Ltd* [1991] 2 VR 449, 494; *Young v Northern Territory* (1992) 107 FLR 264, 271.

84 See, for example, *Scott-Whitehead v National Coal Board* (1987) 53 P & CR 263; *Puntoriero v Water Administration Ministerial Corp* (1999) 104 LGERA 419; *Alec Finlayson Pty Ltd v Armidale City Council* (1994) 84 LGERA 225; *Armidale City Council v Alec Finlayson Pty Ltd* (1999) 104 LGERA 9.

85 *Overseas Tankship (UK) Ltd v Morts Dock and Engineering Co Ltd* [1961] AC 388; *Overseas Tankship (UK) Ltd v The Miller Steamship Co Pty Ltd* [1967] 1 AC 617; *Barnes v Hay* (1988) 12 NSWLR 337; *Thorpe Nominees Pty Ltd v Henderson* [1988] 2 QdR 216; *Chordas v Bryant (Wellington) Pty Ltd* (1988) 20 FCR 91 and *Bennet v Minister of Community Welfare* (1992) 176 CLR 408.

86 *Chapman v Hearse* (1961) 106 CLR 112; *Mount Isa Mines Ltd v Pusey* (1970) 125 CLR 383.

87 Zada Lipman and Gerry Bates, *Pollution Law in Australia* (2002) 104.

88 Michael Kerr, 'Tort Based Climate Change Litigation in Australia' (July 2002) prepared for the Australian Conservation Foundation and available at http://www.acfonline.org.au. See also, David Grossman, 'Warming up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation' (2003) 28 Columbia Journal of Environmental Law 1 and various articles posted on http://www.climatelaw.org.

89 On 30 July 2003, Climate Action Network Australia ('CANA') launched Australia's 'Climate Justice Program' - a program to 'explore legal avenues for making the perpetrators of climate change accountable for the damage they cause': see <http://www.cana.net.au>.

3.4.5 Ongoing liability and limitation periods

From a common law legal liability perspective, a geosequestration project proponent needs not only to consider the possible sources of liability (in trespass, nuisance and negligence, discussed above) but also the period during which the proponent is potentially exposed.

Significantly, if a geosequestration project proponent owes a common law duty or standard of care to certain persons, this duty or standard is ongoing. In other words, provided that the requisite elements of the relevant action are present (such as reasonable foreseeability and proximity, discussed above), and the relevant action is not barred by statute (see below), a project proponent's exposure to claims are not subject to time limitations. As a result, in the absence of statutory reform (or obtaining contractual indemnities from all potentially affected persons), a geosequestration project proponent's potential liability extends for the life of the geosequestration project (which will be indefinitely in respect of the long-term storage stage).

Limitation periods are prescribed by legislation in each Australian jurisdiction and differ for various causes of action. The general limitation period for causes of action in tort (including trespass, nuisance and negligence) is six years.[91]

The limitation period takes effect when the relevant cause of action accrues. For example, time begins to run on a negligence claim at the time that damage is suffered, even if the plaintiff is unaware of the damage.[92]

In certain circumstances a court has a discretion to extend the limitation period so that special time limits apply. For example, where a plaintiff has suffered a 'latent' personal injury (such as harm arising from exposure to asbestos) the time may run on an action for negligence from the time that the plaintiff became aware (or ought to have been aware) of the nature of the injury suffered and the connection between the injury and the defendant's act or omission.[93] However, there does not appear to be any evidence at this time to suggest that a geosequestration project may cause this type of latent injury.

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90 In July 2004, eight American States and New York City commenced public nuisance proceedings against five utilities in a Manhattan federal court, alleging that they contribute to global warming by releasing millions of tonnes of carbon dioxide into the atmosphere each year: see http://www.pawalaw.com/html/cases.htm.

91 *Limitation Act* 1969 (NSW), s 14; *Limitation Act* 1958 (Vic), s 5; *Limitation Act* 1974 (Qld), s 10; *Limitation Act* 1936 (SA), s 35; *Limitation Act* 1935 (WA), s 38; *Limitation Act* 1974 (Tas), s 4; *Limitation Act* 1985 (ACT), s 11. However, the relevant period in the Northern Territory is three years: *Limitation Act* 1981 (NT), s 12;

92 *Williams v Milotin* (1957) 97 CLR 465 at 474; [1957] ALR 1145; (1957) 31 ALJ 820 per Dixon CJ, McTiernan, Williams, Webb and Kitto JJ; *Distillers Co (Bio-Chemicals) Ltd v Thompson* [1971] 1 NSWLR 83; [1971] AC 458 at 467-8; [1971] 1 All ER 694; [1971] 2 WLR 441 per Lord Pearson; *Ratcliffe v V S & B Border Homes Ltd* [1987] 9 NSWLR 390 at 398 per Hunt J; *Scarcella v Lettice* (2000) 51 NSWLR 302; (2001) Aust Torts Reports 81-589 at 66,480 per Handley JA, CA(NSW).

93 See, for example, *Limitation Act* 1969 (NSW), s 60; and *Limitation Act* 1935 (WA), s 38.

3.5 Regulation of geosequestration at International law

3.5.1 Sources and nature of international obligations

Despite it having no direct or plenary constitutional power to do so, one of a number of ways that the Federal Government exercises power over the environment is through its external affairs power, which among other things, allows it to sign and implement international treaties.[94] In doing so, international environmental law treaties, and customary international environmental law principles embodied in them, are increasingly reflected in Australian domestic law.[95] Australian courts have also begun to recognise principles of customary international law such as sustainable development and the precautionary principle.[96]

According to general principles of customary international law, countries can exercise their sovereignty in their territories and therefore can engage in activities such as geosequestration within their jurisdiction. However, countries have a responsibility to ensure that activities conducted within their jurisdiction or control do not cause environmental damage to other countries.[97]

More specifically, Australia is party to a number of global and regional environmental treaties, notably relating to climate change and the law of the sea and marine environment, which may be interpreted to impact on geosequestration projects (particularly those conducted offshore). Some of the key treaties are discussed below.

3.5.2 The Law of the Sea Convention

The most significant international marine convention is the *United Nations Convention on the Law of the Sea* 1982 ('UNCLOS'), which came into force in 1994. The aim of UNCLOS is to regulate all uses of the sea including, among other things:

- pollution from land-based sources;
- pollution from sea-bed activities subject to national jurisdiction; and
- pollution from dumping.[98]

It is not clear whether carbon dioxide is a 'pollutant' under UNCLOS, although the release of carbon dioxide is likely to be covered by UNCLOS where it causes harm to living marine resources.[99]

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94 Constitution, s 51(xxix).

95 See, for example, the *Environmental Protection and Biodiversity Conservation Act* 1999 (Cth). See also, *Leatch v National Parks and Wildlife Service and Shoalhaven City Council* (1993) 81 LGERA 270.

96 See generally, Patricia Birnie and Alan Boyle, *International Law & the Environment* (2002). See also, D Rothwell and B Boer, 'From the Franklin to Berlin: The Internationalisation of Australian Environmental Law and Policy' (1995) 17 Syd LR 242.

97 DE Fisher, *Australian Environmental Law* (2003) 49.

98 See Articles 192-237.

99 See Ray Purdy and Richard Macrory, 'Geological Carbon Sequestration: Critical Legal Issues' (January 2004) Working Paper prepared for the Tyndall Centre for Climate Change Research, 18. 'Pollution' is defined in Article 1(4) of UNCLOS as 'the introduction by man, directly or indirectly, of substances or

In essence, rather than providing specific regulation, UNCLOS is more of a framework document, leaving more precise rules to be elaborated further in other more specific international conventions.[100] For example, all States that are party to UNCLOS are required to adopt laws and regulations and take other measures to control pollution by dumping, and these must be no less effective that the 'global rules and standards'.[101] The 'global rules and standards' are considered to be those of the London Convention 1972 and the 1996 Protocol to the London Convention (both discussed below).[102]

3.5.3 The London Convention 1972 and the 1996 Protocol to the London Convention

In addition to UNCLOS, Australia is a signatory to the *Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter* 1972 ('London Convention') as well as the *Protocol to the London Convention* 1996 ('London Protocol').[103] In essence, the London Convention is intended to prevent the indiscriminate disposal at sea of materials and wastes that may be harmful to human health, living resources and marine life, or which may damage amenities, or interfere with other legitimate uses of the sea. While there is some debate, it is likely that carbon dioxide is covered as a 'waste' for the purpose of the London Convention and London Protocol.[104]

'Dumping' is defined in the London Convention as the 'deliberate disposal at sea of wastes or other matter'.[105] It includes disposal of redundant ships, aircraft, or oil and gas platforms, including abandonment or toppling of these and other man-made structures at sea.[106] Under the London Convention, there were arguments either way as to whether the disposal of substances under the seabed would be covered.[107] However, the London Protocol has made it clear that dumping includes storage 'in the seabed or subsoil', but only if accessed by vessels or structures 'at sea'.[108]

The definition of 'dumping' in the London Convention (as amended by the London Protocol) produces the interesting result that offshore geosequestration projects appear to be covered by the London Convention if the carbon dioxide is transported to the injection site by tanker, but the London Convention may not apply where the carbon dioxide is piped directly to the injection site from shore.

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energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities'.

100 See Ray Purdy and Richard Macrory, 'Geological Carbon Sequestration: Critical Legal Issues' (January 2004) Working Paper prepared for the Tyndall Centre for Climate Change Research, 17.

101 Article 210.

102 Ray Purdy and Richard Macrory, 'Geological Carbon Sequestration: Critical Legal Issues' (January 2004) Working Paper prepared for the Tyndall Centre for Climate Change Research, 18.

103 For a detailed discussion of the London Convention and the London Protocol see Patricia Birnie and Alan Boyle, *International Law & the Environment* (2002) 419.

104 Ray Purdy and Richard Macrory, 'Geological Carbon Sequestration: Critical Legal Issues' (January 2004) Working Paper prepared for the Tyndall Centre for Climate Change Research, 22.

105 London Convention, Article 3(1).

106 London Convention, Article 1(1).

107 Patricia Birnie and Alan Boyle, *International Law & the Environment* (2002) 422.

108 Article 1(4)(1).

A further consideration exists in relation to whether geosequestration of carbon dioxide under the sea bed may be considered to be the 'placement' of matter for a purpose 'other than mere disposal thereof'. If this is the case, and the placement is not contrary to the general aims of the London Convention and the London Protocol, then geosequestration may not be covered.[109] However, it is likely that the injection of carbon dioxide for indefinite storage would be regarded as 'disposal' (rather than 'placement') and, if so, it seems likely that the London Convention and London Protocol will apply to regulate offshore geosequestration projects.[110]

3.5.4 Other treaties that may apply

Apart from UNCLOS, the London Convention and the London Protocol, there are a number of other global and regional treaties to which Australia is a party that may impact on a geosequestration project. These will need to be more closely considered by proposed geosequestration project proponents (particularly where the project is proposed offshore), and include among others:

- the *Basel Convention on the Control of the Transboundary Movements of Hazardous Wastes and their Disposal* 1992;[111]
- the *United Nations Framework Convention on Climate Change* 1992;
- the *Noumea Convention on the Protection of the natural Resources and Environment of the South Pacific Region* 1986;[112] and
- the *Apia Convention on Conservation of Nature in the South Pacific* 1976.[113]

4. THE MINISTERIAL COUNCIL'S APPROACH AND FINDINGS

4.1 The Ministerial Council's approach

As outlined in section 3 of this paper, while there are examples of State legislation that specifically regulate all or part of a geosequestration project, there is no nationally consistent legislative control over geosequestration projects in Australia. This regulatory void was the primary motivation for the establishment by the Ministerial Council of the Regulatory Working Group to develop the Draft Guiding Regulatory Framework, with the ultimate aim of producing a

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109 London Convention, Article III(1)(b); London Protocol, Article 1 (4)(2)(2).

110 Ray Purdy and Richard Macrory, 'Geological Carbon Sequestration: Critical Legal Issues' (January 2004) Working Paper prepared for the Tyndall Centre for Climate Change Research, 23.

111 The Convention was adopted in 1989 and came into force in 1992. It regulates the import and export of hazardous and other wastes among the parties to it, and establishes legal obligations to ensure that such wastes are managed in an environmentally sound manner. Australia gives effect to its obligations under the Basel Convention in the *Hazardous Waste (Regulations of Exports and Imports) Act* 1989 (Cth).

112 The Convention seeks to protect and manage the marine and coastal environment of the South Pacific Region. It is amended by two associated protocols: the *Protocol for the Prevention of Pollution of the South Pacific Region by Dumping* 1986; and the *Protocol Concerning Cooperation in Combating Pollution Emergencies in the South Pacific Region by Dumping* 1986.

113 These Conventions are detailed in D E Fisher, *Australian Environmental Law* (2003) Ch 3.

framework of nationally agreed standards, regulations and, if appropriate, legislation to guide the development of carbon dioxide geosequestration projects.[114]

In generating its Draft Guiding Regulatory Framework, the Regulatory Working Group acknowledged that the most significant issue was how to allocate responsibility at various stages in a carbon dioxide geosequestration project between private industry proponents and government. In doing so, it has sought to develop principles that provide:

- certainty for stakeholders;
- public confidence that natural resources, the environment and human health and safety will be adequately protected;
- an environment that encourages investment in the research and development of geosequestration technology; and
- consistent regulation of geosequestration technologies and processes.[115]

4.2 The Ministerial Council's findings

4.2.1 Access and property rights

In relation to access and property rights, the principles contained in the Draft Guiding Regulatory Framework include statements that access should (wherever possible):

- recognise and adequately account for the interests of other stakeholders, including existing and future surface and sub-surface rights holders; and
- provide certainty to rights holders of their entitlements and obligations.

The Regulatory Working Group also recognised the need to appropriately define 'geosequestration gas' in terms of the levels of other gases that will be allowed to be geosequestered together with the carbon dioxide.

4.2.2 Long term responsibilities

As discussed above, identifying who has responsibility for the risks associated with a geosequestration project over the project's life was the most important issue for the Regulatory Working Group to address. In relation to long term responsibilities, the Draft Regulatory Guiding Principles provide as follows:

- responsibility and associated liabilities should remain with the project proponent until the relevant Government is satisfied to a high degree of certainty that:
    - future land-use objectives defined at the time of the project approval have been met;
    - the residual risks of leakage and liability are acceptably low; and
    - the ongoing costs associated with the site are acceptably low or are otherwise appropriately managed (for example through financial assurances, instruments and trust funds); and

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114 Regulatory Impact Statement, pp 2 and 7-9.
115 Draft Guiding Regulatory Framework, p 3.

- following closure, primary responsibility for the site will lie with Government, although some residual liability may remain with the proponent. Further:
    - the scope and nature of these residual responsibilities should be resolved upfront to the extent possible, recognising that responsibility depends on individual circumstances of each case. These liabilities should be determined and negotiated with the proponent on a project-by-project basis; and
    - there may be a need to manage any residual liability that remains with the project proponent e.g. through means such as ongoing indemnities, insurance policies and trust funds.[116]

4.2.3 Environmental issues

The Regulatory Working Group identified that the environmental risks associated with geosequestration technology is something that will require continued monitoring as new scientific information becomes available. It considered that this may require a review of, and possible amendments to, existing Australian environmental legislation in order to meet one of the Regulatory Working Group's aims of adequately protecting natural resources, the environment and human health and safety. However, the Regulatory Working Group also advocated the need for stakeholder (particularly investor) certainty and warned against the dangers of overregulation in this area.[117]

4.2.4 Authorisation and compliance

The Regulatory Working Group supported an authorisation and compliance approach for geosequestration projects that is consistent with existing regulation of other applications that are analogous to various stages of a geosequestration project (for example, chemical manufacturing, pipeline transportation, storage of hazardous waste etc). To do so, it suggested that legislation that is currently in force be amended to provide for geosequestration in a nationally and internationally consistent way, possibly in accordance with a single national industry code of conduct.[118]

4.2.5 Monitoring and verification

In relation to monitoring and verification, the Draft Regulatory Guiding Framework provides that any future regulatory regime should:

- provide for the generation of clear, comprehensive, timely and accurate information that is used effectively and responsibly to manage environmental, health, safety and economic risks and to ensure that performance standards are being met; and
- determine to an appropriate level of accuracy the quantity, composition and location of gas captured, transported, injected and stored and the net abatement of emissions.[119]

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116 Draft Guiding Regulatory Framework, p 3.
117 Draft Guiding Regulatory Framework, p 3; Regulatory Impact Statement, p 14.
118 Draft Guiding Regulatory Framework, p 3; Regulatory Impact Statement, p 14.
119 Draft Guiding Regulatory Framework, p 4.

4.2.6 Transportation

The Regulatory Working Group found that existing legislation regarding the transport of gas, especially by pipelines, may already apply to the transport stage of a geosequestration project. To the extent that the access, safety and environmental implications of carbon dioxide transport are not covered, the Regulatory Working Group advocated the identification of any regulatory gaps and consideration of legislative reform.[120]

4.2.7 Financial issues

There is a general recognition in the Draft Guiding Regulatory Framework that, consistent with the need to create and maintain public confidence, all fiscal and regulatory measures must be subject to a least cost approach which preserves international competitiveness, uses established regulatory principles and procedures and avoids fiscal burdens.[121]

5. FUTURE REGULATION OF GEOSEQUESTRATION

5.1 Initial public consultation following the release of the Draft Guiding Regulatory Framework

Following release of the Draft Guiding Regulatory Framework, the Ministerial Council invited submissions from interested parties. The initial consultation period closed late 2004, by which time the Ministerial Council had received submissions from 21 organisations.[122] These organisations represented:

- industry;[123]
- environmental conservation groups;[124] and
- the Western Australian Government; and
- other groups and organisations.[125]

Generally, industry representatives were in support of the principles contained in the Draft Guiding Regulatory Framework. However, a number of issues were raised by industry representatives, including:

- a general desire to avoid overregulation of geosequestration projects and to rely, as far as possible, on established regulations and project approval processes rather than developing new procedures;[126]

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120 Draft Guiding Regulatory Framework, p 5.

121 Draft Guiding Regulatory Framework, p 5; Regulatory Impact Statement, p 21.

122 Copies of all the submissions made are available at http://www.industry.gov.au/ccs.

123 These were the Australian Coal Association; the Australian Petroleum Production and Exploration Association; Australian Power and Energy Limited; BHP Billiton; National Generators Forum; New South Wales Minerals Council; Origin Energy; Stanwell Corporation Limited; Woodside Energy Limited; and Xstrata Coal Australia Pty Ltd.

124 These were Eco Property Pty Ltd; the Australian Conservation Foundation; the Conservation Council of Western Australia; Climate Action Network Australia; Friends of the Earth; and Rising Tide.

125 These were Baker & McKenzie; the Cooperative Research Centre for Greenhouse Gas Technologies; the Cooperative Research Centre for Coal in Sustainable Development and PricewaterhouseCoopers Legal.

- a preference that legislative reform arising from the Draft Regulatory Framework should only apply to commercially operating geosequestration projects, and not research, development and demonstration projects;[127]
- a view that existing performance-based regulatory structures are preferred over prescriptive regulations that could lead to unnecessary restrictive outcomes or higher costs;[128]
- a suggestion that, at least in respect of some aspects of a geosequestration project, market-based initiatives or self-regulation may be preferred to regulatory reform; [129] and
- support for further financial incentives that encourage industry to adopt geosequestration and other greenhouse gas mitigation technologies.[130]

Many of the other (non-industry) groups provided a more critical response to the Draft Guiding Regulatory Framework, particularly the environmental conservation groups. Comments from these groups included:

- general criticism of geosequestration as an appropriate greenhouse gas mitigation measure and support instead for approaches that reduce levels of carbon dioxide emissions at the source;[131]
- criticism that there was a lack of appropriate and meaningful consultation during the preparation of the Draft Guiding Regulatory Framework; [132]
- a view that the principles contained in the Draft Guiding Regulatory Framework are biased towards an industry perspective and do not adequately account for environmental and public health issues;[133] and
- a view that the description of technical and environmental risks contained in both the Draft Guiding Regulatory Framework and the Regulatory Impact Statement are biased in favour of industry and do not properly reflect the actual physical risks associated with geosequestration technology.[134]

5.2 Further consultation and release of a revised Draft Guiding Regulatory Framework

It is important to note that the principles contained in the Draft Guiding Regulatory Framework are still only draft and are expressed to be flexible and subject to ongoing development to meet

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126 See, for example, the submission of BHP Billiton.

127 Research, development and demonstration projects should be encouraged by minimising regulatory burdens: See, for example, the submission of the Australian Petroleum Production and Exploration Association. This preferred approach is picked up in the introduction on p 1 of the Draft Guiding Regulatory Framework.

128 See, for example, the submission of Australian Power and Energy Limited.

129 See, for example, the submission of the National Generators Forum.

130 See the submission of Origin Energy.

131 See, for example, the submission by Rising Tide.

132 See, for example, the submission by the Australian Conservation Foundation.

133 See, for example, the submission by the Conservation Council of Western Australia.

134 See, for example, the submission by the Climate Action Network Australia.

experience and circumstance.[135] Consequently, they provide a guide only as to how Australian geosequestration projects might be regulated in the future.

The Department of Industry and Resources is currently establishing a stakeholder group consisting of representatives from key industry, research, environmental and other organisations who will meet in March 2005 to discuss the Draft Guiding Regulatory Framework and Regulatory Impact Statement. Following this further consultation period, a standing committee of relevant State, Territory and Commonwealth officials will conduct further analysis with a view to preparing a revised Draft Guiding Regulatory Framework and Regulatory Impact Statement. These will be presented to the Ministerial Council for its consideration at its meeting scheduled for July 2005 in Adelaide.[136]

The Ministerial Council has not provided any details of the likely process following its meeting later this year. However, the Ministerial Council has made it clear that, while the Draft Guiding Regulatory Framework aims to provide a nationally consistent framework for the regulation of geosequestration, it will be up to each Australian jurisdiction to separately consider whether or not to implement the principles contained in the Draft Guiding Regulatory Framework once it has been finalised.[137]

5.3 Outlook

The principles contained in the Draft Guiding Regulatory Framework are in draft and evolving, but are an important step towards building an appropriate regulatory framework for geosequestration projects in Australia.

Putting aside the political, technical and economic questions as to the viability of geosequestration technology as a greenhouse gas mitigation strategy, it appears that the overarching question is how best to balance the need to provide investors with a legal and regulatory environment that facilitates investment in geosequestration projects on the one hand with the need to provide confidence that the health and safety of the public and environment are adequately protected on the other.

As the Regulatory Working Group identified, it is useful to draw analogies for geosequestration projects with existing processes and activities for which regulatory frameworks are already in place. For the capture, transport and injection stages of a geosequestration project, it appears that existing legislation, to a large degree, is well placed to meet the concerns of all relevant stakeholders.

The long-term underground storage stage poses a more difficult challenge. Given the time frames proposed for the storage of carbon dioxide and the life span of corporate entities, there is clearly no other reasonable alternative than to provide a regulatory framework that transfers responsibility for a geosequestration project from private operators to government following 'closure' of the project. Although much was made of the Ministerial Council's support of this approach following

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135 Draft Guiding Regulatory Framework, p 1.

136 Telephone discussion with Resources Division of the Department of Industry and Resources, 18 February 2005.

137 Regulatory Impact Statement, p 8.

release of the Guiding Regulatory Framework, the critical question is not if, but when (and on what terms) liability should pass in order to achieve the balance referred to above.

Regulatory analogues to storage of carbon dioxide underground (particularly those in the mining and petroleum industries dealing with decommissioning and rehabilitation requirements) suggest that primary responsibility for a geosequestration project should only pass to the government when the relevant government is satisfied to a high degree of certainty that the future risks of leakage and liability and the ongoing costs associated with the carbon dioxide storage site are acceptably low or are otherwise appropriately managed (for example through financial assurances and indemnities etc). However, the long-term (indefinite) storage of carbon dioxide poses risks that do not apply in the same way to other industry processes and governments may need additional evidence garnered from further research, development and demonstration of geosequestration technology before they are able to make an assessment of when the risks associated with a carbon dioxide storage site are acceptably low or appropriately managed.

A possible way forward might be to consider some kind of staged regulatory approach that initially encourages research, development and demonstration projects by providing lower, and/or project specific, regulatory burdens.[138] Results from this initial research, development and demonstration stage might be used to develop a regulatory regime that applies to commercial projects. While this approach may, at least preliminarily, tip the balance in favour of industry and expose the public and the environment to increased levels of risk, it recognises the risk that overregulation may curb interest in geosequestration and cause the loss of an opportunity to reduce greenhouse emissions using this technology.

Whichever approach is taken, it is critical that regulatory reform (if any) in each Australian jurisdiction has been properly informed by appropriate consultation with all relevant stakeholders and consideration of state of the art scientific evidence of the potential risks associated with geosequestration projects.

6. CONCLUSIONS

While it may be some time before geosequestration is accepted as a technically and commercially viable (and politically acceptable) method of curbing the release of carbon dioxide into the atmosphere, Australia's reliance on its abundant fossil fuel resources will ensure that the large-scale use of geosequestration technology in this country will continue to be seriously considered. The decision by the Ministerial Council to release the Guiding Regulatory Framework indicates that the Federal and State and Territory Governments are keen to understand who and what might be impacted by geosequestration and then set out as clear a regime as possible to establish the responsibility and liability of a geosequestration project proponent.

In general, geosequestration has not been taken into account when drafting existing national and international legislation. Nevertheless, there are many regulations which may impact on a geosequestration project in Australia. An understanding of the basic activities involved each stage

[138] Stanwell Corporation Limited, in its submission on the Draft Guiding Regulatory Framework and Regulatory Impact Statement supported a two-tiered approach to the regulation of geosequestration. Other industry groups also indicated a general preference that research, development and demonstration projects should be treated differently to commercial projects: see footnote 124, above.

of a geosequestration project and the potential physical risks associated with geosequestration provide a proper basis for identifying and considering these regulations.

The main sources of responsibility in relation to geosequestration will be environmental legislation and duties and standards of care imposed by the common law. However, other legislation and international law impose other obligations that may be relevant.

In considering reform proposals, the Federal and State and Territory Governments will need to proceed cautiously to ensure:

- that the various responsibilities arising from various legislation and the common law are coordinated and consistent so that geosequestration projects are governed by a workable regime; and
- not only that the public is adequately protected, but also that the appropriate balance is struck between encouraging investment in geosequestration technologies on the one hand while not hindering investment in other methods for reducing carbon dioxide emissions on the other.