

TOWARDS AN EFFECTIVE LEGAL FRAMEWORK FOR THE GEO-SEQUESTRATION OF CARBON DIOXIDE IN NEW ZEALAND

BY GREG SEVERINSEN¹

I. INTRODUCTION

With global concern over climate change on the rise, the new millennium has seen the international community take significant steps towards reducing global greenhouse gas emissions. The implementation of various international and domestic legal instruments has given industry an incentive to develop technologies capable of reducing emissions to the atmosphere. A recent development with great potential to do so is carbon capture and storage (CCS) technology, also known as carbon geo-sequestration, in which carbon dioxide is captured at its source and injected for permanent or long-term storage in underground formations. Unfortunately, the technological capabilities of CCS have developed in New Zealand much faster than the law required to regulate them and, given the inadequacy of existing legal instruments, the latter must now catch up.

This paper is designed to provide an overview of some of the most important legal challenges that the regulation of CCS poses in this country, and does not purport to provide a comprehensive analysis of all such problems. Similarly, it offers some potential solutions and at times proceeds on the basis that such solutions are most desirable, but this is not to say that alternative solutions do not exist and do not merit discussion; legislators and lawyers remain free to argue and adopt a myriad of other viewpoints.

The paper begins by providing a brief background on the international and national instruments concerning climate change that have affected and continue to affect the development and viability of CCS, and technical aspects relevant to its establishment in New Zealand. It then explores whether existing legal regimes under the Crown Minerals Act 1991

(CMA) and Resource Management Act 1991 (RMA) are sufficient to regulate geo-sequestration, concluding that the current law has serious deficiencies. It goes on to explore the content of international responses to CCS, and is followed by a discussion of the suitable objectives of the new legislation that is required. These objectives colour the discussion of the legal problems and solutions that follow, namely: questions over the legal ownership of gas and formations, appropriate methods to allocate and arbitrate between diverse and competing resource interests, the suitability and form of both substantive and procedural rules of environmental protection and monitoring, and issues over the distribution of short and

1 LLB(Hons), BA, Barrister and Solicitor of the High Court of New Zealand. The author was the recipient of the 2009 Canterbury Law Review Prize for the top honours dissertation at the Canterbury University School of Law. Grateful thanks go to Professor Elizabeth Toomey for her valuable supervision of this paper.

long-term liability. Finally, the paper offers thoughts on the ideal form of new legislation, and comes to the unequivocal conclusion that a new, stand-alone Act is required in New Zealand. This must give certainty to presently uncertain legal issues, avoid undermining existing law and rights as far as possible, and encourage investment in CCS through the effective regulation of a previously-unregulated activity.

Due to space constraints, there are several issues that are not touched upon; these include issues of sub-seabed geo-sequestration, problems associated with carbon dioxide capture and transportation, the sequestration of carbon in mineral carbonates, trees and the deep ocean, and the relative merits of CCS and renewable energy options. These areas all warrant further research.

II. THE BACKGROUND: GLOBAL CLIMATE CHANGE

A. *The Problem and Global Responses*

The role of carbon geo-sequestration in New Zealand and the importance of its regulation cannot be properly understood without reference to the context of global climate change in which it has appeared. The current level of atmospheric carbon dioxide, due to anthropogenic emissions, is unprecedented in over 20,000 years and looks likely to increase.² This is now causing significant melting of perennial ice on the polar caps,³ which has huge implications for wider climate systems. Increased scientific acceptance of the reality of climate change has seen the international community respond to this global threat. The 1992 Rio Conference was closely followed by the United Nations Framework Convention on Climate Change (UNFCCC) and its associated Protocol signed at Kyoto (the Kyoto Protocol). The latter sets binding targets of greenhouse gas emission reductions for party states over the first commitment period of 2008 to 2012.⁴ New Zealand must reduce its greenhouse gas emissions (largely comprised of carbon dioxide) to 1990 levels,⁵ or purchase⁶ or generate assigned amount units (AAUs)⁷ if emissions stay above this level.⁸

2 N Franklin, Z Lipman, R Lyster, L Pearson and G Wiffen *Environmental and Planning Law in New South Wales* (Federation Press, Sydney, 2007) at 190.

3 A Gore, "Global Warming Is an Immediate Crisis" (Speech To New York University School of Law, New York, 2006).

4 A recent meeting of the parties at Copenhagen has failed to specify reductions for a subsequent commitment period, but agreement may eventually be reached elsewhere.

5 This amount is the equivalent of 309,564,733 metric tonnes of carbon dioxide: Ministry for the Environment *Net Position Report 2009: New Zealand's Projected Balance of Kyoto Protocol Units During the First Commitment Period* (Ministry for the Environment, Wellington, 2009) at 3.

6 G Milner-White "The Legal Implications of Climate Change in New Zealand for the Forestry Industry" (2007) 11 NZJEL 141at 149.

7 One AAU is equivalent to gas comprising the global warming potential of one tonne of carbon dioxide.

8 Protocol to the United Nations Framework Convention on Climate Change (Kyoto Protocol), art 17.

B. National Responses and the Viability of CCS

Although there exist many problems with the Kyoto Protocol,⁹ John Key's National government has recently implemented an amended emissions trading scheme (ETS)¹⁰ to achieve Kyoto targets by internalising the cost of carbon.¹¹ Under the scheme, participants must surrender a number of pre-allocated carbon credits (each backed by an AAU) equivalent to actual emissions. If they cannot, they must either purchase the cost of excess emissions on the carbon market¹² or generate credits through the creation of carbon sinks.¹³

Thus far, the New Zealand market has focused on reducing or mitigating carbon dioxide emissions by generating carbon credits or moving towards renewable energy sources such as hydro or wind generation. In practice, although it effectively shields New Zealand from internationally high carbon prices,¹⁴ the ETS in its current form gives little incentive for investment in new emission reduction technology. It introduces no 'cap' on the allocation of credits (thus assigning credits low value)¹⁵ and does not take a long term view (and therefore does not allow reliable forecasting of carbon prices).¹⁶

However, should the requirements of the ETS become more stringent and the price of emissions higher in the future, a real option for industry (and the only one in which the ability to develop large fossil fuel reserves is retained)¹⁷ is to develop CCS technology. In fact, there is the significant potential for New Zealand to make money in an international CCS market, which is potentially worth over \$400 billion.¹⁸ In this process, which is examined in the following Part, carbon dioxide is not released to the atmosphere and is therefore not treated as an emission under the scheme. CCS proponents could therefore sell any resulting unused credits at a profit.

- 9 For example, there is uncertainty as to whether CCS can be included in the clean development mechanism and be considered a 'non-emission': C Gough and S Shackley (eds) *Carbon Capture and its Storage: An Integrated Assessment* (Ashgate, Aldershot, 2006) at 123. There are also questions over the willingness of developed states to reduce emissions rather than simply purchase credits emissions: B Rogers, "Carbon Markets" [2007] NZLJ 336 at 337.
- 10 Climate Change Response (Moderated Emissions Trading) Amendment Act 2009.
- 11 Ministry of Agriculture and Forestry "Economic Governance Model for Sustainable Development" (2008) Ministry of Agriculture and Forestry <www.maf.govt.nz>.
- 12 Victorian Department of Primary Industries *Position Paper: Strategic Policy Framework for Near-Zero Emissions from Victoria's Fossil Fuels* (Victorian Department of Primary Industries, Victoria, 2008) at 23.
- 13 Developing forested areas is currently the most widespread method of creating carbon sinks.
- 14 Rogers, above n 9, at 338.
- 15 Climate Change Response Act 2002, s 68.
- 16 A M Andrews "Picking up on what's Going Underground: Australia should Exempt Carbon Capture and Geo-sequestration from Part IIIA of the Trade Practices Act" (2008) 17 Pac. Rim L.& Pol'y J. 407 at 409. The same problem exists with AAUs under the Kyoto Protocol.
- 17 T Kerr CO2 "Capture and Storage: Legal and Regulatory Update" (Presentation to Carbon Capture and Storage Summit, London, 2008).
- 18 Coal Association of New Zealand *Coal e-Newsletter* (New Zealand, May 2007) at 7.

III. THE BASICS OF THE CCS PROCESS

As has been seen, it is unlikely that carbon geo-sequestration will become commercially viable in New Zealand until the ETS is amended. However, the science and technology necessary to undertake CCS has existed for many years. The process is complex, and is defined by recently passed Victorian legislation as ‘the injection of a greenhouse gas substance¹⁹ into an underground geological storage formation for the purpose of permanently storing that substance underground’.²⁰ The process in fact comprises four distinct stages. Firstly, the gas is captured from a point-emission source such as a power station or industrial plant. Secondly, the emission is compressed into a liquid state and transported via pipeline to an injection site. Thirdly, it is injected into a deep geological formation such as a partially or fully depleted petroleum field,²¹ saline aquifer or unusable coal seam. Finally, the stored gas must be monitored and the injection site maintained.

There is estimated to be significant suitable pore space²² and pre-existing infrastructure²³ to enable CCS to occur in New Zealand, and site characterisation is currently taking place.²⁴ The technology is promising, and has the potential to reduce greatly point source emissions. However, technical developments have far outpaced considerations of the regulation required to govern it, especially in New Zealand.²⁵ Whether or not the existing statutory framework of this country is sufficient to govern CCS operations, or whether new legislation is required, must now be determined.

IV. THE ADEQUACY OF EXISTING NEW ZEALAND LAW IN THE REGULATION OF CCS

A. Introduction

It has been proposed that carbon geo-sequestration is theoretically possible in New Zealand, and may become commercially viable. To allow investment certainty, prevent disputes and protect various interests, the law should be ready to respond if it does, and the Ministry of Economic Development has set this as a priority.²⁶ However, there are serious questions over whether existing statutory frameworks contained in the CMA, the RMA and the Hazardous Substances and New Organisms Act 1996 (HSNO Act) are

19 The scope of this paper is, however, limited to a discussion of only carbon dioxide storage.

20 Greenhouse Gas Geological Sequestration Act 2008 (Victoria), s 5.

21 These may be most useful because of the presence of a well defined cap rock.

22 Such space is estimated to be capable of sequestering all projected national emissions between 2000 and 2050.

23 Energy Federation of New Zealand *Energy Research Investment Strategy* (2006) at 51.

24 S W Edbrooke, B D Field, R H Funnell, and A Nicol *The Potential for Geological Sequestration of CO₂: Opportunities for New Zealand and its Energy Sector* (GNS Science, Lower Hutt, 2008).

25 D W Keith and E A Parson “Fossil Fuels without CO₂ Emissions” (1998) 282 *Science* 1053 at 1053.

26 “Carbon Capture and Storage: Where are We Now?” (Proceedings of the International Carbon Capture and Storage Seminar, Wellington, 2009) at 33.

adequate to do so. Although the greatest problems of commercial cost arise at the capture stage of the process, most legal problems arise only at the injection and post-injection stages, and this paper focuses on these.²⁷

Given that CCS activities bear a strong resemblance to those of petroleum mining, it would not be unreasonable to assume that applicable mining legislation, the CMA and the RMA, could effectively govern CCS. The CMA is designed to control the use of a valuable yet non-regenerative resource, while the RMA manages the environmental effects of doing so.

B. The Applicability of the Crown Minerals Act

1. Before Injection

The purpose of the CMA is to reform the law relating to the management of Crown owned minerals. All rights, duties and powers in the Act relate only to such minerals. Carbon dioxide in its pre-injection state is not a mineral for the purposes of the Act, which defines a mineral (inter alia) as being beneath or at the surface of the Earth.²⁸ Permits are also only required for minerals in land.²⁹ The CMA therefore appears incapable of governing pre-injection CCS activities such as capture and transport. However, the CCS Policy Group has raised the possibility that the CMA could govern injection and post-injection activities.

2. After Injection

If injected carbon dioxide is capable of coming within the meaning of a Crown owned mineral, this has implications not only in terms of what legislation governs the activity, but also for who has a proprietary interest in the gas itself.

a. The Definition of 'Mineral'

After injection into the ground, carbon dioxide arguably comes within the definition of a mineral: a naturally occurring inorganic substance beneath or at the surface of the Earth, which includes non-metallic minerals.³⁰ Carbon dioxide is not specifically mentioned, but the Act's definition of a non-metallic mineral appears to be non-exhaustive. Furthermore, the scope of such terms can change over time; in the same way that 'mineral' has come to include rock or stone.³¹ However, the definition is arguably not flexible enough to extend to carbon dioxide; all substances listed are solids such as barite, magnesite and quartz.³² If the rule of statutory construction of *noscitur a sociis*³³ is applied, the list likely excludes gaseous (or compressed liquid)

27 Legal issues do, of course, arise at other stages of the process, and further research is warranted in these areas..

28 Crown Minerals Act 1991, s 2.

29 Ibid, at s 23.

30 Ibid, at s 2.

31 *Shire of Wannon v Riordan* [1955] VLR 413.

32 Above n 28, at s 2.

33 Literally, '[the word] is known by the company it keeps'.

substances like carbon dioxide. Gaseous or liquid minerals only expressly come within the purview of the Act if they are hydrocarbons, in which case they fit within the more specific definition of petroleum.³⁴

Perhaps more persuasive is the notion that although carbon dioxide can occur naturally underground, the gas actually injected did not occur naturally in that formation and was not even produced by natural means. Thus, it likely cannot meet the criteria for inclusion as a mineral under the CMA. In addition, the term mineral does not include the space occupied by the mineral, so the Crown cannot manage CCS on the basis that the CMA allows it to manage pore space.³⁵

b. The Definition of 'Crown-Owned'

Assuming for a moment the unlikely conclusion that the injected gas is a 'mineral' under the CMA, it will still only in a limited number of cases be Crown owned and thus subject to the Act.³⁶ It is not a mineral automatically deemed to be property of the Crown irrespective of where it lies.³⁷ Ownership would be reserved to the Crown only if the land containing the gas were alienated by the Crown after 1 October 1991, or specifically reserved under previous legislation.³⁸ Permits cannot be issued under the CMA over privately owned minerals.³⁹

c. A Sole Purpose of Extraction?

If one accepts that in limited cases injected gas will be a Crown owned mineral, it is likely that the CMA will only regulate activities associated with its removal. Section eight states that a person cannot "prospect, explore or mine" for Crown owned minerals without a permit. All these terms are defined with reference to a purpose of extraction rather than injection.⁴⁰ Enhanced petroleum recovery is able to be regulated under the Act simply because it is incidental to other activities that do have a purpose of extraction.

Ultimately, it is sensible that the CMA does not prohibit, allow or even govern CCS activities. The Act is a tool for the Crown to manage what is essentially its own private property, not the property of others. Therefore it would seem conceivable that the activity could be governed effectively by the RMA alone, which appears to apply to the activity.

34 Above n 28, at s 2.

35 However, it is still arguable that although the CMA does not confer such a right, the common law may vest ownership and thus control over a formation in the owner of the mineral that used to occupy this space. This is discussed later in Part VII.B.2.

36 Although s 79 of the CMA is unique in dealing with privately owned minerals, the main restrictive s 8 applies only to Crown owned minerals.

37 By virtue of s 10 of the CMA, only petroleum, gold, silver and uranium are subject to such a blanket rule.

38 By virtue of s 59 of the Land Act 1948, any alienation of land from the Crown since 1949 has reserved ownership of the mineral underlying that land in favour of the Crown.

39 Above n 28, at ss 25(1A) and 32(7).

40 Above n 28, at s 2.

C. The Applicability of the Resource Management Act

The RMA regulates activities having effects on the environment, through a requirement of compliance with national environmental standards, regional and district plans, and conditions attached to resource consents required under such plans. The fact that the Act applies to mining activities under the CMA,⁴¹ and the similarities of the activity with CCS, *prima facie* suggest it will also apply to the latter.

1. The Act's Purpose

It must first be decided whether CCS activities fall within the purpose of the RMA, the promotion of sustainable management of natural and physical resources.⁴² Firstly, carbon dioxide is not excluded from the concept of sustainable management. Moreover, the conclusion reached above that the gas is likely not a 'mineral'⁴³ means that the RMA's definition of sustainable management applies in full;⁴⁴ authorities will have power to take into account the reasonably foreseeable needs of future generations in managing the resource. This might, however, not be overly significant; although the long term flow-on effects of injection could probably be taken into account,⁴⁵ the effect on climate change cannot be considered in the writing of plans unless it impacts on renewable energy.⁴⁶

Secondly, although it is not a 'mineral', injected gas may still fall within the term 'natural or physical resource'. This expressly includes land, water, air, soil, energy, plants, animals and structures.⁴⁷ The definition of land does not specifically mention underground gas, while air (although not defined) is generally treated as being only the receiving environment of a contaminant.⁴⁸ There is also the possibility that the gas will be viewed not as a resource but rather as only a contaminant or liability. However, the definition of natural or physical resource is non-exhaustive and likely is left deliberately open,⁴⁹ and may include a store of carbon dioxide. Furthermore, underground pore space is clearly part of land⁵⁰ and, as such, the regulation of its use falls within the purpose of the Act.

Perhaps most importantly, the RMA regulates activities according to their environmental effects, rather than an activity's use of resources. The process of geo-sequestration will inevitably impact or have adverse effects on other natural and physical resources that are subject to controls under the RMA. The gas, as a contaminant,⁵¹ would inevitably or potentially be discharged to

41 Above n 28, at s 9.

42 Resource Management Act 1991, s 5(1).

43 By virtue of s 2 of the RMA, the definition of 'mineral' is the same under the CMA and the RMA.

44 That is, s 5(1)(a) of the RMA applies.

45 *Canterbury Regional Council v Waimakariri District Council* (2002) 8 ELRNZ 33.

46 Above n 42, at s 70A.

47 *Ibid*, at s 2.

48 *Ibid*, at s 15.

49 *New Zealand Rail Ltd v Marlborough District Council* [1994] NZRMA 70 (HC).

50 'Land' includes the minerals under it, so presumably must include the general subsurface: *Gebbie v Banks Peninsula District Council* [2000] NZRMA 553 (HC).

51 Under s 2 of the RMA, this is any substance likely to change the physical, chemical or biological condition of the air or land.

land, air, and water, affect plants and animals, or undermine structures. As Panckhurst J confirmed in *Gebbie v BPDC*, ‘the control and management of these issues is the very stuff of the Act’.⁵² Although the common law continues to give certain rights to use one’s own land, the exercise of such rights is nevertheless subject to statutory controls.⁵³

2. The Machinery of the Resource Management Act

For the RMA to affect CCS operations, not only must the regulation of injection fall within the purpose of the Act, but also the machinery of the Act must implement it. Regional councils may lack the residual power to manage injected carbon dioxide itself under section 30(1)(a) RMA that they possess for minerals, as the gas may not be viewed as a resource. However, the use of land, which includes the drilling, tunnelling or other disturbance inevitable in CCS injection,⁵⁴ can be regulated through district plans.⁵⁵ In addition, the discharge of contaminants into land, where the contamination of water may result, can be regulated by regional plans, as can the discharge of contaminants to land from⁵⁶ industrial or trade premises.

D. The Applicability of the Hazardous Substances and New Organisms Act

Although the RMA undoubtedly applies to CCS injection, the same cannot likely be said of the HSNO Act. To be classed as a ‘hazardous substance’ and regulated by the Act, a substance has to be explosive, flammable, oxidising, corrosive or toxic, either by its nature, or when exposed to contact with water or air that is not artificially pressurised or heated.⁵⁷ Carbon dioxide possesses none of these characteristics. Although the gas can form carbonic acid when in contact with water, to produce more than minimally corrosive levels would likely require artificially high pressure or temperature levels in underground air pockets not present in CCS.⁵⁸

E. The Ability of the Resource Management Act to Regulate CCS Alone

The RMA appears to be the only piece of legislation currently capable of regulating CCS in New Zealand. The Act, in conjunction with private contractual arrangements, has proved adequate in controlling the mining of privately owned minerals. However, whereas the public have comparatively little interest in how privately owned minerals are used,⁵⁹ there is strong public interest in the effectiveness of CCS projects. A regulatory framework must take this into account. Furthermore, unique legal issues that arise in the context of geo-sequestration concerning the ownership of gas and pore

52 *Gebbie v Banks Peninsula District Council*, above n 52, at 559.

53 E Toomey ‘Case Notes on *Gebbie v The Banks Peninsula District Council*’ (2000) 9 BCB 98 at 100.; *New Zealand Suncern Construction Ltd v Auckland City Council* (1997) 3 ELRNZ 230.

54 Above n 42, at s 9(4).

55 *Ibid*, at subss 9(2) and 9(3).

56 The production site of the contaminant is required to be the industrial or trade premises, not the injection site: *Taranaki Regional Council v Works Infrastructure Ltd* (2002) 8 ELRNZ 75.

57 Hazardous Substances and New Organisms Act 1996, s 2.

58 J Ennis-King, K Pruess and N Spycher ‘CO₂-H₂O Mixtures in the Geological Sequestration of CO₂’ (2003) 67 *Geochim Cosmochim Acta* 3015 at 3015.

59 Separate, of course, from any associated effects on the environment.

space, the allocation of property rights, the protection of the environment and the assignment of liability must receive strong statutory solutions if investment in the technology is to be encouraged. New legislation to govern CCS is necessary.

*F. Differentiating between the Roles of New CCS Legislation and the
Crown Minerals Act*

Although the role of new legislation must be to regulate the unique features of carbon geo-sequestration, it must also be careful not to upset the long-established regime governing mining under the CMA. More specifically, the problem is whether the practice of enhanced petroleum recovery (whereby carbon dioxide is injected into a petroleum formation to increase pressure and therefore the yield of oil and gas) should be subject to regulation under a mining or CCS framework. To minimise disruption to the oil and gas industry, true enhanced petroleum recovery (EPR) should continue to be subject only to a mining permit under the CMA.⁶⁰ However, it is equally important that those engaged in CCS are prevented from circumventing new legislation by injecting under the pretence of EPR; the imposition of rules determining ownership and liability will be more important for CCS proponents, given the larger volumes and value of gas injected.⁶¹ Exacerbating the confusion is the fact that early CCS injection projects are likely to take place in partially depleted petroleum fields where EPR is already practiced and make use of existing infrastructure.⁶² If the cost of emitting carbon increased, 'back door' carbon storage through EPR could become a very real risk.⁶³

Two alternative approaches are available to determine under which regime any given activity should operate. Firstly, the Australian approach at federal level has been to restrict EPR activities partly by requiring that carbon dioxide be under a certain concentration.⁶⁴ However, setting such a figure would limit the discretion of decision makers and potentially produce unfair results for miners who have the legitimate intention of engaging in EPR. A better approach would be to confirm that injection under the conditions of a mining permit can only occur where it is incidental to the extraction of petroleum, and where permanent or long-term storage is not a more than minor purpose. This would minimise disruption to industry, allow decision makers to consider all relevant information while retaining the ability to make an objective assessment, and enable the regulation of all

60 The petroleum industry has been strongly protected in the USA: T Dixon, I Havercroft and T Kerr "Legal and Regulatory Developments Associated with Carbon Dioxide Capture and Storage: a Global Update" (2009) 1 *Energy Procedia* 4395 at 4397.

61 <www.epa.gov>

62 International Energy Agency *Carbon Capture and Storage: Full-scale Demonstration Progress Update* (IEA, 2009) at 7.

63 In the author's view, the Australian Petroleum Production and Exploration Association underestimates this risk: Australian Petroleum Production and Exploration Association *Comments on the Draft Greenhouse Gas Storage Act 2008 (Queensland)* (2008) at 6.

64 Offshore Petroleum Bill 2005 (explanatory memorandum) (2005).

true CCS projects under a separate regime. Any payment to an injector by a third party to inject the latter's carbon dioxide could, perhaps, be construed as good evidence that storage is a more than minor purpose.

Having determined the inadequacy of existing law and the limited scopes of the CMA and RMA, it is now necessary to consider what specific legal issues need to be addressed in new CCS legislation. In this inquiry, the experience of other jurisdictions might prove instructive, with Australian examples having the greatest value.

V. LEGISLATIVE RESPONSES IN OTHER JURISDICTIONS

Although the Western Australian,⁶⁵ Queensland⁶⁶ and Commonwealth⁶⁷ legislatures have regulated geo-sequestration, the oldest and most useful on-shore statute is Victoria's Greenhouse Gas Geological Sequestration Act 2008 (GGGSA). This Act deals with several, although not all, issues that will be relevant in New Zealand, notably the purpose of CCS regulation, various ownership issues, the development of pore units, interactions with environmental legislation and the rights and obligations of various resource owners. While Victorian solutions are a useful starting point, unique features of New Zealand law and society mean that many may not be entirely appropriate. Differences in the purpose and objectives of Victorian and proposed New Zealand legislation can highlight this point.

VI. THE PURPOSE AND OBJECTIVES OF NEW LEGISLATION

The answers to all legal questions associated with CCS will be influenced by the purpose and objectives of the legislation governing it. As such, the first task of legislators must be to draft these provisions with the utmost care. Although partly a political question, two generally applicable purposes can be stated. Firstly, the Act must aim to create certainty around uncertain legal issues. Secondly, it may be taken that legislation should aim to facilitate and encourage⁶⁸ investment in CCS to achieve reductions in carbon emissions, while balancing legitimate competing interests in resources.⁶⁹ Given the continued applicability of the RMA to environmental matters in CCS, it may not be appropriate to include sustainable management or environmental protection as a general purpose of new legislation. This contrasts with the Victorian approach, where environmental planning statutes do not apply to CCS projects.⁷⁰

65 The legislature of Western Australia regulates CCS projects on a case by case basis only: Victorian Department of Primary Industries *Discussion Paper: a Regulatory Framework for the Long-Term Underground Geological Storage of Carbon Dioxide in Victoria* (Department of Primary Industries, Melbourne, 2008) at 7.

66 Greenhouse Gas Storage Act 2009 (Queensland).

67 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Australian Commonwealth)

68 Greenhouse Gas Geological Sequestration Act 2008 (Victoria), s 1.

69 CCS may not, perhaps, always be encouraged at the expense of other things like renewable energy or petroleum operations.

70 Above n 68, at ss 189 – 191.

The objectives of new legislation are particularly relevant in determining whether the common law is adequate in allocating ownership of certain resources, or whether Parliament's intervention is necessary. These property issues are now explored in detail.

VII. LEGAL ISSUES SURROUNDING THE OWNERSHIP OF CARBON DIOXIDE AND UNDERGROUND STORAGE FORMATIONS⁷¹

A. Ownership of Carbon Dioxide

Before injection, there is no reason why carbon dioxide, as a matter of personal property law, cannot be treated as a commodity that can be purchased and sold.⁷² If there is no contract to the contrary, it is owned by the person who produced it. However, more uncertain is whether the gas can be considered 'part and parcel of the land' after injection, and consequently whether an injector⁷³ can be prevented from trading it without dealing with the land itself.

1. The Importance of Legal Certainty

The resolution of this question is essential, since a guarantee of ownership of the gas to the injector could encourage investment in CCS technology.⁷⁴ Carbon dioxide has many existing, and may develop additional future, industrial uses and is therefore potentially valuable not as a waste stream but rather as a resource. It is already used in refrigeration, horticulture and water treatment processes,⁷⁵ in carbonating soft drinks and making dry ice, in producing various chemicals like urea, and may be converted into hydrocarbons for use as fuel or plastics.⁷⁶ Furthermore, the person held liable under several common law actions is determined by who owns or controls a substance,⁷⁷ and liability has potential to encourage or discourage investment.

It seems possible that the existing law could govern property rights associated with CCS, but if it cannot do so effectively or consistently then statutory intervention will be necessary. The law's answer to the question may indeed vary depending on the way in which the gas is physically or chemically trapped underground.⁷⁸

71 It is worth noting that in the context of CCS, the issues surrounding ownership of carbon credits do not arise as they do with forest sequestration; geologically stored carbon represents the *absence* of an emission rather than an emission *offset* because it is not discharged to the atmosphere. However, an economic comparison between these classifications warrants further research.

72 *National Provincial Bank Ltd v Ainsworth* [1965] AC 1175 at 1247-12488.

73 The term 'injector' is used here to mean the owner of the carbon dioxide immediately before injection, and may include a person with whom an injector or emitter has contracted.

74 D Gerard and E Wilson (eds) *Carbon Capture and Sequestration: Integrating Technology, Monitoring and Regulation* (Blackwell, Iowa, 2007) at 243.

75 B Metz, O Davidson, H de Coninck, M Loos and L Meyer *Carbon Dioxide Capture and Storage* (Intergovernmental Panel on Climate Change, 2005) at 344.

76 Victorian Department of Primary Industries *Carbon Capture and Storage: Putting the Carbon Back* (Victorian Department of Primary Industries, Melbourne, 2008) at 1.

77 These issues of liability are discussed in Part XIII.A.

78 Victorian Department of Primary Industries, above n 65, at 23.

2. Ownership where Chemical Reaction or Physical Mixing Occurs

It is worth remembering that if the injected gas mixes with petroleum in a partially-depleted oil or gas formation,⁷⁹ ownership in this gas will pass to the Crown and, once extracted, to a Crown mining permit holder. This is because under the CMA, ‘petroleum’, which is Crown owned when in its natural state, is defined as any naturally occurring mixture of hydrocarbons containing carbon dioxide or other listed gases.⁸⁰ Significantly, the carbon dioxide does not have to be naturally occurring. Therefore despite the operation of the common law, a property interest in petroleum under the CMA would override any property interest in the gas contained within it.

Similarly, it seems arguable that if carbon dioxide is injected into a saline aquifer, ownership of the gas will pass to the Crown or into a more vague notion of ‘public’ ownership. The common law continues to give a landowner the right to use water present on his or her land,⁸¹ but this does not affect the notion of a public right or *publici juris* to its ownership.⁸² This also remains unaltered by the RMA.⁸³ Thus, if the gas became inseparable from water,⁸⁴ it is unlikely that an injector could maintain rights over either; should the water flow onto an adjacent property, this landowner would become entitled to use (although not own) the water and gas within. Given the increasing value that New Zealanders place on the public nature of water and its fair allocation, it would likely be politically impossible for a statute to vest ownership of carbon dioxide-rich water in a CCS injector.⁸⁵ The flipside of this, however, is that it is also unlikely (although not impossible) that the Crown would choose to impose a rental on storage space within such water.⁸⁶

Finally, injectors should be aware that if the injected gas reacts chemically with substances in the pore space to form mineral salts, proprietary rights to the gas will be lost. This is because the ‘gas’, as a matter of logic, will no longer exist, its constituent parts will be annexed to the land by more than their own weight, and its elements will be inseparable from those rightfully belonging to the landowner.

79 Given that carbon dioxide is soluble in oil, this may be quite likely.

80 Above n 28, at s 2.

81 This is subject, of course, to a requirement under the RMA to gain consent if required by a regional plan: *Acton v Blundell* (1843) 12 M & W 324.

82 D E Fisher “Rights of Property in Water: Confusion or Clarity” (2004) 21 EPLJ 200 at 214.; *Embrey v Owen* (1851) 6 Exch 353 at 369.

83 Given that ‘the Act is simply not about the vindication of personal property rights’: *Falkner v Gisborne District Council* [1995] 3 NZLR 622 at 632.

84 This is likely, given that saline aquifer sequestration relies on the effectiveness of this trapping mechanism.

85 Although the ownership of saline aquifers are arguably less politically charged than freshwater aquifers.

86 This is especially because water may not be regarded as Crown property, but rather as *publici juris* which is not ‘owned’ by anyone.

3. Ownership where no Mixing or Reaction Occurs

a. The Applicability of the Crown Minerals Act

The law is more complex in situations where injected gas remains intact and separate from a surrounding formation and its contents. As has been discussed previously,⁸⁷ it is unlikely that injected carbon dioxide becomes a Crown owned mineral for the purposes of the CMA. However, to give certainty to investors, new legislation should ideally specify that the gas (unless coming within the definition of petroleum) is not Crown owned. Whether under new legislation title to the gas should pass to the Crown once an injection permit has been surrendered is a political question, and outside the scope of this paper.⁸⁸

b. Ownership under the Common Law: The Basic Test

Since the CMA does not apply, and the RMA does not govern private property interests, it must be left to the common law to decide who owns injected carbon dioxide. No cases in New Zealand or relevant common law jurisdictions⁸⁹ appear to have confronted the issue directly, but general tests can potentially be applied. The primary question that needs to be answered is whether the gas has become ‘part and parcel’ of or ‘annexed to’ the land and therefore the property of the landowner, or whether it has remained separate from the land and thus the property of the injector.⁹⁰

In the leading New Zealand case of *Lockwood Buildings Ltd v Trust Bank Canterbury Ltd*,⁹¹ Cooke and Tipping JJ gave roughly consistent judgments. Although the terminology of ‘fixture’ and ‘chattel’ used by their honours has since been discarded⁹² in favour of an assessment of whether an object is or is not ‘part’ of the land⁹³ (being more in line with early authority),⁹⁴ the dictum of the case remains good law. Tipping J adopted the test in *Stack v Eaton*⁹⁵: if an object is attached by more than its own weight, it prima facie becomes part of the land. This presumption can be overturned by an assessment of the degree of annexation and the object of annexation.⁹⁶

c. Attachment by more than Own Weight at Common Law

The law first has to decide whether, prima facie, geo-sequestered carbon dioxide is part of the land by virtue of its being attached to the land by more than its own weight. This test seems nonsensical in the context of CCS; it is certainly arguable whether the gas is attached even by its own weight, given

87 Refer to Part IV.B.2.

88 Although an argument could be made that the benefit of ownership should arguably correspond with the burdens of monitoring and liability if the latter pass to the Crown: Dixon, above n 60, at 4399.

89 Gerard, above n 74, at 247.

90 D McDonald “The New Property Law Act” (2007) 12 BCB 204 at 204.

91 *Lockwood Buildings Ltd v Trust Bank Canterbury Ltd* [1995] 1 NZLR 22.

92 R T Fenton “When is a Floating Pontoon Land?” (2000) 9 BCB 93 at 93.

93 *Elitestone Ltd v Morris and Another* [1997] 2 All ER 513. Adopted in *Auckland City Council v Ports of Auckland Ltd* [2000] 3 NZLR 614.

94 *Holland v Hodgson* (1872) LR 7 CP 328, at 334.; Fenton, above n 92, at 94.

95 *Stack v Eaton Co* (1902) 4 OLR 335.

96 *Auckland City Council v Ports of Auckland Ltd*, above n 93.; *Trust Bank Central Ltd v Southdown Properties Ltd* (1991) 1 NZ ConvC 190.

that this term appears to require gravity to force a mass towards the centre of the Earth, whereas pressure in a formation would tend to push much gas towards the surface. On the other hand, the gas is arguably ‘attached’ because it is completely enclosed within the land, it cannot (ideally) escape, and in fact over time will be immobilised and absorbed into increasingly smaller pores.⁹⁷ Therefore, at best, the gas is attached not by more than its own weight, but by other than its own weight.⁹⁸ Any legal test to determine when such gas would become ‘part’ of the land would also necessarily be arbitrary (and likely impossible to verify),⁹⁹ and results would always be inconsistent according to the features of specific sites.

d. The Degree of Annexation at Common Law

Although no prima facie conclusion as to the status of the carbon dioxide can be reached with any degree of certainty, it still seems reasonable to proceed to the next step of the inquiry: the degree of annexation to the land.¹⁰⁰ Two relevant aspects of this test exist. Firstly, it can be asked whether it would, in the opinion of a reasonable passerby, be ‘patent for all to see’ that the object was attached to the land.¹⁰¹ Even if the phrase were taken to mean that the answer would be apparent to a person who was aware of the nature of the gas,¹⁰² it is most probable that (as in *Lockwood*) this person would simply say that it is a ‘question for the lawyers’.¹⁰³ Secondly, one could argue that if the removal of the object would cause irreparable damage to the land, then it must be ‘annexed’ to it.¹⁰⁴ It remains uncertain, however, whether removing the gas after a certain period of absorption and dispersion would even be possible, let alone damaging to attempt. An inquiry into degree of annexation is fundamentally unhelpful.

e. The Object of Annexation at Common Law

Difficulties in applying the third limb of the test, the object of annexation, in the context of CCS means this, too, is unlikely to clarify ownership of the gas under common law. All relevant circumstances can be considered in this inquiry,¹⁰⁵ but the subjective intentions of the injector and contracting landowner are excluded¹⁰⁶ in determining an objective legal position.¹⁰⁷ Firstly,

97 Intergovernmental Panel on Climate Change *Carbon Dioxide Capture and Storage: Summary for Policy Makers* (2005) at 14.

98 This is arguably not enough; if one imagines, for example, a hot air balloon being tied to a strong foundation, one should not assume that the balloon is a ‘part’ of the land.

99 Such arbitrary tests could include limits to the volumes of separate ‘pockets’ of gas or the ability of one to ‘re-gather’ a set amount of gas into one volume.

100 E H Burn and J Cartwright *Cheshire and Burn’s Modern Law of Real Property* (14th ed, Butterworths, UK, 1988) at 137.

101 *Stack v T Eaton Co*, above n 95.

102 Given that one cannot ‘see’ carbon dioxide or reasonably ‘pass by’ it.

103 *Lockwood Buildings Ltd v Trust Bank Canterbury Ltd*, above 91, at 26.

104 *Short v Kirkpatrick* [1982] 2 NZLR 358 (HC); *Avondale Hotel No 1 Ltd v Portage Licensing Trust* (2006) 6 NZCPR 702 (CA).

105 T Bennion, R Muir, K A Palmer and E Toomey *New Zealand Land Law* (Brookers, Wellington, 2005) at 543.

106 *Lockwood Buildings Ltd v Trust Bank Canterbury Ltd*, above n 91, at 27.

107 Unless, of course, the dispute is between the contracting parties; contractual privity does not extend to third party purchasers of the land, a mortgagee, or a subsequent purchaser of the gas: B Allan “Commercial Law” [2009] NZLJ 101 at 102.

as in *Ports of Auckland*, it may be relevant that an object's use is dependent on maintaining some degree of annexation.¹⁰⁸ Perhaps even more so than the pontoon in that case, the purpose behind CCS depends on the affixation or sequestration of gas; if it were allowed to escape from the land, the aim of reducing atmospheric emissions would be defeated. However, an equally relevant circumstance, and one that suggests the opposite conclusion, may be the extent to which the gas has been objectively abandoned. The primary purpose of CCS is, admittedly, the long term if not permanent storage of the gas to mitigate the effects of climate change. However, if the gas is capable of being removed and has value, then a significant secondary purpose may be as a long term financial investment. Simply because an investment is long term does not render investment property abandoned.

Furthermore, continuing liability and monitoring responsibilities placed on an injector suggest that the gas is not abandoned. If one bears the burden of property, policy would suggest that one should also be entitled to reap its benefits. Finally, a tenant has a 'reasonable time' to remove tenants' fixtures after the expiry of a lease;¹⁰⁹ it is certainly arguable that by analogy, a 'reasonable' time for removing sequestered gas is almost indefinite. Other relevant circumstances, such as whether the gas were intended to improve the value of the land,¹¹⁰ could also be argued either way, since the gas could be seen by the market as either damage or a valuable resource.

The general common law test of annexation to the land to determine ownership of underground gas provides little of the certainty required to encourage investment in CCS. However, the specific rules carved out by American state jurisdictions around the ownership of temporarily stored natural gas may provide a basis for the New Zealand judiciary to develop similar rules for sequestered carbon dioxide.¹¹¹

f. Common Law Analogies with Temporarily-Stored Natural Gas

Some overseas authority has suggested that carbon dioxide, once injected, may become part of the land.¹¹² Similar conclusions have been reached in the United States under the rule of capture and the associated doctrine of non-ownership, which states that 'fugitive' or 'wandering' beings and substances belong to the landowner on or under whose land they happen to exist at the time.¹¹³ This doctrine can certainly be subjected to criticism, in that it makes an analogy between wild animals (in which context it was first developed) and gases, which are of a fundamentally different character. Animals, by their nature, are not 'attached' to the land, and domesticated animals (such as cats) that wander onto land do not become the property of the landowner. They remain chattels, which may be traded freely. The doctrine may justifiably apply to wild animals, and to subsurface gas existing in its natural state,

108 *Auckland City Council v Ports of Auckland Ltd*, above n 93, at [75].

109 Bennion, above n 105, at 543.

110 *Maori Trustee v Prentice* [1992] 3 NZLR 344.

111 Metz, above n 75, at 256.

112 Victorian Department of Primary Industries, above n 65, at 24.; *Minsball v Lloyd* (1837) 2 M&W 450 at 459.; International Energy Agency *Legal Aspects of Storing CO₂* (International Energy Agency, 2007) at 35.

113 *Hammonds v Central Kentucky Natural Gas Co* 75 S.W. 2d 204 (Ky. 1934).

because here the law only has to apportion rights between parties having the same basic identities: adjacent landowners or rival permit holders. By basing gas ownership on instant geographical location, these parties are placed on equal footing; adjacent landowners' rights are governed by simple probability of gas movement, and competing permit holders both have the opportunity to start extraction from different parts of the formation.

In contrast, basing gas ownership on rights to land in cases of natural gas or carbon dioxide storage represents the application of an inflexible rule developed in distinguishable circumstances. The property in question may be similar, but the relative identities of the claimants (landowner and injector) are different. Basing gas ownership on the ownership of land is fundamentally unjust, since the injector owns no land and is thus placed on an unequal footing, to the extent of being automatically dispossessed. The doctrine is inappropriate not because of its result (vesting ownership in the landowner), but because its method is incapable of balancing the competing property interests of these parties.

Suggestions that the rule of capture might apply in New Zealand¹¹⁴ have been based solely on the consideration of the interests of rival mining permit holders under the CMA.¹¹⁵ As a result, proposed solutions have invariably focused on mineral unitisation, which does not determine whether the gas is 'part' of the land and is thus of no use where disputing parties are an injector and an adjacent landowner.

More appropriate in the context of CCS is the alternative doctrine of ownership that has developed in other American states. This states that an injector retains ownership of intentionally stored gas.¹¹⁶ However, this is subject to the proviso that the formation must be well defined, which could present a difficulty in cases of CCS. Furthermore, it might be possible to distinguish natural gas storage from carbon sequestration, as the intention is to store the latter for much longer, and perhaps indefinitely.

Ultimately, it must be concluded that the existing common law (and even its potential developments) provides too little certainty to potential CCS proponents to encourage investment in the technology. However, it is possible that existing legal mechanisms exist that could be invoked to ensure ownership will rest where an injection contract intends.

114 D Edmunds "Unitisation and the Law of Capture in New Zealand" (1991 New Zealand Oil Exploration Conference Proceedings, Wellington, 1991) at 457-461.

115 To some extent this was inevitable given that landowners cannot even claim title to Crown owned petroleum.

116 S Som "Creating Safe and Effective Carbon Sequestration" (2008-2009) 17 NYU Envtl LJ 962, 981.; *Natural Gas Co v Mahon & Rowsey Inc* 786 F 2d 1004 (10th Cir 1986); *Texas American Energy Corp v Citizens Fidelity Bank & Trust* 736 S W 2d 25 (Tex 1987).; *Lone Star Gas Company v Murchison* 353 S W 2d 870 (Tex Civ App 1962). This view is also implicitly endorsed under s 2 of the CMA, where the Crown only owns natural gas minerals in their *natural* condition in land.

g. Appropriateness of Existing Optional Mechanisms in Clarifying the Common Law Position

An express or implied contract between an injector and landowner is not enough by itself to determine ownership of carbon dioxide. The doctrine of contractual privity provides that a third party purchaser of the land with no notice of the interest, a mortgagee, or an adjacent landowner will not be bound to recognise the agreement, and a third party purchaser of the gas could not enforce it as against a landowner.¹¹⁷

A licence coupled with a proprietary interest¹¹⁸ may be enough to secure an injector's ownership of gas.¹¹⁹ However, although a protected interest can be personal or real, the licence must be in a different form depending on which of these interests it protects. An oral contract is sufficient to create an interest in personalty. However, to be enforceable between persons other than the licence holder and landowner,¹²⁰ a licence for an interest in land must be created in a manner required for legal force,¹²¹ that is, capable of notation on the electronic register. An interest merely in personalty cannot be recorded on a certificate of title or, consequently, caveated.¹²² In the absence of a clear legal classification of injected carbon dioxide, it would remain frustratingly uncertain for both injector and landowner as to what form a licence should or could be created to protect an interest in the gas.

It would appear that the execution of a sole profit à prendre in gross may be sufficient to give certainty on this issue. This would give the right to take the gas off the land and, if registered under the Land Transfer Act,¹²³ would bind third parties.¹²⁴ However, this mechanism has potential flaws; it is not binding on a mortgagee without his or her consent, and any liability in trespass, nuisance and strict liability may unjustly fall on the landowner rather than the holder of the profit à prendre.¹²⁵ Perhaps most importantly, to grant a profit à prendre, the owner of the servient tenement must have legal title to the gas in the first place (it must be part of the servient tenement),¹²⁶

117 J F Burrows, J Finn and S Todd *Law of Contract in New Zealand* (3rd ed, Lexis Nexis, Wellington, 2007) at 500.

118 A licence alone is a personal, not proprietary interest, and is not binding on third parties: Bennion, above n 105, at 424.

119 Most case law has been focused on taking property which was the property of the landowner: *Wood v Leadbitter* (1845) 13 M & W 838. However, there seems no reason why this cannot extend to retaining ownership of a chattel placed by a licensee on the land.

120 This is enforceable between these parties at equity, although not law: *Frogley v Earl of Lovelace* (1859) John 333.

121 Bennion, above n 105, at 420.

122 *Miller v Minister of Mines* [1963] NZLR 560.

123 Land Transfer Act 1952, ss 90, 90A and 90B. However, it is uncertain whether an interest in gas is able to be registered on a title as a profit à prendre, given that neither a chattel interest nor a mining permit (minerals clearly being part of land) are capable of registration: *Miller v Minister of Mines* [1961] NZLR 844 (CA); [1963] NZLR 560 (PC) at 568. On the other hand, the result may be different since a mining permit does not confer ownership of the substance *in situ*, whereas an interest in underground gas does, and the conferral of a mining right is not *inter partes*, whereas agreement as to the ownership of gas is.

124 Bennion, above n 105, at 803.

125 The landowner is arguably still the person in control of the gas until it is taken, whereas the injector simply has a right to take it.

126 Bennion, above n 105, at 801.

and this is the very thing that remains uncertain. Indeed, there seem to be no optional mechanisms that can overcome the inherent uncertainty of the common law and guarantee that the property rights agreed between injector and landowner will be binding on third parties. A clear legislative statement is required as to who owns the injected carbon dioxide.¹²⁷

h. Ideal Legislative Response: Political and Legal Considerations

Apart from the fact that legislation has to give the law certainty, the decision as to who owns the gas is largely a political one and, as such, has varied internationally.¹²⁸ However, some comments can be made regarding the consistency of provisions with the purpose of new CCS legislation (the encouragement of investment in CCS technology) which remains a matter of law.¹²⁹ Granting ownership of the gas to an injector would further this purpose not only by providing certainty, but also by balancing the likely burden of short term liability and monitoring and maintenance costs with the benefit of a potentially valuable carbon dioxide store. Furthermore, vesting ownership in landowners above the pore space would be providing persons who have most likely not contracted with the injector on commercial terms with an unjustifiable windfall, or potentially imposing on them non-consensual and burdensome liability in control or ownership-dependent torts like trespass or nuisance.¹³⁰ In the interests of consistency, the gas – even if the injector sells it to a landowner – should be treated as a separate estate in land or commodity with ownership governed by contract. However, to prevent confusion, the legislation should also stipulate that should the gas react to form mineral salts or become mixed with petroleum or groundwater, the injector’s title will be lost.¹³¹

i. The Interaction between New CCS Legislation and the Land Transfer Act

A potential problem with legislation simply ‘deeming’ that ownership of gas resides with an injector (and not deciding whether it constitutes an interest in land) is that the relevance of the Land Transfer Act 1952 (LTA) becomes uncertain.¹³² Since the common law has proven unhelpful in this inquiry, whether this Act should apply or not must be dictated by policy considerations. Firstly, due to the fact that ownership of the gas is granted to an injector, new legislation must make clear that it in the event

127 Victorian Department of Primary Industries, above n 65, at 24.

128 The United Kingdom’s Energy Act assigns ownership of injected gas to the state (T Dixon, “International Regulatory Developments for CCS” (Presentation made under the International Energy Association’s Greenhouse Gas R&D Programme, 2009) at 19), while Wyoming assigns ownership to the injector: D Hayano “Guarding the Viability of Coal and Coal-fired Power Plants: a Road Map for Wyoming’s Cradle to Grave Regulation of Geologic CO₂ Sequestration” (2009) 9 Wyoming Law Review 139 at 159.

129 This assumes that such a purpose, discussed in Part VI, is valid.

130 Victorian Department of Primary Industries, above n 65, at 24.

131 As discussed earlier in Part VII.A.2.

132 A similar deeming provision in the CMA has no such problem; even though ownership of certain minerals is vested in the Crown, the minerals clearly remain ‘part’ of the land and thus prima facie subject to the LTA.

of inconsistency,¹³³ it will prevail over the LTA.¹³⁴ A similar provision should also, ideally, be included in a non-exhaustive schedule to the LTA detailing this Act's overriding statutes. Secondly, the gas should be deemed to be an interest in land for the purposes of the LTA.¹³⁵ Although not entirely 'annexed' to the land as a 'fixture', the carbon dioxide is equally unique as a 'chattel' in that it is unlikely ever to be entirely removed, and also presents a potential risk to land or potentially unavailable resource. Consequently, a prospective purchaser of the land should be entitled to know of the nature of the injector's interest¹³⁶ by having this information compulsorily¹³⁷ provided on the electronic register, as required for interests in land under the LTA.¹³⁸ Alternatively, a schedule could be attached to the LTA¹³⁹ detailing a class of 'removable' fixtures, including sequestered gas, that are 'annexed' to the land for the purposes of legal definition but may be lawfully severed by another person at some point in the future.

B. Ownership of Sub-Surface Formation

If CCS technology became viable in New Zealand, potentially rare sub-surface pore space suitable for storing carbon dioxide could prove as valuable as the gas itself.¹⁴⁰ The injector, of course, has no right to the formation unless it is appropriately executed as an interest in the land. However, in a partially or fully-depleted mineral formation, there remains uncertainty as to whether the space once filled with mineral is owned by the owner of the depleted mineral estate (the Crown, in cases of petroleum wells),¹⁴¹ or the landowner.

133 A similarly effective provision is found in s 85(1) of the CMA.

134 For example, new legislation should prevail over ss 62 and 182 of the LTA, which would otherwise allow a third party purchaser, in the absence of fraud (that is, dishonesty) or an effective *in personam* claim, to invoke his or her indefeasibility of title and remain unaffected by notice of such an unregistered 'interest' in land.

135 Such a provision would not be necessary for the overriding statute to have effect, given the availability of the maxim *Generalia specialibus non derogant*, but it would certainly make land law more user-friendly: *Regal Castings Ltd v Lightbody* [2009] 2 NZLR 433.; *Barber v Mayor of Petone* (1909) 28 NZLR 609.

136 This rationale also underpins s 86 of the CMA.

137 Notation on the electronic register of an interest in the mineral estate is only optional under s 86 of the CMA, presumably because a prospective purchaser can discover the separate ownership of a mineral estate by looking at the publicly-available CMA and Land Acts, and would also be alerted to the presence of an interest by the compulsory notation of a permit holder's access rights under s 83(1) of the CMA. The mandatory notation of an interest in gas is more important in CCS cases since any separate ownership of carbon dioxide (which might exist naturally) cannot be discovered by looking at statute law. The notation of access rights on the title of the land where injection took place (although it should also be compulsory) would, by itself, be insufficient to alert the prospective purchaser of adjacent land to the presence of gas that may have migrated under adjacent land. This is because an injector may not require access to land other than the injection site.

138 Land Transfer Act 1952, s 67.

139 And also, perhaps, the Personal Property Securities Act 1999.

140 V B Flat "Paving the Legal Path for Carbon Sequestration from Coal" (2008-2009) 19 DELPF 211 at 217.

141 A mining permit holder does not own the mineral until it is reduced to surface possession, as the CMA appears to confer a right to take the mineral only.

1. *A Possible Approach in New Zealand: Vesting Ownership in the Crown*

Unlike in Victoria, where by virtue of statutory declaration the Crown owns all deep underground geological formations,¹⁴² New Zealand likely has no legal authority concerning the general ownership of pore space. New legislation is required to give the law certainty in this area. The wording of the CMA in fact suggests that the Crown owns only the Crown mineral estate and not the space it inhabits.¹⁴³ However, nowhere is this explicitly stated, and the Act does not govern private mineral estates.¹⁴⁴

It is possible, given this gap in the law, that new legislation could vest ownership of deep underground pore space in the Crown.¹⁴⁵ This would provide a lucrative source of income for the Crown, and prevent arguably vexatious claims for trespass and nuisance by adjacent subsurface property owners. However, it would fail to prevent claims for intrusions to the surface estate, a reduced revenue stream without a reduction in risk might make landowners more likely to withhold permission for injectors to access their lands, and such an intrusive abrogation of jealously-guarded private property rights might make it politically difficult to achieve.

2. *Alternative Options: Ownership by Landowner or Ownership by Mineral Estate Owner?*

Rather than asserting Crown ownership of mineral formations, most relevant common law jurisdictions have implemented one of two alternative approaches, both of which appear open to New Zealand to follow. The ‘English Rule’¹⁴⁶ states that a mineral estate owner retains proprietary rights to the vacated space.¹⁴⁷ John Sprankling has gone further and proposed that a surface estate owner in fact has no proprietary interest in any of the deep subsurface. This is because, he claims, ownership is based largely on expectations, physical possession or occupation as the ‘touchstone of property rights’, enforcement of rights is impossible under the surface, and the interior of the Earth should be treated as publicly owned ‘wilderness.’¹⁴⁸

142 Above n 68, at s 14.

143 Above n 28, at s 2.

144 The CCS Policy Group in the Ministry of Economic Development is, however, investigating whether the CMA can reasonably regulate the allocation of pore space in New Zealand: *Carbon Capture and Storage: Where are We Now?*, above n 26, at 34.

145 An alternative option would be compulsory acquisition by the Crown on a case by case basis under the Public Works Act 1981.

146 This has been adopted in the United Kingdom, some states of the Union, Canada, and much of continental Europe: T A Campbell “Carbon Capture and Storage Project Development: An Overview of Property Rights Acquisition, Permitting and Operational Liability Issues” (2007-2008) 38 *Texas Environmental Law Journal* 169 at 174.; Metz, above n 75, at 256.

147 M A De Figueiredo *Property Interests and Liability of Geologic Carbon Dioxide Storage: A Special Report to the MIT Carbon Sequestration Initiative* (MIT, Massachusetts, 2005).

148 J Sprankling “Owning the Centre of the Earth” (2008) 55 *UCLA Law Review* 979.

In contrast, the ‘American Rule’ states that ownership of pore space is vested in the surface estate owner.¹⁴⁹ As long as it has not been altered by statute, this view regards the old common law maxim, “*Cuius est Solum, Ejus est Usque ad Caelum et ad Infernos*” (*Cuius est Solum*), that a fee simple holder owns up to the heavens and down to the centre of the earth, as relevant as ever.¹⁵⁰ Owen Anderson has pointed out in support of this view that a property right not expressly conveyed should be treated as retained.¹⁵¹

Neither perspective has gained universal acceptance.¹⁵² However, the superior approach in a New Zealand legislative context would be an adoption of the American Rule.¹⁵³ The quasi-legal arguments of Sprankling are unlikely to be persuasive in this country. A focus on the lack of physical occupation and the difficulties in enforcing legal rights underground ignore the fact that land is often bought and sold based on characteristics of the sub-surface, which is factored into expectations and is thus far from ‘wilderness’.¹⁵⁴ Furthermore, if an injector were forced to gain permission from, and pay, two separate parties for use of land and pore space under the English Rule, this could discourage investment in CCS.¹⁵⁵

As will be seen in the following part, the only truly objectionable feature of the American Rule in a CCS context is the potentially limitless liability that injectors face in trespass. As such, a remedy is required for this specific problem only, and the valuable certainty and property rights given by the *Cuius est Solum* doctrine should not be upset more than reasonably necessary. In adopting the approach of Sprankling (or, to a lesser extent, the English Rule) the law would be cracking a nut with a sledgehammer.

VIII. USING THE LAW TO BALANCE COMPETING RESOURCE INTERESTS IN CCS

Settling property rights in both gas and pore space is of great importance. This is not only because owners may be provided with a potentially valuable resource, but also because much legal liability and standing is decided by reference to ownership and control.¹⁵⁶ Legal ownership is therefore a double-edged sword.¹⁵⁷ As discussed above, the financial benefit of the ownership of gas should rest with the injector, and that of that of the pore space with the

149 A Klass and E Wilson “Climate Change, Carbon Sequestration, and Property Rights” (2010) U Ill L Rev (pending publication) at 23.; Gerard, above n 74, at 245.; O L Anderson, “Geologic CO₂ Sequestration: Who Owns the Pore Space” (2009) 9 Wyoming Law Review 97.

150 M Conner and L Nettles “Carbon Dioxide Sequestration: Transportation, Storage and other Infrastructure Issues” (2008-2009) 4 TJOGEL 27 at 15.; *Case of Mines* (1568) 1 Plow 310, 75 ER 472.

151 Anderson, above n 149, at 99.

152 Gerard, above n 74, at 245.; Klass, above n 149, at 23 and 32.

153 Some jurisdictions, such as Wyoming, have already legislated in this manner: Hayano, above n 128, at 144.

154 Klass, above n 149, at 36.

155 In practice, the permission of a mineral estate holder may almost always be required given that a formation will never be depleted completely.

156 Som, above n 116, at 980.

157 Anderson, above n 149, at 118.

surface landowner.¹⁵⁸ However, it remains arguable whether the potential burdens of liability under various common law actions do or should apply to these persons in a sub-surface context.¹⁵⁹

A. Competing Interests in the Land between CCS Operator and Adjacent Landowner

The legal ‘ownership’ of pore space enjoyed by a landowner under the *Cuius est Solum* rule does not convey unlimited rights to use the land or prevent its use by another.¹⁶⁰ No grant of land tenure by the Crown is absolute or allodial,¹⁶¹ and the bundle of rights attached to ownership of the sub-surface may at common law be arguably smaller than that attached to the surface.¹⁶² This is important in reconciling the competing rights to the subsurface of a CCS injector and a landowner adjacent to an injection property.

1. Trespass

The first method by which a landowner¹⁶³ may traditionally assert rights over an exclusively possessed interest¹⁶⁴ is through an action in the tort of trespass. This action is designed to protect landowners from unjustifiable, direct, and negligent or intentional¹⁶⁵ interference with their land. It is actionable per se, since it serves a vindicatory as well as compensatory purpose.¹⁶⁶ It is worth noting that a statutory permit to inject will not by itself shield an injector from a claim in trespass to either the surface or, more controversially, sub-surface space.

a. Sub-Surface Trespass

No case law exists in any relevant jurisdiction on whether the non-consensual spread of injected gas under land adjacent to an injection property constitutes an actionable trespass.¹⁶⁷ It is certainly arguable, although not certain, that this amounts to the required ‘direct’ interference with land, since the dispersal of such a fugitive plume is a ‘necessary and natural consequence’ of the act of injection.¹⁶⁸

158 Subsequent discussion proceeds on this basis.

159 Here, the focus is on whether or how one owning resources affected by CCS operations should be entitled to relief under common law action. This is a different question to that posed in Part X, which concerns whether an injector or another should have to pay this relief.

160 *Lord Bernstein of Leigh v Skyviews & General Ltd* [1977] 2 All ER 902.

161 *R v Symonds* (1847) NZPCC 387 at 388.

162 Indeed, owing to common law’s recognition of the Crown’s right to underground gold and silver deposits by virtue of royal prerogative, this is already the case: Bennion, above n 105, at 18.

163 The term ‘landowner’ is used during the discussions on trespass, nuisance and strict liability to refer to both owner and an occupier establishing possession.

164 J McLaren and J Fahey “Key Legal and Regulatory Considerations for the Geo-sequestration of Carbon Dioxide in Australia” (2005) 24 AURELawJl 46 at 61.

165 *Smith v Stone* (1647) 82 ER 533.

166 S Todd (ed) *The Law of Torts in New Zealand* (4th ed, Brookers, Wellington, 2005) at 361.

167 J W Moore “The Potential Law of On-shore Geologic Sequestration of CO₂ Captured from Coal-Fired Power Plants” (2007) 28 Energy LJ 443 at 477.

168 *Gregory v Piper* (1829) 9 Barn & Cress 591.

However, one can contend that the mental state required of a trespasser will not likely be present in a sub-surface context. Liability in trespass is often described as being 'strict'; however, although there is no requirement of an intention to trespass, there is a requirement that one must intend one's act, or be negligent as to it.¹⁶⁹ In contrast to several cases decided in the United States concerning the storage of extracted natural gas,¹⁷⁰ a CCS injector arguably does not act on an intention to occupy a neighbouring property.¹⁷¹ The act of injection itself does not force the gas off the injection site, rather this occurs from the natural tendency of carbon dioxide to disperse; the injector is powerless to prevent it.¹⁷² However, this argument is by no means unassailable,¹⁷³ and is probably not certain enough to give peace of mind to CCS investors. Furthermore, the fact that a landowner may lack the ability to prove that a sub-surface trespass has occurred¹⁷⁴ provides inadequate protection to injectors, given that future technologies may give greater capacities to monitor gas movements.

An interesting trend in some US jurisdictions has been increased calls for the alteration of the test for actionable trespass in a subsurface context to require damage or interference with actual or reasonably foreseeable use.¹⁷⁵ Such a development in the common law of New Zealand would require a careful balancing, in a zero sum game, of an injector's and the public's interest in having CCS occur unimpeded, against the public interest in minimising the abrogation of carefully contracted private property rights. Such rights should not, of course, be undermined more than necessary. However, since trespass is a tort actionable per se, and formations may extend over tens of miles,¹⁷⁶ a CCS injector would at present be open to potentially limitless liability to surrounding landowners. This is hardly desirable if CCS is to be encouraged. Furthermore, the public interest in the success of CCS is arguably as, if not more, important than that in enhanced oil recovery, in which context the approach was first justified.

At least one New Zealand case has implemented an approach requiring interference in use,¹⁷⁷ but has been met with severe academic criticism for confusing trespass with nuisance.¹⁷⁸ A radical semantic sleight of hand

169 Thus a person who is thrown onto an adjacent property is not himself liable in trespass: *Smith v Stone*, above n 165.

170 *Texas American Energy Corp v Citizens Fidelity Bank & Trust* 736 SW 2d 25 (Tex 1987).

171 *Klass*, above n 149, at 32.

172 This is arguably in the same way that a person pushed over a property boundary is powerless to prevent this action.

173 In the above example, the situation is arguably more analogous to one putting oneself in the position where one knows that one is going to be pushed through no fault of another, which would amount to a requisite standard of subjective recklessness.

174 *Moore*, above n 167, at 477.

175 *Flat*, above n 140, at 222.; *Mongrue v Monsanto* 249 F 3d 422 (5th Cir 2001).; *Chance v BP Chem Inc* 670 NE 2d 985 (Ohio 1996).

176 J Apps, J Garcia, K Preuss and T Xu "Numerical Modelling of Aquifer Disposal of CO₂" 2003) 8 Soc Petrol Eng J 49 at 52-53.; *Railroad Commission of Texas v Manziel* 361 SW 2d 560 (Tex 1962).

177 *Concrete Properties Ltd v Churchill Group Holdings Ltd* (HC Auckland CP297/88, 18 April 1988).

178 *Todd*, above n 166, at 365.

might allow this approach to be viewed with greater sympathy in this country. It would be possible for the courts to conclude that the tort has always had a requirement of harm, but in a surface context such harm has simply constituted a non-rebuttable presumption.¹⁷⁹ This would not upset the outcomes of existing authority, yet would enable consistency in the basic nature of trespass irrespective of where it occurred; the presumption would simply be reversed in sub-surface cases. Parliament's intention in new legislation to encourage CCS may be enough impetus for the courts to take this line, or indeed implicitly¹⁸⁰ to provide a defence of statutory authority to underground trespass, since legislators would know that wide dispersal of the gas would be scientifically inevitable.¹⁸¹

However, uncertainty clearly remains as to how an action in sub-surface trespass would develop at common law.¹⁸² Even US authority is divided on the issue.¹⁸³ Although compulsory unitisation of pore space under statute might prevent an undesirable result by providing an injector with a defence of consent, a legislative change to the test for sub-surface trespass is the best option. Requiring harm or interference with existing or reasonably foreseeable use would deal directly with the problem itself rather than inappropriately extending the scope of a defence,¹⁸⁴ and the common law doctrine of *Cuius est Solum* would remain intact and subject only to the certainty of statutory limits.¹⁸⁵

Should an action in trespass be brought against a landowner by an injector, legislation should also require that an injector's gas be harmed or its use interfered with. This would prevent unreasonable disruption to a landowner's right otherwise to use his or her land, and is particularly important since many landowners may not have consented to the presence of the stored gas.

b. Surface Trespass

The difficult issues surrounding sub-surface trespass are largely absent in surface actions. From the point of view of compensating or vindicating landowners, the existing common law may justifiably pin liability on an injector if gas escapes to the surface of adjacent properties or, indeed, the injection site.¹⁸⁶ The lower probability of such an escape means that the floodgates to liability would likely not be opened wide, the risk inherent in surface gas leaks means there is no serious objection to treating the tort as actionable per se (or, alternatively, treating harm as a non-rebuttable presumption), and the public interest in encouraging effective sequestration would in fact be met by discouraging surface leaks.

179 Klass, above n 149, at 28.

180 Although some authority states that such a defence must be made explicit: *Choudry v Attorney-General* [1999] 2 NZLR 582 (CA) at 592-593.

181 *Manchester Corp v Farnworth* [1930] AC 171 (HL).

182 As late as 2001 the High Court reiterated that the doctrine of *Cuius est Solum* applies in New Zealand: *De Richaumont Investment Co Ltd v OTW Advertising Ltd* [2001] 2 NZLR 831 at 840.

183 Todd, above n 166, at 363.

184 There is hardly true 'consent' if unitisation is forced on a landowner.

185 Todd, above n 166, at 365.

186 Consent to intrusion in some parts of the land is not consent to intrusion in all parts.

2. Private Nuisance

An adjacent landowner might also be entitled to claim in nuisance against a CCS injector, for the indirect and unreasonable interference with a landowner's right to reasonable enjoyment¹⁸⁷ of the sub-surface.¹⁸⁸ The fact that a gas moves on its own accord is irrelevant, as long as the movement was initially caused by the injector.¹⁸⁹ Unlike a trespass action, liability is already limited by the requirement of damage or interference with enjoyment, and thus a limited number of people are likely to succeed in an action. However, the amount of liability (if such harm occurs) may remain potentially limitless given that the intrusion would be treated as a continuous interference rather than an isolated escape.¹⁹⁰ Again, this is not conducive to encouraging CCS investment. As with trespass, relying on a defence of statutory authority or difficulties of proof would be too uncertain. It is arguable that a claim would not lie because any effect¹⁹¹ of the gaseous interference may not be unreasonable,¹⁹² or that there is no offence to the 'sensibilities'¹⁹³ of the plaintiff as he or she possesses no reasonable right to enjoyment of the pore space. However, these conclusions are by no means certain, and unreasonable interference will likely be presumed if substantial damage is caused.¹⁹⁴ Because of the uncertainty on the question of extensive liability, new legislation should specify that nuisance is not actionable for the escape of gas to adjacent pore space or to the surface estate. The revised trespass action described above, which could treat dispersal as an isolated escape, would adequately compensate a landowner for any harm or interference suffered in either case.

3. Strict Liability under the Rule in *Rylands v Fletcher*

Although technically a 'subset' of nuisance, strict liability under the rule in *Rylands v Fletcher*¹⁹⁵ in practice is taken to exist as a separate cause of action in New Zealand.¹⁹⁶ As such, it should not be captured by a statutory restriction on nuisance actions. The rule in *Rylands* holds an exclusive occupier or controller of a substance¹⁹⁷ liable for indirect damage caused by its isolated escape, if it represents a non-natural use of the land. This is because the risk inherent in the use of the substance on the land should only be tolerated for reasons of social utility if it does not cause harm to neighbours.¹⁹⁸

187 *Lemmon v Webb* [1894] 3 Ch 1 at 11.

188 McLaren, above n 164, at 61.; Todd, above n 166, at 396.

189 McLaren, above n 164, at 61.

190 Todd, above n 166, at 409.

191 *Bank of New Zealand v Greenwood* [1984] 1 NZLR 525 at 531.

192 Which has been stated as meaning more than what a person in the plaintiff's position can be reasonably expected to tolerate: Todd, above n 166, at 397.

193 *Lippiatt v South Gloucestershire Council* [2000] QB 51 (CA) at 60.

194 *Halsey v Esso Petroleum Co Ltd* [1961] 1 WLR 683.

195 *Rylands v Fletcher* (1868) 133 L.R. 3 H.L. 330.

196 *Hamilton v Papakura DC* [2000] 1 NZLR 265 (CA).

197 CCS injectors are likely to meet this test, as control over a pipeline has been held sufficient for its operator to be liable under *Rylands*: *Charing Cross Electricity Supply Co Ltd v Hydraulic Power Co* [1914] 3 KB 772 (CA).

198 *Rickards v Lothian* [1914] AC 263 (PC).

Although the bulk storage of natural gas is classed as a non-natural use of the land,¹⁹⁹ carbon dioxide can arguably be distinguished because of its non-flammability.²⁰⁰ Furthermore, carbon dioxide is often found naturally underground. However, CCS injection occurs in large volumes, under high pressure, and into formations in which the gas might not usually exist, which could perhaps give rise to foreseeable harm to the sub-surface or surface.²⁰¹ As above, the defence of statutory authority may apply to limit the application of the rule to injectors. However, potential liability ultimately remains uncertain.

The continued application of common law strict liability should not be limited by statute. If storing carbon dioxide underground is indeed a non-natural use of the land, the action is valuable in ensuring that landowners who do suffer harm to either the subsurface or surface are rightfully compensated. This is especially so given that an action in trespass could potentially be defeated by a lack of intention for the gas to be on the land. In addition, retaining the action would not give rise to limitless liability, since proof of damage would be required and the movement of the gas would be classed as an isolated rather than continuous escape.

4. Negligence

As long as a reasonably foreseeable kind of damage is sustained by an adjacent landowner,²⁰² there also appears no reason why he or she could not bring an action against a CCS injector in the tort of negligence. A novel duty of care is likely to be found based on these parties' close proximity, the reasonable foreseeability of harm to land (that could be caused by injection operations and the movement of high pressure carbon dioxide), and an absence of persuasive policy factors militating against the recognition of a duty.²⁰³ Landowners are in a vulnerable position²⁰⁴ because they cannot protect against the dispersal of the gas, and an absence of a duty of care for injectors would encourage injectors to cut corners in places where industry standards would otherwise apply.²⁰⁵

Allowing the recognition of a duty would not expose CCS injectors to excessive liability. The focus of a negligence inquiry is the blameworthiness of a defendant's state of mind, rather than the (potentially greater) damage sustained by a plaintiff. The standard of care required of injectors, in preventing leakage to the surface or damage to formations, would likely be relatively low given the scientific uncertainty and lack of industry standards²⁰⁶ surrounding these aspects of CCS. Liability would only be attracted fairly easily (and justifiably so) where there was a failure to warn of

199 *Miller v Addie & Sons (Collieries) Ltd* [1934] SC 150.

200 Therefore any resulting damage might also be too remote: Todd, above n 166, at 450.

201 *Hamilton v Papakura DC*, above n 196.

202 Todd, above n 166, at 323.

203 *Ibid*, at 120.; *Anns v London Borough of Merton* [1978] AC 728.

204 The vulnerability of a plaintiff is a valid consideration in the policy inquiry: Todd, above n 166, at 129.

205 Such standards would apply to CCS activities similar to those conducted in the petroleum industry.

206 Todd, above n 166, at 315.

the risks posed to neighbours.²⁰⁷ Furthermore, despite a foreseeable risk of harm²⁰⁸ and an obligation to prevent the spread of harm to neighbours,²⁰⁹ an injector would be obliged only to respond reasonably to the risk given his or her own capabilities.²¹⁰ It would be extremely difficult or even impossible to mitigate any adverse effects of carbon dioxide once injected. The continuing availability of a negligence action would thus not discourage investment in CCS more than in the petroleum sector.

5. The Limits of Common Law Liability in Resource Allocation

Common law principles contained in trespass, nuisance and negligence actions are valuable in establishing with certainty the limitations to the rights of competing resource owners like landowner and injector. However, such mechanisms are slow to evolve and are only effective when allocating rights between two private parties; for activities like CCS in which the public interest in reducing greenhouse gas emissions plays a central role, statutory mechanisms are required.

There exists only a limited number of formations in New Zealand suitable for geo-sequestration. If a landowner refuses a prospective injector access to such a space on commercial terms, it might nevertheless be in the public interest to override the landowner's private property rights. However, the common law is incapable of doing so, and a CCS permit would not automatically confer this power. New legislative provisions should emulate the Victorian approach, and vest in the Crown the ability to impose injection on landowners.²¹¹ A similar provision, which allows decisions to be made by Ministerial arbitration on the grounds of national interest, is already contained in the CMA for access to Crown minerals.²¹² Although no constitutionally guaranteed right of eminent domain exists in New Zealand²¹³ as it does in the USA,²¹⁴ new legislation should specify that if forced to enter into an agreement to inject, fair compensation must also be payable to a landowner.²¹⁵

207 Ibid, at 149.

208 *Wyong Shire Council v Shirt* (1980) 146 CLR 40 (HCA) at 47-48.

209 *Goldman v Harvgrave* [1967] 1 AC 645 (PC).

210 *Wagon Mound (No 2)* [1967] 1 AC 617 (PC) at 643-644.

211 Above n 68, at s 200.

212 Above n 28, at s 66.

213 *Waitakere City Council v Estate Homes Ltd* [2007] 2 NZLR 149.

214 Conner, above n 150, at 46.

215 Provision for compensation should be modelled on s 76(1) of the CMA or s 201 of the GGGSA, but also include compensation for the use of the landowner's underground pore space.

B. Competing Interests in Pore Space between CCS Operator and Mineral Permit Holder

1. Introduction

The law not only has to decide how the competing rights of landowner and injector are to be allocated, but also how to apportion rights between an injector and a holder of a permit issued under the CMA. These may coincide relatively often, since both require similar pore spaces. Again, common law liability is useful in governing relations between private parties, and the conclusions reached in Part VIII.A are equally applicable to landowners and mineral estate owners. Ownership of the pore space likely vests in the landowner.²¹⁶ However, if gas intruded into a mineral estate itself, an injector's liability in trespass and the rule in *Rylands* would likely be greater than if it intruded into an adjacent pore space; because the mineral would be more intensively monitored it would be easier both to interfere with or damage and to prove such interference or damage.²¹⁷ Furthermore, standing to sue would rest not only with the Crown as mineral owner,²¹⁸ but also with a permit holder under the CMA.²¹⁹

However, the importance of the public interest in both CCS and mining, and in the balancing of conflicting private interests, again renders statutory intervention necessary. The law must ensure that both activities are undertaken with maximum efficiency and thus minimum conflict.

2. The Role of the Public Interest

In some cases, petroleum mining and geo-sequestration can be mutually beneficial, while still serving the public interest. The extraction of petroleum can provide more space for gas to be sequestered, while well-managed carbon dioxide injection can enhance petroleum recovery. However, oil extractors may wish to use their own carbon dioxide for this purpose, or fill the space with by-products such as waste water.²²⁰ New Zealand law should therefore mirror Victorian or Australian Commonwealth legislation, in requiring both mineral and CCS permit applicants to obtain or take all reasonable steps to obtain the consent of existing authority holders whose resources would be adversely impacted²²¹ or at risk of contamination.²²² In addition, the compulsory unitisation of pore space, as provided for in the CMA,²²³ could prevent disputes arising by having parties develop the space as a single unit, and give legal certainty based on prearranged contractual agreement.²²⁴

216 See part VII.B.2 for this conclusion.

217 The gas could interfere with the ability of a miner to extract the mineral as well as physically intruding into the mineral.

218 Mineral ownership remains with the Crown until reduced to surface possession by a permit holder.

219 This is because a mining permit is an interest in the land capable of possession: *Tainui Maori Trust Board v Attorney-General* [1989] 2 NZLR 513.

220 Klass, above n 149, at 14.

221 Dixon, above n 60, at 4398. Such 'impact' could include any increase in capital or operating costs, reduced rates of petroleum extraction or gas injection, or reduced volumes of petroleum or gas extraction or injection.

222 Above n 68, at s 42.

223 Above n 28, at s 46.

224 Conner, above n 150, at 47.

However, consent may still be withheld,²²⁵ and the often incompatible aims of CCS and petroleum proponents might render unitisation agreements less effective than in an extraction-only context.

Therefore the public interest might not always be served by forcing agreement, and would rather require one activity in the pore space to proceed at the expense of another. This should not be determined according to a 'first in, first served' model such as the RMA, but rather, as under the GGSA,²²⁶ by careful consideration of the public interest by the Minister. This could be influenced primarily by energy and climate change policy, but also by social, environmental and economic concerns.²²⁷ Compensation should also be payable to the disentitled right holder for the loss of opportunity to recover the resource.²²⁸

3. The Problem of Existing Mining Permits

Applications for permits under the CMA and new CCS legislation are not guaranteed to be received at the same time to enable the Minister to make a balanced decision. Consequently, it is arguable that an exclusive permit granted under the CMA over a mineral formation would be unlawfully derogated from were a CCS permit to be granted over the same pore space. However, it is more likely that permits under the CMA are for the sole purpose of extraction, and by no means guarantee unimpeded access to the mineral.²²⁹ If the permit purported to govern all use of a formation, the Minister would, in fact, be acting *ultra vires* the Act. The tenure security of permit holders is undoubtedly an issue, and an important one;²³⁰ however, in an age of dwindling fossil fuel supplies and climate change, and if combined with fair compensation, it may justifiably be subordinated to the public interest.

C. Competing Interests in Pore Space between two CCS Applicants

An equally important issue is how bids between two or more rival CCS permit applicants are to be decided. A permitting procedure is essential to enable suitable CCS projects to proceed while preventing others that have not been subject to scrutiny. The rationale behind the process is different to the CMA, in that it views the Crown's position as one of trustee of the public good rather than manager of property; however, to encourage investment, it must be similarly transparent, fair, and based on nationally consistent principles.

225 This is exacerbated by the fact that in practice, there will almost always be a risk of contamination: S Benson and D Cole "CO₂ Sequestration in Deep Sedimentary Formations" (2008) 4 *Elements* 325 at 328.

226 Above n 68, at ss 42(2)(b) and 98(2)(b).

227 *Ibid*, at s 3.

228 *Ibid*, at s 49.

229 In fact, landowner approval and compliance with other enactments such as the RMA are expressly required.

230 A Reese "Climate: States Moving to Clarify Landowners' Rights over CO₂ Storage Space" (2009) <www.eenews.net>

1. Stages of the Permitting Process

Under Victorian legislation, there are two specific permits that are required to undertake CCS activities: an exploration permit and an injection and monitoring permit.²³¹ Given that this system is based on Victorian petroleum legislation, there seems no reason why New Zealand should not conduct CCS on a three-permit system consistent with the CMA.²³² Requiring a prospecting permit (to identify specific pore space of potential value), followed by an exploration permit (to assess the viability of formation) and finally an injection and monitoring permit (as opposed to the CMA's mining permit) would increase efficiency by allowing industry to retain many procedures developed for petroleum mining.

In deciding between competing bids, the Minister should have regard to objective factors furthering the purpose of the new legislation, while retaining some discretion. Such factors could include the relative merits of the plans and work programmes compulsorily submitted by applicants,²³³ the likelihood of work being carried out, risks of disruption to petroleum operations, health and safety measures,²³⁴ and any other relevant information concerning the public interest.²³⁵ However, if it is in the public interest to do so, the Minister should be able to grant more than one permit over a single formation, with conflicts to be resolved through a compulsory unitisation agreement.²³⁶

2. Entitlement to Subsequent Permits

New legislation should also stipulate that the grant of one kind of permit does not entitle an applicant to the next permit in the process. There should only be an exclusive right to apply for the subsequent permit. This is consistent with the approaches in Victoria²³⁷ and under the CMA,²³⁸ and allows a CCS proponent to begin some operations without the oppressively large initial cost of drawing up detailed injection plans. Most importantly, the operation should have to be viable before an injection permit is granted;²³⁹ the public interest would not be met if an injector had to wait years for a reliable CCS stream.²⁴⁰ However, if satisfied of all criteria, the minister should be required to grant an injection permit, thus providing industry with valuable investment certainty.

An exclusive right to apply for a subsequent permit should not apply forever. Exclusivity provides the security needed for proponents to invest, but a threat of eventual competition would give an equally important incentive to achieve injection as soon as practicable. Such incentives must be carefully

231 Above n 68, at ss 19 and 71.

232 Above n 28, at s 30.

233 Above n 68, at s 24.

234 Flat, above n 140, at 220.; Victorian Department of Primary Industries, above n 65, at 29.

235 S Barrymore and A M Mathison "Update: Offshore Petroleum Amendment (Greenhouse Gas Storage) Act 2008 (Cth)" (2008) <www.freehills.com.au/4500.aspx> at 3.

236 Above n 68, at s 119.

237 Ibid, at s 19.

238 Above n 28, at s 32.

239 Above n 68, at s 24(2).

240 Victorian Department of Primary Industries, above n 65, at 33.

balanced; rapid progress towards injection is desirable, but not at the expense of sound industry practice. In some cases the grant of a limited retention or holding lease²⁴¹ over a formation may be appropriate.²⁴²

Statute and common law have great potential to allocate fairly various legal rights as between existing and prospective resource users. However, equally important are the interests of the environment in which they are operating.

IX. ENVIRONMENTAL PROTECTION AND RESPONSIBILITY FOR ONGOING MONITORING AND MAINTENANCE

A. Introduction

Although it is important that CCS is encouraged, this should not be achieved at the expense of the health of the environment. New Zealand is fortunate in that its environmental legal framework is more streamlined than Australian models, with the RMA being a 'one stop shop' in planning matters.²⁴³ It has been established that the RMA undoubtedly currently applies to injection activities.²⁴⁴ However, a more fundamental question is whether it should, or whether new CCS legislation should have its own environmental provisions.

B. Should New Legislation Contain Substantive Rules on Environmental Protection?

1. Should the Resource Management Act apply to CCS?

Government and industry have mooted the idea that CCS legislation should be a code governing all aspects of the activity, as this would streamline the process and allow better returns on (and thus encourage) investment.²⁴⁵ Mandatory compliance with both the CMA and RMA already elevates costs associated with mining, and has attracted industry criticism. However, this dual regime has not in fact proved overly off-putting to petroleum investment. The RMA also provides a valuable framework for devolved decision making, where local government and thus local populations have an important power to determine the shape of the communities in which they live. If a CCS project were truly of national significance and stakeholders were not all local, the RMA's call in procedures would be capable of removing most

241 Above n 68, at s 58.

242 However, the imposition of a rent payable to the Crown would *not* be appropriate, since the Crown does not own the formation in New Zealand.

243 In contrast, Australia possesses no fewer than 300 environmental statutes.

244 Refer to Part IV.C.

245 International Energy Agency, *Near-term Opportunities for Carbon Dioxide Capture and Storage: Summary Report* (International Energy Agency, 2007) at 17.

obstacles.²⁴⁶ Furthermore, to ensure a level playing field for the development of environmentally friendly energy sources,²⁴⁷ CCS injectors should not be the sole persons exempted from the RMA.²⁴⁸

2. Which Act should Prevail?

If both new legislation and the RMA are to apply to geo-sequestration, the question then arises as to which Act should prevail in the event of a conflict. In a sense this question should be irrelevant, as the concerns of the Acts should not overlap if new law is carefully drafted. Both should apply, with both CCS permits and resource consents being required of operators.

3. Is the Resource Management Act Alone Enough to Protect the Environment?

Accepting that the RMA should apply for reasons of devolved governance and consistency is not, however, the same thing as accepting that its provisions for environmental protection are adequate in a CCS context. The effects of leakage of injected gas to the atmosphere are arguably not regulated sufficiently under the RMA. There is the potential for small but constant leakage to constitute a permitted activity in regional plans, since plans are currently unable to take into account the effects of climate change unless impacting on renewable energy.²⁴⁹ However, if injection sites remain well monitored, penalties under the ETS should be sufficient to deter such emissions.

It is arguable that, as in Victoria, geo-sequestration should also be subject to a statutory ban in areas of highest conservation value²⁵⁰ or subject to a ministerial direction that for environmental reasons it cannot take place on certain lands.²⁵¹ This may not be necessary in New Zealand, given existing powers of the Crown under the National Parks Act and Conservation Act and powers to deny access to its own lands where conservation value is likely to be highest.

Local government also arguably lacks the resources and expertise to assess the environmental effects of such a new and scientifically uncertain technology, and a central or even international agency of experts is required to do such work.²⁵² However, to avoid multiple layers of costly bureaucracy dealing with the same thing, such an agency should act as advisors to local

246 Above n 42, at s 142.

247 In contrast, CCS encourages fossil fuel industries.

248 Although the extent to which CCS should be encouraged is largely a political question, methods of encouraging the technology that are to be preferred are those that do not involve the costly process of altering legislation, such as state subsidisation or lower-level regulatory policy.

249 Above n 42, at ss 68(3) and 70A.; *Genesis Power Ltd v Greenpeace New Zealand Inc* [2008] 1 NZLR 803.

250 Above n 68, at s 192.

251 *Ibid.*, at s 12.

252 "New Zealand Submission to the UNFCCC Secretariat on Carbon Dioxide Capture and Storage in Geological Formations in the Clean Development Mechanism" (2008) at 1.

government making decisions under the RMA rather than decision makers in their own right. The value of local government is as a gatekeeper in allowing certain effects in the region, and there exists no objection to public responsibilities for environmental monitoring being transferred to a central expert agency.²⁵³ Ultimately, the existence of environmental provisions in Victorian CCS legislation is necessary in that state because, in contrast to New Zealand, planning statutes do not apply to geo-sequestration.²⁵⁴ Therefore, in imposing substantive rules of environmental protection through planning and consenting procedures, the RMA and ETS seem adequate. However, in terms of procedural rules, powers under the RMA to conduct ongoing maintenance and monitoring of the environmental effects of CCS are insufficient.

C. Ongoing Maintenance and Monitoring of Environmental Effects

1. Procedural Limitations of the Resource Management Act and Possible Solutions

Although atmospheric, seismic and geochemical methods to monitor CCS sites are currently being developed, the powers and duties of government to use them are currently limited. Apart from those issued for land use (which apply indefinitely), RMA resource consents and associated statutory responsibilities for an activity expire after 35 years.²⁵⁵ Of course, a local authority at any time can, and in fact must, monitor the general state of the environment.²⁵⁶ To this end it can enter private land without landowner or occupier consent, as long as the action is authorised in writing.²⁵⁷ However, legislation needs to oblige local government or a central agency to conduct intensive environmental monitoring of a CCS site for much longer than 35 years after injection. This monitoring must also not only be for the purposes of ensuring compliance with the RMA, plans and national environmental standards, but also to enable remedial action to be taken if a site is not generally behaving as it should. The imposition of consent conditions could achieve this.²⁵⁸ Therefore new legislation should ideally specify that discharge permits issued for CCS activities endure indefinitely.

253 This agency could potentially be New Zealand's new EPA, if it were to expand its capabilities in the future.

254 Above n 68, at ss 189 and 190.

255 Above n 42, at s 123.

256 *Ibid*, at s 35(2)(a).

257 *Ibid*, at s 332(1); *Waikato Regional Council v Wellington City Council* [2003] NZRMA 481 (HC).

258 Situations where intervention is required should be specified in new legislation, and required to be written into consent conditions: Flat, above n 140, at 220.

2. Responsibility for and Funding of Ongoing Monitoring and Maintenance

An indefinite responsibility to monitor and maintain a site logically entails large costs. The financial responsibilities of industry and government must be made clear from the outset to give certainty to investors. In Victoria,²⁵⁹ the United Kingdom²⁶⁰ and several states of the USA,²⁶¹ maintenance and monitoring costs rest initially with the injector, but are eventually transferred to the state. This system accepts that the state inevitably is more permanent than private businesses,²⁶² encourages investment while limiting as far as practicable the financial burden on the state, and recognises that the public interest in successful CCS justifies the contribution of the Crown. To ensure that an injector meets his or her financial obligations, a compulsory trust fund could be established, insurance taken out, or a monitoring and rehabilitation bond paid.²⁶³ In contrast to Victoria,²⁶⁴ raising funds through the imposition of a rental on pore space would be inappropriate, given that in New Zealand the state does not own the formation. An injection and monitoring permit, transferred to the state, should also grant an automatic right of access to the parcels of land in question and require easements to be registered on their certificates of title. This would reduce costs associated with contracting access agreements with third party purchasers of the land.

3. Timing of Transfer of Responsibility and Funding

The exact timeframe for transferring financial responsibility for monitoring to the state is a political question, but one that requires certainty. The most effective system would set a period of time of injector responsibility, which would give an incentive for operators to implement careful, long-term planning. After this period has expired, an injector should retain responsibility until performance based criteria, such as predictability of gas movements or a reduction in pressure levels, have been fulfilled to the satisfaction of the Minister.²⁶⁵ This retains a relatively objective standard which industry can move towards with certainty, while ensuring some discretion remains with the Crown in avoiding taxpayer responsibility for particularly risky ventures.

259 Parliament of the Commonwealth of Australia House of Representatives Standing Committee on Science and Innovation *Between a Rock and a Hard Place: The Science of Geosequestration* (2007), at 100.

260 United Kingdom House of Commons Science and Technology Committee, 'Meeting UK Energy Needs: The Role of Carbon Capture and Storage' (2006) *First Report of Session 2005-2006* at 72.

261 Massachusetts Institute of Technology, *The Future of Coal: Options for a Carbon-Constrained World* (2007) at 60.

262 United States Environmental Protection Agency *Approaches to Geologic Sequestration Site Stewardship after Site Closure* (Office of Water, 2008) at 8.

263 Above n 68, at s 112.

264 Victorian Department of Primary Industries, above n 65, at 66.

265 Above n 68, at s 168.; United States Environmental Protection Agency "Federal Requirements under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO₂) Geologic Sequestration (GS) Wells" (2008) 73 Federal Register 43492, at 43520.

X. RESPONSIBILITY FOR ONGOING LIABILITY IN CCS OPERATIONS

A. Introduction

Investors in CCS projects require certainty not only as to the future costs of environmental monitoring and maintenance, but also as to the future potential costs of taking on long-term liability. It has already been established that resource owners affected by CCS activities should, for legal and policy reasons, be compensated where an injector is liable in trespass and negligence, and under strict and statutory liability.²⁶⁶ However, a more politically-charged question is whether the liable injector itself should have to pay this compensation, or whether the Crown should bear some financial responsibility through indemnification.

Investment in CCS will not be attractive if operators remain exposed to common law liability indefinitely.²⁶⁷ Exposure may, however, (at the time of writing this paper) likely to be indefinite since a cause of action will accrue only when gas escapes or damage is done, and a limitation period will run from this point.²⁶⁸ Equally off-putting would be the fact that damages payable are potentially large; seepage rates to the surface may be low,²⁶⁹ but a plume area will be extensive²⁷⁰ and the effects of high concentrations²⁷¹ of carbon dioxide on livestock, plants and human health can be enormous.²⁷² For geo-sequestration to be commercially viable, a transfer of liability to the Crown at some point appears necessary.²⁷³ The extent of indemnification is largely a question of policy, as it will affect not only the national budget, but will also determine the relative attractiveness of investment in renewable energy,²⁷⁴ which has similar potential in reducing national emissions and significant existing value in the energy and tourism sectors. However, the law also has a role to play in ensuring that the transfer of liability is consistent

266 Refer to Part VIII.

267 R Cooter "Unity in Tort, Contract, and Property: The Model of Precaution" (1985) 73 CLR 1 at 7-8.

268 Limitation Act 1950, s 4. Since this paper was written, the Limitation Act 2010 has come into force. This act provides that a limitation period in a claim for damages runs from the date of the act/omission on which the claim is founded, rather than the date of accrual of a cause of action. The following comments remain relevant, however, as it may be possible to argue that a claim is founded on an omission to monitor or maintain adequately a CCS site that has, later in its life, caused damage.

269 Rates of leakage have been estimated at less than 0.01% per year: S Benson and R Hepple "Implications of Surface Seepage on the Effectiveness of Geologic Storage of Carbon Dioxide as a Climate Change Mitigation Strategy" (2002) <www.escholarship.org/uc/item/86c1t97r>.

270 J Bradshaw "Carbon Capture and Storage: Some Technical Practicalities and Legal Implications of Geological Storage of CO₂" (Paper presented at Session 6A, 33rd Annual Conference AMPLA Ltd, Sydney, 2008) at 3.

271 Generally this means concentrations of over 30 percent: Flat, above n 140, at 221.

272 The escape of carbon dioxide from a natural formation in Cameroon is reported to have asphyxiated 1,700 people in 1986.

273 Som, above n 116, at 981.

274 New Zealand Submission to the UNFCCC, above n 255, at 1.

with existing law, and provides injectors with legal certainty. For this reason, McLaren's statement that long-term liability could be negotiated between injector and Crown on a case by case basis appears misguided.²⁷⁵

B. Allocation of Short-Term Liability

1. Liability of Injector

In the short term, it would be sensible for an injector to retain liability under certain actions, and some jurisdictions have been premature in allowing the state to take on full responsibility.²⁷⁶ The state should not insulate an injector from a claim in negligence; if a breach of duty can be established – given the low standards expected of injectors in areas of scientific uncertainty – liability would represent the unexpected fault of an operator rather than a commercial risk built into an initial assessment of project viability. Even though liability is potentially high,²⁷⁷ the standard of care would be similar to that expected in the petroleum industry and would not be any more likely to dissuade investors. In addition, injectors should, while in control of the site, naturally be subject to new CCS legislation and liable for breaches of statutory duty. To meet their short-term responsibilities, injectors should be statutorily obliged to take out insurance.²⁷⁸

2. Crown Indemnification

The public should not be required to subsidise private industry excessively.²⁷⁹ However, policy would suggest that the Crown should, from the time of injection, indemnify CCS proponents (either fully or where liability exceeds a set figure)²⁸⁰ for damages under trespass and strict liability claims. This is partly in recognition that some responsibility should rest with a body authorising the activity if it has knowledge of the activity's potential effects. In addition, if part of the aim of CCS is to achieve a benefit for the public, then the public – through the Crown – should also bear some of its costs. Extensive limits to these common law actions²⁸¹ also suggest that occasions on which indemnification is necessary may be relatively rare.

The Crown should also arguably insulate injectors from statutory liability under the ETS and RMA. The underlying purpose of the ETS is to decrease emissions of carbon dioxide in New Zealand, yet if carbon dioxide escaped from an underground formation through a fissure in a cap-rock, the injector would be obliged to purchase extra credits. This risk could discourage investment in a fledgling technology with great potential to achieve the purpose of the scheme; emissions reductions would arguably be greater if

275 McLaren, above n 164, at 69.

276 United States Department of Energy Office of Fossil Energy *Carbon Sequestration Technology Roadmap and Program Plan* (2007) at 15.

277 Emissions due to a negligent leak in an injection seal would likely be far greater than those from leaks in a formation's cap-rock: A Heller "Locked in Rock: Sequestering Carbon Dioxide Underground" (2005) <www.llnl.gov/str/May05/Friedmann.html>.

278 Victorian Department of Primary Industries, above n 65, at 63.

279 United States Environmental Protection Agency, above n 263, at 8.

280 Flat, above n 140, at 225.

281 As discussed in Part VIII.A.

geo-sequestration were implemented and some leakage occurred than if CCS activities never took place at all.²⁸² Similarly, the imposition of damages on an injector for unpredictable discharges to air under RMA strict liability²⁸³ would add to commercial risk and render CCS less viable.

In addition, although not particularly desirable, the Crown should take on all direct statutory and tortious liability for CCS if a proponent ceases to exist. In such an extreme case, if the relevant monitoring bond, insurance or trust fund proved insufficient to meet third party claims, a fair response might be for legislation to vest ownership of the gas in the Crown.

C. Allocation of Long-Term Liability

In the long-term, the Crown should arguably take on greater liability. The silence of Victorian legislation on the matter presumably means that no transfer will occur in that jurisdiction,²⁸⁴ and statute law in some US states²⁸⁵ specifies that all liabilities of ownership remain with the injector.²⁸⁶ Although these approaches recognise the risk that a transfer of liability would pose to the credibility of the industry,²⁸⁷ in reality private business will lack the permanence to meet legitimate future claims.²⁸⁸ Investors will also lack the will to retain statutory liability on an indeterminate basis. For the reasons discussed above, an injector should retain indefinite liability in negligence only. While the short-term injection of gas is in the private interest of the injector, the permanent storage of the gas is arguably more exclusively in the public interest. As such, the Crown could justifiably take on long term liability not only for claims in trespass, strict liability, under the RMA and ETS, but also for statutory liability under new CCS legislation itself.

D. Timing of Transfer of Liability

The specific timeframe for the transfer of liability from injector to Crown is, again, primarily a question of policy. The US Environmental Protection Agency (EPA) has recommended that liability remain with an injector for 50 years,²⁸⁹ while in Australian Commonwealth waters²⁹⁰ and in the European Union²⁹¹ the period is at least 20 years. However, timeframes should as far as possible be made consistent with existing law.²⁹²

282 Flat, above n 140, at 224.

283 Above n 42, at ss 338 and 341.

284 Victorian Department of Primary Industries, above n 65, at 62.

285 Hayano, above n 128, at 159.

286 A Klass and E Wilson "Climate Change and Carbon Sequestration: Assessing a Liability Regime for Long-Term Storage of Carbon Dioxide" (2008) at 1 <http://works.bepress.com/alexandra_klass/4 at 4 December 2009>.

287 United States Environmental Protection Agency, above n 262, at 12.

288 Metz, above n 75, at 257.

289 United States Environmental Protection Agency, *Geologic Sequestration of Carbon Dioxide: Public Hearing on Proposed Rule Making* (2008)

290 Above n 67, at s 400.

291 Dixon, above n 128, at 10.

292 Gerard, above n 74, at 243.

Since the person who controls an intruding substance is generally the person held liable in trespass and under *Rylands*, it would make sense for direct liability²⁹³ in these causes of action to transfer at the same time that the Crown takes on responsibility for monitoring and maintenance. Similarly, statutory liability under CCS legislation and the RMA should also transfer at this point, since the Crown would then become the holder of all relevant resource consents and injection and monitoring permits. Thus the point at which long-term liability should be transferred could be governed by the same minimum timeframe and performance-based tests under which the transfer of monitoring and maintenance responsibilities should occur.²⁹⁴ Although a political balance still needs to be struck between encouraging investment in CCS and minimising the financial burden on the Crown, there exist persuasive legal reasons for CCS legislation both to insulate an injector from some short term liability, and transfer most non-fault based direct liability to the Crown after certain performance-based criteria have been fulfilled.

XI. THE FORM OF NEW CCS LEGISLATION

Almost as important as the content of new CCS legislation is the form that it should take: stand-alone or attached to the CMA.²⁹⁵ A large rationale behind the development of a stand-alone statute in Victoria was to ensure consistency with other, resource-specific, legislation.²⁹⁶ In contrast, relevant New Zealand law has, since 1991, been focused on effect or activity rather than resource.²⁹⁷ As such, some arguments exist supporting the attachment of new law to the CMA. Much is materially similar between mining and CCS activities, especially in prospecting and exploration, and unnecessary repetition would be a waste of legislative effort.²⁹⁸ In addition, it may be desirable to have rules inbuilt into a single statute to deal efficiently and consistently with the inevitable conflicts between miners and injectors.

However, the disadvantages of stand-alone legislation are arguably outweighed by its benefits. Fundamental differences in terminology, procedures and legal issues associated with CCS and mineral activities, their opposing aims, and differences between the Crown's role as regulator of mineral property and its role as trustee of the public good, would be recognised by passing a separate Act.²⁹⁹ It would seem nonsensical for an Act concerned with the extraction of minerals to be artificially extended to govern an activity involving neither extraction nor minerals. The petroleum industry would also be subject to less disruption if (probable) amendments

293 This is in contrast to the full or partial indemnification provided in the short-term

294 Refer to Part IX.C.3.

295 This latter approach was taken by the Commonwealth of Australia in the Offshore Petroleum and Greenhouse Gas Storage Act 2006.

296 Victorian Department of Primary Industries, above n 65, at 11.

297 Namely the CMA and RMA.

298 M Sewell "Geological Storage of CO₂: A Disposal Option for the Steel Industry" (Presentation by Australian Government's Department of Resources, Energy and Tourism, 2008)

299 Victorian Department of Primary Industries, *Discussion Paper: Greenhouse Gas Geological Sequestration Regulations* (2009) at 3.

to the law on geo-sequestration were confined to a different statute.³⁰⁰ This being said, new legislation should mirror the CMA where appropriate, and Parliament should be careful to harmonise the two acts to avoid uncertainty as to the prioritisation of CCS and mineral interests. To avoid regulatory gridlock from competing ministries and ensure the availability of relevant expertise, decisions under both acts should also be made by the Minister of Energy.³⁰¹

XII. CONCLUSION

Radical alterations to the ETS will most likely be required before CCS becomes a viable emissions-reduction option for industry in New Zealand. However, a discussion of its regulation is well worth having and is, in fact, well overdue. Both the technology and suitable pore space needed for CCS already exist in this country, and by the time that the stand alone legislation required is drafted, a revised and strengthened ETS or successor to the Kyoto Protocol may have injected a financial incentive to utilise them. Large-scale investment in CCS will require legal and commercial certainty in all its aspects, and most likely require active statutory encouragement. This paper has concluded that to provide these things, such legislation must specify who owns injected carbon dioxide and the formation into which it is injected. It must also give clear answers as to how competing resource interests are to be reconciled, through the possible alteration of common law actions, the development of permitting processes and powers of ministerial decision making. The Act must stipulate how the protection of the environment is to be ensured, and must state in no uncertain terms who is to bear the costs of ongoing monitoring, maintenance and liability. However, above all, it is to be hoped that this paper will stimulate an active and much-needed legal discussion on the future role of carbon geo-sequestration in New Zealand.

300 Victorian Department of Primary Industries, above n 65, at 21.

301 This is despite the fact that CCS may fit more logically within the portfolios of the Minister for Climate Change or Minister for the Environment.

Appendix: Suggestions for Further Research

- The impact of Maori issues on new CCS legislation, notably in terms of consistency with the principles of the Treaty of Waitangi, ownership of gas and pore space, potential restrictions on injection site locations and the possibility of additional requirements of consultation or approval.
- The regulatory environment and unique legal issues and associated with sub-seabed geo-sequestration within the territorial sea.
- The different legal issues arising from sub-seabed geo-sequestration within the EEZ and high seas, and under the continental shelf, notably the impact of international marine and environmental law contained in the UNCLOS, the London Convention and its associated Protocol.
- The potential need for a different and flexible regulatory regime to govern initial, small scale CCS pilot projects in New Zealand.
- The impact of economic instruments like the ETS and taxation regimes in encouraging or limiting investment in CCS relative to renewable energy options.
- Perceptions of geo-sequestration among the New Zealand public and possible impacts on the tourism industry.
- Further legal issues that arise only at the capture and transportation stages of CCS.
- The adequacy of existing intellectual property law in encouraging CCS investment, and intellectual property complications arising from the involvement of the Crown in geo-sequestration projects.