THE UNIVERSITY OF
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Te Whare Wānanga o Waikato

Carbon Capture and Storage:

Designing the Legal and Regulatory Framework for New Zealand

Barry Barton, Kimberley Jordan and Greg Severinsen

with contributions from Nigel Bankes, Hans Christian Bugge, Trevor Daya-Winterbottom, Robert Pritchard, and Valmaine Toki

September 2013

A report for the Ministry of Business, Innovation and Employment and the New Zealand Carbon Capture and Storage Partnership

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CENTRE FOR ENVIRONMENTAL, RESOURCES AND ENERGY LAW / TE PUTAHI O TE TURE TAIĀO

CEREL is a research centre in Te Piringa / Faculty of Law at the University of Waikato. Its objective is to promote and facilitate high-quality research and teaching in the fields of Environmental Law, Natural Resources Law and Energy Law.

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PREFACE

The purpose of this Report is to identify the best possible legal framework for carbon capture and storage (CCS) in New Zealand. The Report is of a study funded by the Ministry of Business, Innovation and Employment under research contract UOWX1204.

The aim of the research was to provide a comprehensive framework for the development of law and policy to govern CCS in New Zealand. The methodology involved an analysis of the existing law and policy as it applies to CCS, assessment of any barriers, and a comparison with law in selected other jurisdictions. That analysis was followed by discussion of different policy options and evaluation of the possibility of addressing CCS in the existing legal framework. Recommendations were made for law reform on each aspect of the subject.

The Report is concerned with the legal framework for geological storage or sequestration of carbon dioxide (CO_2). It does not address biosequestration, where CO_2 is accumulated, temporarily or permanently, in forests or other vegetation. Nor is it concerned with the sequestration of CO_2 in oceans, or with climate engineering.

Our aim has been to evaluate the issues and policy choices in law reform for CCS, and to identify the nature of the law and regulation required. We have not sought to draft the legislation itself. Nor have we inquired whether CCS is needed, economic, or desirable. Questions of policy for the promotion of CCS lie outside this Report. Its concern is the law to regulate a CCS project, if one is proposed. The legal and regulatory settings must be such as to allow a project to be properly analysed in accordance with best international practice, and to allow for regulatory decisions to be implemented effectively. Thus we do not examine climate change policy, the price on the right to discharge greenhouse gases (the "price on carbon"), regulations that could compel companies to engage in CCS operations, or subsidies that could entice them to do so. It is likely that in New Zealand CCS will occupy specific niches rather than a more general or widespread position in the economy. Yet the premise of this research is that action on climate change requires all possible options to be available, and that no option should be unavailable for the mere reason that there is no legal framework for it.

This Report has greatly benefited from input, suggestions and insights from its Advisory Committee: Sir Grant Hammond, President of the Law Commission; Margaret Wilson DCNZM; Brigid McArthur, Partner, Greenwood Roche Chisnall; George Hooper, Senior Consultant, Transfield Worley; and Chris Baker, Chief Executive Officer, Straterra. We acknowledge their valuable input and thank them for their time. We are equally thankful to members of the research team and others who could join the Advisory Committee and researchers for a two-day workshop during which a draft report was considered: Ian Havercroft, Senior Adviser of the Global CCS Institute, Nigel Bankes, Professor of Law at the University of Calgary, Robert Pritchard, Director of ResourcesLaw International in Sydney, and representatives from the Ministry of Business Innovation and Employment and the Environmental Protection Authority.

We would also like to thank the following for their input and valued comments on the drafts of this Report: Michael Dworkin of Vermont Law School in his time at Waikato as a CEREL Visitor, Juliet Chevalier-Watts of Waikato University, James Hazeldine and Danielle Lind of Transfield Worley, Brad Field of GNS Science, Kennie Tsui from the Environmental Protection Agency, and Anne Aylwin and Kate Townsend from the Ministry of Business, Innovation and Employment. As well as having a role on the Advisory Committee, Margaret Wilson was always willing to share her knowledge and experience of policy and legislative processes.

The sequence that we follow through the issues in this study is as follows, using the numbering of chapters in the Report.

2 **Whether CCS injection activities can be managed under existing law.**

3 **The introductory matters required in the CCS Act.**

4 **Property rights.**

5 **A permitting regime.**

6 **Detailed regulation of CCS activities.**

7 **The relationship with other subsurface activities.**

8 **Transportation of CO_2.**

9 **CCS in the marine environment.**

10 **Liability issues.**

11 **GHG accounting under the Emissions Trading Scheme.**

12 **Matters that require early attention.**

Statements in this Report about the interpretation or application of legislation are the opinions and conclusions of the authors, and should not be regarded as legal advice. Any errors or omissions are those of the authors and not of the Advisory Committee or of any of the people who kindly agreed to review drafts.

The law is stated as at 13 September 2013, with one or two more recent developments noted. One of these is that the Marine Legislation Bill was split into two bills via supplementary order paper and enacted, on 22 October 2013, as the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Amendment Act 2013 and the Maritime Transport Amendment Act 2013. Different provisions will come into force on different dates. The text of the legislation remains, in substance, largely the same as in the version of the Bill reported from Select Committee (on which this Report relies). Two late changes are, however, worthy of brief note: the Amendment Act introduces the concept of a non-notified discretionary activity status into the EEZ Act, and also shifts responsibility for emergency discharges in continental waters from the Maritime Transport Act to the EEZ Act. Our text however remains as it stood before the Bill became law; the changes do not alter the substance of the Report's recommendations in relation to CCS.

EXECUTIVE SUMMARY

Carbon capture and storage (CCS) is a method of reducing emissions of carbon dioxide (CO_2) in order to reduce the effects of human activity on the global climate. At thermal power stations and industrial plants where large amounts of CO_2 are generated, various capture technologies can separate CO_2 from other gases that will be discharged to the atmosphere and compress it. It can then be transported by pipeline to a location where it can be injected deep underground (at least 800 metres) for permanent storage or sequestration. Several different types of geological formation can provide effective CCS storage, allowing CO_2 to be injected in sufficient quantity and containing it permanently under impermeable cap rock formations. CCS brings together technologies that are well understood, and a number of large CCS operations have been operating in different countries for some time. Although CCS will be a new activity in New Zealand, there is a great deal of experience with it elsewhere.

Work in New Zealand has identified a number of possible sources of CO_2 that would justify CCS operations. Some of them are coal and natural gas fired power stations, although New Zealand has less fossil-fuel electricity generation than many countries. Other sources are industrial activities such as gas processing, oil refining, cement making and steel making. Suitable geological formations for CCS injection and storage have also been identified.

Law for carbon capture and storage

This Report analyses existing law and regulation as it applies to CCS and makes recommendations for a legal regime that will make CCS possible in New Zealand, subject to proper regulatory constraints. Its purpose is a framework that will facilitate the evaluation of CCS projects and their implementation if approved. It does not consider policy settings or carbon prices that will bring CCS about or promote it; its focus is the regulation *of* CCS, not *for* CCS. Most of the focus of the Report is on the injection phase, and pipeline transportation along with it; relatively few legal issues arise in the capture phase of CCS. The Report considers the law concerning CCS projects onshore and offshore. Our recommendations are based on the rapidly-growing experience with CCS law and research on the subject internationally. Three valuable comparative reports contributed to the research and are found in the Appendices.

The existing legal framework as it applies to CCS

Regulation of the injection and storage of CO_2 under our existing legislation is problematic. The Resource Management Act 1991 (RMA) does not enable CCS with any clarity, and indeed particular provisions may prevent CCS operations from proceeding. It is equally significant that the RMA does not facilitate the close ongoing regulatory supervision that CCS requires over very long time frames. Its procedures for the allocation of permits are unsuitable, especially in respect of the staged

regulation required for CCS, from exploration to injection and then post-injection. The RMA does not deal with long-term liability for CCS operations after closure. Similarly, the Crown Minerals Act 1991 is not suitable for the regulation of CCS; even though it provides a staged application process for the different phases, and even though there is commonality between the geology and technology of CCS and oil and gas, its fundamental purpose is quite different.

A close analysis of the RMA, the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act), and the Crown Minerals Act 1991 produces the conclusion that none of those Acts is capable, either in its detail or its general architecture, of delivering the legal framework that is required for CCS. Thus, we conclude that new legislation should be enacted that specifically regulates the injection of CO_2 for permanent sequestration, any subsequent leakage or migration, and exploration for storage formations. We propose that those matters will be removed from control under the RMA and EEZ Act, and will not require permits under them. Carbon dioxide storage under the proposed CCS Act will be more specific, and more capable of providing the kind of regulation that CCS requires. It can be drafted to be, and as a matter of principle it definitely should be, no less protective of the environment and human health than the RMA and EEZ Act. (We refer to the proposed Act as the "CCS Act".) In regards to the transport phase, we conclude that the RMA and the Health and Safety in Employment Act 1992 provide a suitable framework, after amendment.

A new CCS Act

The proposed CCS Act will provide a permitting regime for CCS activities in New Zealand both onshore and offshore, with regulation that is site-specific and performance-based. The purpose of the CCS Act will be to facilitate and to regulate the permanent geological sequestration of CO_2, as part of efforts to reduce the emission of greenhouse gases, in such a way as to protect the environment and human health and safety. It will also state ancillary principles to guide decision-makers exercising functions under the Act, including a duty to have regard to the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

Public participation for CCS should occur early and continue throughout the life of the project, with varying levels of engagement, however, there should only be one public hearing with submissions before a board of inquiry, at the point when an application for an injection permit is considered and determined.

We consider the issues to be taken into account in determining which regulatory agency should administer the CCS law. It is unlikely that a new agency will be created to manage projects that, although large, will be infrequent. We do not recommend which agency should administer CCS. We refer simply to "the CCS agency," "the regulator" or the "Minister," without prejudging the matter.

Property rights

One of the fundamental legal issues for CCS is property rights. A CCS operator will need access to land, including the surface and subsurface, and will need to be protected against claims for trespass and nuisance for its use of the subsurface.

For CCS pipelines and injection facilities, the law should allow a CCS operator to use existing RMA procedures as a network utility operator and requiring authority. That allows the operator to implement the RMA designation process in district plans. It also allows the operator access, under supervision, to rights of compulsory acquisition of land with compensation payable to the affected land owner. In regards to injection, this should be confined to companies that have been granted injection permits. The result is similar to what is done overseas, and to what is done in New Zealand for other pipelines and for oil and gas operations. The use of the subsurface for injection and permanent storage is somewhat different. A plume of injected CO_2 may spread some kilometres, but without any perceptible effect on the enjoyment of the surface. Following the pattern of law reform in similar countries, we recommend that the rights and powers necessary to explore for storage formations and to inject CO_2 and store it permanently be vested in the Crown. Compensation should be payable for actual loss or diminution of value to the land.

A permitting regime

The proposed CCS Act should provide for exploration permits and injection permits. This is common overseas. The permitting regime should be phased, transparent and flexible. It should provide suitable investment security, protection of existing uses, and control of the activity of permit holders. The initial phase is exploration. An application for an exploration permit must include details about the technical qualifications and financial resources of the applicant, its proposed work plan, and a public participation proposal detailing the level of public engagement proposed for the life of the project. The permit gives the holder the exclusive right to explore a specified area for CCS storage formations for a limited time and to undertake the work necessary to establish site characterisation, which is necessary for an application for an injection permit. Test injections may be carried out with approval. The exploration permit also gives a priority right to an injection permit.

The second phase is the injection permit. An application for an injection permit is the occasion for the thorough scrutiny of a CCS injection project in order to decide whether it is in the public interest for it to be allowed to proceed. The applicant must provide a proposed site plan which includes a site characterisation, environmental impact assessment, work plan, monitoring plan, corrective measures plan, and site closure plan. The application will be determined by a board of inquiry, with submissions from the public and a public hearing. In order to obtain the injection permit, the applicant must meet a threshold test spelled out in the law; that the project will not present significant risk of leakage from permanent storage, significant risk to health and safety, or significant risk to the environment. If the project meets that test, the board of inquiry may grant the injection permit. It also approves the initial site plan. This approval may be withdrawn later by the Minister or regulatory agency if there appears any significant risk to human health, the environment, or other resources, or if there is non-compliance with the CCS Act. The Minister can subsequently re-approve the site plan when the situation is remedied. Conditions can be attached to the permit regarding the storage site, but the operational and technical details will be managed under the site plan. No term will be stated for an

injection permit. Instead, an injection permit will continue until the regulatory agency issues a site closure authorisation. A site closure authorisation will signify the end of liability for the CCS operator. It will be granted only when the injected CO_2 is behaving as expected, a monitoring plan is provided and paid for in advance, and all decommissioning obligations are met.

Detailed regulation of CO_2 injection activities

The detailed technical regulation of CO_2 injection will be carried out through an approved site plan. If there is a significant problem with the operator's performance or with the project generally, approval may be withdrawn, meaning that injection is prohibited. The use of the site plan in regulating operations, instead of imposing conditions on a permit, is to facilitate flexible regulation, to allow for technological advancement, and to deal with any unexpected behaviour in the injected CO_2. The site plan will be reviewed regularly and when necessary, and will be varied as appropriate. In certain situations the Minister should be able to issue directions requiring the operator to do, or refrain from doing, any act; and the Minister may require the operator to carry out corrective measures to rectify an irregularity.

The design aspects of injection wells are to be regulated under Health and Safety legislation. We recommend regulations be promulgated that will address CCS exploration and storage.

An important part of the framework for regulating CCS is measurement, monitoring and verification. This work is necessary to ensure the integrity of the Emissions Trading Scheme (ETS), because CCS is a removal activity which could receive credits under the Scheme.

Relationship with other subsurface activities

Other subsurface resources and activities may be affected by CCS; oil and gas, coal, geothermal energy, saline aquifers, and potable groundwater are examples. Both harmful and beneficial effects are possible. CCS law will need to manage the relationships between these resources and their users. It will need to protect existing uses and facilitate new ones. The Minister or some other decision-maker will have power under the proposed CCS Act to evaluate the merits of competing proposals, and make decisions in the public interest, using either spatial separation, permit conditions, or control of specific activities. CCS proposals will need to identify existing uses and the effect on other resources as part of the environmental impact assessment submitted in the proposed site plan. To facilitate the resolution of conflict between competing uses, we recommend that a set of principles be included. Both the CCS Act and the Crown Minerals Act will need provisions to allow a decision-maker to take the principles into account when determining competing applications.

Enhanced oil recovery (EOR) can work by injecting CO_2 underground in order to stimulate petroleum flow, and can therefore involve CCS issues. EOR can be carried out with no intention of leaving CO_2 in storage, but it can also be carried out in a manner that leaves considerable amounts of the gas in permanent underground storage. In order to claim the benefits of CCS (and in particular removal credits under the ETS), an operator will have to meet the regulatory standards of the CCS Act. We propose that it be possible for an EOR operator to be a voluntary participant in the ETS in order to claim credits if it holds an injection permit under the CCS Act.

Transportation of CO_2

Carbon dioxide is likely to be transported between the capture facility and the injection installation via pipeline. The design of CO_2 pipelines is reasonably well understood, and is the subject of a parallel study. The existing legal framework does not provide clearly for CO_2 pipelines, and clarity is required. Pipelines are currently regulated under the RMA and the Health and Safety in Employment Act, and both statutes need to be amended to deal with CCS. As we noted above, a CCS pipeline operator should be a network utility operator under the RMA, in order to enable it to obtain rights to land, and to enable it to use the designation process under the RMA. A National Environmental Standard on CO_2 pipelines under the RMA is also recommended to facilitate a national approach, and to state objectives, policies, standards, and in particular decommissioning requirements. The Health and Safety in Employment (Pipelines) Regulations 1999 also need amendment to ensure that they apply to CO_2 pipelines. Further amendments are needed to clarify that the Regulations apply to pipelines offshore. Industry governance, and in particular third party access to CO_2 pipelines and other CCS infrastructure with monopoly characteristics, should be controlled when necessary by regulations made under the CCS Act.

The legal framework for CCS offshore

We propose that the legal framework for CCS offshore be generally similar to that proposed for CCS onshore. It is necessary, however, that the CCS Act complies with the provisions in the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention) and its 1996 Protocol. The key requirement of the Protocol is that the CO_2 stream shall consist overwhelmingly of CO_2. The framework we recommend removes the injection of CO_2 into storage formations under the seabed from the ambit of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 and the RMA, and requires regulation under the CCS Act. However the EEZ Act and the RMA should continue to apply to incidental aspects of CCS operations. Pipeline regulations under the HSEA will need to be amended to include CO_2 pipelines offshore.

Liability

CCS operations overseas have not shown themselves to be likely to cause injury to persons or property, but general principles of law impose suitable levels of liability on a CCS operator during the operational period. The CCS framework we propose will remove the right of person to make a proprietary claim (eg for nuisance or trespass) against a CCS operator for subsurface operations that do not affect the surface. This is consistent with international trends. An operator will be required to provide financial assurance for its obligations under the CCS Act.

The key issue is long-term liability. Because of the time-frames involved with CCS projects, which can span many decades, a CCS operator may cease to exist or no longer have the financial capability to make good any claim for damages that may arise in the decades following site closure. We therefore recommend that the Crown assumes liability once a site closure authorisation is given by the regulatory agency. This liability will be for continued monitoring (paid for in advance by the operator), any remediation work, any actual losses, and remaining obligations under the ETS. Again this is consistent with international patterns of law reform.

CCS and the Emissions Trading Scheme

Under the New Zealand ETS, CCS is treated as a removal activity. Once the relevant provision is brought into force, a participant conducting CCS will be entitled to claim a credit for each tonne of CO_2 that it removes from the atmosphere. However, this only includes emissions of CO_2 from activities that are required to surrender units under the ETS. Because of the staged implementation of the ETS, this is a problem, and we propose that CCS be a removal activity whether or not the CO_2 is from an activity that is required to surrender units. A robust measurement, monitoring and reporting regime will be necessary to ensure integrity of the ETS, and the Climate Change (Other Removal Activities) Regulations 2009 should be amended or complemented with regulations for CCS for this purpose and for any other necessary matter.

The Climate Change Response Act 2002 lists CCS as a removal activity but makes no other provision for it. To enable the ETS to require a CCS operator to surrender units for any leakage, then Schedule 3 of the Act should be amended to require a CCS operator to be a participant that must surrender units. Furthermore, to ensure that a CCS operator will surrender units for any leakage following the cessation of injection, the Climate Change Response Act should require a CCS operator to be a participant until a site closure authorisation is given and liability passes to the regulatory agency.

Matters requiring early attention

We note three matters which deserve early attention in policy processes, even if a new CCS Act is not enacted immediately. First, a public awareness programme for CCS is desirable, in order to ensure that members of the public are well informed. The programme can be implemented in the general context of activity on climate change and energy policy. Secondly, we note that in some countries "CCS Ready" policies encourage or require industry to prepare for CCS in the construction of new facilities such as power stations, by ensuring that CCS retrofits are technically possible. CCS Ready may have niche applications in New Zealand and may have a broader role if new climate change policies are required. Finally, enhanced oil recovery (EOR) stands out as being a candidate for early implementation of CCS, and appears to deserve policy action in order to promote CO_2 storage that is incremental and not merely incidental to petroleum recovery.

TABLE OF ABBREVIATIONS

BECCS	Bioenergy with carbon capture and storage
CCRA	Climate Change Response Act 2002
CCS	Carbon capture and storage
CCSR	Carbon capture and storage ready
CCRA	Climate Change Response Act 2002
CMA	Crown Minerals Act 1991
CO_2	Carbon dioxide
CO_2-EOR	Enhanced oil recovery using carbon dioxide
EEZ	Exclusive economic zone
EEZ Act	Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
EGR	Enhanced gas recovery
EHR	Enhanced hydrocarbon recovery
EOR	Enhanced oil recovery
GHG	Greenhouse gas
GCCSI	Global Carbon Capture and Storage Institute
HSEA	Health and Safety in Employment Act 1992
HSNOA	Hazardous Substances and New Organisms Act 1996
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
LDC	Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention)
LDP	1996 Protocol to the LDC
MLB	Marine Legislation Bill 2013 (58-2)
MMV	Measurement, monitoring and verification
$MtCO_2$	Megatonne of carbon dioxide
MTA	Maritime Transport Act 1994
NES	National environmental standard (under the RMA)
NPS	National policy statement (under the RMA)
OPGGSA	Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth, Australia).
RMA	Resource Management Act 1991
UNFCCC	United Nations Framework Convention on Climate Change
WRI	World Resources Institute

CONTENTS

CHAPTER 1
INTRODUCTION

1 The Role of Carbon Capture and Storage

Carbon capture and storage (CCS) is a method of reducing greenhouse gas (GHG) emissions that affect the global climate. It is a key tool for climate change mitigation. In order to limit the rise in global mean temperature to 2.0°C, a reduction in global emissions of 50–80 per cent of 2000 levels will be needed by 2050.[1] CCS is one option for meeting this target, by capturing quantities of carbon dioxide (CO_2) from the burning of oil, natural gas and coal, and from industrial processes, compressing it, and injecting it into geological formations where it will stay permanently. It can be seen as a step or an intermediate step towards a low carbon society.

CCS involves three phases. The first, as the name suggests, is capture, mostly in the process of burning fossil fuels. The major sources of CO_2 for CCS in many countries are electricity generation, including gas, coal, geothermal and biomass. The processes for the capture of CO_2 can operate either pre-combustion or post-combustion. Capture is the most expensive phase of CCS, and a great deal of research and development effort is going into bringing the costs down.[2] The capture phase does not involve a great number of legal issues beyond what are ordinarily associated with the construction and operation of any large industrial plant.

The second phase of CCS involves purifying and compressing the CO_2 into a supercritical phase to transport it to a location where a suitable geological storage formation exists. Transport will generally be by pipeline, because for the large quantities concerned pipelines are more economical than road or rail or shipping. The construction and operation of CO_2 pipelines are well understood, and the legal issues are reasonably clear. A thorough analysis has been carried out in a parallel New Zealand study.[3]

The third and final phase of CCS is the injection of the CO_2 into the geological storage formation where it will be permanently stored or, more accurately, put into geosequestration.[4] The storage formation needs capacity to take quantities of CO_2, injectivity, and containment by virtue of caprock formations that have enough depth, physical integrity and impermeability to hold the CO_2 in place permanently. Several different types of formation can perform effectively; deep saline aquifers with no surface connection, depleted oil and gas fields, and deep coal measures. A storage formation must

1 Intergovernmental Panel on Climate Change, *Fourth Assessment Report* (2007).

2 See International Energy Agency, *CO_2 Capture and Storage: A Key Carbon Abatement Option* (2008) chapter 3 for a good discussion on capture technologies.

3 Transfield Worley, Carbon Dioxide Transport and Pipelines - Engineering Requirements for Design, Construction and Operation, 170212-RPT-X0001, (July 2013).

4 See S Haszeldine "Geological Factors in Framing Legislation to Enable and Regulate Storage of Carbon Dioxide Deep in the Ground" in I Havercroft, R Macrory, and R Stewart, *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Hart Publishing, Oxford, 2011). See also World Resources Institute, *CCS Guidelines: Guidelines for Carbon Dioxide Capture, Transport, and Storage* (2008).

be at least 800 m below the surface of the earth in order to keep the CO_2 in supercritical state, and it will usually be deeper, as far as 3,500 m below the surface. The quantities of CO_2 that may be injected are very large; as a rule of thumb, CCS is considered viable when CO_2 emissions are above 0.8 to 1.0 million metric tonnes per year for a coal-fired power station, and 0.4 million metric tonnes per year for other applications.[5] This is far larger than a deep well waste-water disposal operation, for example. The likely lateral spread of CO_2 and associated pressure waves in subsurface storage formations is likely to be kilometres or tens of kilometres from an injection well, so that the subsurface of a great deal of land is involved.[6] These characteristics of the storage or sequestration phase of CCS involve the greatest number of legal problems, and feature prominently in this Report.

CCS is not new. According to the Global CCS Institute there are 68 large integrated CCS projects world-wide that are active or in planning, 17 of which are in operation or under construction.[7] Eleven of the 17 projects involve enhanced oil recovery, which injects substantial quantities of CO_2. The first large CCS project, Sleipner, in Norway, began operation in 1996, but enhanced oil recovery operations have been carried out for decades. Thus the engineering and geological issues in CCS operations are reasonably well understood.

The International Energy Agency (IEA) calculates that CCS could contribute 12 per cent of the emissions reductions necessary for the transformation of the global energy system by 2035 in the 450 Scenario, which could limit the temperature increase to 2.0°C, compared to the New Policies Scenario.[8] The IEA has repeatedly urged member countries to work together to ensure the broad introduction of CCS by 2020, as a critically important part of the path to achieve low-carbon stabilisation goals.[9] It sets goals of at least 30 CCS demonstration projects by 2020 storing over 50 $MtCO_2$ per year, by 2030 CCS is routinely used in the power sector and industry, storing 2,000 $MtCO_2$ per year, and 7,000 $MtCO_2$ per year by 2050. It proposes a vision of CCS growing by 2030 into an industry with large-scale deployment and continued R&D and economies of scale reducing costs significantly.[10] The sectors in which CCS will appear (electricity generation, other fuels, or industrial processes) will vary widely from country to country depending on the cost of local abatement opportunities.

5 Transfield Worley Ltd, CCS in New Zealand: Can Carbon Capture and Storage Deliver Value to New Zealand? Summary Report (2011) at 5; Global CCS Institute, The Global Status of CCS, (January 2013).

6 For details, see Chapter 4, where the implications of this characteristic for property rights are discussed.

7 Global CCS Institute, *Status of CCS Project Database*, available <www.globalccsinstitute.com> as at 30 June 2013.

8 International Energy Agency, *World Energy Outlook 2012* (2012) at 241. (Note however that energy efficiency could contribute more than half.) The 450 Scenario is where energy policies are adopted that put the world on a pathway consistent with a 50% chance of limiting the global increase in average temperature to 2°C in the long term, and the New Policies Scenario is where existing policies are maintained and recently announced commitments and plans are implemented in a cautious manner: at 35.

9 International Energy Agency, Technology Roadmap: Carbon Capture and Storage (2013).

10 At 23 and 36.

This Report is concerned with the legal framework for geological storage or sequestration of CO_2. It does not address biosequestration, where CO_2 is accumulated, temporarily or permanently, in forests or other vegetation. Nor is it concerned with the sequestration of CO_2 in oceans or with climate engineering. Indeed, the London Protocol prohibits dumping of CO_2 into sea water, although it allows sequestration into the subsurface seabed under a permitting regime.[11]

Questions of policy for the promotion of CCS also lie outside this Report. Its concern is the law to regulate a CCS project, if one is proposed. The legal and regulatory settings must be such as to allow a project to be properly analysed in accordance with best international practice, and to allow for regulatory decisions to be implemented effectively. It is regulation "of" CCS, not regulation "for" CCS. Thus we do not examine climate change policy, the price on the right to discharge GHGs (the "price on carbon"), regulations that could compel companies to engage in CCS operations, or subsidies that could entice them to do so. This Report takes no position on such matters. It is likely that in New Zealand CCS will occupy specific niches rather than a more general or widespread position in the economy. Yet the premise of this research is that action on climate change requires all possible options to be available, and that no option should be unavailable for the mere reason that there is no legal framework for it.

The purpose of this Report is to ascertain the best legal and regulatory framework for CCS in New Zealand. Our purpose is to recommend changes in the law that will allow for the consideration of a proposal for a CCS project, and for its implementation if the interests of the public and the environment are adequately protected.

2 The Likely Character of CCS Operations in New Zealand

Considerable work has been undertaken to investigate the viability of CCS in New Zealand. Investigations of the geological, technical and engineering aspects of CCS have been undertaken by GNS Science,[12] Transfield Worley, and the NZCCS Partnership.[13] New Zealand participates in the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC), in the Global CCS Institute, and the CCS work of the International Energy Agency.

There are a number of existing sources of emissions of CO_2 that have been identified as suitable for CCS. The largest at the present is the Huntly coal-fired power station that emits around 5–7 Mt of CO_2 per year, and the next largest is the Glenbrook steel mill that emits about 1.7 Mt of CO_2 per year.[14] Other emitters with CCS potential are the Marsden Point oil refinery, Golden Bay cement mill, Motunui methanol

11 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (as amended in 2006), Article 4. See Chapter 9 on marine issues.

12 For a list of publications see <www.gns.cri.nz/Home/Our-Science/Energy-Resources/Oil-and-Gas/Research/Outputs-and-Outcomes>.

13 See particularly Transfield Worley Ltd, *CCS in New Zealand: Case Studies for Commercial Scale Plant: Final Report* (2010); Transfield Worley Ltd, *Summary Report* (2011) above n 5.

14 B Field and R Funnel, *Carbon Capture and Storage in New Zealand – Why, Where, and When? Full Abstract* (The Energy Conference, NERI, Wellington, February 2013).

plants, Stratford power station, and Kapuni gas treatment and ammonia-urea plants.[15] Some sources, such as the refinery and the Kapuni plants, separate CO_2 as part of their existing operations, so that the capture phase is in effect completed already. Future sources may include new industrial activities, gas processing associated with new gas field discoveries, and biomass energy. Some configurations of biofuel production with CCS that are receiving research attention in New Zealand can effect permanent net removal of CO_2 from the atmosphere.[16]

Significant storage potential appears to exist in many parts in New Zealand, such as Taranaki, Canterbury, Whanganui, Northland and East Coast.[17] Only Taranaki has been characterised well enough to be reasonably clear in its suitability and capacity. Potential storage sites capable of securely storing CO_2 have been found there, and one can speculate that Taranaki may one day host a pipeline hub and storage sites accommodating local emissions and CO_2 transported from other regions by pipeline. Depleted oil and gas fields may be the best opportunities for New Zealand, but the finding, appraisal and development of a geological storage site is likely to be the technically critical path for any CCS project.[18]

In New Zealand fossil fuels (coal, oil and natural gas) make a smaller contribution to electricity generation than in many countries, 28 per cent in 2012; and renewable electricity generation (geothermal, wind and hydro) is increasing its contribution.[19] The consequences are that CCS associated with electricity generation is less foreseeable in New Zealand, and that industrial processes such as gas processing, oil refining, and steel, aluminium and fertiliser production are more likely sources of CO_2 for CCS.

3 Characteristics of Carbon Dioxide and Carbon Capture and Storage

Before we discuss the character of CCS itself and the possible risks that might arise from it, it will help to understand the characteristics of carbon dioxide.

3.1 Physical properties of carbon dioxide

Carbon dioxide is a non-toxic, non-flammable, odourless, colourless gas that is naturally present in the atmosphere and is an essential part of the life-cycle of plant and animal life on earth.[20] Humans and other animals produce it in respiration; it is produced in the fermentation of organic compounds, and in volcanic activity. The quantities of CO_2 that cause concern from a climate change point of view are those produced by the combustion of coal, oil and natural gas.

15 Transfield Worley, *Summary Report* (2011), above n 13, at 5.

16 International Energy Agency, *Technology Roadmap*, above n 9 p 36. Bioenergy with carbon capture and storage (BECCS) uses biomass that has removed atmospheric CO_2 while it grew, burns or ferments it to produce fuels and in the process produces CO_2 which can be sequestered geologically, so that the result is a net removal of CO_2 from the atmosphere.

17 B Field, M Arnot et al, *New Zealand Carbon Dioxide Storage Site Assessment: Phase 2* (Canberra: Cooperative Research Centre for Greenhouse Gas Technologies Publication RPT09-1579, 2009); B Field and R Funnel *Carbon Capture and Storage in New Zealand – Why, Where, and When? Full Abstract* (The Energy Conference, NERI, Wellington, February 2013).

18 Transfield Worley, *Final Report*, above n 13 at 37-39.

19 Ministry of Business, Innovation and Employment, *Energy in New Zealand* (2013) at 63.

20 See B Metz, O Davidson, H de Coninck, M Loos, L Meyer (eds), Intergovernmental Panel on Climate Change Special Report on Carbon dioxide Capture and Storage, (Cambridge University Press, 2005) Annex 1: Properties of CO_2 and Carbon-Based Fuels.

The physical properties of CO_2 vary with temperature and pressure. At ambient conditions CO_2 is a gas, at low temperatures it is a solid (dry ice), if it is warmed with low pressure it is a vapour, and at intermediate temperatures it may be compressed into a liquid. When CO_2 is at temperatures higher than 31.1°C and the pressure is above 73.9 bar it enters a supercritical phase where it is dense and has properties between those of a gas and a liquid. It is in this phase that CO_2 will be transported, injected and placed in permanent storage.

Carbon dioxide in its gas phase is 1.5 times denser than air, so it can accumulate in a low-lying area if there is no wind. It is soluble in water, and when released from pressure and is expanding rapidly its temperature decreases and it can freeze materials that come into contact with it. It also forms carbonic acid when in aqueous solutions. But, at the normal atmospheric concentration of 0.037 per cent, CO_2 is considered harmless. The workplace exposure standards in New Zealand are 0.5 per cent concentration,[21] and at concentrations of up to 1.5 per cent for an hour or more there are no noticeable physical consequences.[22] When concentrations increase to 3 per cent or above, hearing loss, headache and visual disturbances occur and health may be significantly affected. At concentrations in the range of 7–10 per cent CO_2 acts as an asphyxiant and can be fatal. At concentrations above 20 per cent death can result in 20–30 minutes.[23]

3.2 Risk of leakage and harm from carbon capture and storage

The IEA considers that the main risks of a leakage in CCS arise during injection and immediately after the closure of an injection site.[24] It estimates that provided the geological reservoirs are appropriately selected and managed, the CO_2 retained underground is very likely to exceed 99 per cent over 100 years with a 90 per cent probability, and is likely to exceed 99 per cent over 1,000 years with a 66 per cent probability. Overall, it is believed that the risk of CO_2 leakage from properly sited operations is very low,[25] but that careful site selection is vital. This is relevant to the design of a legal framework.

The main risks arise at the injection wells, and can be caused by poor design or the aging of equipment. Another source of risk is old oil and gas wells in the vicinity; if they have not been plugged and abandoned properly, they may allow leakage to the surface or into other underground strata. Inadequate characterisation of cap rock, seismic activity, and migration via natural fractures or hydrologic flow also present risks.[26] However, the risk of a leakage is not the same thing as risk to human health or the environment; in fact, the risk to public health from even a large leak of CO_2 to the surface is likely to be minimal.[27] Finally, it is significant that the longer that the CO_2 is stored underground the less likely it is to move; it becomes progressively more stable. This is significant for the design of legislation, in that the risk of an unexpected event will decline over time.[28]

21 Ministry of Business, Innovation and Employment, Workplace Exposure Standards and Biological Exposure Indices: Effective from February 2013 (7th ed) (2013) at 40.

22 Metz et al, above n 20, at 391.

23 At 392.

24 International Energy Agency, *CO_2 Capture and Storage*, above n 2, at 125. A thorough analysis of risk and risk management is European Commission, *Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide Guidance Document 1 CO2 Storage Life Cycle Risk Management Framework* (2011).

25 A Ingelson, A Kleffner, and N Nielson, "Long-term Liability for Carbon Capture and Storage in Depleted North American Oil and Gas Reservoirs – A Comparative Analysis" (2010) 31 Energy Law Journal 431, at 437.

26 International Energy Agency, *CO_2 Capture and Storage*, above n 2, at 125.

27 M Granger Morgan and S McCoy, Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers (RFF Press, New York, 2012) at 41.

28 At 40.

Because of the extensive use of CO_2 in industry already – in chemical manufacturing, beverage carbonation, refrigeration, and enhanced oil recovery (EOR) – the hazards of using it and handling it are well known and routinely managed, so that health and safety regulations offer adequate protection for workers on CCS sites.[29] Benson says:

> The potential public health and environmental risks of CCS are believed to be well understood based on analogous experience from the oil and gas industry, [and] natural gas storage … For CCS, the highest probability risks are associated with leakage from the injection well itself, abandoned wells that provide short-circuits to the surface and inadequate characterization of the storage site – leading to smaller than expected storage capacity or leakage into shallower geologic formations. Potential consequences from failed storage projects include leakage from the storage formation, CO_2 releases back into the atmosphere, groundwater and ecosystem damage. Avoiding these consequences will require careful site selection, environmental monitoring and effective regulatory oversight. Fortunately, for the highest probability risks, that is, damage to an injection well or leakage up an abandoned well, methods are available to avoid and remedy these problems. … [I]mplemented on a small scale, in a well characterized geologic setting, geologic storage poses no unique or poorly understood risks.[30]

The types of harm that may arise from leakage of a failed storage site include toxicological effects and harm to the environment and climate.[31] Toxicological effects will depend on the concentration and duration of exposure. The accumulation of the gas in a topographically sensitive area could be a concern, with the possibility of harm to persons and livestock, although the gas can normally be expected to dissipate, just as it does from a gas processing plant or a thermal power station. The effect on plant life at high concentrations can be detrimental, but at moderate concentrations it can actually be beneficial. Environmental effects include harm to groundwater, where acidification of water can result. But when the water rises to the surface and the CO_2 is no longer under pressure the CO_2 will return to its gaseous state, resulting in bubbles of CO_2 in the water – essentially, soda water. Just as with a bottle of carbonated soft drink, once the CO_2 equilibrates with the pressure of the atmosphere the CO_2 will dissipate.[32] A further effect is that brine displacement and the mobilisation of metal compounds in subsurface formations may occur. This would be significant if the formations was in hydrological communication with accessible potable groundwater or the surface. When CO_2 is injected at high pressure into underground formations in CCS operations, there is a risk that it will affect the availability of other underground resources such as oil and gas. Finally, climate harm will occur where CO_2 leaks to the atmosphere; in that case the effort to reduce an emission of greenhouse gas will not have been successful.

Fortunately, keeping track of CCS storage formations to ensure that damage does not occur to them should not be difficult in New Zealand, because there will be few CCS operations in the foreseeable future, and because there is a low density of oil and gas drilling compared to other countries. However CCS increases the importance of high-quality data about wells for oil and gas, geothermal and other purposes, including their location and the manner in which they are plugged and abandoned.

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29 S Benson, *Carbon Dioxide Capture and Storage in Underground Storage Formations* (2004) Centre for Climate and Energy Solutions 10-50 Workshop Proceedings <www.c2es.org> at 9.

30 At 9.

31 M de Figueiredo, D Reiner, H Herzog, K Oye, *The Liability of Carbon Dioxide Storage* (presented at the eighth International Conference on Greenhouse Gas Control Technologies, Trondheim, Norway, 2006). See also A Ingelson, A Kleffner, and N Nielson, "Long-term Liability for Carbon Capture and Storage in Depleted North American Oil and Gas Reservoirs – A Comparative Analysis" (2010) 31 Energy Law Journal 431.

32 This is Henry's Law: see W Moore, *Physical Chemistry* (Longman, London, 1972), T Engel and P Reid, *Physical Chemistry* (3rd ed) (Pearson, USA, 2013).

4 Developing a Legal Framework

There is a clear consensus internationally and in New Zealand that CCS requires a comprehensive regulatory framework, in order to provide structure and certainty for operators, investors, and the public, and to ensure the safety and permanence of CCS operations.[33] Without it, CCS will be either difficult or impossible; the lack of an adequate legal regime is a roadblock to progress.

The legal situation of CCS in New Zealand has been considered in two published articles and an unpublished report.[34] This research has confirmed that there is no adequate framework for CCS at present, and indeed that it is probably not actually possible at all under the existing law. At a minimum the existing law does not send a message that New Zealand is receptive to applications for CCS projects. The existing research has identified most of the main issues, but it leaves many of them unexplored in any detail. It does not carry out the analysis necessary to recommend a path of law reform for CCS. This study builds on that research, examining first the application of the existing law to CCS, chiefly in Chapter 2, and then the different components of viable law for CCS.

There is considerable research under way internationally on law and regulation to provide for CCS, and we have drawn on it extensively in this study.[35] International authorities have contributed to the study with comparative analyses of CCS legal developments in Australia, Canada, and Norway and the European Union. Those analyses are Appendices A, B, and C of this Report. We have referred directly to the legislation of those jurisdictions where CCS laws have emerged, particularly the Australian Commonwealth, Victoria, and Queensland; Alberta in Canada; and the European Union Directive of 2009 on CCS.[36] We have referred to American developments as well, for example the research project that produced a bill ready for enactment by Congress.[37] Particular initiatives such as the Alberta Regulatory Framework Assessment are worthy of note.[38] International organisations are working on the development of CCS legal frameworks, in particular the Global CCS Institute, the International Energy Agency and the Intergovernmental Panel on Climate Change.[39]

The best aggregation of current thinking about international best practice for CCS legislation is the International Energy Agency's *Model Regulatory Framework* of 2010[40] and we have relied on it extensively. It is founded on a wide research base and addresses most of the issues that we believe

33 Granger Morgan and McCoy, above n 27 at 63; Transfield Worley, *Final Report*, above n 13 at 7.

34 B Barton, "Carbon Capture and Storage Law for New Zealand: A Comparative Study" (2009) 13 NZJEL 1; and G Severinsen, "Towards an Effective Legal Framework for the Geo-Sequestration of Carbon Dioxide in New Zealand" (2010) 16:2 Canterbury Law Review 331; Baker and McKenzie, *Strategic Analysis of the Global Status of Carbon Capture and Storage: Report 3: Country Studies: New Zealand* (GCCSI, 2009).

35 N Hoffman, "The Emergence of Carbon Sequestration: An Introduction and Annotated Bibliography of Legal Aspects for CCS" (2011) 29 Pace Envtl L Rev 218.

36 A publication that provides a useful critique of legislation is CO_2 Capture Project, Regulatory Challenges and Key Lessons Learned from Real World Development of CCS Projects: Final Report (2012).

37 Granger Morgan and McCoy, above n 27.

38 Alberta Energy, Carbon Capture & Storage: Summary Report of the Regulatory Framework Assessment (2013); see also H Krupa, "Legal Frameworks for CCS in Canada" in I Havercroft, R Macrory and R Stewart, Carbon Capture and Storage: Emerging Legal and Regulatory Issues (Hart Publishing, Oxford, 2011) at 53.

39 The *Intergovernmental Panel on Climate Change Special Report* (above n 20) deserves mention: It discusses CCS comprehensively, including the legal and regulatory issues, risks, costs and the economic potential, gaps in knowledge, and the implications for emissions inventories and accounting. The *2006 IPCC Guidelines on National Greenhouse Gas Inventories* have been revised to include accounting for CCS within the Kyoto Protocol framework.

40 International Energy Agency, Carbon Capture and Storage Model Regulatory Framework (2010).

are relevant to New Zealand. However it is not highly detailed and in a number of situations our analysis is better served by having regard to a range of options in the literature and in the legislation of different countries. The *Framework* does not inquire into the integration of CCS law into the general fabric of national legal systems, an aspect which features prominently in this research. The IEA *Model Regulatory Framework* is therefore important but not exhaustive and not the sole point of reference.

We can identify certain other items that we have particularly relied on in this study.

- Bankes, N, Poschwatta, J and Shier, M, "The Legal Framework for Carbon Capture and Storage in Alberta" (2007) 45 Alta L Rev 585. The article examines the legal issues particular to injection and storage (property rights, regulation, and liability) in an Alberta context.
- Granger Morgan, M and McCoy, S and others, *Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers* (RFF Press, NY, 2012). This book gives an evaluation of the United States law, addressing pipelines, permitting, access arrangements, liability, GHG accounting, and concludes with a draft Bill for the United States Congress.
- Havercroft, I, Macrory, R and Stewart, R, *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Hart Publishing, Oxford, 2011). A global view of CCS is provided in this publication, with perspectives from Canada, the United States, Europe, Australia, India and China. It identifies developments in the law of CCS, trends, barriers, and obstacles that need to be addressed.
- International Energy Agency, *Legal Aspects of Storing CO_2: Update and Recommendations* (2007). This publication identifies key legal issues, provides case studies, and makes useful conclusions.
- International Energy Agency, *Carbon Capture and Storage Model Regulatory Framework* (2010), noted above.
- Ministerial Council on Mineral and Petroleum Resources, *Carbon Dioxide Capture and Geological Storage Australian Regulatory Guiding Principles* (2005). These regulatory guidelines identify the different facets of a CCS project that require a nationally consistent approach: assessment and approvals process, access and property rights, transportation, monitoring and verification, liability and post-closure responsibilities, and financial issues. Advantages and disadvantages are discussed on options for implementation.
- World Resources Institute, *CCS Guidelines: Guidelines for Carbon Dioxide Capture, Transport, and Storage* (2008). Guidelines are included for regulators, policy makers, and project developers and have a technical focus covering all phases of a CCS project.
- World Resources Institute, *CCS and Community Engagement: Guidelines for Community Engagement in Carbon Dioxide Capture, transport, and Storage Projects* (2010). This document identifies key principles and provides guidelines for regulators, local decision-makers, and project developers for effective community engagement, based on themes and lessons learned from case studies.

(This list is by no means comprehensive. It is confined to items that consider the overall legal framework. A number of other publications address specific issues such as property rights, measurement, monitoring and verification (MMV), transport of CO_2, and liability.)

There is a reasonable consensus about the issues that CCS law reform must deal with. The IEA *Model Regulatory Framework* lists them as shown in **Figure 1**.

FIGURE 1: Key issues relating to CCS regulatory frameworks identified by the IEA

Broad regulatory issues	1.	Classifying CO_2
	2.	Property rights
	3.	Competition with other users and preferential rights issue
	4.	Transboundary movement of CO_2
	5.	International laws for the protection of the marine environment
	6.	Providing incentives for CCS as part of climate change mitigation strategies
Existing regulatory issues applied to CCS	7.	Protecting human health
	8.	Composition of the CO_2 stream
	9.	The role of environmental impact assessment
	10.	Third-party access to storage site and transportation infrastructure
	11.	Engaging the public in decision making
CCS-specific regulatory issues	12.	CO_2 capture
	13.	CO_2 transportation
	14.	Scope of framework and prohibitions
	15.	Definitions and terminology applicable to CO_2 storage regulations
	16.	Authorisation of storage site exploration activities
	17.	Regulating site selection and characterisation activities
	18.	Authorisation of storage activities
	19.	Project inspections
	20.	Monitoring, reporting and verification requirements
	21.	Corrective measures and remediation measures
	22.	Liability during the project period
	23.	Authorisation for storage site closure
	24.	Liability during the post-closure period
	25.	Financial contributions to post-closure stewardship
Emerging CCS regulatory issues	26.	Sharing knowledge and experience through the demonstration phase
	27.	CCS ready
	28.	Using CCS for biomass-based sources
	29.	Understanding enhanced hydrocarbon recovery with CCS

Source: IEA, Carbon Capture and Storage Model Regulatory Framework (2010) at 17.

A useful simplified listing of the CCS legal issues is:

1. Property issues
2. Regulatory issues or permitting system
3. Long-term liability
4. Carbon crediting and accounting.[41]

The sequence that we follow through the issues in this study is as follows, using the numbering of chapters in the Report.

2. Whether CCS injection activities can be managed under existing law.
3. The introductory matters required in the CCS Act.
4. Property rights.
5. A permitting regime.
6. Detailed regulation of CCS activities.
7. The relationship with other subsurface activities.
8. Transportation of CO_2.
9. CCS in the marine environment.
10. Liability issues.
11. GHG accounting under the ETS.
12. The different stages where regulatory change is necessary and matters that require early attention.

This study confines itself to legal and policy matters. It makes no judgement about scientific, engineering or technical matters. On the borderline between legal and technical matters, one notes that much effort has been made internationally for best practice guidelines and standards for the design and operation of CCS projects. Notable are the World Resources Institute Guidelines mentioned above, and the Det Norske Veritas Guidelines and recommended practices for managing risk and covering all phases of a CCS project. Indeed, the recommended practices from Det Norske Veritas have been the foundation for the European Union's Guidance Document to the implementation of the CCS Directive.[42] The International Standards Organisation is also pursuing standards for all phases of CCS, and the Canadian Standards Association is also active, having promulgated a standard covering the storage phase of CCS.

41 N Bankes, The Developing Regime for the Regulation of Carbon Capture and Storage Projects in Canada, Appendix B, at 14-345.

42 The Guidance Document 1 is based on CO2QUALSTORE and adapted to meet the needs and terminology of the CCS Directive; Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide: Guidance Document 1 – CO_2 Storage Life Cycle Risk Management Framework (2011) at 35.

5 International Law Considerations

Although CCS has received a lot of attention internationally, there are few international treaties or conventions that affect the actions of a state in making law for CCS, at least on land. The key international convention is the United Nations Framework Convention on Climate Change (UNFCCC). Although the Convention does not specifically mention CCS, it does say that "'[s]ink' means any process, activity or mechanism which removes a greenhouse gas … from the atmosphere". This appears to include the sequestration of CO_2 in geological formations. Under the UNFCCC all parties commit themselves to promote and cooperate in the development of technologies and processes that control, reduce, or prevent anthropogenic GHG emissions in the energy, transport, industry, agriculture, forestry and waste management sectors. To do so, each party shall adopt national policies and take corresponding measures to mitigate climate change, limiting its emissions of GHGs and protecting and enhancing its GHG sinks and reservoirs.[43] From this obligation one can infer that New Zealand has an obligation to promote and develop CCS as a means of reducing our GHG emissions, but if so it is only at a very general level. In the Kyoto Protocol to the UNFCCC, the Annex I parties of the developed world were encouraged to implement or elaborate policies and measures in accordance with its national circumstances such as research on, and promotion, development and increased use of CO_2 sequestration technologies.[44] Again it is a very general obligation. More specific was the decision in 2011 under the Kyoto Protocol to allow CCS to be counted in emission reductions under the Clean Development Mechanism. That constituted a ratification of sorts of CCS, but its application is to projects in non-Annex I countries, so does not affect CCS in New Zealand. More relevant will be the treatment of CCS in the conventions or protocols that may be negotiated to succeed the Kyoto Protocol. It is highly unlikely that they will be adverse to CCS as a means of mitigating greenhouse gas emissions, but they may make new requirements about how CCS is to be included in a state's carbon accounting. That could affect the measurement, monitoring and verification (MMV) of CCS projects.

At sea, the chief applicable law is the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the London Convention) and the London Dumping Protocol of 1996 which for New Zealand effectively supersedes the Convention.[45] The Protocol prohibits the deliberate dumping at sea of many substances. Carbon dioxide was one such substance, but in 2006 an amendment was made to allow CCS to proceed, provided that it is injection into sub-seabed geological formations and not the water column, provided that it is subject to a permitting regime, and provided that the CO_2 stream must "consist overwhelmingly of carbon dioxide".

43 United Nations Framework Convention on Climate Change (signed 9 May 1992, entered into force 21 March 1994), Art 4.

44 Kyoto Protocol to the United Nations Framework Convention on Climate Change (signed 11 December 1997, entered into force 16 February 2005) Art 2(1).

45 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1046 UNTS 120 (signed 29 December 1972, entered into force 30 August 1975); 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 36 ILM 1 (signed 7 November 1996, entered into force 24 March 2006). The London Convention and Protocol are more fully discussed in Chapter 9.

The international community is making substantial efforts to advance CCS in the field of international policy activity even if there is little activity in international law. The efforts focus on research and on informing policy makers about the potential of CCS to provide for the safe and effective permanent sequestration of CO_2 in order to reduce greenhouse gas emissions. The Global CCS Institute and the IEA are the two main intergovernmental organisations. Industry organisations and research institutes are also active.[46]

Overall, it is only at sea (in the territorial sea, exclusive economic zone and extended continental shelf) that international law imposes constraints on the making of new law in New Zealand on CCS. There are few international obligations affecting the design of CCS law in New Zealand.

46 For example, the CCS Association in London; the CO_2 Capture Project combining members from the United States and the European Union; the CCS Network established by the European Commission; and CO2CRC, a collaborative research centre of Australia and New Zealand.

CHAPTER 2
CCS AND EXISTING LAW

1 Introduction

This Chapter addresses a basic question of legislative design, the extent to which existing law can be used to provide an approvals process, or permit, for the storage phase of CCS and how the detailed regulation of activities can be provided for. Its primary subject matter is the Resource Management Act 1991 (RMA), the Crown Minerals Act 1991 (CMA), and the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act). It also addresses the Health and Safety in Employment Act 1992 (HSEA) and other ancillary legislation that affects CCS. Its general conclusion is that neither the RMA, the EEZ Act nor the CMA provides a basis for law for CCS, whether amended or unamended; but that the HSEA should apply to CCS activities.

The Climate Change Response Act 2002 is considered in Chapter 11. It does not need to be included in the analysis at this point because it does not have provisions that could be adapted to establish an approval and regulatory process for CCS. Its purpose is to meet New Zealand's international commitments under the Kyoto Protocol and to establish the New Zealand Emissions Trading Scheme.

2 Resource Management Act 1991

2.1 General characteristics of the RMA relevant to CCS policy

The RMA is New Zealand's main environmental law. With its predecessors in land use planning, water management and pollution control, it has roots that go back many decades in the New Zealand legal system. It applies to virtually any land-based or resources-based project in New Zealand or in the territorial sea, out 12 nautical miles from the shore. It is the subject of continuing political debate, and has been amended most years since 1991, but it also represents a shared body of assumptions about the law for the management of natural resources and the environment. It represents something of a benchmark against which proposals for other environmental and resources legislation will be judged.

In the analysis below, we first consider the character of the RMA, and then the application of the RMA as it now stands to CCS. It is reasonably clear that under the present law CCS injection is a discharge of a contaminant into land and therefore subject to regulation under the RMA, but that provisions in the Act on climate change probably make it difficult to obtain consent. We then ask, even if these particular obstacles were removed, whether the RMA would provide a satisfactory regulatory framework for CCS, and we come to the conclusion that it would not; the way that permits are managed and the limited extent of regulation after a permit is granted are notable problems.

We then consider a range of options for using the RMA, concluding that the injection of CO_2 should move out of the RMA while other aspects of CCS project stay under it.

Many aspects of CCS are comparable with activities that are already managed under the RMA, and we recommend drawing on the accrued capability and experience where possible. For example, pipelines and oil and gas operations have for some time been managed (as to their environmental effects) under the Act. Other comparisons, such as deep well injection of waste, are less strong in that there is less RMA experience with them, and that the project scale, as we noted in Chapter 1, is enormously different.

At the present two separate RMA law reform processes are under way. The Resource Management Amendment Act 2013 received assent on 3 September 2013. Some parts of it are already in effect and others will be brought into effect progressively. It deals with Auckland issues, faster processing of simpler consents, direct referral to the Environment Court, and new section 32 requirements. Secondly, the Minister has initiated a process of reform generally known as the RMA Phase Two reforms. (Phase One resulted in amendments in 2009.) The Minister released a discussion paper, drawing on a technical advisory group report and other technical discussion papers, and in August 2013 announced an intention to proceed with legislation.[1]

The RMA has certain characteristics that are relevant to the making of law for CCS.[2]

Integration. The RMA seeks integration in environmental and resource management. In the process of law reform that led to its enactment, one of the key concerns with the existing legislation was its diffuse and unconnected nature; there was a multitude of different laws dealing with urban land use, pollution, solid waste, noise, geothermal, mining, oil and gas, harbours, etc. An applicant would need to apply under multiple statutes. Decision makers under the different statutes had different mandates to pursue and different criteria to apply. A key policy objective for the RMA was therefore to produce uniformity of principle, consistent procedures, and above all integrated management.

In relation to CCS, the characteristic of integration suggests that there should be caution in removing some resource management issue from the RMA. However, this has now been done several times where it has been thought necessary: hazardous substances and new organisms, and greenhouse gas emissions (to the extent they impact on climate change) are examples. (Crown minerals were originally to be part of the Act but were removed before the law reform process was completed.)

1 Ministry for the Environment, *Resource Management Summary of Reform Proposals 2013* (ME 1119, August 2013).

2 See D Grinlinton, "Integrating Sustainability into Environmental Law and Policy in New Zealand" in K Bosselmann, D Grinlinton and P Taylor (eds), *Environmental Law for a Sustainable Society* (2nd ed) (Auckland: NZ Centre for Environmental Law, University of Auckland, 2013) at 21; K Palmer, "Resource Management Act 1991" in D Nolan (ed), *Environmental and Resource Management Law* (4th ed) (Wellington, LexisNexis, 2011) at 93.

Similarly, EEZ environmental law reform has been carried out with a new Act outside the RMA, although the Act follows the pattern of the RMA in some respects.

Consistency. The RMA seeks to provide consistent management of all uses of natural and physical resources, and consistent treatment of projects whatever activity or industry they come from; a gold mine and an aggregate quarry, for example, should both be considered on the basis of their effects on the environment rather than the category of activity that they fall into. Projects sponsored by local government and central government should be treated the same as private projects. In the reform process there was an intention to ensure that government-sponsored projects did not get exempted or fast-tracked outside the main laws. It was intended that similar projects would be evaluated similarly on the basis of their effects on the environment, without undue regard to which industrial sector they came from. For CCS reform, this characteristic indicates the desirability of consistency of principle, and minimising the extent to which environmental regulation differs from one industry or one activity to another.

Integrated public participation. The RMA encourages public participation and seeks to initiate it at an early stage of a strategic initiative or a project application, but it seeks to channel participation through one set of procedures. The purpose again is to provide integration and to ensure that applicants and other participants do not face multiple hearings on different components of a project. For CCS reform, the point seems to be that it is desirable to provide for public participation, but to avoid a multiplicity of statutory procedures.

Decentralisation. Decentralised decision-making is a characteristic of the RMA, based on the premise that local decision-makers are best placed to make the decisions that affect them most. Local bodies, some of them quite small, make decisions that in other countries would be made by a national or state-wide environmental protection agency. It was originally intended that central government would play a strong complementary role through national policy statements (NPS), national environmental standards (NES), and departmental advocacy. However the government's role has not been an active one, even though some NPS and NES have appeared in recent years, and it has become more common for nationally significant projects to be "called in." The administration of the law is dispersed. For CCS law reform, this characteristic poses a policy question, whether local bodies or central government should regulate CCS.

Overlapping statutes and boundary issues. The RMA is designed to focus on the environment, on the management of natural and physical resources. The general intention of its design is to keep it out of social planning and economic planning. While this distinction has not always been easy to implement, it helps explain why a major project will be regulated under more than one statute. General concerns such as buildings, health and safety, and local body infrastructure, for example, all have their own focus and own legislation that applies as well as the RMA. In addition, more specific legislation often controls aspects of particular activities or industries, such as oilfields and mines, airfields, and electricity transmission lines. It is therefore common for more than one Act to apply to a project. Complex projects have complex permitting requirements.

Determining the legal effect of overlapping statutes is a significant part of statutory interpretation.[3] A court faced with such an issue will often determine that the legislature intended both Acts to

3 J F Burrows and R I Carter, *Statute Law in New Zealand* (4th ed, Wellington, LexisNexis, 2009).

apply, sometimes because the legislation says so expressly, and other times because it is the natural meaning of the statutory framework as a whole. Only occasionally are statutes in direct conflict with each other. Law drafting seeks to minimise such occasions. Drafting seeks to state the boundaries of each regulatory regime, and sometimes includes mechanisms to deal with boundary issues.[4]

For CCS law reform, we see that overlapping statutes and boundary issues are a normal state of affairs, whether general or standalone statutes are involved. The emphasis should therefore be on ensuring that the different statutes, considered together, provide a workable regulatory framework. There will be various options available in locating the boundaries between different statutory regimes, and they will all have their strengths and weaknesses.

2.2 Application of the RMA to CCS as it stands

The first set of questions to ask about CCS legal design in relation to the RMA is the extent to which CCS is controlled by the RMA as that Act stands at the present without amendment. Once that is clear it becomes possible to consider questions about the suitability of the RMA regime, with or without amendment.

RMA permits required for CCS activity. It seems clear that the injection of CO_2 into a storage formation in land amounts to a discharge of a contaminant from industrial or trade premises into land within the meaning of section 15 of the RMA. It is therefore an unlawful action, subject to prosecution, unless authorised by a provision in a planning instrument or by a discharge permit.[5] The definition of land in section 2 does not specifically say land extending downwards, but conventional legal uses of the word include the subsurface. Similarly a discharge of CO_2 into a deep saline aquifer is a discharge of a contaminant into water within the meaning of section 15. There is no reason to think that discharges of CO_2 are exempt from the Act because they are made unusually deep. The discharge of GHGs to the atmosphere from industrial or trade premises is a discharge of a contaminant within the meaning of the Act that requires a discharge permit.[6] The consequence is that, under present regulatory settings, a carbon capture injection operation requires a resource consent from the regional council or unitary council. Council decisions on resource consents are usually governed by the provisions of the regional plan and regional policy statement, but we are not aware that any council has included provisions for CCS in its plan or regional policy statement (RPS).

Leakage or migration of CO_2 from the geological storage complex into which it has been injected in a CCS storage operation may constitute a separate discharge of a contaminant under section 15 of the RMA. The point is unclear. It could be that the discharge was the injection, and that the CO_2 can only be discharged once, so that after the injection it is in the natural environment; alternatively, it can be argued that the discharge of the contaminant into a part of the environment authorised under a consent does not authorise a release of it from that part into another part. The terms of the consent would be important. If a leakage is a further discharge, then a further discharge consent is required, or else enforcement action including prosecution is possible.[7]

4 See T Daya-Winterbottom "Resource Management Act Issues" Appendix D. The Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 has a number of provisions to deal with cross-boundary projects.

5 See Daya-Winterbottom, above n 4.

6 *Genesis Power Ltd v Greenpeace NZ Inc* [2008] 1 NZLR 803 (CA) para 15.

7 See Daya-Winterbottom, above n 4.

A CCS pipeline is likely to need approval under an RMA district plan in relation to the use of land, and under an RMA regional plan in relation to earthworks and the disturbance of watercourses. There is no general Pipelines Act.

Other CCS activities are also subject to the RMA. Some of them may not need resource consents. For example, it is possible that a land use consent will not be necessary for CCS capture equipment at a power station or some other plant that is already dealt with under the district plan as an industrial or energy facility. In other cases resource consents are likely to be required for a CCS injection operation and associated pipelines. The more foreseeable of them are:

- Industrial facilities in a rural area;
- Incidental noise and light spill;
- Incidental discharges of gas or vapour;
- Incidental discharges of liquid waste;
- Incidental takings, diversions or damming of water.

In addition, a project in the coastal marine area (inside the 12 nautical mile limit) will require coastal permits from the regional council, and a project in the exclusive economic zone (the EEZ) is likely to require a marine consent and marine dumping consent from the Environmental Protection Authority under the EEZ Act. Those matters are dealt with in Chapter 9. In every case, the actual needs of a project for resource consents depends on the detailed provisions of planning instruments under the RMA (rules in plans and national environmental standards), and the need for marine consents and marine dumping consents depends on regulations (when promulgated) under the EEZ Act. In practice the planning of a particular project requires a careful inventory of all such requirements.

RMA provisions on climate change and renewables. The RMA appears to pose an unintended barrier to CCS in provisions concerning the discharge of GHGs. The general purpose of these provisions, inserted in 2004, is to prevent local authorities (mainly regional councils) from considering the effects on climate change of discharging GHGs to air when making rules and resource consent decisions. The background was the decision that the main national strategy for the mitigation of climate change would be a price on CO_2 and other GHGs. That strategy is now implemented by the Emissions Trading Scheme, considered in Chapter 11. Section 104E is one of the main provisions:

> When considering an application for a discharge permit or coastal permit to do something that would otherwise contravene section 15 or section 15B relating to the discharge into air of greenhouse gases, a consent authority must not have regard to the effects of such a discharge on climate change, except to the extent that the use and development of renewable energy enables a reduction in the discharge into air of greenhouse gases, either—
>
> (a) in absolute terms; or
>
> (b) relative to the use and development of non-renewable energy.

Section 70A is similar to section 104E in instructing regional councils when making rules in regional plans not to have regard for the effects of the discharge of GHGs on climate change. The operation of these sections and the 2004 Amendment Act generally has been in dispute in the courts for some time, but some of the main features of the law have been clarified. It is not necessary to give a detailed

account of the decided cases, but we note the key points that indicate that the positive effects of CCS on climate change cannot be taken into account under the RMA.[8]

- The restriction in the 2004 Amendment concerns the effects of activities *on* climate change, and not the effects *of* climate change (i.e. adaptation).
- A purposive interpretation of the 2004 Amendment is required, using an overall scheme and purpose approach to the RMA as amended in 2004.
- The clear legislative policy is that addressing the effects of activities on climate change lies outside the functions of councils under the RMA.
- The discretion under section 104 to grant resource consents is consequently restricted.
- The restriction applies to territorial authorities as well as regional councils, and applies to ancillary consents as well as consents for the actual discharge of contaminants to air. The carve-out for effects on climate change is a wide one.
- Parliament was mindful of the positive effects of reductions in the discharge of GHGs, but chose to allow them to be considered only in relation to the use and development of renewable energy.
- Under a purposive interpretation, the consent that CCS would need under section 15 to discharge CO_2 into a storage formation would be one relating to the discharge of a greenhouse gas into air (in the words of section 104E) so that its positive effects on climate change cannot be considered. Its only purpose, and positive effect, is the avoided discharge of a GHG to air, but that positive effect cannot be taken into account.
- A decision on a CCS discharge to storage would ordinarily require consideration of the effects of the alternative to storage, the discharge of GHGs to air; but on a purposive approach that consideration cannot be taken into account.

In summary, the current law is that neither positive nor negative effects of an activity on climate change may be taken into account; and the application need not be for a discharge for this to be so; it can be an application for some other aspect of a project. The overall consequence appears to be that the positive effect of CCS on climate change cannot be taken into account (it is not a renewable energy project), but its possible negative effects on the environment more broadly can be. This could make it practically impossible to get consent for a CCS project, and below we recommend an amendment to avoid that result.

Sections 70B and 104F contemplate the making of a National Environmental Standard (NES) that could control the effects on climate change of the discharge into air of greenhouse gases. If such an NES is made, then regional plans may include rules to implement it (and which cannot conflict with it), and consent authorities would need to implement the standard in their decisions on resource consents. There are uncertainties about how such an NES is intended to work. An NES in effect states rules, such as a rule that states that some activity is a permitted or controlled activity or must meet certain standards to be classified as such. An NES does not state the policy considerations to be taken into account, once the need for a resource consent has been triggered, which affects the application

8 The two main cases are *Genesis Power Ltd v Greenpeace NZ Inc* [2008] NZSC 112, [2009] 1 NZLR 730 (SC) and *West Coast ENT Inc v Buller Coal Ltd* [2013] NZSC 87, 19 September 2013. In the latter decision, refer in particular to paras [130], [169], [171]-173], [176].

of section 104F in particular. If an NES is accompanied by a National Policy Statement (NPS), the problem may be resolved. However it is not clear that an NPS or even an NES can entirely lift the prohibitions in sections 70A and 104E. The Act does not provide for an NPS to override the prohibition. Although an NES can override the prohibition, it is still not clear that an NES can be issued to favour CCS, when the allowed purpose is to control the effects of climate change on the discharge of GHGs to air. The closest it may be able to come is to require certain discharges to be abated by CCS.

An additional RMA difficulty for CCS applications is the preference it states for renewable energy sources. Section 7(j) directs RMA decision-makers to have particular regard to the benefits to be derived from the use and development of renewable energy. The NPS on Renewable Electricity Generation made in 2011 encourages decision-makers in the same direction, and directs them to have regard to the government's target, which is 90 per cent of electricity generation to come from renewable sources. The preference for renewables does not translate into a ban on thermal electricity generation, nor does it translate directly into opposition to CCS associated with fossil fuel generation, but CCS could be said to undermine the 90 per cent target by making fossil fuels more viable.[9]

Some alleviation of these RMA difficulties for CCS could be obtained by making an NES as contemplated by sections 70B and 104F accompanied by an NPS. However the foregoing analysis shows that that option may not be enough. It leaves a number of obscurities of interpretation, in a field where there has been much dispute in the courts.[10] The more prudent option, which we recommend, is to take those steps, making an NES and an NPS, but in addition to make amendments to the RMA itself to remove the barrier. In particular we recommend:

- Add a matter to section 7 along the lines of renewable energy, so that decision-makers must have particular regard to the benefits to be derived from the use and development of CCS.
- Add a second exception to sections 70A and 104E to allow councils and consent authorities to have regard to the extent that the use and development of CCS enables a reduction in the discharge into air of greenhouse gases, either in absolute terms or relative to the use and development of non-renewable energy without CCS.

From a general law reform point of view, the occasion may serve also to clarify some of the difficulties that the 2004 amendments have created; but one may reasonably foresee complexity and controversy in that course of action.

The overall conclusion to this part of the consideration of the application of the RMA to CCS is that the Act does apply, and that there are likely to be serious difficulties, probably not intended in the enactment or amendment of the Act, in obtaining approval of a CCS project under the Act. It is not possible to put the matter beyond doubt. But the likelihood of difficulty seems strong enough to require law reform action if CCS is to be possible. It may be that minor amendments along the lines suggested would be enough, but, whether they need to be major or minor, what seems clear is that amendments to make CCS possible seem to be essential.

9 Admittedly, in the short term CCS in New Zealand is more likely to be associated with industrial or chemical processes than with electricity generation.

10 It is not clear how an NES or an NPS will override the restrictions in ss 70A and 104E. One notes in particular that ss 70B and 104F says that the regional council consent authority must make rules or a decision as "necessary to implement the standard"; this test of necessity may prove to be difficult to apply.

2.3 The RMA as a regulatory framework

The second set of questions about the RMA in relation to CCS legal design goes beyond the difficulties described above, and the possibility of minor amendments to remove specific barriers to CCS, and considers more broadly whether the RMA would provide a satisfactory regulatory framework CCS. Before considering what we believe to be a series of difficulties, we should identify the advantages of using the RMA to regulate CCS. Integration and comprehensiveness in environmental management would be advanced. The value of generality in the law would be advanced. There would be no special Act for one industry. There would be less risk of special preference or advantage to one industry or kind of activity. There would be no boundary issues between the RMA and some new Act. There are precedents for the use of the general RMA framework with modifications, for example with respect to aquaculture.

The RMA is a long-established and well-understood framework of law and practice, and using it for CCS would have advantages. The value of building on existing regulation for CCS has often been recognised. The RMA has a carefully-considered purpose and principles and strategic planning procedures. The procedures for handling applications for project resource consents, including public participation, are carefully stated and well known. The management of resource consents including term, inspection, transfers, and surrenders are all well provided for. Other provisions deal with monitoring and enforcement. Requiring authority and designation procedures are well-fitted to the needs of pipelines. Project activity in lakes, rivers, and the territorial sea are accommodated.

Nonetheless, there are several aspects of the RMA that are at odds with what is needed to regulate CCS properly, judging by the consensus of international thinking reflected in the IEA *Model Regulatory Framework*, the WRI Guidelines, and the CCS legislation enacted in Australia and Canada. We go through the issues one by one. The result is that we find a number of characteristics of the RMA that do not produce the kind of regulation that CCS requires. They imply that a stand-alone CCS Act would be more clear and facilitative than an RMA amendment.

Permit management. Several aspects of the RMA present difficulties for the kind of permits that international experience and analysis show to be desirable for CCS. It is generally recognised that CCS rights need to be granted as authorisations, licences, or permits, in order to provide an orderly system of allocation of rights for different aspects of CCS, identifying the rights and obligations of a permit holder at each stage. Suitable provisions are needed for term, cancellation, transfer, and a number of administrative matters. The RMA deals with some of these matters in resource consents. There are several different kinds of resource consent, the main ones for our purpose being the discharge permit and the coastal permit. There is experience with the allocation of commercially valuable rights to resources in the form of RMA resource consents, such as water, geothermal fluid, and coastal space for aquaculture. However there are features of the Act that may prove difficult in the case of CCS.

One particular difficulty for CCS is a key feature of the RMA's application to the allocation of rights. Where there is competition between different companies for the use of a natural resource such as water, the consent authority is obliged to consider each complete application for a resource consent in turn on its merits. The result is that the resource is allocated among competing users on the basis of "first in first served."[11] It is certainly arguable that this is not the best method of allocation; if for

11 *Fleetwing Farms Ltd v Marlborough District Council* [1997] 3 NZLR 257 (CA).

nothing else because it causes applicants to come forward with premature proposals so as not to get lost in the rush. Regional councils have been given an opportunity to modify "first in first served" by regional plan rules for the allocation of rights to water, geothermal energy, and assimilative capacity.[12] Other provisions have been made for tendering for coastal resources such as sand and for rules for allocating space in the common marine and coastal area.[13] The use of the RMA for CCS would require some similar set of provisions. Otherwise the default "first in first served" will apply.

More generally, the allocation of permits for CCS exploration activity and injection activity will require more active discretionary management that the "first in first served" rule or any other set formula is likely to provide. Choices may be needed between different parties, locations and types of project as part of a national effort to reduce greenhouse gas emissions. Substantial discretion in deciding applications will be necessary in order to manage the relationship of CCS activities with oil and gas activities, as discussed in Chapter 7.

A further difficulty with permits is that the RMA does not provide for a sequence of permits to be issued as happens under the Crown Minerals Act, giving a company that carries out exploration work a legal assurance (although not unqualified) that it will receive a mining permit if it is successful. While companies sometimes stage their developments under the RMA, the Act does not allow for the granting of a permit for CCS exploration and delineation on terms that give the permit holder a clear path to obtaining a development or injection consent in the event that its exploration work is successful. That is adverse to investment confidence.

Permit term. The maximum term that can be granted for a resource consent for the discharge of a contaminant is 35 years: section 123. Injection operations for CCS are likely to span longer periods than that. International examples also show that it is common to require a stabilisation period or "post-closure period" of 10 or 20 years after injection ends and before the operator is allowed to relinquish financial and operational responsibility. What an operator of a long-term discharge is required to do under the RMA is to apply for a new resource consent. The Act requires the consent authority to have regard to the value of the investment of the existing consent holder: section 104(2A). But the requirement virtually to start again in the application process and justify the project afresh puts an element of uncertainty into the investment climate. Extra compliance costs will also occur. The problem is greater if the consent authority grants a permit for a term less than 35 years; on occasion consent authorities try to keep consent holders on a "short leash" this way.[14] The 35-year maximum term is therefore not suitable for CCS operations.

Continuing regulation of activity. CCS operations require continuing regulatory oversight and interaction over an extended period. The reasons for this are that they are long-term operations (especially when the post-closure phase is included); they are complex; and they are evolving (although numbers of commercial-scale storage operations are now under way internationally); and they are obliged to deal with geological and engineering uncertainties. They call for some form of adaptive management. International analysis and law-making is therefore clear in conferring on the responsible regulatory agency a major ongoing role, and substantial jurisdiction to impose new regulatory requirements from time to time through the life of the project.

12 Resource Management Act 1991, ss 30(1)(fa) and 30(4). Further changes that will affect water allocation have been proposed: Ministry for the Environment, *Freshwater Reform 2013 and Beyond* (2013).

13 Resource Management Act 1991, ss 151AA et seq, 165G.

14 Daya-Winterbottom, above n 4.

The structure of the RMA is focused on a more specific kind of regulation, particular to the appraisal of the effects on the environment of an individual project. Policies and plans do provide a broader perspective on the management and regulation of a resource such as a lake or a catchment, but the orientation is towards the resource or the environment rather than the project. When an application is made for a resource consent for a project, the likely effects of the project on the environment are considered, and are made the subject of conditions on the resource consent when issued in order to avoid, remedy, or mitigate those effects. The issue of a consent with such conditions is therefore a single event, rather an element of continuous regulatory control.

Nonetheless, consent authorities have often sought flexibility, especially in dealing with the details of complex projects and in allowing for issues to be addressed as they arise over time, and they have often resorted to permit conditions for that purpose. Section 108 of the RMA uses broad language to allow a consent authority to impose conditions on the grant of a resource consent, but there are implicit in it a number of limitations that are relevant to the use of RMA consent conditions for a project as long and complex as CCS. The granting of a resource consent is an act that is final in disposing of the application; the application must be granted, refused, or granted subject to conditions. The conditions therefore cannot impart to the consent a quality in virtue of which it ceases to be final.[15] A consent cannot be granted on condition that some aspect of the project may not proceed without the approval of the council. In effect that would be an attempt to retain the discretion for a future date. In the leading case in the field, concerning a consent for a shopping mall, conditions were held to be acceptable if they stated particular matters (such as colours and landscaping) to be completed to the satisfaction of a named professional who would use her skill and judgment as a certifier, but a condition that gave the professional a power to settle disputes generally was invalid for purporting to appoint an arbitrator or special tribunal.[16] An RMA permit cannot be granted subject to a condition that a wildlife survey be conducted and that the consent authorities be satisfied that the site is not of special significance; that was a question that could not be delegated.[17] A condition must be certain. It can leave the certifying of detail to a delegate, using that person's skill and experience, but cannot delegate the making of substantive decisions.[18]

Management plans sometimes appeal to consent authorities as a way of providing some flexibility; the authority imposes a resource consent condition that a management plan be prepared, certified, and maintained to achieve outcomes that are stated in consent conditions. That can be done, but not on the basis that future amendments be approved by a consent authority or some delegate at a later time, except to the extent that the delegate can be regarded as a certifier.[19] A management plan approved by the consent authority in deciding the resource consent conditions cannot be altered without a change to the consent, which requires formal processes under the Act.[20] A condition that is

15 These words seem entirely relevant to the RMA even though they were said in reference to its South Australia equivalent: *City of Unley v Claude Neon Ltd* (1983) 32 SASR 329 at 332.

16 *Turner v Allison* [1971] NZLR 833 (CA).

17 *Director-General of Conservation v Marlborough District Council* [2004] 3 NZLR 127.

18 *Royal Forest and Bird Protection Soc v Gisborne District Council*, EnvC, W26/2009, 7 April 2009 para [88].

19 *Wood v West Coast Regional Council* [2000] NZRMA 193 (EnvC). *Mount Field Ltd v Queenstown Lakes District Council* [2012] NZEnvC 262 para [77]: a consent condition must set out clear outcomes, in respect of which a management plan as a process condition, dealing with how those outcomes would be met, could be certified by a council officer.

20 *Walker v Manukau City Council*, EnvC C213/99, 7 Dec 1999.

flawed by uncertainty and delegation in attempting to allow future changes in a management plan or elsewhere will not be saved by having been volunteered by the applicant.[21]

The RMA does not offer any other convenient tools to provide flexible long-term management of an activity. One option is an application by the resource consent holder for the change or cancellation of a condition, under section 127, but the application is subject to effectively all the requirements of an application for a discretionary activity resource consent. It is not a process for making minor adjustments. Another is a review of the conditions by the consent authority under section 128, but the consent authority can only initiate the review in certain defined circumstances, and again the process is similar to the consideration of a resource consent application. The power cannot generally be extended to terminate a consent except in particular circumstances. For a project under a designation, an outline plan allows some details to be provided at a later stage, but only up until the date of construction.[22]

Overall, one sees that the grant of a resource consent subject to conditions is an event that comes to final conclusion, subject only to monitoring of compliance and to formal review procedures. The RMA is not arranged in a manner that allows on-going responsive regulatory action over an extended period. RMA conditions do not appear to provide what is needed for the satisfactory regulation of a CCS operation.

Consistent CCS provisions nationally. The RMA, as noted above, provides for decentralised decision-making; CCS will be managed by district councils and regional councils, unless other arrangements are made. Those councils will regulate particular CCS projects by the consideration of applications for resource consents. However that activity will occur against the background of policies and rules that the councils have established at the strategic level. Each district council and regional council has the power to make its own policies and rules for CCS. While those rules and policies can be appealed to the Environment Court, each council has considerable latitude to on how to carry out the sustainable management of natural and physical resources in its area. Possible consequences for CCS are:

- Rules for CCS up and down the country could be very different, creating investment uncertainty. A project crossing regional council boundaries could become particularly complex.
- There is a risk of unintended difficulty for CCS. In parts of Marlborough, for example, the injection of any substance into a borehole is made a prohibited activity,[23] with the result that CCS injection is entirely ruled out.
- The process of changing district and regional plans, for example to include CCS, is slow. Plan changes can easily take several years.
- The institutional capacity of councils to regulate technically complex activities is variable.

21 An "Augier condition" is one imposed on the basis of a representation or undertaking offered by the applicant, allowing a broader range of matters to be the subject of a condition: *Mora v Te Kohanga Reo Trust* [1996] NZRMA 566 (PT), *Frasers Papamoa Ltd v Tauranga City Council* [2010] 2 NZLR 202; but there is no reason to think that the requirements of certainty and non-delegation are excused for that reason.

22 Resource Management Act 1991, s 176A.

23 Marlborough Sounds Resource Management Plan rule 26.1.11.4 and Wairau /Awatere Resource Management Plan rule 27.1.4.4.

The RMA does include mechanisms to produce greater consistency. The central government can initiate procedures for the making of National Policy Statements (NPS) and National Environmental Standards (NES). An NPS can state objectives and policies for matters of national significance that are relevant to promoting the sustainable management of natural and physical resources. An NPS for CCS, for instance, could state an objective of facilitating CCS and state particular policies to bring this about. An NES can prohibit or allow an activity and, among other things, prescribe standards, methods or requirements for monitoring. However, NPSs and NESs are subject to limitations; they do not allow a re-writing of the RMA, and could not change the shortcomings identified above as to term, permit character, and continuing regulation. The matters to be taken into account under Part 2 and sections 70A and 104E are unchanged except where change is specifically allowed. A second limitation of NPS and NES is that there is little experience in making them, and such experience as has accumulated shows that the procedures to make them are slow.[24] Even with these constraints on them, we consider that an NPS and an NES have a role to play in the legal framework for CCS, and we go into the matter further at Part 2.6 below.

The other mechanism to produce greater consistency and centralisation is the procedure of "call-in" of a project, a resource consent or a notice of requirement for a designation if it is a proposal of national significance.[25] If the Minister for the Environment or an applicant initiates this procedure then the matter will be decided by a board of inquiry appointed for the purpose, or by the Environment Court without preceding hearings before a local authority. The Environmental Protection Authority administers call-ins. Once a call-in procedure comes to an end, resulting resource consents are administered by the local authority, such as in respect of monitoring. While call-ins have become more frequent, they are not intended to be common; they are for projects of national significance.

Generally, NPS, NES, and call-in procedures allow a certain amount of centralisation of decision-making. They should be put to use in relation to CCS, as we recommend below. But they do not alter the fact that the underlying framework of the RMA is one where the different district councils and regional councils have a substantial role. Policy statements and plans are made by those councils even if subject to modification by NPS and NES. Resource consents, once they are issued under a call-in, become the responsibility of the district and regional council for administration, monitoring, review, and enforcement. Furthermore, a call-in is at the discretion of the Minister, and there is no guarantee that ministerial decisions would provide a nationally consistent approach over time to the regulation of CCS.

Long-term liability. The liability provisions of the RMA, centred on section 314, are general in character. They impose strict liability on numerous parties, with limited statutory defences, and limited direction as to who should be primarily liable for any breach of conditions.[26] The provisions do not allow for the transfer of liability to the Crown after a CCS post-closure period ends. Such a transfer is a common feature of the CCS regimes emerging internationally, mainly because of the

24 Since 1991 only 5 NES have been made (air quality, drinking water, telecommunication facilities, electricity transmission, and contaminated soil evaluation) and 4 NPS (coastal, electricity transmission, renewable electricity, freshwater). Most of them have been made in the last 5 years.

25 Resource Management Act 1991, ss 140-149ZE. Although it can only be a matter of conjecture, it is likely that a CCS project would meet the criteria under s 142 for national significance (*inter alia*, arouses widespread public concern or interest; involves technology, processes, or methods that are new to New Zealand; affects our international obligations; likely to affect more than one region or district), and it is quite possible that a Minister could consider it suitable to be called in.

26 See Daya-Winterbottom, above n 4.

long time it might take for any irregularity in the behaviour of injected CO_2 to become apparent. (A transfer is not an invariable feature; in some Australian states the law remains silent on the matter, as Chapter 5 notes; but it is a major focus of much law reform to deal with CCS.) The RMA does not provide for the detailed analysis that is required in such regimes to manage closure, stabilisation, and a transfer of liability, in the form of a closure authorisation or surrender of an injection permit, which provides a high level of assurance about the level of remaining risk.

Discharges to water. Uncertainty and a potential obstacle to CCS exist in the application of sections 70 and 107 of the RMA to the discharge of supercritical CO2 underground. These sections protect waters from a discharge (or a dumping, in the coastal marine area) that is likely, among other things, to produce conspicuous suspended material or a conspicuous change in colour or visual clarity. A consent authority cannot grant a discharge permit or a coastal permit that would give rise to one of these effects, unless it is satisfied that (inter alia) exceptional circumstances justify the granting of the permit. In respect of a deep saline aquifer two kilometres below the surface of the earth it could be difficult to provide positive proof that these effects would not occur. (Indeed some mineral precipitates may well be put into suspension, and would be a satisfactory result in geosequestration.[27]) The test of exceptional circumstances is a high one; its interpretation is likely to be affected by the fact that the other two reasons for which a consent authority can allow these effects are that the discharge is of a temporary nature, and that the discharge is associated with necessary maintenance work. The consent authority's decision must also be consistent with the purpose of the Act. Whether a change in colour in a deep saline aquifer takes place may not be important, but one sees clearly that the RMA was not enacted with such matters in mind.

Result: the RMA as a framework. In evaluating this second set of questions, we have found several key features of the RMA that would be difficult, if not impossible, to adapt for the regulation of CCS. How permits are issued and managed under the RMA is significantly different from what CCS requires. The permit terms for CCS, which include closure periods, are likely to exceed 35 years. Continuing regulatory activity and oversight will be vital for CCS, both technically and in the eyes of the public; CCS injection permits and the site plans under them must be subject to review, variation and directions in ways that are not possible under the RMA. Elaborate regulation of closure and formal transfers of long-term liability are not possible under an RMA resource consent. In addition, one must note a number of other necessary ingredients of CCS law that the RMA does not provide: the claims of land owners to the subsurface (see Chapter 4), the need to accommodate petroleum, coal, and other subsurface activities (see Chapter 7), anti-monopoly provisions such as third-party access (see Chapter 8).

The result is that, even if minor specific amendments are made to the RMA in order to remove barriers to CCS, the RMA has a number of general features that are inconsistent with what is required for the proper regulation of CCS. They mean that many of the basic features of the RMA would have to be altered to provide a satisfactory legal regime for CCS.

27 K Michael, M Arnot, P Cook, J Ennis-King, R Funnell, J Kaldi, D Kirste, L Paterson, "CO_2 Storage in Saline Aquifers I: Current State of Scientific Knowledge" (2009) Energy Procedia 3197, doi:10.1016/j.egypro.2009.02.103.

2.4 Options for using the RMA

The relationship between the RMA and any new legislation is one of the more significant questions of design of law for CCS. Having considered first the extent to which CCS is controlled by the RMA as it stands at the present, and then the extent to which the RMA with amendments would provide a satisfactory regulatory framework for CCS, we can move to a third stage of bringing together the foregoing analysis and evaluate the strengths and weaknesses of the different possibilities. We identify five options, some of which rather obviously disqualify themselves, but others of which need careful consideration.

1. RMA without amendment

The first option is that CCS be regulated by the RMA without amending that Act. There could be vigorous use of NPS and NES procedures. Regulations could be made for CCS operators to be requiring authorities. The call-in powers could be used for all proposals for CCS operations.

It seems reasonably clear that the RMA without amendment is not capable of acting as a legal framework for CCS. Not only would it provide an unsuitable framework for a CCS project, but there is a real possibility that the climate change and renewable energy sections will act as a specific barrier to CCS even if NPS and NES are made. This option is readily ruled out, but is put here for the purposes of context.

2. RMA alone but with amendment

The second option is that CCS be regulated by the RMA, but with substantial amendments to the Act in order to produce a viable regulatory framework. A new Part would be added to the RMA. There would be no separate CCS Act. NPS, NES regulations, and call-in measures would be used as well.

In order to implement this option, the amendments to the RMA would be numerous. Many would be required to alter provisions made by the Act at present, for example as to term of permits, financial assurance, and monitoring. Many other amendments would be required to add provisions that have no equivalent at all in the Act at present, for example, separate permits for exploration and injection with a right to proceed from one to the other, a tendering system for permits and other means of allocation, alteration of subsurface rights of land owners, adjustment of relations with petroleum, coal, and other subsurface users, continuing regulation, long-term liability, injection permits that cannot be surrendered without approval, and third party access.

If all these provisions were to form a new Part of the Act, it would be a very substantial one. The nearest analogy, as a Part directed at the needs of a specific activity and industry, is Part 7A on aquaculture. A new Part for CCS is likely to be larger. As well as being large, the Part would be very different from the rest of the Act; it would be a Part quite unlike any other Part. There would be a risk of distortion and reduced coherence in the RMA's scheme, especially from the addition of material that has nothing to do with the management of natural and physical resources. Third party access is a good example of something that is necessary for CCS, but as a matter of commercial law is foreign to the RMA's purpose, principles, and overall scheme. Indeed, it can be strongly argued that environmental legislation should not be used to regulate an industrial activity; the two are essentially different. Such use of environmental legislation is likely to be unwelcome in the industrial sectors likely to initiate CCS projects. Along with

this size, and this difference of a CCS Part in the RMA, is likely to come confusion; readers of the New Zealand statute book may be surprised to find the law for CCS in an environmental statute. The placing of proposed legislation in relation to existing law should assist the public understanding and acceptance of the proposed law and the law as a whole.[28]

Boundary problems will not be eliminated by encompassing CCS regulation in the RMA. They will occur as questions about which Part of the RMA applies, instead of about which Act applies.

Overall, even with a significant amendment that adds a new Part to it, the RMA presents a difficult legal framework for CCS. It is technically possible to use the RMA for this purpose, but the results are likely to overburden the RMA with a large amount of material that is entirely different in character, so that the result is likely to be complex and confusing.

3. RMA plus a CCS Act for non-RMA-type matters

The third possible relationship between the RMA and CCS is an amendment to the RMA in order to eliminate obstacles and to provide effective environmental management of CCS. In addition there would be a CCS Act that would deal with the commercial aspects of CCS such as third party access. The division between the two statutes would be modelled on that between the RMA and the Crown Minerals Act 1991 (CMA). Under that model, a petroleum operator needs permits under the CMA, for rights to Crown minerals, and to satisfy regulators about its capability, work programme, and payment of royalties. At the same time the operator must obtain resource consents under the RMA for the environmental aspects of its project. There is no difficulty with overlap because, at least in theory, the spheres in which the two statutes operate are reasonably distinct.

The RMA-CMA model applied to CCS has its attractions, and there is no technical reason why it should not be followed. There is a strength in the model in that it is well understood. It also has the potential for all environmental regulation to occur under the main environmental legislation, the RMA. The enactment of a CCS Act would remove the need to burden the RMA with a great deal of unsuitable material. But there are also substantial weaknesses with the model. Above all, the RMA-CMA analogy is not perfect. The extraction of petroleum or minerals is less of an RMA concern than is the injection of CO_2. The extraction of petroleum may or may not involve significant RMA concerns, but they are incidental to extraction, whereas the injection of a substance is immediately an RMA concern – it is prohibited under section 15 unless authorised – and is in itself controlled by the RMA. To put it the other way around, the injection of CO_2, even if it is an RMA issue, is at the heart of a system of CCS regulation. The result is a higher risk of overlap between the RMA and a CCS Act. There is a risk of two regulatory agencies, two processes for application for permits, two sets of criteria, and two processes for administration, both of which have the injection of CO_2 as their core concern. With overlap there is a risk of duplication and inconsistency.

An effort could be made to avoid duplication and inconsistency with detailed provisions and mechanisms to reduce conflict between the two statutes, but there would remain the core problem that the CCS legislation was skirting around the injection of CO_2. We are not aware that any such design has been adopted in CCS legislation internationally.

28 Legislation Advisory Committee Guidelines: Guidelines on Process and Content of Legislation (Wellington, 2001) at 145.

Another variation of this option would be a new CCS Act that leaves RMA jurisdiction over injection and other environmental matters substantially unimpaired, and addresses the remaining aspects of CCS management. The chief difficulty with such an arrangement would be an awkward spread of provisions between the two Acts – some provisions in the RMA, and the left-overs, as it were, in the new CCS Act. It would produce a poorly integrated framework for CCS.

4. RMA plus a CCS Act for injection and non-RMA matters

The fourth option is to move the injection of CO_2 to a CCS Act, but for the RMA to continue to apply to other aspects of a CCS operation. Incidental discharges to air and water, water takes, coastal waters and earthworks would continue to be regulated by regional councils. Land use for CCS would continue to be regulated by district councils. Local input would therefore be provided, but in both cases the law would ensure co-ordination, and would ensure that incidental concerns do not determine the overall result of CCS applications. NPS and NES would be used for this purpose, as explained below in Part 2.6 of this Chapter. Designation would also be used, as shown in Chapter 4. The procedure would be akin to an RMA call-in. The injection of CO_2 would be regulated under legislation designed for that purpose, and designed to be no less onerous and no less protective than the RMA. RMA regulation of the injection would not be necessary.

The key change to the RMA would be that the injection of CO_2 and associated fluids would be made lawful notwithstanding the prohibitions in section 9 to 15C, if approved under CCS legislation. Supporting it would be a change so that the effects of injection could not be taken into account by a council in the making of a policy or plan, or by a consent authority in determining a resource consent for a related activity. The injection would only be approved under the CCS legislation if there were no significant risk of leakage and if no significant environmental or health risks exist.[29] As well as the injection itself the CCS legislation would provide for the further management of the CO_2, for example in corrective measures.

A good delineation or definition of the boundary between the RMA and the proposed CCS Act would be important. For example, the CCS Act could say that an injection permit can only be granted if it is unlikely to have any adverse effect on potable ground water that is likely to be used in the reasonably foreseeable future. Boundary problems would also be reduced by statutory requirements for liaison, for example in requiring the CCS regulator to forward an application to a regional council and to have regard to its views on the matter.

One of the strengths of this option is that it would provide a comprehensive and integrated framework for CCS, with suitable connections to existing law in the RMA. The proposed CCS law would deal fully with CCS activities. It would be reasonably clear that it was the "rule book" for CCS, with resultant benefits in clarity and accessibility. The rules for CCS would be in one place, all together rather than spread out in different Acts, and reasonably easy to find. The injection of CO_2 under the new CCS Act would be regulated under a system designed for the purpose, and capable of exerting stricter control over the activity than the RMA can provide.[30] At the same time, the RMA

29 See Chapter 3 for the full discussion of purpose and principles, and Chapter 5 for matters to be taken into account and the threshold test to apply to the decision to grant an injection permit.

30 Foreshadowing the analysis in Chapters, 3, 5, 6 and 10, one can identify stricter controls as the more specific rules for an elaborate analysis to support an application, a threshold test to be passed to obtain an injection permit, continuing regulation and variation of permit conditions by the regulator, continuing control of the site plan and related plans, liability stronger and more explicit, and restrictions on surrender of a permit.

would continue to apply to those activities that are commonly the subject of RMA regulation at the present, including land use, water use, coastal occupation, and incidental discharges to air and water. There would be no duplication.

A shortcoming of this option is that it would take a particular activity out of the RMA, reducing its integration and comprehensiveness. It could introduce an artificial boundary between different aspects of a project that would be better managed together. This shortcoming could be addressed by providing for a joint process under which all aspects of the proposal are heard together by a board of inquiry, but decided under different, yet tightly connected, regimes.

5. CCS Act alone with no RMA controls

The final option is that CCS would be removed altogether from the RMA. A CCS Act would be passed that would say that CCS activity is not subject to the RMA.

This option would have strength in clarity and avoidance of duplication. It would allow CCS to be managed entirely under a purpose-built CCS legal framework. It would give a CCS operator an attractive "one stop shop" system of regulation.

One weakness of this option is that it would need the new CCS Act to mirror or re-create RMA systems for the management of land use, incidental discharges, water use, pipelines, and so forth. It would result in considerable repetition and a great deal of overlap with the RMA. Boundary problems would not be avoided; indeed they would be more substantial than under some of the other options. In addition there would be a substantial and unnecessary alteration of general expectations about environmental and resources law; there is no precedent in New Zealand for a particular industry being made entirely an exception to the RMA. It is unlikely that the prospects of CCS would be advanced by pursuing such a route in law reform.

2.5 Recommendations as to the RMA

Some form of interaction between the RMA and CCS legislation is inevitable. Deciding what is the best arrangement will necessarily involve a balancing of different considerations. This analysis shows that Option 1, "RMA without Amendment" will not work, and that Option 5, "CCS Act alone with no RMA Controls" is unprecedented and unnecessary. Option 2, "RMA Alone but with Amendment," would be difficult; the advantages of keeping CCS in the RMA do not appear to outweigh the disadvantages. Options 3 and 4 are the only ones where the strengths seem to be greater than the weaknesses. Option 3, "RMA Plus a CCS Act for Non-RMA-Type Matters," presents significant complications, and in particular duplication of regulatory effort. It seems better to adopt a policy of "regulate once, and regulate well." That leads us to conclude that Option 4, "RMA Plus a CCS Act for Injection and Non-RMA Matters," is the right option. It appears to have fewer shortcomings, and is more likely to lead to a coherent comprehensible framework. Generally, we consider that the CCS legal framework should follow that of the RMA where it can, in order to take advantage of the substantial shared knowledge and expectations that have developed under the RMA. We therefore recommend that the injection and storage of CO_2 be authorised under a new CCS Act, while the RMA continues to apply to other aspects of CCS operations.

Our recommendations to this effect are summarised at the end of this Chapter.

2.6 National Policy Statement and National Environmental Standard for CCS

We saw earlier that a National Policy Statement (NPS) and a National Environmental Standard (NES) can produce greater consistency under the RMA nationally, and can provide policy and regulatory guidance and direction. On a specific matter, they can make and impose particular policy choices, so that decision makers no longer approach it only under the general policy framework of the Act. They must both be given effect by regional councils and district councils, and by a board of inquiry on a call-in. However they cannot do anything that would be tantamount to amending the Act, and must be made in the light of the Act's purpose and principles. What can be put in an NPS or NPS, the process for making them, and their effect, is stated in sections 43 to 55. The New Zealand Coastal Policy Statement has slightly different provisions.

An NPS for CCS would build on the new paragraph we recommend above in section 7, to ensure that regard will be had to the benefits to be derived from the use and development of CCS. (In that it will be similar to the NPS for Renewable Electricity Generation.) The NPS would follow statutory requirements for content. It would state the matter of national significance to which it applies as the benefits to be had from CCS, and the need to make CCS available as part of New Zealand's effort to reduce the discharge of GHGs and to respond to climate change. Its objective would be to recognise the national significance of CCS by providing for exploration, injection and transportation. It would state policies directed at decision-makers, such as:

- Recognise and provide for the national significance of CCS, including its national and international benefits (which could be identified).
- Recognise and provide for the effective development and operation of CCS.
- Recognise the relationship between policy on CCS and policy on renewable energy production, energy efficiency, and other aspects of climate change policy and energy policy. (The NPS would be an opportunity to explain these relationships.)
- Consider (or have particular regard for) the scrutiny given to a CCS proposal and the ongoing management under the requirements of the proposed CCS Act.
- Consider the need to locate CCS operations where capture is possible, where storage is possible and where pipelines connecting them can reasonably be constructed.
- Consider the constraints imposed on avoiding, remedying, or mitigating adverse effects of CCS activities by the technical and operational requirements of CCS.
- Enable reasonable operational, maintenance and minor upgrade requirements of an existing CCS operation.
- Require provisions in a policy statement or a plan to be based on identified standards or guidelines.
- Manage activities to the extent reasonably possible, to avoid reverse sensitivity effects.

The Act allows an NPS to specify how and when it is to be incorporated in regional policy statements and regional and district plans, but we do not recommend that for CCS, because it would impose an

undue burden on local bodies. The New Zealand Coastal Policy Statement could usefully be amended to facilitate CCS at sea, in the coastal marine area. It could make many of the policy points above, and could usefully ensure that coastal permits do not present a barrier to pipelines construction, which is an issue noted in Chapter 9.

An NES for CCS could say that no CCS operation (including a CCS pipeline) shall be a prohibited or non-complying activity. That would mean that district plans and regional plans would have to make CCS operations permitted, controlled, restricted discretionary or discretionary. The scrutiny that we propose through a board of inquiry process is compatible with discretionary activity status and the more accommodating categories. An NES could also be used to impose rules on CCS activities such as for the monitoring and decommissioning of a CCS pipeline.

Between them an NPS and an NES can also prescribe a certain amount of detail about the information that should accompany a CCS application, the way in which it should be processed, the criteria against which it is to be judged, and the conditions that are to be imposed. We have not examined other possibilities that an NPS or NES could address, such as whether they could require the call-in of CCS applications; that we think should be required by the Act itself.

Finally, an option for the making of an NPS and NES should be noted. The conventional procedures prescribed by the RMA may be quite sufficient, but it is also possible for the new CCS Act to make an NPS or NES directly, or by declaring that certain of its provisions shall be deemed to be NPS or NES for the purposes of the RMA. If the desired policy direction is clear, this option will bring about the necessary changes without delay or uncertainty.[31]

3 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012

Many of the limitations that occur under the RMA also occur under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act). These include the effects of climate change provisions, duration of consent, transfer of consent, priority rules, entitlement to subsequent permits, on-going and flexible regulatory control, detailed monitoring, long term liability, financial assurance, relationships with other subsurface uses, and private property and access matters. The EEZ Act and the RMA also have similar purposes (sustainable management of natural and physical resources), however the Marine Legislation Bill proposes an additional purpose to the EEZ Act of protection against pollution, which may add uncertainty and complexity. A distinction between the EEZ Act and the RMA is that CCS injection would be classified as "dumping" rather than a "discharge". The legal framework governing CCS in the territorial sea and the EEZ is discussed in detail in Chapter 9.[32] The above mentioned limitations lead to a conclusion similar to that we have reached above in relation to the RMA, for broadly similar reasons. The best option is to remove injection and storage from the

31 The Hauraki Gulf Marine Park Act 2000 s 9 is a precedent: s 55 of the RMA applies as though ss 7 and 8 of the Hauraki Gulf Act were a national policy statement. Also see the Waitakere Ranges Heritage Area Act 2008, ss 10 and 13, and the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010 ss 11-17, where that Act's vision and strategy are deemed to be part of the Waikato Regional Policy Statement, and are to be implemented in other planning documents.

32 Further detail is provided in Appendix F.

EEZ Act regime and assess it according to the purpose of new, dedicated legislation on CCS which contains its own environmental protection provisions. This is consistent with the recommendations made in relation to injection on land and within the coastal marine area. The EEZ Act would continue to apply to the exploration phase, the transport phase, and the incidental aspects of a CCS storage operation, but injection and associated activities would be made lawful notwithstanding the restrictions under the Act if carried out pursuant to an injection permit under new CCS legislation.

4 Crown Minerals Act 1991

The Crown Minerals Act 1991 (CMA) will come to mind in a discussion of the legal management of subsurface resources. It certainly is the main law for the management of subsurface resources at the present. As we did with the RMA, we ask whether the CMA in its present form governs CCS, and then whether it could usefully be amended so as to become the legislation for CCS, including different options. We find that the CMA is very different in its character from what is required for CCS legislation.

4.1 Whether the Act in its present form authorises CCS

In reading the CMA to ascertain its application, as is, to CCS, we start with its purpose section, then what it means by minerals, prospect, explore and mine, and finally what Crown-owned minerals it applies to.

Purpose. The purpose of the CMA is expressed in the new section 1A, added in 2013:

> (1) The purpose of this Act is to promote prospecting for, exploration for, and mining of Crown owned minerals for the benefit of New Zealand.
>
> (2) To this end, this Act provides for—
>
> (a) the efficient allocation of rights to prospect for, explore for, and mine Crown owned minerals; and
>
> (b) the effective management and regulation of the exercise of those rights; and
>
> (c) the carrying out, in accordance with good industry practice, of activities in respect of those rights; and
>
> (d) a fair financial return to the Crown for its minerals.

There is nothing in this statement of purpose about CCS specifically, and nothing more general that applies, such as the use of underground formations.

In order to ascertain precisely what activities the Act applies to, one works back from the offence provision, section 100; every person commits an offence against the Act who contravenes section 8. Section 8 says that no person may prospect or explore for, or mine, Crown owned minerals in land unless he or she holds one or another kind of permit granted under the Act or is otherwise exempt. One must therefore analyse three elements: (i) prospect, explore for, or mine; (ii) Crown-owned; and (iii) mineral.

Mineral. What is a "mineral" can be disposed of without delay. The definition in section 2 of the Act is:

> [M]ineral means a naturally occurring inorganic substance beneath or at the surface of the earth, whether or not under water; and includes all metallic minerals, non-metallic minerals, fuel minerals, precious stones, industrial rocks and building stones, and a prescribed substance within the meaning of the Atomic Energy Act 1945

The CO_2 that results from carbon capture – the capturing of CO_2 from burning fuels for electricity generation, or from industrial processes – cannot be described as naturally occurring without making the term meaningless. Nor can the term extend far enough to include geological structures that may be usable as CCS storage sites; the emphasis is on substances and not structures or in-situ character or capability. CO_2 and CCS are therefore not controlled by the CMA.

Prospect, Explore for, Mine. One can then turn to the three verbs, prospect, explore for, and mine. "Prospecting" is defined in section 2:

> (a) means any activity undertaken for the purpose of identifying land likely to contain mineral deposits or occurrences; and
> (b) includes the following activities:
> (i) geological, geochemical and geophysical surveying:
> (ii) aerial surveying:
> (iii) taking samples by hand or hand held methods:
> (iv) taking small samples offshore by low-impact mechanical methods

The core of the definition appears to be "mineral deposits or occurrences." It is arguable that this could extend to mineral structures in the subsoil, which could be exploited by CCS operations. However one must be careful with the use one makes of more open language in a definition like this; one must read the statute as a whole.

"Exploration" means:

> [A]ny activity undertaken for the purpose of identifying mineral deposits or occurrences and evaluating the feasibility of mining particular deposits or occurrences of 1 or more minerals; and includes any drilling, dredging, or excavations (whether surface or subsurface) that are reasonably necessary to determine the nature and size of a mineral deposit or occurrence; and **to explore** has a corresponding meaning

Whether this allows activities directed at establishing the existence of a formation capable of storing CO_2 is by no means clear. Are such formations mineral deposits or occurrences? That strains the language somewhat. The evaluation of the feasibility of mining may be a limiting condition within the definition; if so, there is no room for CCS operations at all.

"Mining" is defined to mean:

> (a) means to take, win, or extract, by whatever means,–
> (i) a mineral existing in its natural state in land; or
> (ii) a chemical substance from a mineral existing in its natural state in land; and

(b) includes–

(i) the injection of petroleum into an underground gas storage facility; and

(ii) the extraction of petroleum from an underground gas storage facility; but

(c) does not include prospecting or exploration for a mineral or chemical substance referred to in paragraph (a)

The verbs are take, win, and extract. There is nothing said about depositing, injecting, storing, disposing, or sequestering. It seems clear that CCS operations cannot be included within this definition. It is likely that this clear definition of "mining" must colour the interpretation of "explore" and "prospect." The statute must be read as a whole, and in particular, one would expect a set of carefully-crafted definitions in the one section to be mutually reinforcing. This would prevent the more elastic readings of general words in the definitions of "explore" and "prospect," and clarify that the Act as a whole only authorises mineral activity in the conventional sense. Where an unconventional meaning is intended for "mining", as with storage, the conventional sense is expressly extended. This reading back, to construe 'explore' and 'prospect' in the light of 'mining' and 'mine,' is especially valid when section 32, in protecting the right of a permit holder to subsequent permits, shows that the Act is engaged in the management of rights at different stages in the one sequence of mineral activity.

The prohibition in section 8 is against prospecting, exploration for, or mining Crown-owned minerals without a permit granted under the Act. The permits granted under the Act are stated in section 30. The holder of a prospecting permit has the right to 'prospect,' the holder of an exploration permit has the right to 'explore,' and holder of a mining permit the right to 'mine.'[33] So the rights that can be conferred on permit holders are confined by the definition of the three verbs.[34] These are the only rights that the Minister can grant; he or she is bound by the legislation. It is unlikely that the Minister can exceed these statutory definitions by including more generous rights as permit conditions.[35]

Section 2 also defines 'mining operations' as operations in connection with mining, exploring, or prospecting for any Crown owned mineral, including a variety of connected activities. One of those, paragraph (b)(iv), is 'the deposit or discharge of any mineral, material, debris, tailings, refuse, or wastewater produced from or consequent on the operations'. The last words of this definition rule out the inclusion of CO_2 from a combustion source not associated with mineral activity. It should also be noted that this definition does not take the central place in the permitting regime; the permits are granted for prospecting, exploring, and mining as defined.

33 In addition, the holder of an exploration permit may prospect, and the holder of a mining permit may prospect and explore. The permit may specify the mineral and impose other conditions. However these aspects of the grant of rights do not seem relevant to the present discussion.

34 *Greymouth Petroleum Holdings Ltd v Todd Taranaki Ltd*, unreported, High Court Wellington CIV-2004-485-1651, Wild J, 25 July 2006 observed para 55 that the Act manages petroleum exploration and mining by prohibiting those activities except pursuant to a permit for a defined area of land. The regulation is primarily of activities, except by permit. At para 77 it notes that 'mining operations' are defined in an inclusory way, but the point is not developed.

35 *Cudgen Rutile (No 2) Ltd v Chalk* [1975] AC 520 (PC) is the case in point. Section 105(1)(l) authorises the making of regulations prescribing the duties of permit holders and the activities to be carried out under permit, but it cannot authorise regulations that in effect amend the definitions that Parliament has chosen to give in s 2.

Crown owned. Petroleum is declared by section 10 to be Crown owned notwithstanding any Crown grant, certificate of title or other instrument of title. It is the mineral most likely to be associated with arguments about CCS. Section 2 defines it as follows:

> [P]etroleum means—
>
> (a) any naturally occurring hydrocarbon (other than coal) whether in a gaseous, liquid, or solid state; or
>
> (b) any naturally occurring mixture of hydrocarbons (other than coal) whether in a gaseous, liquid, or solid state; or
>
> (c) any naturally occurring mixture of 1 or more hydrocarbons (other than coal) whether in a gaseous, liquid, or solid state, and 1 or more of the following, namely hydrogen sulphide, nitrogen, helium, or carbon dioxide—
>
> and, except in sections 10 and 11, includes any petroleum as so defined which has been mined or otherwise recovered from its natural condition, or which has been so mined or otherwise recovered but which has been returned to a natural reservoir for storage purposes

Although a court would draw on expert evidence if this comes into dispute, there seems to be no room at all for an argument that CO_2 is one of the hydrocarbons. Nor does there seem to be any room to argue that a substance like CO_2 is naturally occurring if it is a product of combustion, the product of industrial processes, or the product of natural gas treatment and injected in a CCS operation. There is no authorising of CCS operations.

Storage, which is referred to in the definition of petroleum, cannot be interpreted so as to include CCS in the sense of geosequestration. There are several reasons. What is returned to a natural reservoir must be petroleum, which could be a mixture, but cannot be CO_2 alone, nor (if one looks at the purpose of the definition and the Act as a whole) predominantly CO_2. Secondly, it must be a naturally occurring mixture. Thirdly, it must have been mined or otherwise recovered from its natural condition. Fourthly, the purpose must be storage, which is the action of keeping or accumulating a thing for future use. The purpose of CCS operations is the permanent sequestration or disposal of greenhouse gases. The possibility that the sequestration may not be perfect over geological time frames does not detract from that. Readiness for retrieval is the last thing that is intended. Carbon capture and 'storage' is therefore something of a misnomer.[36] Finally, the words "except in sections 10 and 11" mean that stored petroleum is not vested in the Crown, which is logically necessary, but mean that any possible general effect of section 10 to empower the Crown to authorise CCS does not extend to storage. The reference to storage in the definition is tightly confined; it does not authorise CCS operations.

36 *Concise Oxford Dictionary* (11th ed rev 2004): "Store v. 1 keep or accumulate for future use. Storage n. 1 the action of storing. 2 space available for storing; *Shorter Oxford English Dictionary* (5th ed rev 2002): "storage ... 4 The action of storing or laying up a thing or things in reserve; the condition or fact of being stored. E19." "store ... v. ... 4 Keep in store for future use; collect and keep in reserve; form a store, stock, or supply of; accumulate, hoard."; N Bankes, J Poschwatta, and E M Shier, "The Legal Framework for Carbon Capture and Storage in Alberta" (2008) 45 Alberta Law Review 585, note that the terms 'disposal' and 'sequestration' are more suitable. However it is impractical to abandon the general usage of the term 'carbon capture and storage.'

The other Crown-owned minerals to which the CMA is confined[37] are gold, silver and uranium, where ever situate; and minerals reserved to the Crown at the time of alienation of land to a private owner. None of those cases is likely to concern CCS, although they are considered further in Chapter 4 in relation to property rights.

Former Legislation. "Grandparented" rights exist under the Petroleum Act 1937, Mining Act 1971 and Coal Mines Act 1979, and have some time to run. It is possible that old legislation affecting those particular licences may produce results that are different from the analysis presented here. However it is most unlikely that any differences, if they exist, would authorise the grant of new rights to CCS activity.

Result. The necessary conclusion is that permits for CCS operations cannot be issued under the CMA, and the holders of permits under the CMA cannot claim to hold the rights to carry out CCS operations in their permit areas. Since the definitions of 'prospect,' 'explore' and 'mine' do not include CCS operations, those operations are not prohibited by section 8 of the CMA, and are not an offence under section 100. This is an interesting and perhaps unexpected consequence, but it does not alter the fact that the CMA permitting regime does not include and does not authorise CCS operations.

4.2 Should the CMA be extended to CCS?

If new law is to be written for CCS, could it be part of the CMA? This option needs careful consideration. It is an option that was adopted for the Australian Commonwealth legislation, but the petroleum law was given an inclusive name and purpose, the Offshore Petroleum and Greenhouse Gas Storage Act 2006, the object of which is (section 3) to provide an effective regulatory framework for (a) petroleum exploration and recovery and (b) the injection and storage of greenhouse gas substances, in offshore areas. This change of name and objective makes sure that the dual intentions of the legislation are readily understood. That option is also being taken in Western Australia with amendments that will cause the petroleum legislation to be renamed the Petroleum, Geothermal Energy, and Greenhouse Gas Storage Act 1967. In Canada, Alberta has made its CCS provisions under the Mines and Minerals Act and the Oil and Gas Conservation Act, but without making the new jurisdiction so obvious. However, the path of separate legislation was taken in Australia for the onshore CCS legislation of Queensland in the Greenhouse Gas Storage Act 2009, and of Victoria in the Greenhouse Gas Geological Sequestration Act 2008.

In all probability, a prerequisite for the option of enacting CCS legislation as an amendment of the CMA is that the administration of CCS must be carried out (or at least primarily carried out) by the same agency that administers the CMA, namely, New Zealand Petroleum and Minerals in the Ministry of Business, Innovation and Employment. It would be an unusual arrangement for one part of an Act to be administered in a different department from the rest of the Act. (On the other hand, it is common for several different or related Acts to be administered in the one department.) The policy question "which Act?" is therefore connected to the question "which agency?" which is considered in Chapter 3 below.

37 The Minister cannot issue exploration or mining permits for privately-owned minerals. Crown Minerals Act 1991 s 25(6), subject to an exception concerning the Marine and Coastal Area (Takutai Moana) Act 2011. A prospecting permit can be issued for private minerals: s 30(1).

Several advantages can be identified for the option of using the CMA:

- Commonality of subject-matter, in dealing with the management of subsurface formations.
- Commonality in the administration of the permitting regime which is at the centre of the minerals regime and the CCS regime, with the possibility of same or aligned provisions for the management of bidding rounds, applications, granting, monitoring, and recording.
- One statute within which to manage the relationship between CCS and petroleum activities, including overlapping interests and enhanced oil recovery (EOR).
- Same provisions for access to land.

Equally, disadvantages in using the CMA for CCS can be identified:

- Different purpose. The purpose of the CMA (and ideally its title as well) would need to be changed, as in the OPGGSA. Alternatively a new part in the CMA for CCS would have to say that it applies notwithstanding the main purpose of the Act.
- Different orientation. Apart from its formal expression of purpose, many provisions of the CMA reflect that it deals with mineral exploration and extraction.
- Lack of environment, safety and GHG containment oriented provisions. While amendments to the CMA in 2013 introduce new provisions as to environmental and health and safety capability, the detailed regulation that will be necessary for CCS would be a new feature for the CMA. In particular, the matters to be established before an injection permit can be issued and can be ended have no parallel in the CMA.
- Perception of CCS as an offshoot of petroleum and coal management. There is a risk that the new CCS industry may be seen to be influenced and controlled by the thinking and expectations arising out of the petroleum and coal industries.

The advantages and disadvantages of using petroleum legislation have been discussed by Australian practitioners who note that it provides a familiar framework for industry, and provides efficiency for the interaction between CCS investors and oil and gas companies.[38] The disadvantage is that petroleum legislation is designed to regulate extraction of petroleum, and not the long-term disposal of CO_2. Stand-alone CCS legislation is specifically designed to manage the long-term injection of CO_2 and the associated risks. It includes specific requirements for liability and for monitoring and verification. Such provisions provide clarity and certainty for investors.

The analysis thus far shows both advantages and disadvantages in using the Crown Minerals Act to regulate CCS.

38 M Gibbs and P McCormack "No Consistent Approach to CCS Legislation" *Blake Dawson Resources and Energy Law Update* (October 2008).

4.3 Options for using the CMA

Just as with the RMA, it seems useful to take the analysis further by marshalling the different options for the relationship between the Crown Minerals Act and new CCS legislation. However there seem to be fewer real options than in that case.

1. CMA without Amendment

It is clear from the foregoing analysis that the CMA in its present form does not apply to CCS. The Minister of Energy and Resources is not able to grant permits under the Crown Minerals Act in its present form for CCS operations.

2. CMA Alone

It is equally clear is that the CMA would need very considerable amendment to apply to CCS. While there is commonality in dealing with the management of subsurface formations, and the administration of a permitting regime, the underlying objective that the CMA pursues is different from CCS and would need to be addressed. This would mean significant changes. The changes could be implemented by re-writing the provisions that deal with ownership of subsurface formations, minerals programmes, the issue and management of permits, permit conditions and work programmes, so that in each case they deal with CCS exploration and injection as much as with mineral extraction. Additional provisions would be required for the detailed regulation of CCS operations; the equivalent under the CMA for petroleum or other operations is not strongly enough developed to be adopted even if it was flexible enough to cover a very different kind of operation.

The other way to make such significant changes is with a separate Part added to the CMA to provide a new regime for CCS. The question that it would pose is, if the CCS regime is so separate from the rest of the CMA, whether it is usefully placed in that Act at all. Readers of the statute book may not expect to find it there unless the Act is renamed – as the Crown Minerals and Carbon Capture and Storage Act, for example.

Constituting CCS law as part of the CMA may make it easier to provide for the interaction of CCS operations with petroleum and other operations.[39] Those interactions include protection of existing investments, protection of resources, enhanced oil recovery (EOR), and the rights of one kind of explorer to finds of the other kind of resource. However the nature of those provisions may be much the same whether they are located entirely within the CMA or whether they are distributed between the CMA and a new CCS Act.

The RMA should also be considered at this point. RMA environmental regulation will be relevant to CCS legislation enacted in the CMA unless it is specifically excluded. The issues traversed in the previous section will be relevant in the much same way whether the CCS law is in the RMA or in its own Act. The strengths and weaknesses of the different options would be equally relevant. The one additional observation is about moving aspects of CCS out of the RMA, especially injection. It was noted above that there seems to be a strong case for moving injection out of the RMA and into a legislative framework that is more specific and effective for CCS, even if it has an environmental dimension to it. But the logic

39 See Chapter 7.

behind that choice seems to be reduced if injection and related environmental matters is moved into the Crown Minerals Act. The CMA does not engage in environmental regulation in any other respect,[40] and the CMA may not be a suitable location for a kind of regulation that is removed from the RMA.

3. CCS Act Separate from the CMA

This option would not place the new law for CCS in the CMA, but in a separate CCS Act. There would necessarily be amendments to the CMA, particularly for the relationship between CCS activity and petroleum, coal and other subsurface activity.

One strength of this option is that it would give CCS legislation more visibility than it would have as part of the CMA. Even a major re-write of the CMA to give suitable prominence to CCS, with a good deal of disruption attendant on the exercise, may fail to bring CCS clearly enough to the eye of the reader of the statute book, and may fail to dispel an assumption that CCS is subordinate to extractive uses of the subsurface. This option would also produce a single enactment where the reader will find most of the relevant provisions covering the activity. Another strength is that it would not presume that CCS will be regulated by New Zealand Petroleum and Minerals as the agency that administers the rest of the CMA. That possibility would remain open along with other possibilities.

Possible weaknesses of the option are that it would add a new Act of Parliament where it could have been avoided, and that it would make arrangements for co-ordination of subsurface uses more difficult. However neither of those seem to be substantial matters when considered closely.

4. CMA Plus RMA Plus a CCS Act

One further option is for some CCS provisions to be located in the CMA, while others are located in a new CCS Act, and while reliance on the RMA continues as well. However there is an obvious risk, in spreading provisions out among three Acts, of failing to integrate and failing to enact law clearly. This option may have some value, however, as a reminder that the precise location of its elements is not important so long as the statutory scheme is clear. Modern statute drafting can include sections that direct the reader to relevant provisions in another Act, informing the reader without having legal force themselves.

4.4 Recommendations as to the CMA

Just as with the RMA, an evaluation of the different options involves a balancing of various considerations. Option 1, "CMA without Amendment," is plainly unworkable. Option 4, "CMA Plus RMA Plus a new CCS Act," perhaps cannot be dismissed outright, but it presents the risk of a divided and opaque provision for CCS. Option 2, "CMA Alone," is possible, but it seems to have few advantages. The similarities between CCS and mineral extraction are not high, and a new CCS Part to the CMA would need to have its own objectives and to operate separately in most respects. Option 3, "CCS Act Separate from the CMA," has more strengths.

We recommend that a new CCS Act be enacted separately from the CMA. Most of the questions about the relations between the two systems are addressed in Chapter 7.

40 There are new provisions in the CMA s 29A(2) on environmental capability of applicants, but they do not displace the RMA or the offshore environmental legislation.

5 Whether a New Act is Required to Provide an Approval Process

The above discussion has examined a number of different design options for CCS law in relation to the existing statutory framework under the RMA and the CMA. Some options rule themselves out quickly, while others have strengths and weaknesses that must be balanced.

One option that can be considered is to include CCS law in either the RMA or the CMA. (RMA Option 2 and CMA Option 2.) Both appear to be technically viable, but neither seems to bring many benefits with it. In each case the CCS Part would be isolated from the rest of the Act, with fewer connections and collocation benefits than might at first appear. The option of using the RMA to manage injection, alongside a CCS-specific Act, (RMA Option 3) seems liable to create an uncertain and duplicative division of responsibilities.

We conclude therefore that there is a good case to enact a stand-alone CCS statute. (In the discussion above, RMA Option 4 and CMA Option 3.) A separate CCS Act, establishing an approval process along with all the other main aspects of CCS activity, would provide a high degree of integration in the management of CCS projects. It would make sure that CCS law is reasonably visible and comprehensible.[41] Connections to the RMA, the EEZ Act, and the CMA, and the delineation of boundaries between them, seem manageable, and certainly no less difficult than with any of the other options. Connections and boundaries can be clarified by provisions in the law that describe in a general way how different matters are regulated in the different Acts, without affecting the interpretation or application of the Acts directly.[42] This is our recommendation, and in the following chapters of this Report we assume that this option is chosen.

6 Detailed Regulation of CCS under the Health and Safety in Employment Act 1992

When the Health and Safety in Employment Act 1992 (HSEA) was introduced, it repealed many industry-specific statutes concerning the safe use of equipment, such as the Petroleum Act 1937, Geothermal Energy Act 1966, and Mining Act 1971. The former legislation had been prescriptive in character, specifying in detail the codes to be followed, and, for example, the maximum pressure allowed in a pipeline and the thickness and specifications of the steel to be used. The HSEA introduced regulation that was different in character, and emphasises performance standards; the required standard of safety and elimination of hazards is identified, and the company is given considerable latitude in how to achieve those standards. Thus, the detailed regulation of design, operation, maintenance and decommissioning of analogous activities is through regulations under health and safety legislation, rather than by industry-specific statutes.

41 The option of new regulation that particularly addresses CCS is said to provide increased industry certainty, transparency and consistency, and reduced risk to the environment, health and safety: Ministerial Council on Mineral and Petroleum Resources *Carbon Dioxide Capture and Geological Storage Australian Regulatory Guiding Principles* (2005), at 45.

42 An example is s 20A of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, to be inserted by the 2013 Amendment Act.

In this section we consider whether the HSEA should apply to CCS operations. The question is different from the application of the RMA and Crown Minerals Act, which each have the potential to provide a general regulatory framework for CCS. The HSEA's role is more confined, but no less important within its scope. We consider the different issues and conclude that the HSEA and particular regulations under it can apply to CCS with little amendment.

6.1 General characteristics of the Health and Safety in Employment Act 1992

The HSEA is a statute of general application that affects all businesses and activities. It imposes general obligations on employers to ensure the safety of employees, and obligations to ensure that places of work do not present hazards to non-employees and people in the vicinity of the place of work.[43] Employee participation, information disclosure, training, monitoring, inspection, accident investigation, and enforcement are all provided for. The government may issue a code of practice for a field of work that is not compulsory but is powerful persuasive authority in the event of an investigation or prosecution. In the ordinary course of events, the HSEA will apply to CCS operations. There is no reason to suggest that it should not. CCS capture facilities can be regulated effectively within the HSEA framework. CCS injection sites and pipelines can be regulated effectively within it with only minor modifications (refer to Chapters 6 & 8).

Health and safety regulation is receiving substantial policy attention because of the Pike River coal mine tragedy, and because of a more general recognition that New Zealand's workplace safety record is worse than that of many other countries. The recommendations of the Royal Commission are being implemented.[44] The Health and Safety (Pike River Implementation) Bill before Parliament focuses on mine safety and on the establishment a new Crown entity named WorkSafe New Zealand that will have responsibility for the HSEA. The Bill does not propose any change that is likely to affect CCS directly. A wide-ranging review has been carried out by an independent taskforce, and is likely to lead to more significant changes in the field.[45]

The HSEA obliges the employer to ensure the safety of employees in the workplace, this includes employees working offshore aboard a ship or on an installation. As well as the general health and safety measures provided in the Act, the provisions particularly pertinent to our discussion include hazard identification and management, the powers of inspectors, and the power of the Minister to issue codes of practice. The HSEA gives inspectors the power to enter and inspect a work place at any time, and where necessary to issue an improvement notice or a prohibition notice. A prohibition notice may be issued to cease operations where the inspector believes there is a likelihood of serious harm to any person, until the inspector believes measures sufficient to eliminate the hazard have been taken.[46] The Act also provides that, where an inspector believes there is a failure to comply with

43 Health and Safety in Employment Act 1992, ss 6 and 16. The duties are restricted to taking 'all practicable steps' to ensure that there is no hazard. The duty to persons in the vicinity of the place (relevant to pipelines) is expressed in broad terms; the duties to persons in the work place who are not employees or invitees vary in character.

44 Royal Commission on the Pike River Coal Mine Tragedy Volume 1+Overview (2012).

45 Independent Taskforce on Workplace Health and Safety, *Report* (April 2013).

46 Health and Safety in Employment Act 1992, s 41.

a provision of any other enactment regarding health and safety, the inspector may notify the local authority concerned.[47]

The High Hazards Unit of the Department of Labour oversees the mining, petroleum and geothermal industries. If it continues to be a part of the institutional arrangements, as part of WorkSafe New Zealand, its role, for the sake of administrative convenience, should be expanded to cover all phases of a CCS project.

6.2 Is the HSEA suitable for regulating CCS?

In New Zealand, there is a strong reliance on health and safety legislation for the detailed regulation of activities such as mining and oil and gas operations. The regulation of CCS under the HSEA would follow well-established practice. HSEA regulation is in a period of improvement, as shown by the new mining and petroleum regulations. If CCS is to be regulated under the HSEA, overlap of regulatory functions would be minimised.

On the other hand, the HSEA is focused on personal safety in the workplace. A decision maker exercising powers under the HSEA cannot take into account considerations of the effects of climate change, the environment and other resources. To do so would be outside the scope of his or her powers and the decision would be void in law.[48] If these considerations are to be taken into account (and indeed they should be at some point in the overall regulatory fabric) then must be addressed under the proposed CCS Act. The CCS Act that we propose will do this in two ways. First, before an injection permit is granted the board of inquiry must be satisfied the proposed project poses no significant risk to human health, the environment, or other resources (the threshold test; see Chapter 5 at 5.3). Second, if a situation arises where there is a significant risk the Minister may issue directions to the permit holder to either compel or prohibit a certain act. Because of this framework in the proposed CCS legislation, the environment and human health and safety and other resources can be safeguarded, meaning that health and safety legislation can be used to regulate CCS activities without leaving any gaps in the legislative framework.

We believe that two further provisions in the proposed CCS legislation will be helpful in this respect. The first is a broad power to make regulations in order to give effect to the purpose of the Act. While being something of an open-ended "catch-all" provision, a general power to make regulations seems desirable in order to fill any gaps that may arise and to deal with specific issues, especially issues that concern health and safety. The second is powers for information-sharing between agencies, in order to ensure that important knowledge about CCS operations is passed to the agency that needs it, without any undue constraint. The example of recent amendments to the Crown Minerals Act 1991 should be followed, allowing the CMA regulator, the HSE regulator, and others, to provide information to each other including information about activities under permits.[49]

47 Section 61.

48 Such a decision would contravene the doctrine of *ultra vires*, the central principle of administrative law: H Wade and C Forsyth, *Administrative Law* (10th ed, Oxford University Press, Oxford, 2009) at 30.

49 Crown Minerals Act 1991 ss 90E and 90G; also ss 29A, 33A, 33B and 33D.

6.3 Application of the HSEA to CCS

The HSEA will apply to all the capture, transport, and injection phases of a CCS project. It is likely that regulations under the Act will specifically regulate the construction, operation, maintenance, and certain other aspects of CO_2 pipelines and injection operations. This situation is consistent with how the oil and gas industry is regulated. The application of the HSE (Pipeline) Regulations to the transport phase is discussed in detail in Chapter 8; the application of the HSE (Petroleum Exploration and Extraction) Regulations to the detailed regulation of injection and storage operations is discussed in Chapter 6. Difficulties in applying the Act at sea, and applying the Pipeline Regulations in particular, are discussed in Chapter 9.

6.4 Recommendations as to the HSEA

We recommend that the Health and Safety in Employment Act 1992 apply to CCS operations. Regulations under the HSEA are appropriate mechanisms for regulating the safety aspects of CCS operations. We recommend that regulations be made that will address CO_2 storage exploration and injection, and that the HSE Pipeline Regulations be amended to include CO_2 pipelines. (See Chapters 6 and 8.) We recommend that the proposed CCS Act include a general power to make regulations to give effect to the purpose of the Act, especially for health and safety reasons, and powers for the inter-agency exchange of information.

7 Ancillary Legislation Applicable to CCS Operations

There are a number of statutes that affect different phases of CCS, or any commercial activity for that matter, and that will apply because of their general application, not because of any unique characteristics that arise because of the nature of CCS. For example, legislation regarding conservation land, Māori land, foreign investment, and employment will all apply regardless of the activity. We do not discuss the legal questions that may arise under such legislation, but below we note two statutes that are directly applicable to CCS and may require policy attention to address gaps or barriers.

7.1 Hazardous Substances and New Organisms Act 1996

The Hazardous Substances and New Organisms Act 1996 (HSNOA) controls the use of hazardous substances by regulating identification, packaging, tracking, and emergency management. The Act defines hazardous substances, but also erects a complex system of classification of substances according to their character. Carbon dioxide is currently not classified as hazardous.[50] Carbon dioxide in supercritical form is not separately classified, but we understand that it is not presently in commerce in New Zealand. If CO_2 were to be classified as a hazardous substance, the result will be new administrative rules as to labelling, record-keeping and equipment, but with only minor

50 Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004. See also Environmental Protection Authority's Chemical Classification and Information Database. CO2 is identified as a non-flammable and non-toxic gas.

implications for CCS operations.[51] A further result would be that the Hazardous Substances (Disposal) Regulations 2001 would apply, stipulating methods of disposal that are incompatible with CCS.[52] We recommend that the classification of CO2 under HSNOA remain unchanged.

It is worth noting that general HSNOA requirements for the use and storage of chemicals will apply to CCS capture facilities, but there may be no need to change them for the specific case of CCS.

7.2 Building Act 2004

The Building Act 2004 routinely applies to the construction of buildings, including most structures. Thus, a capture facility or injection facility will be required to comply with the provisions in the Act. A CCS operator can apply to be exempted from obtaining a building consent,[53] although it may still have to comply with the Building Code. The Act currently excludes offshore installations used for petroleum mining, and we suggest this should be amended to include offshore installations used for CCS as well. We also recommend the Act be amended to include a CO_2 pipeline operator as a network utility operator so that (as discussed in Chapter 8) a CO_2 pipeline is not treated as a building.

8 Recommendations

Recommendations as to the RMA

1. The injection and storage of CO_2 should be authorised under a new CCS Act, while the RMA continues to apply to other aspects of CCS operations.
2. The RMA will be amended so that the injection of CO_2 for permanent sequestration will not be the discharge of a contaminant. Injection and any migration or leakage from a geological storage formation will be dealt with under the proposed CCS Act and not the RMA.
3. Incidental discharges from CCS injection activities and transport (for example occasional discharges of CO_2 to the atmosphere, or stormwater runoff from industrial facilities) will remain regulated under the RMA, and continue to be discharges to land, air or water under that Act, regulated by the regional council.
4. Section 7 will be amended to ensure that regard will be had to the benefits to be derived from the use and development of CCS.

51 For example the Hazardous Substances (Classes 6, 8, and 9 Controls) Regulations 2001 as to recording the date and time of applications would be unsuitable if they were to apply to CCS.

52 Hazardous Substances (Disposal) Regulations, regs 8, 9.

53 Building Act 2004, Schedule 1, cl 1(k).

5. Sections 70A and 104E and related provisions will be amended to ensure that CCS is not unintentionally obstructed by the policy of removing from the RMA the consideration of the discharge into air of GHGs. A second exception can be added to sections 70A and 104E to allow councils and consent authorities to have regard to the extent that the use and development of CCS enables a reduction in the discharge into air of GHGs, either in absolute terms or relative to the use and development of non-renewable energy without CCS.

6. A National Policy Statement will be made under the RMA in order to provide nation-wide guidance and policy direction for CCS activities that remain subject to the RMA. Alternatively, provisions in the proposed CCS Act can be deemed to be an NPS.

7. A National Environmental Standard should be considered to facilitate aspects of CCS operations, especially pipelines.

8. The powers of the Minister for the Environment to call in a proposal of national significance under sections 140 to 150AA of the RMA will be amended to provide that, where a person makes an application for an injection permit under the proposed CCS Act, the Minister shall exercise his or her powers to call in all RMA aspects of the proposal to be heard and decided in the same process as that for the injection permit. A board of inquiry will be empowered to decide the RMA resource consents along with the injection permit. The public participatory processes under each Act should be aligned so that submissions are processed and heard only once in relation to a single CCS proposal.

9. The RMA will be amended to extend the list of network utility operators in section 166 to a person who operates, or proposes to operate, a network for the purpose of carbon capture, the transmission of CO_2 and geological storage of CO_2. This will make a CCS company eligible to become a requiring authority with rights to designate and to acquire land and rights of way compulsorily, and will facilitate status as an accommodated activity under the Marine and Coastal Area (Takutai Moana) Act 2011.

10. The drafting of CCS legislation should draw on the accrued capability and experience with the management of comparable activities under the RMA.

Recommendations as to the CMA

11. A new CCS Act should be enacted separately from the Crown Minerals Act 1991.

Recommendation whether a new Act is required

12. A stand-alone CCS statute should be enacted.

Recommendations as to health and safety

13. The Health and Safety in Employment Act 1992 and regulations under it should apply to CCS operations.

14. The proposed CCS Act should include a general power to make regulations to give effect to the purpose of the Act, especially for health and safety reasons, and powers for the inter-agency exchange of information.

Recommendations as to ancillary legislation

15. The classification of CO_2 under the Hazardous Substances and New Organisms Act 1996 (not classified as hazardous) remain unchanged.

16. The Building Act 2004 should be amended to include offshore installations used for CCS, and to include a CO_2 pipeline operator as a network utility operator so that a CO_2 pipeline is not treated as a building.

CHAPTER 3
A NEW CCS ACT

The need for a new statute for carbon capture and storage emerged from the analysis in Chapter 2. The conclusion we came to there was that the injection of CO_2 and subsequent leakage or migration should be removed from control under the RMA and EEZ Act. Its control under the proposed CCS Act will be more specific, and more capable of providing the kind of regulation that CCS requires. The new Act should be no less protective of the environment and human health than the RMA and EEZ Act.

This Chapter addresses general preliminary questions concerning that legislation; its design, nomenclature, its purpose and principles, requirements for public participation, and what regulatory agency should administer it. The detailed requirements of the legislation are discussed in subsequent Chapters. But at first it seems desirable to provide a short general overview of the CCS legislation that we propose, and in particular its procedures

1 Overview of Regulation under a New Act

The central feature of regulation under the new CCS Act will be the grant of permits for CCS exploration and for CCS injection. Chapter 5 explains the permitting regime, and Chapter 6 explains the detailed regulation of injection and storage under an injection permit and under the associated site plan which will be an important and flexible aspect of continuing regulation of CCS after the permit is issued. Site closure and the right to relinquish an injection permit will be carefully controlled, because it will amount to acceptance of the stability of the injected CO_2 in permanent storage, with an associated transfer of liability to the public, as considered in Chapter 10. Below in this Chapter we consider options as to what agency should manage this permitting system.

The procedure for obtaining an exploration permit will not be especially complex because exploration will not involve CO_2 injection except possibly for small test injections. The application will require public engagement but not a formal hearing. It will be decided by the CCS regulatory agency. The company will apply separately to the regional council for any incidental activities such as earthworks or water takes; they will still be managed under the RMA.

The procedure for obtaining an injection permit will be more complex, and in Chapter 5 we identify the material that an applicant will have to supply in order to explain its project, the site characteristics, environmental impact assessment, health and safety, and risk management. The application will be made to the CCS regulatory agency and will be heard either by it or by a board of inquiry. (We will refer to a board of inquiry generally without pre-judging that question.) One model of a board of inquiry is that under the "call in" procedures of the RMA, which is appointed by the Minister for the particular

matter, having regard to the nature of the application and suggestions from the local authority.[1] It has 3, 4 or 5 members, and is chaired by a current, former or retired Environment Court Judge, or by a retired High Court Judge. The board is serviced by the Environmental Protection Authority. The board makes a decision on the application, subject only to appeal on a point of law to the High Court. Another model is the EEZ Act, where it is the EPA itself which hears and decides an application for a marine consent, subject similarly to appeal to the High Court on a point of law only.[2]

The board of inquiry will hold a public hearing into the application for the CCS injection permit. At the same time it will consider all applications for resource consents or marine consents under the RMA or EEZ Act for ancillary activities associated with the project. In particular it will consider an RMA designation for a CO_2 pipeline if one is applied for as part of the project. Procedural simplicity and integration will result. Amendments of both those Acts will be required to bring this about.

For CCS, we consider that a board of inquiry is suitable for several reasons apart from simplicity and integration. It provides a high quality of procedure and a high level of public participation. The appointment of a board for a particular application is a convenient arrangement for CCS where only few applications are likely but where the projects will be large. The constitution of a board can include members of local authorities, persons knowledgeable of tikanga Māori, and persons with relevant technical expertise. A board is well suited to making decisions on ancillary activities under the RMA and EEZ Act as well as injection under the CCS Act.

A board of inquiry would make a decision on an application for an injection permit, and therefore on the initiation of any CCS project. However if a board is separate from the regulatory agency (as it is under the RMA) then its role will come to an end, and the ongoing regulatory powers under the CCS Act will be exercised by the CCS regulatory agency. The ongoing control of activities under the RMA and EEZ Act will be exercised by the local authorities concerned and (in the EEZ) by the EPA.

2 The Case for a General CCS Law

Two options to a general statute for CCS should be mentioned, even if only for the sake of form. One is a special Act; project-specific legislation. The chief example is the Barrow Island Act 2003 of Western Australia, ratifying a government agreement for a large natural gas project accompanied by CCS. A special Act is tailored to the particular project, and can allow CCS to proceed without having

1 Resource Management Act 1991, ss 149J-149V.

2 The EPA can delegate a decision on a marine consent to a committee. It can delegate to a board of inquiry only on cross-boundary activities that are of national importance: Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, ss 16, 99.

to develop a general framework. However special agreements and Acts do not produce consistency and legal certainty,[3] and do not give a message to the industrial and investment community that a country and its legal system are ready to move on CCS. A special Act for CCS exploration would be unlikely. In contrast to Western Australia, there is no modern experience in New Zealand with special Acts for resource development projects.

The second option is a simple Act, or amendment of an existing Act, that authorises the Governor General in Council to make regulations for CCS. It might only be one section. This may be attractive in allowing CCS regulatory requirements to be met in a progressive and timely way, as the need arises. However, just as with special Acts, it does not send any message that the country and its legal system is ready for CCS. In addition, some of what is required for a CCS legal framework should be in a statute made by Parliament and not in a regulation made by the government. Laws affecting the rights of land owners are a clear example.

We are left with the preferred option of well-developed CCS legislation that will apply to a project, should one eventuate in New Zealand. An initial matter is the form that regulation should take. Options include self-regulation, co-regulation, or direct government regulation. The obvious difficulty with an Act that promotes extensive self-regulation is the lack of public confidence and the potential risk to the environment, public health and other resources, and reduced transparency and consistency. Self-regulation is common in codes of practice written by industry, but generally they receive statutory backing. Co-regulation combines elements of legislation with self-regulation and involves government and industry sharing responsibilities. The *Australian Regulatory Guiding Principles* offer a helpful analysis of the advantages and disadvantages of the different types of regulation on each of the different regulatory issues for CCS.[4] The general conclusion is that CCS lends itself to direct government regulation due to the increased certainty and clarity that it provides for industry, increased consistency and transparency, and the reduction in risk to the environment, health and safety. The emergence of CCS as an industry is uncertain, and especially in such circumstances self-regulation and co-regulation are unlikely to reduce cost, complexity or timeliness.

3 Title of Legislation for CCS

Carbon capture and storage, or CCS, is now the term that is in common use in technical, policy and legal circles around the world. It is a well established term. However it is plain that it is not very accurate. In Chapter 2 we saw that the intention is to dispose of CO_2 permanently, and not merely to put it into a store for future use. A more accurate word is sequestration, or (to distinguish biological storage) geosequestration, but the word has a sesquipedalian unattractiveness. Further, the legislation does not really need to provide for the capture phase; its emphasis is storage and transport.

"Carbon Dioxide Geological Sequestration" is accurate, but again it does not flow off the tongue easily. It excludes other GHGs, although that is not likely to be a serious problem; the next most

3 M Gibbs and P McCormack, "No Consistent Approach to CCS Legislation" *Blake Dawson Resources and Energy Law Update* (October 2008) at 13.

4 Ministerial Council on Mineral and Petroleum Resources, Carbon Dioxide Capture and Geological Storage Australian Regulatory Guiding Principles (2005).

common GHG is methane, and it would be put to use (it is the main component of natural gas) rather than put into storage. "Geological Sequestration Act" is precise, and provides a certain amount of latitude, but it does not make the connection with GHGs or climate change in the way that some Australian Acts do. "Greenhouse Gas Geological Sequestration Act" makes that connection, but it is a lengthy title. Internationally there is no consistent approach; examples from other jurisdictions are included in **Figure 2**.

FIGURE 2: Examples of titles to legislation from other jurisdictions

Offshore Petroleum and Greenhouse Gas Storage Act (Commonwealth, AU)

Greenhouse Gas Geological Sequestration Act (Vic)

Greenhouse Gas Storage Act (Queensland)

Carbon Capture and Storage Statutes Amendments Act (Alberta, CAN)

Directive on Geological Storage of Carbon Dioxide (EU)

Act Regulating Carbon Sequestration (State of Montana, USA)

Carbon Dioxide Reduction Act (State of Kansas, USA)

We make no recommendation on the matter, and refer in this Report to the proposed statute simply as the Carbon Capture and Storage Act or CCS Act.

4 Definitions for CCS

The International Energy Agency (IEA) *Model Regulatory Framework*[5] is a good source for the definition of key terms in New Zealand law, because it represents a substantial gathering of international best practice for CCS regulation. Other sources such as the European Union Directive are also available.[6] Exactly what is "carbon capture and storage" comes up immediately in the statement of statutory purpose, considered below. A definition of storage could state plainly that storage, including in the purpose section, is the permanent containment of CO_2 in geological formations. This goes further than the IEA *Model Regulatory Framework*, which defines storage in broad terms. These matters will need to be settled in the legislative drafting stage where the terminology of the legislation as a whole can be considered, and it seems premature to make recommendations on them at this point.

The IEA states that a storage site is "a storage complex, overburden, the surface projection of the storage complex and injection facilities".[7] In contrast, the EU Directive says a storage site is "a defined volume area within a geological formation used for the geological storage of CO_2 and associated

5 International Energy Agency, Carbon Capture and Storage Model Regulatory Framework (2010).

6 Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114.

7 International Energy Agency, *Carbon Capture and Storage Model Regulatory Framework*, above n 5, at 58.

surface and injection facilities"; the storage complex is the "storage site and surrounding geological domain which can have an effect on overall storage integrity and security; that is, secondary containment formations".[8] This Report has generally adopted the definitions used by the IEA. The CCS literature is consistent with its terminology for the behaviour of injected CO_2, and leakage refers to any CO_2 that escapes to the surface; migration refers to movement of the CO_2 plume subsurface. It should be noted that the IEA make a distinction between migration and unintended migration, the latter meaning movement of the CO_2 outside the storage complex.

A phrase which does not appear in the IEA *Model Regulatory Framework* and appears to be unique to the Australian legislation is "serious situation",[9] the existence of which triggers ministerial powers to make directions to deal with the situation. Providing a definition of what constitutes a serious situation gives a clear statement of when the Minister may intervene and could be a desirable aspect to import from the Australian legislation.

A further definitional question is the point at which a pipeline that forms part of the injection facility becomes a pipeline for the transmission of CO_2. This will be necessary because pipelines that form part of the injection facility should not be included under the regulations for transport of CO_2.

5 Statutory Purpose

It is now common for legislation to state its purpose expressly, and to state the principles which are to govern its application.[10] These provisions serve a role in communicating the purpose and direction of legislation to the public. They also help in statutory interpretation, where the courts must ascertain the general intention of the legislature in order to give proper effect to specific provisions. Most of all, they guide discretionary decision-making. Where an Act grants broad discretionary powers to decide particular cases, a statement of purpose and principles gives direction to decision-makers about the general objectives to be pursued and particular matters to be taken into account in exercising their discretion. They confine and structure the discretion. For such purpose and principles to have real effect, the legislation must make it clear that particular decisions must be taken in accordance with them. The Resource Management Act 1991 (RMA) is a leading example of an Act that declares that particular decisions (such as decisions on plans or resource consents) must be made subject to the Act's purpose and principles.

Core of a CCS Act purpose. The core of the purpose for the CCS Act should be to facilitate CCS or make it possible, and to regulate it. Just what is meant by CCS needs to be defined, as we have discussed in the preceding two sections of this Chapter. It must be permanent storage. It must be in geological formations. It must include, at least by reference, ancillary matters such as exploration, monitoring, and the transport of CO_2. (Most of the law for pipeline transport will be in the RMA and the HSEA,

8 Directive 2009/31/EC, above n 6, Article 3.

9 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 379; Greenhouse Gas Storage Act 2009 (Qld), s 363; Greenhouse Gas Sequestration Act 2008 (Vic), s 6.

10 J Burrows and R Carter, *Statute Law in New Zealand* (4th ed, LexisNexis, Wellington, 2008) at 220; R G Hammond, "Embedding Policy Statements in Statutes: A Comparative Perspective on the Genesis of a New Public Law Jurisprudence" (1982) 5 Hastings Intnl & Comp L Rev 323.

but a few aspects such as industry regulation will be in the new CCS Act.) These points can be dealt with by the careful definition of terms in an interpretation section, and do not all need to be in the purpose section itself; but exactly how it is done is more a matter for detailed legislative drafting than for decision at this point.

An important general policy question is the extent to which the purpose of the Act is to promote CCS. Different options from positive action to passive disengagement are signalled by different verbs; to ensure, to promote, to facilitate, to make possible, to render lawful. It is common for statutes to promote some direction or activity; both the RMA and the Crown Minerals Act 1991 do so. In Chapter 1 we noted that this Report concentrates on the character of a legal framework under which CCS would be possible, but the broader policy debate about a new law should range more widely. For present purposes we will say "to facilitate."

A less policy-laden point is that the fundamental reason for CCS is to reduce CO_2 emissions to the atmosphere in order to reduce greenhouse gas emissions or mitigate climate change, and that the statutory purpose should say so. An option is to go further and state connections with specific international targets, or specific government objectives with respect to climate change, but it is probably better to avoid such complexity, in favour of a general statement. The New Zealand Climate Change Response Act 2002 avoids detailed policy statements.[11]

The purpose statement should not express any preference for CCS over renewable energy, energy efficiency, or other energy measures. Nor should it express any connection with any particular source of CO_2. The legislation should not favour any particular technology, and should not lead unnecessarily to a CCS-versus-renewables debate or a debate about ending the undesirable use of fossil fuels. The legislation should identify CCS as one of a number of laws required to address climate change.[12]

It is possible to include a direct reference to sustainable development or sustainable management in the statutory purpose. We do not see a great deal of benefit in doing so. There is scope for confusion in doing so. The Victoria Act declares that in its administration regard should be given to the principles of sustainable development, and then lists ten principles.[13] It is not difficult to maintain that CCS is a form of sustainable development or management, however one characterises the concept. It is desirable to ensure that the proposed CCS Act can be administered in parallel with the RMA, so inconsistency of result should be avoided, but we do not consider that repetition or imitation of the RMA's purpose and principles is necessary to administer the two Acts together in a satisfactory way.

Examples. A clear and well expressed purpose is stated in Queensland's Greenhouse Gas Storage Act 2009, section 3:

> **Purposes of Act and their achievement**
>
> (1) The main purpose of this Act is to help reduce the impact of greenhouse gas emissions on the environment.

11 The purpose statement in section 3 of the Climate Change Response Act 2002 refers to meeting international obligations and to reducing New Zealand's net emissions below business-as-usual levels.

12 In contrast, Recital 4 of Directive 2009/31/EC makes some effort to explain the relationship between CCS and energy policy; CCS is to be a bridging technology and its use is not to detract from energy savings, renewables and other safe and sustainable low-carbon technologies.

13 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 8.

(2) The main purpose is achieved principally by facilitating the process called greenhouse gas geological storage, also called greenhouse gas storage (GHG storage).

(3) This Act facilitates GHG storage by

(a) providing for the granting of authorities (called 'GHG authorities') to explore for or use underground geological formations or structures to store carbon dioxide, or carry out related activities; and

(b) creating a regulatory system for the carrying out of activities relating to GHG authorities.

(4) Other purposes of this Act are to ensure the following for the carrying out of the activities

(a) minimisation of conflict with other land uses;

(b) constructive consultation with people affected by the activities;

(c) appropriate compensation for owners or occupiers adversely affected by the activities;

(d) responsible land and resource management.

The equivalent provision in Victoria's Greenhouse Gas Geological Sequestration Act 2008 section 1 is as follows.

> The purpose of this Act is to facilitate and regulate the injection of greenhouse gas substances into underground geological formations for the purpose of permanent storage of those gases, including to facilitate and regulate the exploration for suitable underground geological storage formations, as part of Victoria's commitment to the reduction of atmospheric greenhouse gas emissions.

The Victoria Act goes on in section 7 to state that the objectives of the Act are to encourage and promote greenhouse gas sequestration operations by encouraging and facilitating greenhouse gas sequestration operations. In comparison with Queensland, there is a clearer intention to promote CCS. There is also a clearer inclusion of regulation, permanence, exploration, and CCS as part of a suite of laws to address climate change.

The EU Directive gives another valuable example of a statement of purpose.[14]

1. This Directive establishes a legal framework for the environmentally safe geological storage of carbon dioxide (CO_2) to contribute to the fight against climate change.
2. The purpose of environmentally safe geological storage of CO_2 is permanent containment of CO_2 in such a way as to prevent and, where this is not possible, eliminate as far as possible negative effects and any risk to the environment and human health.

The main statement is neutral rather than promoting, but the statement of the need to fight against climate change certainly takes a position. The element that does not appear in the Australian examples is the prevention or reduction of risk to the environment and human health. ("Eliminate as far as possible" is an awkward phrase.)

Human health, environment, coverage. The objective of avoiding significant effects on human health and safety and on the environment is an essential part of the scheme of the proposed CCS Act. It seems to be important and general enough to have a place in the statement of the Act's purpose. (A possible alternative is to state it separately from the purpose, presumably in principles, and with words that do not allow it to be downplayed.) The matter can be stated in a simple way in terms of protection of the environment and human health and safety. It does not seem necessary to say that the protection is not absolute protection. There is no reason why the word should be read that way. (Certainly the legislation could put the point beyond doubt, in a definition or a clarifying subsection.)

14 Directive 2009/31/EC, above n 6, Article 1.

Alternatively, the matter can be phrased as one of the prevention or elimination as far as possible of risk, as in the EU Directive, or of avoiding and minimising risk, or of avoiding and minimising adverse effects. However there does not seem to be any special advantage in those formulations.

How such protection should relate to facilitation of CCS is another question. It brings out the fact that CCS legislation is both facilitating activity within a particular industrial sector and providing environmental regulation that is no less strong in respect of the particular matters that it controls than would occur under the RMA and related Acts. The purpose of the RMA has prompted a great deal of debate about how such components are to be understood to fit together. Here we avoid using the word "while" which in the RMA's purpose is much argued, and follow the EU Directive with the words "in such a way."

We readily acknowledge that a great number of different variations are possible in the drafting of the purpose of the CCS Act, and there may well exist effective alternatives to what we recommend. Although the task is challenging, we believe that it is important. In Chapter 5 we propose that the matters discussed here form part of key decisions such as the threshold test for the granting of an injection permit. However we also consider that it is important that an over-arching expression of statutory purpose guide the making of the many other decisions required under the Act, such as decisions on exploration, site plan approval, site closure, directions, and cancellation.

Recommendation. We recommend that the purpose of the Act be to facilitate and to regulate the permanent geological sequestration of CO_2, as part of efforts to reduce the emission into the air of greenhouse gases, in such a way as to protect the environment and human health and safety.

6 Principles for CCS

A statement of principles is desirable in support of a statutory purpose in the proposed CCS Act. Principles can ensure that particular values are advanced without complicating a statement of overall purpose. Again, the RMA is an example, where sections 6, 7 and 8 state matters of national significance that decision makers shall recognise and provide for, and other matters that they shall have regard to or take into account. It is important that the relationship between the purpose and principles be carefully stated, and that the obligation to give effect to the principles is also clearly stated both generally and in relation to various specific decisions.

The World Resources Institute identifies a useful set of principles to guide CCS development:

(i) Protection of human health and safety;
(ii) Protection of ecosystems;
(iii) Protection of underground sources of drinking water and other natural resources;
(iv) Ensuring market confidence in emission reductions through regulatory clarity and proper GHG accounting; and
(v) Facilitating cost-effective timely deployment.[15]

15 World Resources Institute, CCS Guidelines: Guidelines for Carbon Capture, Transport, and Storage (2008) at 3.

As we explained above, we take the view that the first two of these principles are sufficiently important to be included as part of the purpose of the Act. (We will not explore the difference between environment and ecosystems.) If that is done, then there is no need for these values to be restated as principles. Item (iii) on the list is perhaps two separate items, both of them deserving treatment separately from the environment or ecosystems generally. The first is well expressed in a focus on sources of drinking water rather than groundwater or potable groundwater more generally. It allows for consideration of the extent to which particular ground water resources are actually needed, taking into account (for example) the depth of the resource and the abundance of surface water. The second, other natural resources, divides down further into surface resources and subsurface resources. The former has only a moderate claim to be recognised separately. The latter is more important, where CCS injection operations and oil and gas or other mineral operations could affect each other. In Chapter 7 we propose that principles be stated to deal with such possible conflict. Those specific principles could usefully be accompanied by a principle that is generally stated.

The fourth item on the WRI list can be argued not to belong because in New Zealand GHG accounting is under the Climate Change Response Act 2002, but the counter-argument is that clarity and proper accounting will depend on the CCS regime providing clear measurement monitoring and verification data to enable the accurate assessment of liability under the emissions trading scheme. We recommend that it be adopted on the basis of a matter to which there should be particular regard.

The fifth item, facilitating cost-effective timely deployment, can be advanced as ensuring that the administration of the proposed CCS Act facilitates and presents no obstacles to CCS. The importance of timely deployment has been urged by the IEA, among others, as we have noted. However goes beyond allowing CCS and into the promotion of CCS, so we make no recommendation it.

From this, the principles that we believe should be stated in the new legislation are for the protection of underground sources of drinking water, the management of conflict with other subsurface resources, and the protection of market confidence in emissions reductions. Other principles relevant to the design of the legislation, rather than principles applying to decisions for CCS management, are discussed in Chapter 6 on the detailed regulation of injection and storage. They include flexibility, transparency, and requirements for public participation and the protection of existing uses.

6.1 Treaty of Waitangi

The Treaty of Waitangi is New Zealand's founding document and deserves explicit provision in CCS legislation. Treaty clauses are now common in legislation dealing with natural resources. Section 8 of the RMA is an illustration:

> In achieving the purpose of this Act, all persons exercising functions and powers under it … shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

The Crown Minerals Act section 4 is very similar:

> All persons exercising functions and powers under this Act shall have regard to the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

There is a strong case for the inclusion of a Treaty clause as a section in the CCS Act, and we so recommend, although it needs to be complemented with specific provisions to accommodate Māori dimensions of resource management.

6.2 Uncertainty, risk and precaution

Much of the technology of CCS is well understood, and the risks that it presents are well understood and manageable. CCS deals with physical systems rather than biological systems or social systems which are often more complex. (Refer to Chapter 1.) However, there is always a level of technical uncertainty, especially in dealing with geological formations that may be hidden from view thousands of metres below the surface. The behaviour of a substance injected there can be modelled and predicted with some sophistication, but it may be affected by characteristics that are not readily discernible. In addition, public reactions to CCS, and public concerns with it, are likely to be different from those of people in the technical community who are well-informed about the issues and overseas experience with CCS and related operations.

Public concern about CCS will be couched in terms of risk to people and to the environment. The CCS legal framework should assist decision makers with matters of risk and uncertainty, and one way to do so is to include statutory principles in the legislation. One candidate is what is known as the precautionary principle. Our examination of the issues leads to the conclusion that the precautionary principle provides some useful perspectives but is not in itself the solution for New Zealand CCS legislation.

Precaution. The precautionary principle emerged in European law and is now found in international law and the domestic legislation of a number of countries.[16] It gained recognition in the 1992 United Nations Rio Declaration on Environment and Development, which says:[17]

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

This version of the principle conveys the core perception that decisions should be taken to prevent serious harm even where there is no definite proof that the harm will occur. The harm can be harm to the environment or to human health and safety. The principle takes a number of different forms. Strong versions emphasise that the burden of proof that an activity or a product is safe lies on the proponent. They may require that a margin of safety be built into all decisions, beyond what has actually been proved to be necessary. They may insist on caution without any balancing of costs and benefits. Weak versions are less restrictive and may not insist that preventive measures be taken in the face of uncertainty, only that they be available, or they may allow economic considerations to be taken into account.[18] A precautionary "approach" is sometimes distinguished from the "principle," and is generally thought to be less restrictive, certainly less restrictive than a strong version of the principle. An approach may have less immediate legal consequences than a principle of law, which may be understood to be very directive. Even though they provide valuable insights, neither the precautionary principle nor the approach has an exact meaning; there is a continuum of understandings.[19]

16 T O'Riordan and J Cameron, *Reinterpreting the Precautionary Principle* (Cameron May, London, 2001).

17 United Nations Rio Declaration on Environment and Development, UN Doc. A/CONF.151/26 (vol. I); 31 ILM 874 (1992), Principle 15.

18 L Cameron, Environmental Risk Management in New Zealand – Is There Scope to Apply a More Generic Framework? (New Zealand Treasury Policy Perspectives Paper 06/06, 2006).

19 C Sunstein, *Laws of Fear: Beyond the Precautionary Principle* (Cambridge University Press, Cambridge, 2005) at 19.

Much of the conceptual confusion disappears if we keep in mind that all countries have elaborate regulatory systems to manage risk to human health and safety and the environment, and that if the precautionary principle has a role it is within such systems. The European Union has declared that all Union policy on the environment shall be based on the precautionary principle,[20] and while the United States has not done the same, like many other countries, it has very elaborate systems in place to manage risk.[21] We believe that the overall regulatory framework provides important context for consideration of the matter, both in New Zealand generally and in CCS legislation in particular.

New Zealand has made no general declaration to adopt the precautionary principle. The RMA does not refer to it expressly, but *Shirley Primary School v Christchurch City Council* held that the precautionary approach was inherent in the RMA, and that to apply the principle separately would lead to double-counting of the need for caution.[22] Other Acts contain provisions that are more directly applications of the precautionary principle. The Hazardous Substances and New Organisms Act 1996 requires the precautionary "approach" to be followed:[23]

> **7 Precautionary approach**
>
> All persons exercising functions, powers, and duties under this Act, including but not limited to, functions, powers, and duties under sections 29, 32, 38, 45, and 48 of this Act, shall take into account the need for caution in managing adverse effects where there is scientific and technical uncertainty about those effects.

Bleakley v Environmental Risk Management Authority held that little assistance was to be had from the somewhat uncertain international concept of the precautionary principle when Parliament had deliberately avoided it, so the section had to be construed in its own light.[24] The Court held that the uncertainty had to be scientific and technical, not ethical or social. Managing adverse effects could include measures to contain the escape of an organism and was not confined to prohibiting the activity. The Fisheries Act 1996 includes "information principles" in section 10 which direct decision makers among other things to use the best possible information and to be cautious when information is uncertain, unreliable or inadequate. The Fisheries Act information principles have been adapted for the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012.

Precaution in the Proposed CCS Act. We have noted above that the conceptual difficulties of the precautionary principle and approach are fewer if we keep in mind the regulatory framework for the management of risk to human health and safety and to the environment.[25] New Zealand legislation will be construed on its own terms, not in isolation from currents of thinking internationally, but with primary reference to the words used in the Act, especially where an underlying concept such as the precautionary principle is so inexact in its meaning.

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20 Treaty on the Functioning of the European Union OJ C 326/132, 26.10.2012, Article 191.

21 Sunstein, above n 19.

22 *Shirley Primary School v Christchurch City Council* [1999] NZRMA 66 (EnvC) at 134-135; also *Environmental Defence Society v NZ King Salmon Co* [2013] NZHC 1992, 8 Aug 2013, at [72]. Generally see A Gillespie, "Precautionary New Zealand" (2011) 24 NZULR 364.

23 Hazardous Substances and New Organisms Act 1996, s 7. In its present form the section is different only in the references to other sections.

24 *Bleakley v Environmental Risk Management Authority* [2001] 3 NZLR 213 at 250-51 per McGechan J.

25 Cameron, above n 18.

The CCS Act that we propose will require a CCS proponent to obtain a permit in order to explore for CCS storage formations or to inject and store CO_2. Pipelines will be controlled under the RMA and the Health and Safety in Employment Act 1992. The applicant company will have to make out its case for a permit, submitting its plans and its assessment of risk to the scrutiny of a regulator and (in applying for an injection permit) to the scrutiny of the public. Subsequent regulation, including monitoring, inspections, directions, and the possibility of cancellation, will all be aimed at reducing risk. In Chapter 5, we propose that the CCS regulator shall not approve an injection permit unless it is satisfied that the CCS project applied for will not present significant risk of leakage from permanent storage, risk to health and safety, or risk to the environment.

This proposal embodies much of what is contemplated by many versions of the precautionary principle; a burden of proof on the proponent of the activity to prove safety, and a standard of proof that requires caution. CCS development cannot proceed in the absence of firm evidence that it will do no harm. Firm evidence is not conclusive or absolute evidence, but the precautionary principle has never seriously been advanced on that basis. Thus, while it is an option, we do not see a case for including a section in the CCS Act like the one in the Hazardous Substances and New Organisms Act 1996 requiring the precautionary principle or approach to be applied.

Information principles are another option, such as in the Fisheries Act 1996 or the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act). They embody some of the ideas associated with the precautionary principle in an effort to guide decision makers. Those in the EEZ Act are in section 61:

> **Information principles**
>
> (1) When considering an application for a marine consent, the Environmental Protection Authority must—
>
> (a) make full use of its powers to request information from the applicant, obtain advice, and commission a review or a report; and
>
> (b) base decisions on the best available information; and
>
> (c) take into account any uncertainty or inadequacy in the information available.
>
> (2) If, in relation to making a decision under this Act, the information available is uncertain or inadequate, the EPA must favour caution and environmental protection.
>
> (3) If favouring caution and environmental protection means that an activity is likely to be refused, the EPA must first consider whether taking an adaptive management approach would allow the activity to be undertaken.
>
> (4) Subsection (3) does not limit section 63 or 64.
>
> (5) In this section, **best available information** means the best information that, in the particular circumstances, is available without unreasonable cost, effort, or time.

A statement of principles like this could help decision makers to address questions of uncertainty, risk, and imperfect information, and would complement more specific statutory criteria that govern particular decisions. However it can be argued that subsections (1) and (2) make requirements that should characterise all regulatory decision making. As for (3), we doubt that adaptive management is suitable for CCS projects, which need to be thoroughly analysed in advance and for which the only really available adaptation would be closure, a possibility which is provided for in any event. It should also be noticed that the EEZ Act context of this statement of principles is one where there is no hurdle or threshold to cross to acquire a marine consent. What we propose for the CCS Act is a clear threshold test imposing a distinct burden of proof.

Some of the experience with the equivalent section 10 of the Fisheries Act suggests a need for caution before inserting a like section in the proposed CCS Act. It has been held that section 10(a) reinforces the possibility that a decision can be set aside on the grounds of a mistake of fact, even if the Minister is seeking to act cautiously;[26] and it has been applied to strike down a decision for using the wrong information even though it was taking a precautionary approach to environmental protection.[27] This is unsatisfactory if it makes it easier to launch judicial review proceedings for what is little more than a dispute about the facts. More positively, the section has been held to mean that fisheries management and protection decisions cannot be postponed even if the information available about a fish stock is poor; the Minister could not overlook information that could be gathered without unreasonable cost even though it would still be incomplete information.[28] Equally positive is the decision that the section does not oblige the Minister to obtain the best possible information (in contrast with best available information), and the emphasis that to achieve the purposes of the Act the Minister may need to act on uncertain information.[29] But the section has become used more for information management than for actual precaution.[30] This makes it a less useful precedent for CCS.

We therefore consider that a statement of information principles in the proposed CCS Act could allow undue re-litigation of questions of fact, without actually adding to the precaution for health and the environment that is provided by the Act as a whole. We observe that if a general direction about precaution is included, it should apply to all decisions made under the Act, and not only to decisions to grant an injection permit. (The Fisheries Act and the EEZ Act offer a contrast in this respect.) Decisions on site plans, directions, and cancellations, for example, should all be included.

6.3 Recommendations as to principles

We recommend that the proposed CCS Act include an obligation for all decision makers under it to have particular regard to:

(i) the protection of underground sources of drinking water;

(ii) the management of conflict between CCS and other uses of subsurface resources; and

(iii) the protection of market confidence in emission reductions through regulatory clarity and proper GHG accounting.

We recommend that decision makers be obliged to have regard to, or to take into account, the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

26 *Northern Inshore Fisheries Co Ltd v Minister of Fisheries*, HC Wellington CP235/01, 4 March 2002 at [50], [74].

27 *Squid Fishery Management Co Ltd v Minister of Fisheries*, CA39/04, 13 July 2004 at [75]-[80], [103]. The Minister was entitled to take a precautionary approach to the balancing of utilisation of a fishery with harm to sealions, but the decision could be attacked under section 10 for failing to use the best available evidence.

28 *Antons Trawling Co Ltd v Minister of Fisheries*, HC Wellington CIV-2007-485-2199, 22 February 2008.

29 *NZ Federation of Commercial Fishermen Inc v Minister of Fisheries*, HC Wellington CIV-2008-485-2016, 23 February 2010 at [34]-[41].

30 C Iorns Magallanes "The Precautionary Principle in the New Zealand Fisheries Act: Challenges in the New Zealand Court of Appeal" (2005), Australasian Law Teachers Association, 2006, available <www.ssrn.com SSRN-id2079837>; D Modeste, "The Precautionary Principle and the Fisheries Act" [2011] NZLJ 179, who offers an interesting re-draft to provide for real precaution.

We recommend that the relationship between these principles and the purpose of the Act be stated clearly to ensure that the principles support the purpose but are not capable of being read down or dismissed by giving undue priority to the purpose.

7 Public Participation

At this point it is desirable to give careful consideration to the public participation that should be provided for in CCS legislation. Public participation is a very general characteristic of environmental and natural resources law in any modern legal system.[31] Where legislation requires a company to apply to a regulatory agency for permits for a project that affects the environment or natural resources, it is common for the legislation to require the agency to receive and take account of submissions from the public.[32] The RMA follows this pattern by allowing substantial public participation. At the strategic level, individuals and companies can make submissions on proposals, and address decision makers at a formal hearing. They can appeal to the Environment Court on the merits and then to the High Court on a point of law. In resource consent application procedures for a particular project, there are similar rights. There are restrictions, such as where an application proceeds on a non-notified basis, or where a called-in application has one hearing rather than a local body hearing followed by appeal to the Environment Court. In comparison, the EEZ Act requires, as part of an application for a marine consent, an impact assessment to be completed that identifies those affected and describes the consultation undertaken and specifies those who have given consent. In other environmental legislation, such as the Hazardous Substances and New Organisms Act 1996, there is provision for public participation in many decisions. However other environmental legislation, such as the Climate Change Response Act 2002, provides for relatively little. Under the Crown Minerals Act, there is limited public participation in the making of minerals programmes which operate at the strategic level, but very little (only consultation with Māori) at the level of the granting of exploration and mining permits. In many other fields of activity, such as health, education, safety, and local government, some decisions, but not all, are made through processes that provide specifically for public participation.

Public participation is often contentious. It is often blamed for delays, complexity, and expense. However, it has a strong basis in human rights and political rights, and also in environmental law. The Rio Declaration of 1992 is an example. Another is the Aarhus Convention of 1998[33] (although New Zealand is not a party). Two broad rationales for public participation are generally understood.[34] One is that participation is an expression of democracy and citizenship, just as important as the right to vote or the right to a fair trial. Participation is a basic civil right. Public participation is connected to the concepts of corporate social responsibility and social licence to operate. The second rationale is that better results will generally be produced by an agency if its process has been open to genuine public participation.

31 E Toomey, "Public Participation in Resource Management: the New Zealand Experience" (2012) 16 NZJEL 117.

32 D Zillman, A Lucas and G Pring, (eds), *Human Rights in Natural Resources Development* (Oxford University Press, Oxford, 2002).

33 United Nations Economic Commission for Europe Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, (adopted 25 June 1998 at Aarhus, Denmark), (1999) 38 ILM 517.

34 B Barton, "Underlying Concepts and Theoretical Issues in Public Participation in Resources Development" in Zilman, Lucas and Pring, above n 32, at 99.

7.1 The range of forms of public participation

Public participation extends across a broad range of possibilities.[35] At the most complete end, participation may amount to a right to control or veto an activity. Other forms, more relevant in this context, are legally-protected rights to have notice, a right to take part, and a right to have the decision-maker take account of what you say. Less elaborate forms can still be important, in particular a right to be consulted before some action is taken, or a right to "notice and comment" before a regulation is made. One general model of public participation proposes three elements or pillars; access to environmental information, participation in the decision-making procedure, and access to justice.[36] From a policy point of view, the whole range should be considered in deciding on what participation is suitable.

This thinking about public participation generally has been applied to CCS. The World Resources Institute identifies three levels of community engagement. The first is that of informing the public and improving community understanding of the project; a one-way provision of information by the project developer, such as in hosting information evenings and open days. The second level is consultation, a two-way exchange allowing the community's input to be incorporated into the decision before it is made. The third level is negotiation, where there is two-way communication and joint decision making on issues that affect the community.[37] For the purposes of this Report, we shall refer to this first level as community or public engagement. The second level, more congruous with public participation under the RMA, we shall refer to as public consultation.

International analysis points clearly to the need for CCS operations to obtain the social acceptance of their communities; their social licence to operate. The level of public engagement can have a significant impact on the success of the acceptance of the CCS project and its viability. Because of the time-frames involved in CCS, it is thought to be important to move away from the usual one-off comment periods and hearings towards a continual but varying level of public engagement. Forbes et al say:[38]

> Especially for CCS, early engagement should be followed by continual public participation throughout the project life-cycle and extending into the final phase of long-term stewardship, although at appropriately varying levels of effort.

The IEA also considers that consultation should be as early as possible, when there is still some flexibility in the project development process.[39] The World Resources Institute believes that processes for multi-stakeholder engagement should be established as part of the regulatory framework.[40] The IEA agrees and says "[r]egulatory approaches should include methods for public engagement and promote public participation in the decision-making process" and that "[e]ffective dispute resolution mechanisms are also needed to ensure that conflicts of interest can be resolved."[41] In Australia, the

35 S. R. Arnstein, 'A Ladder of Citizen Participation' (1969) 35 J. Amer. Inst. Planners 217.

36 J Ebbesson, 'The Notion of Public Participation in International Environmental Law' (1997) 8 Ybk Int. Env. L. 51 at 53.

37 World Resources Institute, CCS and Community Engagement: Guidelines for Community Engagement in Carbon Dioxide Capture, Transport, and Storage Projects (November 2010) at 65.

38 S Forbes, F Almendra, M Ziegler, and R Greenspan Bell, "Regulatory Requirements for Public Engagement around Carbon Dioxide Capture and Storage Demonstrations" in I Havercroft, R Macrory and R Stewart, *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Hart, Oxford, 2011) at 268.

39 International Energy Agency, *Model Regulatory Framework* above n 7, at 48.

40 World Resources International, *CCS and Community Engagement* above n 37, at 68.

41 International Energy Agency, *Model Regulatory Framework* above n 7, at 48.

Victoria legislation places the obligation on the holder of an authority (i.e. a CCS permit) to consult with the community and relevant municipal councils by sharing information and to give them an opportunity to express their views about the activities that may affect them.[42] As part of an application for an authority, the applicant must submit a community consultation plan with general information about the types of activities the applicant intends to carry out, information about how any potential adverse impacts will be managed, and details of procedures to be followed to permit the activities. The plan must advise the community and municipal council that they may seek legal advice on the proposed activities, and must set out the contact details for the Department and the applicant. The consultation plan needs approval by the Minister and may only be submitted after the applicant has consulted with the community and municipal council in relation to the content of the proposed plan. A copy of the plan is to be provided to members of the community and each municipal council who may be affected by the activities proposed. There is no formal hearing. The Queensland legislation provides no public consultation in regards to granting a permit, but consultation is required with a land owner or occupier regarding access over the land on which activities are to be carried out.[43]

7.2 Early and continuing engagement

One key characteristic of good public participation therefore appears to be early engagement by the proponent company with the community. An option is for the CCS legislation to require the proponent to produce a Public Participation Proposal as part of its exploration permit application process. The proposal would assess the local community context and identify the level of participation appropriate at each phase of the project, and say how this will be achieved. The proposal would identify how information will be exchanged about the project and its risks and benefits. The World Resources Institute's guidelines for community engagement for CCS projects are a useful resource and can inform the content of such proposals.[44]

Another desirable option is for the legislation to require the proponent / operator to maintain a continuing programme of public engagement that would run through the exploration phase and any following injection phase and site closure. The programme would include education, information sharing, and, for key steps, consultation.

7.3 Nature of public participation in the form of consultation

Formal public consultation under the CCS legislation, such as in the consideration of an application for an injection permit, should include notification, submissions, a hearing, an obligation that decision-makers take into account submissions and what was said at the hearing, and a reasoned decision. The obvious models are the RMA, the CMA, and the EEZ Act.

42 Greenhouse Gas Geological Sequestration Act 2008 (Vic), ss 152-156.

43 Greenhouse Gas Storage Act 2009 (Qld), s 166.

44 World Resources Institute, *CCS and Community Engagement* above n 37.

The CCS legislation should provide for this public consultation to be arranged by the central government. It is a part of the overall scheme for the management of CCS. The option of local and regional government (as under the RMA) is considered in Chapter 2, but is likely to present difficulties. CCS operations have some similarities with Crown minerals management, climate change policy and energy policy, all of which are dominated by central government rather than local government decision-making.

The CCS legislation should provide for this public participation on an injection permit to include consultation and hearings on all associated RMA resource consents and designation applications, and associated EEZ marine consents, such as for land use, air and water discharges, and water takes. The principle of integrated resource management should apply. This can be achieved through use of the "call-in" powers in the RMA.

The main option for legal provisions for CCS hearings and decisions is to follow the models of the "call-in" provisions of the RMA and the hearings provisions of the EEZ Act. A panel of persons with suitable background and experience would be appointed for each application. The appointment of a panel for each separate application seems to be right given that there will be few CCS injection applications to be processed in the foreseeable future. An option is for the panel to be chaired by a sitting or retired Environment Court judge; such an arrangement ensures a high level of reassurance that the procedure will be fair and effective. Equally, panel members can be selected for technical capability so that there can be a high level of confidence in the decision-making. With such arrangements, the option exists for the right of appeal to be confined to an appeal to the High Court on a point of law only. Again that option would parallel the "call-in" provisions of the RMA and the hearings provisions of the EEZ Act.

7.4 Point of engagement for public consultation

The main options for the timing of formal public consultation appear to be as follows.

In an application for an exploration permit. A strength of this option is that the public are formally engaged at the earliest practicable point. Another strength is that it provides certainty to a CCS proponent, which will not yet have sunk significant amounts of money into the project, but then knows that it faces no other hearings process. However a significant weakness is that at this early stage the applicant for exploration rights will have only the most general of information available to it about the geological formations that it might encounter. It will be in no position to state and justify the engineering design of an injection project that may not be built for years, if at all, somewhere in a large exploration permit area. It will be reluctant to pay for that work prematurely. Equally, affected parties will face difficulties in being called on to make submissions on an incomplete proposal; they would be chasing a mirage. The position of decision makers and their advisers will be equally difficult.

It is possible for the legislation to state that the application process, including public participation, is to consider exploration only, and must not consider injection; but affected parties are likely to find that restriction unsatisfactory. It must also be asked whether exploration activity on its own poses environmental and health risks of a magnitude that a hearing is required. Much exploration work is likely to be transient and unintrusive. The most substantial and intrusive exploration activity is likely to be the drilling of an exploratory well; but that would probably use known oilfield techniques,

and pose environmental and safety risks that are reasonably manageable. The operator would have to comply with the RMA as to noise, pollution and water takes. In addition, an early-stage CCS public participation programme of education, information sharing and consultation would result in engagement with the public even if not in a formal hearing.

In an application for an injection permit. At this stage, an application will be informed by a considerable body of analytical work. The applicant will have carried out engineering design work and related environmental analysis. It will therefore have a specific injection project to take to the public, even final design work remains to be completed. It will therefore be able to explain and justify the project. Many of the expenses of preparing for public hearings will have been undertaken in any event as part of the design and environmental studies for the project. From the point of view of affected parties, they will be able to take part in an evaluation of specific effects of the project upon them, and to make submissions in response.

In both an application for an exploration permit and an application for an injection permit. This option recognises the differences between exploration and injection, and allows both applicants and the affected public to address the issues at each of the two main phases in the CCS development process. It provides the affected public some assurance at the exploration phase that it will have another opportunity to participate properly with respect to an injection project. However this option involves two sets of hearings processes, which will involve additional delay and expense. In addition this option raises the questions, considered under the first option above, whether a formal hearing process is really needed for CCS exploration. Ordinary RMA environmental management would control many of the exploration activities, and a further formal public participation process many not be necessary. Less formal CCS public engagement would however be desirable.

Evaluating the strengths and weaknesses of these three options, we are of the view that there should be formal public participation, in the form of a hearing, at the stage of the consideration of an application for an injection permit. The case for such formal public participation at the exploration stage is much less strong.

In an application for site closure. Another option, complementary to the above options, is that there be a formal process for public participation in the application for the closure of a CCS site and the concomitant transfer of liability to the responsible authority. This process has no direct analogy in the RMA or CMA, but it is an important step in the management of a CCS operation. A case can therefore be made for the public to have a say in this regulatory decision. It could be by way of a formal hearing, or it could be by way of a notice and comment procedure. At a minimum some form of community engagement is desirable.

7.5 Co-ordination with the RMA

Two issues concerning the RMA are relevant here. The first is that the RMA in effect provides a benchmark of expectations about public participation. Virtually any application for a major natural resources project in New Zealand involves substantial public participation under the RMA. Projects offshore involve similar participation under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012. Public participation under the RMA, and the EEZ Act, is not

unlimited, but it is the norm for a large natural resources project.[45] Participation rights under the RMA reflect a social consensus that goes back long before 1991. At the same time those participation rights set an expectation. If CCS legislation departs from this expectation, it is likely that significant policy and political difficulties would be encountered. In our view, in the light of international thinking about the desirability of public participation in CCS regulation, there is a strong case for arranging CCS participation rights in the light of the RMA pattern. The RMA should not be followed exactly, but its pattern should adapted to the different situation, in a way that makes participation rights in relation to CCS just as good as those under the RMA.

The second point about the RMA is that that the CCS legislation needs to be properly co-ordinated with RMA procedures as to public participation. The relationship between the two Acts was considered in detail in Chapter 2 of this Report. While different options were canvassed, it appeared that the best allocation of functions under the two Acts is for the RMA to continue to apply to all aspects of CCS activities, except for the injection of CO_2, which would be regulated under the CCS Act. If this option is adopted, then all RMA applications for resource consents and designations should be brought together with the CCS application, in a procedure like a call-in, so that all aspects of the project are heard and decided at once. There will be a hearings process, but only one hearings process.

7.6 Engagement with Māori

An important part of environmental decision making is the involvement of Māori as tangata whenua. Recognition of Māori interests in lands and resources, and especially ancestral lands, waahi tapu, kaitiakitanga, and Māori land, is an essential part of any engagement with Māori. So too are recognition of tikanga, and recognition of the principles of the Treaty of Waitangi.[46] We consider that CCS legislation should have provisions to ensure such engagement.

One point of reference in existing law is the RMA. Its procedural provisions require that Māori be consulted on certain plan-making matters, but not on applications for resource consents or designations,[47] hearings shall recognise tikanga Māori, and when appointing board of inquiry members the Minister is to consider the need to appoint members with knowledge, skill, and experience relating to tikanga Māori. The RMA guides substantive decision making by requiring a decision maker to recognise and provide for the relationship of Māori with their ancestral lands, to have particular regard to kaitiakitanga, and to take into account the principles of the Treaty of Waitangi.[48]

45 The right of the public under the RMA to participate by making submissions, appearing at a hearing, and having a right to appeal are governed by the decision to notify an application for a resource consent: ss 77D, 95A-95F. Whether an application is to be notified or processed on a non-notified basis depends on several factors. The local authority as consent authority has the discretion to decide. But the matter may be governed by a rule in the district plan or regional plan or by a national environmental standard. If not, it must be notified if the activity will have or is likely to have adverse effects on the environment that are more than minor. It may be notified if special circumstances exist. In contrast, under the Crown Minerals Act 1991, an application for a permit does not require public participation; but a CMA permit does not exempt its holder from compliance with RMA obligations to obtain resource consents.

46 See Toki, Appendix E, for a full discussion.

47 Under the RMA Māori are to be consulted on changes of regional policy statements, regional plans, and district plans: Schedule 1, cl 3. But pursuant to section 36A neither the applicant for a resource consent nor the consent authority is obliged to consult any person.

48 Resource Management Act 1991, ss 6(e), 7(a), and 8.

A different approach in existing law is that of the CMA. The obligation to have regard to the principles of the Treaty is very similar to that in the RMA, but from there, the methods of consultation that are required are stated differently. Consultation must occur at three levels. The first is the preparation of the minerals programme; second, the preparation of petroleum exploration permit block offers; and third, in respect of applications for petroleum permits not made in accordance with a block offer and applications for the extension of area of permits.[49] These obligations for consultation remain following recent amendments to the CMA. The key difference between the RMA and CMA is consultation regarding consent applications.

A third example in existing law is the EEZ Act, where there is no Treaty clause in the conventional sense, but a recording of provisions in the Act that recognise the Crown's responsibility to give effect to the principles of the Treaty. These provisions include a Māori Advisory Committee to advise the Environmental Protection Authority (EPA), requiring the Minister to establish and use a process that gives iwi adequate time and opportunity to comment on the subject matter of proposed regulations, and requiring the EPA to notify iwi authorities, customary marine title groups, and protected customary rights groups directly of consent applications that may affect them.

We recommend that CCS legislation include provisions to recognise Māori interests. Choices can be made from the precedents given by the legislation discussed above, or entirely new arrangements can be made. Making use of the RMA model or its EEZ equivalent will make it easier to maintain a co-ordinated approach, although the two models are themselves quite different.

Options to guide substantive decision-making include:

(i) a Treaty clause, and
(ii) obligations to have regard to ancestral lands, waahi tapu, kaitiakitanga, and Māori land.

Procedural options include:

(i) an obligation to consult before making particular decisions (eg to grant an exploration permit or injection permit) imposed on the applicant or the decision-maker
(ii) special advisory panels, composition of boards of inquiry etc.
(iii) recognition of tikanga Māori in proceedings.

A final note should be made to recognise the fact that provisions of this kind in the CCS legislation do not prevent an iwi or hapu from making a claim to the Waitangi Tribunal that the CCS legislation or an action under it is inconsistent with the principles of the Treaty of Waitangi. Such a claim can be lodged in any event under the Treaty of Waitangi Act 1975. However the presence in the legislation of provisions making suitable recognition of Treaty interests would be a factor that would be taken into account in Waitangi Tribunal proceedings.

49 These provisions were analysed recently in *Greenpeace v Minister of Energy* [2012] NZHC 1422.

7.7 Conclusions as to Public Participation

Community engagement should be initiated at an early stage and continue throughout the life of the project, from the exploration phase and including site closure. At the stage of an application for an injection permit, participation should take the form of a formal public hearing. All applications for related RMA consents and designations should be brought together with the CCS application, so that they are all heard and decided at once. Special provision should be made for Māori participation.

8 A Regulatory Authority

A significant policy choice is the agency or department to be responsible for regulating CCS, which will likely include receiving permit applications, granting exploration permits and site closure authorisations (applications for injection permits will be decided by a board of inquiry[50]), inspecting storage sites, verifying data, and administering the CCS register. There are several dimensions to the matter, which we believe deserve close attention, even though we do not make a final recommendation on which entity should administer CCS law.

Preliminary points. A number of points bear on the matter, which are founded in the international experience and around which there is likely to be a reasonable consensus.

- It is desirable to maintain a distinction between the functions of

  (i) promotion, advocacy, education, and leadership on CCS and

  (ii) regulation and control of CCS.

  Otherwise confusion of roles may result. After the Deepwater Horizon disaster, the United States Bureau of the Interior separated the Bureau of Ocean Energy Management (promotion and royalties) and the Bureau of Safety and Environmental Enforcement. If permitting is an aspect of (ii), regulation and control, then it may be necessary to identify another agency to act as advocate for CCS. Without such a "champion" there may not be enough focus and effort in bringing CCS about.

  It has been argued that the decision whether to accept a CCS site for long-term stewardship should also be kept separate from general regulation and control.[51] However this adds complexity in a small country like New Zealand, and even as a matter of principle it may be better for the one agency to carry responsibility for all aspects of the activity. An alternative is to have the application for a site closure authorisation subjected to external audit or certification by an independent person.

- CCS should be regulated by central government rather than by regional and district councils. The nature of the activity, the novelty of the activity, and the infrequency but magnitude of applications all suggest that an agency of the central government should be responsible. It should be noted, however, that this point does not preclude use of the Resource Management Act 1991; arrangements can be made for RMA decisions to be made centrally.

50 See Chapter 5 at 5.2.3.

51 M Granger Morgan and S McCoy and others, *Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers* (RFF Press, New York, 2012) at 128.

- The low foreseeable frequency of applications for CCS projects militates against establishing a new agency. The task therefore becomes one of identifying and adapting a suitable candidate from among existing central government agencies.

It is likely that there is a reasonable consensus on those points. If that is so, then the range of possibilities is narrowed down in a useful way.

Minister or Agency. The next issue is what kind of official should exercise powers of decision under the CCS legislation. Again, some different options present themselves.

- ***A Minister of the Crown.*** Legislation often gives a minister of the Crown the power to make decisions, whether at a general policy level or at a particular level affecting individuals. In some cases, the power is exercised by the minister in person, in others, it is exercised by departmental officials under express or implied delegation. In the natural resources field, the Crown Minerals Act confers the key powers of decision on the Minister responsible for the administration of the Act. The Hazardous Substances and New Organisms Act authorises the Minister for the Environment to call in certain applications for new organisms. The Minister is democratically accountable in Parliament for his or her decisions, and may also be subject to appeal on a point of law. A ministerial decision may be suitable where a number of different aspects of the public interest must be weighed, and where legitimately political considerations must be taken into account. Decisions by a Minister, or by two Ministers jointly, may be particularly suitable where the objectives of different legislation need to be reconciled.

- ***An Agency or Authority.*** Legislation often gives an agency or authority the power to make decisions. In natural resources, the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 confers the key powers of decision on the Environmental Protection Authority. The EPA has limited powers to delegate its powers to a committee or a board of inquiry. Under the HSNO Act, the EPA similarly decides applications. An agency or authority is likely to be accountable to the Minister, within the framework of its empowering Act and the Crown Entities Act 2004, but not for individual decisions. It may therefore act with a degree of independence from political considerations, and may also be subject to appeal on a point of law.

- ***A Court or a Board of Inquiry.*** Legislation sometimes gives a Court or a special-purpose board of inquiry the power to make decisions. In natural resources, the RMA confers powers on the Environment Court or a board of inquiry if the Minister for the Environment has exercised his or her powers to call a matter in. A Court or board of inquiry provides decision-making that is independent but not politically accountable. It is appointed *pro hac vice* to decide a particular application but cannot provide continuous management afterwards. That is not a suitable attribute for CCS regulation generally. However we have recommended that a board of inquiry of some form be used in an important but limited role, in deciding on an application for an injection permit. We have not made detailed recommendations about the constitution or procedure of such a board; a number of variations are possible. Different variations are also possible about the finality of a board's report; it could be final (subject to appeal) as under the RMA; or it could be a recommendation to a Minister who has the final power of decision.

The two main options for CCS decisions therefore appear to be a Minister, or an agency or authority. However, either of them could appoint a board of inquiry for a particular hearing with power either to decide or to make a recommendation. It is also possible for a statute to allocate some decisions to a Minister and others to an agency or a departmental official.[52]

Which Agency. The final dimension is the choice among existing regulatory agencies or ministries to act as the lead agency for CCS. It appears that the options are as follows.

- New Zealand Petroleum and Minerals (NZPM) is a unit of the Ministry of Business Innovation and Employment. It administers the Crown Minerals Act 1991. Most main decisions under the Act are made in the name of the Minister. The advantage is NZPM for CCS is that it has expertise in geological matters, subsurface formations, issuing permits and managing a permitting regime generally. Another advantage is that the co-ordination of CCS and petroleum activities would be administratively simplified. As noted earlier in this Chapter and in Chapter 7, overlapping interests and enhanced oil recovery are significant matters. However there may be disadvantages in perception in putting CCS under the rubric of fossil fuels. Also, key emitters of GHGs who become involved in CCS will probably be industrial process, not petroleum producers. The Ministry is a department of state identified in the schedules to the State Sector Act 1988, and the responsible minister is the Minister of Energy and Resources.

- The Environmental Protection Authority (EPA) is established under the Environmental Protection Authority Act 2011 as a Crown entity. Factors in favour of utilising the EPA are that it administers call-ins under the RMA, and it administers the EEZ Act and the HSNO Act. As noted above the EPA itself makes key decisions under the EEZ Act and the HSNO Act. It also administers the Emissions Trading Scheme under the Climate Change Response Act 2002, and is therefore has a central place in the management of climate change measures. It has expertise in environmental management, the analysis of complex risks, and the NZ ETS.

- The Ministry for the Environment is established under the Environment Act 1986 and its key function is to provide advice to the Minister. The Ministry is responsible for administering various environmental funds[53] and could administer a long-term liability fund for CCS if one were established. But with a few isolated exceptions it is not involved in environmental administration or management.

Whichever of these three agencies, or some other agency, is selected as the lead organisation for the regulation of CCS, several points are likely to be relevant.

(i) CCS cuts across existing regulatory lines. By its nature it involves aspects of several different technologies and involves a new use of natural resources. It therefore has no obvious home among existing regulatory agencies.

(ii) The agency that is selected to lead the administration of CCS legislation is likely to need to acquire new technical and regulatory capability, but in the foreseeable future the need will not be substantial. The private sector may be able to supply capability as and when needed. Specific arrangements for organisational capacity-building are not within the scope of this analysis.

52 Generally, see the Legislation Advisory Committee, *Legislation Advisory Committee Guidelines* (May 2001, as amended) at 160.

53 Such as the Contaminated Sites Remediation Fund, the Community Environment Fund, the Environmental Legal Assistance Fund, the Fresh Start for Fresh Water Fund, and the Waste Levy and Waste Minimisation Fund.

(iii) Shared regulatory responsibility and formal liaison arrangements are likely to be a feature of CCS regulation. There are numerous different forms that they can take: joint decision by two or more Ministers; appointment of board of inquiry members by different agencies; decision by one agency that requires approval by another to be given; the views of the other agency to be sought and provided for or taken into account; the other agency to be consulted, or to be notified. One can particularly see advantages in a central government agency being obliged to consult and confer with the regional council and territorial authority concerned with a CCS application.

(iv) Informal liaison arrangements between agencies for information-sharing and the pooling of resources are also likely.

Even though we make no recommendation from the various options about the agency that should administer CCS legislation, our appraisal identifies the key issues of legal policy that we consider to be relevant, without engaging in any analysis of institutional capacity. In the rest of this Report, we refer to the "regulatory agency," "the CCS agency," "the agency" and "the Minister," without making any judgement at all about which agency or Minister that should be.

9 Recommendations

1. We do not make a recommendation as to the title of the legislation.

2. We recommend that the purpose of the Act be to facilitate and to regulate the permanent geological sequestration of CO_2, as part of efforts to reduce the emission into the air of greenhouse gases, in such a way as to protect the environment and human health and safety.

3. We recommend that the proposed CCS Act include an obligation for all decision makers under it to have particular regard to:

   (i) the protection of underground sources of drinking water;

   (ii) the management of conflict between CCS and other uses of subsurface resources; and

   (iii) the protection of market confidence in emission reductions through regulatory clarity and proper GHG accounting.

4. We recommend that decision makers be obliged to have regard to, or to take into account, the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

5. We recommend that the relationship between these principles and the purpose of the Act be stated clearly to ensure that the principles support the purpose but are not capable of being read down or dismissed by giving undue priority to the purpose.

6. We recommend that public participation be initiated at an early stage of CCS development, and that it continues throughout the life of the project with varying levels of engagement. Nonetheless, there should only be one formal public hearing, which also covers RMA applications, as part of the permitting process for an application for an injection permit. Special provision should be made for Māori participation.

7. We do not make any recommendation as to what agency should regulate CCS activities.

CHAPTER 4
PROPERTY RIGHTS ISSUES

1 Introduction

This Chapter addresses the questions that land ownership poses for carbon capture and storage operations at injection sites and on pipeline routes. It first considers the special land use characteristics of CCS. The ordinary proprietorship of land at the surface needs no special examination; the proprietor of the estate in fee simple, or his or her tenant, has a right to exclusive possession of the land, and he or she can defend it by an action for trespass or for nuisance, as described in Chapter 10 on Liability. However the rights of a land owner to the subsurface of land are less well understood, and we analyse them in detail. From there we turn to consider the need for law reform to facilitate CCS by restating subsurface ownership and by providing adequate powers of compulsory acquisition of rights to land if a company cannot reach negotiated agreements with land owners.

Any CCS operation will need a land base. An operator will need to secure rights to make installations and carry out operations on land without disturbance. It wishes to operate without interfering with the rights of other people in land, and without being vulnerable to legal action for damages or for injunctions that could close it down. It requires secure legal title for its assets in a form that is satisfactory to lenders and possible purchasers. What legal form of rights to land are necessary will vary from one aspect of the operation to another. Where all that is required is short-term incidental access, such as for exploration, the access may be available by simple agreement – a licence. Longer-term operations may require a legal easement, if it is only for access or a buried pipeline, or they may require more complete control such as by acquiring the land itself in the form of the estate in fee simple.

2 Land Needs of CCS Projects

A CCS project will face particular challenges in assembling a land base because of the special character of CCS as a land use.

Capture / Extraction. Only some power stations or industrial operations will produce enough CO_2 to be candidates for CCS. Facilities for the capture or extraction of CO_2 will need to be built into or next to the power station or factory concerned. If the CCS operator is a different company from the operator of the source gases, access and use of land will probably be one element of a complex agreement between the two companies. We do not consider whether measures will be taken to require emitter companies to enter into CCS arrangements.

Pipelines. Pipelines connecting CO_2 capture sites and storage sites will have a limited range of options for their routes. Route selection will be influenced by physical geography and settlement

patterns. A route for any but the shortest pipeline will cross land held by a variety of owners, both public and private. Pipelines are dealt with generally in Chapter 8 of this Report, but the property rights questions are dealt with in this Chapter.

Surface Installations and Operations at Injection Sites. The location of CCS developments is constrained to sites where geological formations such as deep saline aquifers or depleted gas fields exist which, together with their associated cap rock structures, have the capacity to take and hold the CO_2 indefinitely. The number of such formations known to be suitable is limited. Location is therefore constrained by subsurface geological features. CO_2 injection requires a variety of surface facilities: wellsites for the drilling, maintenance and operation of wells; installations to receive and compress gas; and a network of pipes delivering gas to different wellheads. Existing or abandoned oil and gas wells in the vicinity may be re-entered in order to replace the plugging and carry out other works necessary to ensure a high-quality seal. A network of stations for measurement, monitoring and verification (MMV) will be deployed. MMV operations and periodic well inspection and maintenance will occur through the injection programme and for some time after it. The location and extent of the surface installations will be governed by the location and extent of the subsurface formations that are to be used for storage.

Subsurface Installations and Operations at Injection Sites. Carbon dioxide injection and storage, or geosequestration, naturally makes considerable use of the subsurface. It involves the drilling of wells. Wells are generally completed with the installation of casing, tubing, and plugs in preparation for injection. Directional drilling may be used to increase the penetration of geological storage formations, reaching targets two or three kilometres distant horizontally. Through such wells CO_2 will be injected into the storage formations in large quantities.

Injected CO_2 mixes with other fluids and spreads in the pore space of the storage formation. Formation fluid pressure increases and fluid flows are affected. The buoyancy of supercritical CO_2 causes it to rise to the top of the storage formation and spread laterally. Because of this and the large quantities that are injected, the subsurface area through which the CO_2 spreads can be very large, with a radius perhaps of tens of kilometres.[1] Simulations have shown that the areal extent of a plume of CO_2 injected from a 1 GW coal-fired power plant over 30 years into a zone 100 m thick will be approximately 100 km^2.[2] These areas and distances are considerably greater than is usual for an oil

1 C-F Tsang, J Birkholzer and J Rutqvist, "A Comparative Review of Hydrological Issues Involved in Geologic Storage of $C0_2$ and Injection Disposal of Liquid Waste" (2008) 54 Environmental Geology 1723-1737, doi 10.1007/s00254-007-0949-6; M Granger Morgan and S McCoy, *Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers* (RFF Press, New York, 2012) at 108.

2 J Rutqvist and C-F Tsang, "A Study of Caprock Hydromechanical Changes Associated with CO_2-injection into a Brine Formation" (2002) 42 Environmental Geology 296-305.

or gas field, or for a liquid waste disposal project. The pressure footprint of a CO_2 storage site will be much larger than the CO_2 plume itself.[3]

Land Use Needs. From those characteristics, several features of the land use needs of CCS projects stand out as likely to be relevant from a legal point of view.

(i) The number of storage formations known to be suitable is limited, and location of injection facilities is therefore constrained.

(ii) Pipeline routes will be constrained by the location of CO_2 sources, injection facilities, and intermediate physical and human geography.

(iii) The footprint of a CCS injection project onshore is likely to include formations under the land of large numbers of land owners. Not all of the surface land above such a formation is likely to be affected substantially – indeed its use is likely to be unaffected except for a few well sites and monitoring sites.

(iv) Once a particular formation is selected, there may be some latitude in the location of some surface injection facilities, but for others there may little latitude for the optimum location.

3 Subsurface Installations and Operations at Injection Sites

3.1 Introduction

When a CCS project gets under way, at the injection site wells will be drilled and prepared for the injection of CO_2 into the target formations. Once injection operations begin, the injection will introduce large quantities of supercritical CO_2 into the pores in the rock in the storage formation. The pressure, composition and movement of fluids in the pore space of the target formation will be considerably affected. The CCS company will want to know that it can carry out these operations underground without illegally affecting the rights of others. That requires an analysis of the proprietary rights of others underground.[4]

3.2 The general rule: rights of ownership of land extend downwards

The starting point is that rights deriving from the ownership or possession of an estate in land are presumed to be capable of exercise on all parts of the land, including upwards and downwards, indefinitely. The Latin phrase that expresses this rule is *cuius est solum eius est usque ad coelum et*

3 B Field, S Bachu, M Bunch, M Funnell, S Holloway, R Richardson, *Interaction of CO_2 Storage with Subsurface Resources* (2012) CO2CRC Report No RPT 12-3562 (IEAGHG Report 2013-08 April 2013) at 14.

4 See B Barton, "The Common Law of Subsurface Activity: General Principle and Current Problems" in D Zillman and others (eds) *Energy Underground* (Oxford University Press, forthcoming 2014).

ad inferos; to whom the soil belongs, to that person it belongs all the way to the sky and the depths. As with all such generalisations, the real issues lie in the multiple exceptions, but this is the general rule. The main New Zealand text on land law puts it:

> The general rule at common law is that the owner of the soil is presumed to be "the owner of everything up to the sky and down to the centre of the earth" according to the maxim cujus est solum ejus est usque ad coelum et ad inferos. Where a parcel of land was granted by the Crown or conveyed from one person to another, the grant or conveyance (unless some contrary indication was shown) passed everything which lay below the surface "down to the centre of the earth" and everything above it "up to the sky".[5]

In Australia in the High Court of Australia Windeyer J in *Wade v NSW Rutile Mining Co*[6] refers to:

> [T]he elementary principle of the common law that a freeholder … is entitled to take from his land anything that is his. Except for those minerals which belong to the Crown, the soil and everything naturally contained therein is his.

3.3 Underground trespass

A consequence of the general rule is that the person in possession of the surface can defend his or her possession of the subsurface. Interference with the landowner's right to possession underground is trespass, just as on the surface. The work *Laws of New Zealand* states that "An intrusion into the subsoil is a trespass in just the same way as an intrusion on the surface."[7] Alderson B once said, "There is no distinction between trespasses underground and upon the surface."[8] Thus in Canadian cases *Austin v Rescon Construction (1984) Ltd*[9] and *Epstein v Cressey Development Corp*[10] construction companies inserted anchor rods under the neighbouring property for temporary support; exemplary damages were awarded against them to deprive them of the profits of its trespass. It was no defence that permission to enter was unreasonably withheld. In New Zealand, *Waugh v Attorney General*[11] dealt with a tunnel that the Navy had used for many years, connecting two of its yards in Devonport on either side of a ridge. It went under some private properties and streets. There was a period during which the tunnel was unauthorised, and the owners of one of the properties sued for damages. That the unauthorised tunnel under their land was a trespass went without argument; the only dispute was the measure of damages to be paid for the trespass. It was held that the measure was the Navy's profit from using the tunnel rather than using a longer route through the streets, not merely the loss suffered by the landowners.

5 GW Hinde, NR Campbell & P Twist, *Principles of Real Property Law* (Lexisnexis, Wellington, 2007) at 6.002. Footnotes omitted, the main references being to *Corbett v Hill* (1870) LR 9 Eq 671 at 673 and *Wandsworth Board of Works v United Telephone Co Ltd* (1884) 13 QBD 904 at 915 (CA). Generally, see Y Abramovitch "The Maxim 'Cuius Est Solum Ejus Usque Ad Coelum' as Applied to Aviation" (1962) 8 McGill LJ 247; and M Taggart, *Private Property and Abuse of Rights in Victorian England* (Oxford University Press, Oxford, 2002) at 120. Also see *Laws of New Zealand*, "Minerals and Mining" (2000), para 3, and *Halsbury's Laws of England* (4th ed) vol 31, Mines and Minerals, para 19: "Prima facie 'land' or 'lands' includes everything on or under the surface."

6 *Wade v NSW Rutile Mining Co* (1969) 121 CLR 177, 185.

7 *Laws of New Zealand,* "Tort" para 197, citing *Bulli Coal Mining Co v Osborne* [1899] AC 351 (NSW PC); *Russo v Ridgway* (1914) 33 NZLR 1495. Also see J Howell, " 'Subterranean Land Law': Rights below the Surface of Land" (2002) 53 NILQ 268.

8 *Hunter v Gibbons* (1856) 1 H&N 459, 465, 156 ER 1281, 1284.

9 *Austin v Rescon Construction* (1984) Ltd (1989) 57 DLR (4th) 591 (BC CA).

10 *Epstein v Cressey Development Corp* (1992) 89 DLR (4th) 32 (BC CA).

11 *Waugh v Attorney General* [2006] 2 NZLR 812.

3.4 Subsurface activity as trespass: *Bocardo v Star Energy*

Such cases deal with relatively conventional technology, and with trespass near the surface. There has been uncertainty about the application of the general principle of subsurface ownership at greater depths. The general principle is often put in terms of the maxim or brocard *cuius est solum eius est usque ad coelum et ad inferos*; to whom belongs the soil also belongs all the way to the sky and to the depths. However the maxim was ill-received in *Commissioner for Railways v Valuer-General*,[12] the Privy Council said that its use is imprecise and mainly serviceable as dispensing with analysis. (But the case needs to be read carefully to see that the Privy Council was demolishing an argument that "land" *must* include all space from the centre of the earth upwards; an argument that there was a difference between a stratum and "real" land.) Partly in reliance on *Commissioner for Railways*, for a period it was argued that the wide application of the *cuius est solum* doctrine may not be accurate, and that resources at depth, such as below 200 metres, constitute a *res nullius* so that ownership will vest in the first person to reduce them into possession.[13]

A case of directional drilling for oil allowed the Supreme Court of the United Kingdom to clarify the vitality of the principle of *cuius est solum*, in *Bocardo SA v Star Energy UK Onshore Ltd* in 2010.[14] Star Energy's predecessor had drilled three oil wells under Bocardo's land without seeking its permission. The closest that any of them came to the surface under its land was 800 feet. Bocardo's case was simply that the wells with their casing and tubing were a trespass; title to the land extended downwards and included everything in it, subject to exceptions such as for minerals. (Bocardo could not sue for the petroleum.) The Court referred to the many cases where it was said that prima facie the owner of the surface is entitled to the surface itself and everything below it down to the centre of the earth.[15]

The oil company argued that the surface owner should not be held to own any further down than necessary for the use and enjoyment of the surface.[16] But the Court held that there was no English authority for such a limitation. There was some authority in favour from the United States, but also much authority against it, and that the debate remained alive in American law. The Court cited Smillie that "there appears to be no case in the Commonwealth where a plaintiff has failed on the basis that the area of subsoil invaded was so deep that the surface occupier's possessory rights did not extend that far."[17]

The Court concluded that the maxim *cuius est solum* still has value in English law. The reasons for saying it has no place as to airspace are a good deal less compelling as to the subsurface. The approach in *Chance v BP Chemicals Inc*,[18] that some kind of physical interference with the surface must be shown, would lead to much uncertainty. The law was that the owner of the surface is the owner of the strata beneath it, including the minerals that are to be found there, unless there has been an alienation of them by a conveyance, at common law or by statute to someone else.

12 *Commissioner for Railways v Valuer-General* [1974] AC 325 (PC).

13 A J Bradbrook, "Ownership of Geothermal Resources" [1987] AMPLA Yearbook 353; A J Bradbrook, "The Relevance of the Cujus Est Solum Doctrine to the Surface Landowner's Claim to Natural Resources Located Above and Beneath the Land" (1988) 11 Adel L R 462. K Gray and S F Gray, *Elements of Land Law* (5th ed, Butterworths, London, 2009) at 18.

14 *Bocardo SA v Star Energy UK Onshore Ltd* [2011] 1 AC 380 (SC(E)), [2010] UKSC 35.

15 In particular *Rowbotham v Wilson* (1860) 8 HLC 348, 11 ER 463. The other Judges agreed with Lord Hope on these points.

16 This argued from *Bernstein v Skyviews & General Ltd* [1978] QB 479 which had held the same for airspace.

17 S Todd (ed), *The Law of Torts in New Zealand* (5th ed, LexisNexis, Wellington, 2009) at 426 (in Chapter 9, written by J Smillie).

18 *Chance v BP Chemicals Inc* 670 NE 2d 985 (Ohio 1996).

Bocardo v Star Energy brought to an end the possibility that rights of the surface owner are limited to some maximum depth such as 200 metres. The rights of the surface owner are not restricted to those rights necessary for the ordinary use and enjoyment of the surface. Strata and structures below the surface are not *res nullius*. The subsurface rights of a proprietor of land cannot be diminished by dismissing the *cuius est solum* principle as a whimsy, and by dwelling on the impossibility of owning land right to the centre of the earth. It is better to say that the ownership of the surface extends downwards indefinitely. The nature of the case, dealing with general principles of law, and its strong concordance with existing New Zealand law, make it likely that the precedent will be regarded as authoritative in New Zealand courts.

3.5 Implications for CCS

Four points can be made to draw out the implications of the foregoing analysis on the law concerning carbon capture and storage.

(i) Rights deriving from the ownership or possession of an estate in land are presumed to be capable of exercise on all parts of the land, including the subsurface, indefinitely. The rule is well established.

(ii) The rule is a presumption. It is the default position. It holds true until the contrary is established. A person other than the surface owner who claims proprietary rights in minerals or anything else below the surface must do so by some grant or conveyance or statutory vesting. The onus of proof lies on that person.

(iii) The rule does not only apply to minerals. It applies to everything below the surface including subsurface structures suitable for CCS injection.

(iv) Under this general law, a land owner who is aggrieved with injection operations below his or her land is likely to be successful in an action for trespass or nuisance against the CCS operator. Even if there is no actual damage, nominal damages can be awarded, and an injunction or interim injunction can be granted.

4 Rights of Owners of Privately-Owned Minerals

The next ownership issue that affects CCS is the private ownership of minerals. There is a certain amount of private ownership of minerals in New Zealand, especially in areas of early European settlement, where they were not reserved to the Crown. (Petroleum, gold, silver, and uranium are, however, always Crown-owned.[19]) Those minerals can be separated in ownership from the rest of the land, if the owner sells the land excepting the minerals or sells the minerals to another person. What substances and what rights are held by a mineral owner, rather than the surface owner, will depend upon the interpretation of the original grant or instrument of severance, reading words as they were meant in the vernacular of the mining world, the commercial world, and landowners, at the time

19 Section 10 of the Crown Minerals Act 1991 declares that those minerals existing in their natural state in land, whether or not the land has been alienated by the Crown, are the property of the Crown. It continues similar declarations from earlier legislation.

of the grant.[20] The onus of proof that a particular substance was, at the date of the document to be construed, or is, at the present day, regarded as a mineral is upon those raising the contention. This onus of proof is a reflection of the rule, or presumption, that the proprietor of the surface is proprietor of everything below; that is, the *cuius est solum* rule.

There is a natural tendency to assume that anything subterranean is in the hands of the owners of mineral rights, but a closer examination shows that this is not the case. Mineral rights are grants of minerals, as understood by the vernacular test; they are not grants of all strata, structures and phenomena below the surface. Where mineral rights are owned separately, they do not necessarily entail property rights to all things subterranean. A grant of the surface land is not the mere plane surface but really means a right to all the land except the mines.[21] Thus even where mineral rights are owned separately, they do not necessarily entail rights to everything in the subsurface.

CCS injects supercritical CO_2 into pore space, the minute voids that exist between the solid grains of minerals that make up rock, filled with fluids such as water, oil or gas. The analysis of proprietary rights concerning carbon capture and storage has been couched, especially in American literature, as a debate whether the pore space is owned by the land owner or by the mineral owner.[22] The claim of the mineral owner has generally been preferred, but in fact the authority for doing so is not particularly strong. The preference for the mineral owner has relied on a line of old English and Scottish cases (and one Canadian), in respect of spaces from which minerals have been removed.[23] Recent literature on CCS picked these old cases up as the 'English Rule' to say that the mineral interest holder is the owner of rights in the mineral formation separate and apart from its rights to remove the minerals.[24] Plainly that is not supported by the a reading of the old cases themselves. They all concerned grants of rights to mines of coal or other stratified deposits, and rights to the mine workings, not microscopic pore space. They all stayed close to the construction of the instruments in question without propounding any general rules, except to say that a grant of "mines" is more likely than "minerals" to mean a grant of the workings as spaces. More modern in its outlook was *Mitchell v Mosley*[25] holding that conveyances of land included everything down to the centre of the earth, even including the vacant spaces from which coal may have been worked out by the coal lessees. What was conveyed was not merely of the surface rights but the whole substratum. Indeed it does not appear to be correct to say that the common law declares that

20 *North British Railway Co v Budhill Coal and Sandstone Co* [1910] AC 116 (HL Scot).

21 *Pountney v Clayton* (1883) 11 QBD 820 at 833, 838-840.

22 O. Anderson, 'Geologic CO_2 Sequestration: Who Owns the Pore Space?' (2009) 9 Wyoming L Rev 97.

23 The first of the cases was *Bowser v Maclean* (1860) 2 DeG&J 415, 45 ER 682, the last of them *Little v Western Transfer and Storage Co* [1922] 3 WWR 356 (Alta SC TD). The cases and their subsequent understanding are analyzed in more detail in B Barton, "The Common Law of Subsurface Activity: General Principle and Current Problems" in D Zillman and others, eds, *Energy Underground* (Oxford University Press, forthcoming 2014).

24 T. A. Campbell, R. A. James and J Hutchings, 'Carbon Capture and Storage Project Development: An Overview of Property Rights Acquisition, Permitting, and Operational Liability Issues' (2007) 38 Texas Envtl L J 169 at 172; B. Metz, O. Davidson, H. de Coninck, M. Loos and L. Meyer, *Carbon Dioxide Capture and Storage* (Intergovernmental Panel on Climate Change Special Report, 2005) 256; E. Wilson and M. de Figueiredo, 'Geologic Carbon Dioxide Sequestration: An Analysis of Subsurface Property Law' (2006) 36 ELR 10114at 10121; M. de Figueiredo, 'Liability of Carbon Dioxide Storage' (2007) PhD thesis, Massachusetts Institute of Technology, 287; Interstate Oil and Gas Compact Commission, *Storage of Carbon Dioxide in Geologic Structures: A Legal and Regulatory Guide for States and Provinces* (2007) 19. Other writers sensibly expressed scepticism of the idea of an "English Rule": N. Bankes, J. Poschwatta and E. Shier, 'The Legal Framework for Carbon Capture and Storage in Alberta' (2008) 45 Alta L Rev 585 at 604 and I. Duncan, S. Anderson, J.-P. Nicot, 'Pore Space Ownership Issues for CO_2 Sequestration in the US' (2009) 1 Energy Procedia 4427.

25 *Mitchell v Mosley* [1914] 1 Ch 438 (CA). It was cited in *Bocardo v Star Energy*, along with *Pountney v Clayton*.

a mineral owner has control of a mineral formation for purposes other than extracting minerals. "Pore space" is generally owned by the surface owner, not the mineral owner.

The result is that, even in areas of private mineral ownership, the surface owner can claim rights to the subsurface that could obstruct CCS operations. Even if the private mineral owner prevails, it might be added, the CCS operator is still obliged to deal with a private proprietor; the only question is which one.

5 Crown Minerals

The rights of the owner of land to the subsurface, in relation to CCS storage operations, do not appear to be displaced by the vesting of minerals in favour of the Crown. There are two aspects to be considered; first the statutory declaration that certain minerals are the property of the Crown where ever situated, and secondly the exception or reservation to the Crown of minerals upon alienation of the land by the Crown.

This discussion concerns only the proprietary claims that may be made by the Crown or its permittee against the surface owner. Other aspects of the role of the Crown Minerals Act 1991 are dealt with in Chapter 2, as to managing CCS under that Act, and in Chapter 7, as to the relationship of other subsurface resources.

5.1 Substances declared to be the property of the Crown: petroleum

The first category is the minerals (petroleum, gold, silver and uranium) that section 10 of the CMA declares to be property of the Crown whether or not the land has been alienated by the Crown. The language clearly prevails over claims to minerals derived from the ownership of land, and applies on land in private ownership. It discharges the onus of proof, discussed above, that is borne by a person claiming rights contrary to the presumption of ownership by the proprietor of the surface. Of those minerals, only petroleum has any possible role in founding a Crown claim to rights under the existing law to CCS storage formations that displace those of a surface owner. The definition of petroleum (quoted in Chapter 2) cannot by any stretch of the imagination include CO_2. In addition, the emphasis of the definition is on the petroleum itself, not on the formations containing it. Equally, the definition of "minerals" is of substances, not formations, structures, or character or capacity *in situ*. Natural gas storage, which is referred to in the definition of petroleum, cannot be interpreted so as to include carbon capture and storage in the sense of geosequestration. (See Chapter 2 on that matter as well.) The result is that the vesting of petroleum in the Crown cannot be argued to vest CO_2 from CCS operations in the Crown, and cannot empower the Crown to authorise CCS operations in privately-owned lands.

One might resort to the idea of necessarily-implied rights to argue that the declaration of Crown ownership of petroleum brings with it rights of control of structures or formations where petroleum exists, and therefore CCS formations, but the argument does not seem viable. There is certainly a long-established general principle that the grant of some right will include associated rights required to make the grant effectual.

> When anything is granted, all the means to attain it, and all the fruits and effects of it, are granted also; and shall pass *inclusive*, together with the thing, by the grant of the thing itself … By the grant of mines, is granted the power to dig them …[26]

The reservation of a substance necessarily implies the existence of power to recover it and of the right of working.[27] However such associated rights are limited; it seems inevitable that they must be necessary to the primary grant, and not merely convenient; and they must be for the same purpose, not some other purpose. Petroleum operations can proceed without sole control of an entire formation being vested in one company; and petroleum operations are by their very nature different from CCS operations. The case is quite different from the implication of rights to use the surface in a grant of mineral rights.

The result is that the vesting of rights to petroleum in the Crown under section 10 of the Crown Minerals Act does not give the Crown or its permittee under the Act any property rights that displace the rights of the land owner in such a way that the Crown could allow CCS storage operations under the CMA.

5.2 Minerals reserved to the Crown

The second category of Crown ownership of minerals in privately-owned lands arises from the exception of minerals upon alienation of land by the Crown. After land in New Zealand had been acquired by the Crown, and after customary Māori title had been extinguished in various ways, the land was often alienated – that is, granted, leased or sold – by the Crown to private persons. In the late nineteenth century Parliament began to say in the Land Act and other Acts that all grants of land under the Act were subject to a reservation of various minerals to the Crown. By the time of the Land Act 1948 all minerals were deemed reserved to the Crown from every sale, grant, lease, licence, or other disposition under the Act.[28] This was the predecessor of the present provision, section 11 of the Crown Minerals Act 1991:

> (1) Every alienation of land from the Crown made on or after the commencement of this Act (whether by way of sale, lease, or otherwise) shall be deemed to be made subject to a reservation in favour of the Crown of every mineral existing in its natural condition in the land.
>
> (1A) Nothing in subsection (1) applies to pounamu to which section 3 of the Ngai Tahu (Pounamu Vesting) Act 1997 applies.
>
> (2) For the avoidance of doubt, every mineral reserved in favour of the Crown by any enactment shall continue to be reserved in favour of the Crown, notwithstanding the repeal of that enactment.

The definition of "mineral" in the CMA is a naturally occurring inorganic substance beneath or at the surface of the earth. (It is quoted in full in Chapter 2.)

Different language may have been used in earlier legislation, and section 11 is not retroactive. For any one parcel of land, one must therefore ascertain the terms of the particular Crown grant, the governing legislation at the time of the Crown grant, and the possible effect of the Land Transfer

26 W Shepard, *Sheppard's Touchstone of Common Assurances*, Fed vol. 1 (Luke Hansard & Sons, London, 1820) at 89. Also see *Saunders's Case* (1599) 5 Rep 12a, 77 ER 66; and *Pountney v Clayton* (1883) 11 QBD 820 at 839.

27 *Borys v Canadian Pacific Railway* [1953] AC 217 at 227, Lord Porter.

28 Land Act 1948, ss 2 ("minerals") and 59.

Act.[29] As a result, mineral title to private land is often unclear. Some general observations are possible nonetheless. There is nothing in section 11 of the 1991 Act, and highly unlikely to be anything in its predecessors, that suggests that in making a grant of land the Crown reserved to itself rights to carry out CCS operations. There is no reference to the ownership of the structures from which minerals are extracted; there is nothing about structures or formations. There is nothing about use of structures or substances for another purpose such as CCS disposal. At least in section 11, and in the Mining Act 1971 Act, and in the Land Act 1948 (section 59), there is no exception of "mines." (It will be recalled that a reservation or exception of mines was the basis in a few cases for a conclusion that the chambers left after working were vested in the mineral owner, and that this is the limited basis on which an argument of ownership of pore space for CCS storage could be made.)

The conclusion on this point is that the exception or reservation of minerals to the Crown under section 11 of the Crown Minerals Act 1991 and its predecessors does not give the Crown any property rights to substances, structures, formations, or pore space that displace the rights of the land owner in such a way that the Crown could allow CCS operations. This is the same position as for claims made by reason of the vesting of petroleum and other substances under section 10, discussed above.

5.3 General conclusion

On the whole, therefore, one finds the rights of owners of private land to control the subsurface in respect of developments such as CCS injection operations are little affected by the presence of Crown minerals in the land, any more than they are affected by the private ownership of minerals. The general conclusion therefore stands, that under this general law rights deriving from the ownership or possession of land extend to all parts of the land, including the subsurface, so that a land owner aggrieved with CCS injection operations below his or her land has a strong legal basis on which to attack the operations as trespass or nuisance. When there are so many ways that cases can present themselves, and ways for the law to evolve, it is unwise to make an absolute prediction that all such actions will be successful; but it is entirely justifiable to say that in this situation the land owner has a strong case for his or her claim, and may well obtain damages or an injunction against the CCS operator. The counter-proposition, that there is no legal reason to apprehend such a claim, is not supportable.

6 The Need to Modify Rights to Land for CCS

What we have seen so far in this Chapter is that a CCS operation needs to build pipelines and surface facilities, and to use the subsurface of land for wells and for the injection and storage of CO_2. The legal rights of land owners to the subsurface are in relevant respects similar to their rights to the surface. Substantial areas of land are involved. It may often be possible for the CCS operator to assemble land and property rights through negotiation and agreement with land owners. No law reform is required for that. What does require consideration is whether negotiation will be enough, or whether land rights should be modified for CCS, and whether a CCS operator should have a power of compulsory

29 E C Adams, *The Land Transfer Act 1952*, (2nd ed, Butterworths, Wellington, 1971) at 36; GW Hinde, NR Campbell & P Twist, *Principles of Real Property Law* (Lexisnexis, Wellington, 2007) para 6.008; *Laws of New Zealand*, Minerals and Mining, para 6; G Cain, "The Dormant Mineral Reservation" [1964] NZLJ 279 on transactions concerning private minerals.

acquisition or override of the rights of land owners where necessary. This is a significant question for law reform and policy.

Powers for the compulsory acquisition of rights to land, i.e. expropriation, are common in most legal systems. They are restricted, in recognition of the importance of property rights in society and in the legal system. There is a presumption that a statute is not to be interpreted as depriving persons of property without compensation unless that is clearly the intention of Parliament,[30] and it is a recognised principle that the state should not appropriate private property for public purposes without just compensation.[31] Powers of compulsory acquisition are granted sparingly and subject to constraints. They are granted primarily to public agencies, the Crown and local authorities. Only occasionally are they granted to private persons or companies, and then under close control. The purposes for which they may be exercised are invariably specified with some detail. An expropriating authority may be challenged if it takes land for purposes beyond those allowed. The procedure that must be followed for the taking of rights and the giving of compensation for them is carefully prescribed, ensuring notice to affected persons, opportunities to respond, and in some situations rights of appeal.

The chief alternative to compulsory acquisition of particular lands is a statutory vesting of rights to some incident or attribute of land in the Crown. This could be done for the CCS storage capability of land. There are examples of such general vestings in New Zealand; the Petroleum Act 1937, vesting all oil and gas in the Crown; the Atomic Energy Act 1945 doing the same in relation to uranium and other substances; the Geothermal Energy Act 1953, and, in relation to water rights, the Water and Soil Conservation Act 1967.[32]

Whether there should be a power of compulsory acquisition or a general vesting of CCS rights in the Crown for the public good perhaps depends on whether CCS has special characteristics as a land use. We noted several such characteristics at the beginning of this Chapter. They can be restated with some additional points.

(i) The number of storage formations known to be suitable is limited, and location of injection facilities is therefore constrained.

(ii) Pipeline routes will be constrained by the location of CO_2 sources, injection facilities, and intermediate physical and human geography.

(iii) The subsurface footprint of a CCS injection project onshore, in the form of the CO_2 plume in pore space, is likely to be extensive.

(iv) Only some of the surface of that land will be affected by well sites and monitoring sites.

(v) Once a particular formation is selected, there may be little latitude in the location of some surface facilities.

30 *Attorney-General v DeKeyser's Royal Hotel* [1920] AC 508 (HL) 542 per Lord Atkinson: "The recognized rule for the construction of statutes is that, unless the words of the statute clearly so demand, a statute is not to be construed so as to take away the property of a subject without compensation."

31 G Palmer, "*Westco Lagan v A-G*" [2001] NZLJ 163, p 168.

32 The vesting of uranium is now in the Crown Minerals Act 1991; the vesting of geothermal and water rights in the Crown is continued by s 354 Resource Management Act 1991.

(vi) The large numbers of land owners is likely to be within the footprint of a CCS pipeline or a CCS injection site.

(vii) Some of the land owners may be private land owners occupying their own land, but leases, common ownership and mortgagees push up the numbers of persons affected. Special classes of land like roads, reserves, and Māori land may all pose particular questions.

While some of these uses of land are common to any major project, others are special to CCS. It can be argued that CCS should be encouraged and should not be precluded because of its unusual character as a land use. The CO_2 injection plume, dictated by geology, cannot be adjusted in order to avoid non-agreeing landowners; the plume will percolate through strata below the land of multiple land owners (quite possibly hundreds) who are likely to be entirely unaffected in their enjoyment of their land, but could veto the project. It would be unfortunate from a policy point of view if one such landowner could prevent a CCS project from proceeding, because there is a distinct public interest in facilitating CCS, in mitigating climate change.

CCS as a land use therefore seems to have attributes that are generally thought to provide a rationale and justification for compulsory acquisition or vesting in the public. Without compulsory acquisition a market failure exists that may enable a "holdout" land owner to thwart a development, especially where land attributes and contiguity are important.[33] There are large transaction costs in dealing with multiple owners. There is often a risk of stalemate where for family or personal reasons an owner or co-owners of land cannot decide on any course of action. Land owners who are only involved because of the spread of a CO_2 plume one or two kilometres below the land surface cannot claim that their investment intentions and plans for their use of the land have been thwarted, and they are protected by the elaborate scrutiny provided by the statutory permitting process for a CCS project. CCS shares some characteristics with ports, airports, roading and electricity transmission lines, for which legislation provides rights of access or rights of acquisition.

The counter-argument is that there should be no interference with private property rights. It is certainly accepted that secure private property rights as a civil institution are an essential component of a liberal democracy. The courts and the legislature are slow to interfere with property rights.[34] It can be argued from that point of principle that the CCS industry should not be given preferential treatment or special assistance in the form of powers over other people's private property. Private companies should not have the benefit of statutory powers; there should be a "level playing field;" and the state should not try to pick winners. However property rights are not absolute, and are often modified by statute and regulation in the public interest, subject to careful controls. This is particularly so where the interference with the owner's rights and investment expectations is small or imperceptible.

The result is that there appears to be a clear case for the modification of land use rights in order to facilitate CCS operations, and to provide for compulsory access or acquisition.

33 R Cooter and T Ulen, *Law and Economics*, (6th ed, Pearson, Boston, 2012) at 174.

34 'Next to constitutional rights, property rights are the strongest interests recognised by our law.' Hammond J in *White v Chandler* [2001] 1 NZLR 28 at [67].

7 CCS Rights to the Surface of Land

At this point, we separate our consideration of the needs of a CCS project for rights to the surface of land from its needs for rights to the subsurface. In both cases it appears, as discussed above, that it is necessary to modify private property rights to some extent to enable CCS operations to proceed. However the two cases are different. Firstly, the surface needs of CCS are substantial but they do not have the district-wide character of a CO_2 plume in a storage formation. Secondly, their effect on the use and enjoyment of the owner of the land are more substantial. A general statutory vesting of rights would be imprecise and unsuitable. We therefore consider methods that are procedurally more formal and more selective. Two different methods can be identified. We consider procedures for compulsory access carefully, although ultimately we do not favour them, preferring procedures for compulsory acquisition as a requiring authority.

7.1 Compulsory access: Gas Act and Electricity Act

Some legislation gives powers to an agency or company to obtain compulsory access to land without taking any legal estate or interest in the land. One example is the Gas Act 1992, sections 23 to 36, which grants operators a general right of protection of natural gas fittings that were installed on private land before 1 January 1993, and a right of entry to inspect and maintain them. The Electricity Act 1992, sections 22 to 35, does the same for existing electrical works. Since then, however, utility operators have been obliged to obtain easements for their projects, with the possibility of the RMA "requiring authority" procedure for expropriation (discussed below) in the background. The general right of entry is perhaps suited to the specific situation where power and gas lines crossing private land had never needed formalising individually, and perhaps less suitable as a model for CCS surface installations. Another example is section 181 of the Local Government Act 2002, where a local authority is given power to construct works on or under private land for the purposes of water supply, trade waste disposal, land drainage, sewerage or stormwater. Notice must be given, and there is a right of appeal. Compensation is payable for any injurious affection, but no interest in land is taken.

The chief drawback with the gas / electricity general right of compulsory access is that it is generic and unselective. It may be suitable where the particular fittings or works are plain to see, but less so for a future project. It would leave land owners unnecessarily uncertain about the effect of a project on their use and possession of the land. The water supply and sewerage option produces less uncertainty, but appears to be less sophisticated procedurally than seems desirable for the protection of land owners.

7.2 Access arrangement: Crown Minerals Act

Another relevant right of access without granting an interest in the land is the 'access arrangement' under the CMA. A mining company or a petroleum company requires an access arrangement in order to be able to use the surface of land for the purposes of mineral prospecting, exploration and extraction. It may be able to obtain one by agreement. If not, in the case of petroleum, the company can have the access arrangement determined by an arbitrator under section 53 and section 70. In the case of minerals other than petroleum, a company can obtain an access arrangement

(if agreement is not possible) only by securing an Order in Council, through a complex and difficult process under section 66, that it is in the public interest that an arbitrator proceed to determine an access agreement. Access to private land, especially for non-petroleum minerals, was a contested issue during the law reform and legislative process leading up to 1991. It comes close to providing landowners with a veto of non-petroleum activities on their lands beyond minimum impact activities. Separate provisions are made for minimum impact activities, Māori land, and Crown land.

The "access arrangement" procedure under the CMA is a possible option for CCS injection operations. If the purpose is to provide a viable alternative to obtaining the consent of the land owner, then it should follow the path for petroleum operations, where the arbitration can proceed without compliance with the requirements of section 66. A number of ancillary questions would need to be addressed in order to implement the option of an access arrangement, such as the definition of activities covered, and the right to carry out minimum impact activities. The option would provide an alignment of CCS with petroleum. It may be more suitable for short-term occupation of land than long-term occupation. It is not designed for pipelines.

7.3 Compulsory acquisition of an estate or interest in land

The formal acquisition of a land owner's rights or part of them is provided for by the Public Works Act 1981.[35] It is available primarily for government works and local authority works. The Act brings about the acquisition of all or part of the land in exchange for monetary compensation. The Crown or local authority acquires the estate in fee simple in the land, or an interest in it such as an easement. It therefore acquires registered title. Some other statutes, such as the Local Government Act 2002 (section 189) specifically authorise the taking of property for works.

The Public Works Act is suitable for permanent acquisition. However on its own it is only available for government works and local authority works, which would rule out CCS operators in the private sector. The main existing adaptation of the Act for use by private sector companies is in the Resource Management Act 1991.

7.4 Compulsory acquisition: requiring authority under the RMA

The RMA provides a procedure to allow a company that is a network utility operator to use the Public Works Act powers of expropriation. This option requires close scrutiny because it seems very suitable for CCS purposes. The procedure reconciles the entirely public character of the power of expropriation, as an exercise of the sovereign power of the state, with the land use needs of private companies.

Requiring Authority. The key to eligibility to use the RMA and Public Works Act powers is becoming a "requiring authority." To obtain that status, one must first be a "network utility operator"[36] which is defined to be a person who undertakes or proposes to undertake various specified works, including gas transmission, electricity operations, telecommunication networks, water supply, drainage, sewerage,

35 Generally, see K Palmer, "Compulsory Acquisition and Compensation" at 1297-1346 in T Bennion, D Brown, R Thomas and E Toomey, *New Zealand Land Law* (2nd ed, Brookers, Wellington, 2009). Land Information New Zealand initiated a review of the Act in 2000. Its status is unknown. The Minister responsible recently announced that the Act would be amended: M Williamson, "Public Works Act acquisitions made fairer" (press release, 13 August 2013).

36 Resource Management Act 1991, s 166. (In addition a Minister of the Crown and a local authority has status a requiring authority.)

roads, railway lines and airports. Under sections 166(i) and 360(1)(e) of the RMA other projects or works may be prescribed as network utility operations.[37]

A network utility operator may apply under section 167 to be approved by the Minister for the Environment as a requiring authority. The Minister must be satisfied that the applicant is likely to carry out all the responsibilities, including financial responsibilities, of a requiring authority under the Act, and will give proper regard to the interests of those affected and to the interests of the environment: section 167(4). The Minister must also be satisfied that the approval as a requiring authority is appropriate for the purposes of carrying on the project. The Minister may revoke the approval, in which case all functions, powers and duties are transferred to the Minister.

Designation. Status as a requiring authority enables a company to do two things. The first is to give a notice of requirement to a territorial authority of its requirement for a "designation" for its work: section 168. The notice of requirement procedure includes provisions for notice, a hearing, and an appeal, similar to what is provided for an application for a resource consent.[38] The territorial authority's power on the notice of requirement is only to make recommendations, but it can appeal to the Environment Court. Through this process, the notice of requirement leads ultimately to a designation for the work, which ensures that the work can proceed as if a permitted activity under the district plan. The company can therefore avoid the possibility that the district plan would prevent the work. (However the company must still comply with rules in a regional plan and apply to the regional council for permits for, for example, soil disturbance, takes of water, discharges to air and water, and river crossings.) The designation also prevents any person from undertaking any activity that would prevent or hinder the designated work: section 178.

Compulsory Acquisition. The second thing that status as a requiring authority allows is the compulsory acquisition of land for the project or work. Often this will occur during or after the designation of land for the project under section 172, but section 186 does not require the designation to be under way or completed.[39] There is a restriction in that the land must be "required" for the project. The Minister of Lands must give his or her agreement, and there are no restrictions expressed on what matters the Minister may take into account in deciding whether to give agreement: section 186(1). The requirement for the agreement of the Minister is controls the availability of this important state power by a private company. If the land is acquired, it is vested in the company rather than the Crown. The owner's claim for compensation lies against the Minister, which again puts the state between the owner and the company. However the Minister may recover all the costs and expenses of the acquisition, including the compensation, from the company.

Where the network utility operator requires land that is held by the Crown or by a local authority, section 186(4) of the RMA states that the land may be set apart for the operator's project as provided by sections 50 and 52 of the Public Works Act. The consent of the relevant Minister or the local

37 That power has been used, for a hydro project: Project Aqua Resource Management (Project Aqua Network Utility Operation) Regulations 2003, SR 2003/31. The Regulations described the project and the lands affected, and stated that for the purposes of section 166 of the RMA Project Aqua is a network utility operation. The project did not proceed.

38 Resource Management Act 1991, ss 166-186. Generally, see D Kirkpatrick, "Land Use and Subdivision" chapter 4 in D Nolan (ed) *Environmental and Resource Management Law* (4th ed, Lexisnexis, Wellington, 2011) at para 4.18.

39 Confirmed by *Kett v Minister for Land Information*, High Court, Auckland AP 404/151/00, Paterson J, 28 June 2001.

authority is required.[40] The Minister may stop a road under section 116 of the Public Works Act, although the consent of the local authority is required for a road under its control. The Public Works Act 1981 applies to Māori land, although with special provisions, and the procedures in the RMA for a notice of requirement, designation, and compulsory acquisition apply to Māori land but special consideration is desirable.[41]

In the territorial sea, the power to set apart land that is held by the Crown is extended by section 52 of the Public Works Act to a setting aside of a part of the common marine and coastal area, with the consent of the Minister of Conservation or Transport. CCS pipelines, like other such operations, will require a coastal permit, as explained in Chapter 9.[42] The Marine and Coastal Area (Takutai Moana) Act 2011 provides a means of access for an accommodated activity across an area for which customary marine title has been recognised. However, there appears to be no way to obtain similar access across a marine area already occupied by a coastal permit such as for aquaculture, and in Chapter 9 we explore the options to deal with the matter.

Subsoil. Particularly to be noted in relation to CCS is that a designation can not only be for the project or work itself, but can also be, in respect of any land, water, subsoil or airspace where a restriction is reasonably necessary for the safe or efficient functioning or operation of the project or work.[43] The general effect of a designation is to prevent any person from doing anything in relation to land, without the consent of the requiring authority, that would prevent or hinder the work or project to which the designation relates.[44] Also particularly relevant to CCS is that a compulsory acquisition need not be for the entire fee simple; it can be for an easement, and it can be for only part of the subsoil.[45]

Advantages. On the whole we see substantial advantages in using the requiring authority mechanism for CCS injection:

(i) It is an established and known part of the legal system.

(ii) Few changes are required.

(iii) The eligibility of a person or company to become a "requiring authority" is controlled by the Minister for the Environment. Approval is conditional on the fitness of the applicant for the project and for having regard to the interests of those affected. Revocation of the status is a possibility for enforcement purposes. The consent of the Minister is also required for the particular taking. The Crown is further interposed in respect of compensation. The exercise of the statutory power of compulsory acquisition of private land by a company is therefore closely controlled.

40 Also see section 29 of the Public Works Act 1981, where the power to acquire land includes the power to take land vested in a local authority. It is likely that the particular RMA provision for requiring authority applies to make consent necessary. We have not examined the application of the Public Works Act to the many particular categories of public lands for example those under the management of the Department of Conservation.

41 Public Works Act 1981, ss 18(5), 23(2); *McGuire v Hastings District Council* [2002] 2 NZLR 577 (PC).

42 Chapter 9, Part 3, Legislation for the Territorial Sea, especially under the heading of coastal occupation.

43 Resource Management Act 1991, s 168(2).

44 Section 176. By reason of sections 9(4) and 338 it is a criminal offence to do such a thing.

45 Public Works Act 1981, s 31.

(iv) A requiring authority can give a notice of requirement for a designation to address issues in district plans and ensure that no impediments occur in the application of the plan to the project. A notice of requirement for a designation can be called in for centralised decision-making. (We have considered those matters in more detail in Chapter 2.)

(v) The designation mechanism enables the procedures for the approval of compulsory acquisition to be integrated with the procedures for the approval of a CCS project generally. The mechanism can apply to an injection project, a pipeline project, or a project that involves both. The matter is considered further in Chapter 5.

7.5 Recommendations

We recommend that the requiring authority system under the RMA leading to a Public Works Act process be made available for CCS pipeline and CCS injection operations, in order to provide certainty in relation to RMA approval and in order to provide a means to obtain rights to land where negotiation is unsuccessful. (We believe that CCS exploration operations will not need such powers, but it would be acceptable to include them if thought fit.) In particular we recommend as follows.

(i) The definition of "network utility operator" in section 166 of the RMA should include a person who undertakes or proposes to undertake a CCS pipeline operation or a CCS injection operation.

(ii) In relation to injection operations, eligibility should be confined to persons holding injection permits for CCS operations. (We do not believe that it is necessary to institute a CCS pipeline permit; see Chapter 8.)

(iii) A procedure should be introduced for the grant of an overlapping coastal permit for necessary infrastructure with a balancing of the interests of the two parties.

8 CCS Rights to the Subsurface of Land

We return to the consideration of the needs of a CCS project for rights to the subsurface of land. CCS injection is likely to have district-wide effect in a storage formation; the CO_2 plume may spread for kilometres, and the pressure front may go further. However there should be no ordinarily discernable effect on the use and enjoyment of the surface of the land. We consider four options for addressing rights to the subsurface of land.

8.1 Compulsory acquisition: requiring authority under the RMA

The first option is simply to extend the procedures recommended above for the surface, for use of the requiring authority procedure in the RMA. That could be done. It could be facilitated by the use of section 168(2) of the RMA to use a designation to impose restrictions in respect of the subsoil where it is reasonably necessary to do so for the safe or efficient operation of the project. However, this power may not give the requiring authority the right to use the subsoil as it wishes. The matter is certainly not free from doubt, and where there is uncertainty a court will lean against a power being construed to allow a taking of land without compensation.

Designation, of course, also leads to a formal power of expropriation under the Public Works Act. However, the exercise of the power of compulsory acquisition is a formal and complex procedure that may be unsuited to a project that involves hundreds of properties but with little real surface effect. Fixing compensation could be difficult.

8.2 Crown Minerals Act subsurface rights

The second option is a right of access modelled on the CMA. Such a right may be more suitable for the subsurface, where the effect of CCS operations will be general but of a lower or zero impact on a land owner. Where there is little real likelihood of discernible effect on the surface, and where any infringement of property rights seems slight, the need for full expropriation or even expropriation of an easement may be less.

In this regard, one feature of section 57 of the CMA seems very relevant:

> For the purposes of sections 53 and 54 [requiring access arrangements], prospecting, exploration, or mining carried out below the surface of any land shall not constitute prospecting, exploration, or mining on or in land if it –
>
> (a) will not or is not likely to cause any damage to the surface of the land or any loss or damage to the owner or occupier of the land; or
>
> (b) will not or is not likely to have any prejudicial effect in respect of the use and enjoyment of the land by the owner or occupier of the land; or
>
> (c) will not or is not likely to have any prejudicial effect in respect of any possible future use of the surface of the land.

A provision of this kind could simplify relationships with landowners. Within the CMA regime, this provision means that the mineral operator does not need to obtain the consent of the owner for underground operations, and does nott need to rely on obtaining compulsory access through an access arrangement. However, as was the case with the extension of the RMA designation process for protective restrictions, this provision is not clear in overriding any claim of the property rights of the land owner. In addition, the test of "likelihood" to have an effect on the surface is unsatisfactory. So is the test of damage and loss or damage.

8.3 Authorisation plus protection

The third option is similar, in avoiding a full expropriation procedure and a taking of rights to land, while ensuring that the legislation provides what is necessary for CCS operations in relation to the claims of land owners. The first element would be an authorisation of the CCS works. That would protect the operator from any claim by a surface owner that the works are trespasses or nuisance; in effect, an immunity. It would state that the operator of CCS operations approved under an injection permit may carry out drilling and injection activities under any land without the consent of the owner of the land, unless the operations will have any significant effect on the enjoyment of the surface of the land. The second element is the protection of the CCS works from the interference of surface owners relying on property rights, to carry out their own drilling or anything else that might harm the CCS operation. The provision would simply prohibit interference with an authorised CCS operation, including interference with the cap-rock formations. That would prevent the exercise of proprietary rights inconsistently with the authorised CCS works. The third ingredient would be

compensation, for any person in possession of the surface or holding any interest in the surface, for damage to or loss of enjoyment of his or her property in respect to the surface only. (Separate provisions could be added for private mineral owners.)

An approach of this kind would be suitable for use of the subsurface over wide areas at depth. It may have some attractiveness in policy terms, or political terms, if it avoids controversy about property rights, including Treaty rights. Precedents exist, to some extent at least, in section 57 of the Crown Minerals Act (the second option above), and in the mining legislation of some Australian states which allows their state mining Acts to apply to privately-owned minerals. On the other hand, it may not avoid controversy about property rights. In addition, it may not be clear enough in its intention, and that is a serious shortcoming in relation to property, where the courts will demand clarity in legislation that affects property rights. Any ambiguity or lacuna could cause provisions for authorisation plus protection to be ineffectual and allow a land owner a claim where none had been intended.

8.4 General vesting of storage rights in the Crown

The fourth option is to secure public ownership of subsurface storage capability, with a general vesting of storage rights in the Crown by statute. Just as with the second and third options above, where there is little real likelihood of discernible effect on the surface, and where the infringement on property rights seems slight, an expropriation procedure for each parcel of land in the perimeter of the injection site may be unduly complex. We consider that it is more acceptable for a CCS company to have a general power to use the subsurface for injection operations. This option would be more direct in ensuring that the CCS storage capacity of land would be available for public purposes. A clear statement of ownership sometimes clarifies the situation. Clarity and transparency are obtained. It is important in addressing property rights to be clear, because any ambiguity may be construed in favour of the owner.

Examples. This option has emerged as the preferred path of law reform for CCS in a number of jurisdictions. The first example is Victoria, where section 14 of the Greenhouse Gas Geological Sequestration Act 2008 declares:

> (1) The Crown owns all underground geological storage formations below the surface of any land in Victoria.
>
> (2) Subsection (1) does not apply in relation to any land (other than Crown land) to the extent that the underground geological storage formation is within 15·24 metres of the surface of the land.
>
> (3) Subsection (1) applies despite any prior alienation of Crown land.
>
> (4) The Crown is not liable to pay any compensation in respect of a loss caused by the operation of this section.

An underground geological storage formation is defined to include any seal or reservoir of an underground geological formation; and any associated geological attributes or features of an underground geological formation. The reference to formations within 15.24 metres of the surface is carried over from Victoria mining legislation, where the vesting of minerals in the Crown does not include anything within 50 feet of the surface. The assertion of Crown ownership of formations is backed up by a prohibition of exploration or development of such formations without an authorisation under the Act. However interference otherwise with a storage formation is not prohibited. It is not

made clear whether formations suitable for storage of materials other than CO_2 are included, for example for natural gas storage or waste disposal.

The Queensland Greenhouse Gas Storage Act 2009, section 27, is similar.

> (1) All GHG storage reservoirs in land in the State are and are taken always to have been the property of the State.
> (2) To remove any doubt, it is declared that–
> (a) a person does not acquire any property in a GHG storage reservoir or petroleum in it only because the person creates or discovers the reservoir; and
> (b) subsection (1) applies whether or not the land is freehold or other land.
> (3) This section applies despite any other Act, grant, title, or other document in force from the commencement of this section.
> (4) In this section–
>
> ***the State*** does not include any of the adjacent area under the *Petroleum (Submerged Lands) Act 1982*.

Grants of land by the State, whether before or after the commencement of the Act, are taken to be subject to a reservation of GHG storage reservoirs. A GHG storage reservoir is defined (Schedule 2, section 13(a)) as "the spatial extent of an underground geological storage formation that is suitable to store a GHG stream". It is clear that the storage vested in the Crown is for greenhouse gases, not for natural gas storage or other purposes.

In Western Australia it is proposed that the relevant statute be renamed the Petroleum, Geothermal Energy and Greenhouse Gas Storage Act 1967,[46] and that section 9 declare:

> Notwithstanding anything to the contrary contained in any Act, or in any grant, lease, or other instrument of title, whether made or issued before or after the commencement of this Act, all petroleum, geothermal energy resources, geothermal energy, potential GHG storage formations and potential GHG injection sites on or below the surface of all land within this State, whether alienated in fee simple or not so alienated from the Crown, are and shall be deemed always to have been the property of the Crown.

As in Queensland this will be followed by a section deeming GHG storage formations to be reserved from Crown grants. A potential GHG injection site is defined as "a place that is a suitable place to make a well or wells to inject a greenhouse gas substance into a part of a geological formation" (section 5) and a potential GHG storage formation is defined (section 6AA(1)) as "a part of a geological formation that is suitable for the permanent storage of a greenhouse gas substance injected into that part." In determining what is suitable, regard may be had to reasonably foreseeable technological developments. The Act will go on to classify eligible GHG storage formations and identified GHG storage formations.

46 Petroleum and Geothermal Energy Legislation Amendment Bill 2013, second reading 8 August 2013.

In Alberta, Canada, the emphasis has been put on the ownership of pore space:[47]

> 15.1(1) It is hereby declared that
>
> (a) no grant from the Crown of any land in Alberta, or mines or minerals in any land in Alberta, has operated or will operate as a conveyance of the title to the pore space contained in, occupied by or formerly occupied by minerals or water below the surface of that land,
>
> (b) the pore space below the surface of all land in Alberta is vested in and is the property of the Crown in right of Alberta and remains the property of the Crown in right of Alberta whether or not
>
> (i) this Act, or an agreement issued under this Act, grants rights in respect of the subsurface reservoir or in respect of minerals occupying the subsurface reservoir, or
>
> (ii) minerals or water is produced, recovered or extracted from the subsurface reservoir, and
>
> (c) the exception of pore space under this section is deemed to be an exception contained in the original grant from the Crown for the purposes of section 61(1) of the Land Titles Act.
>
> (2) Subsection (1) does not operate to affect the title to land that, on the date on which this section comes into force, belongs to the Crown in right of Canada.
>
> (3) The Minister may enter into agreements with respect to the use of pore space.
>
> (4) It is deemed for all purposes, including for the purposes of the Expropriation Act, that no expropriation occurs as a result of the enactment of this section.
>
> (5) No person has a right of action and no person shall commence or maintain proceedings
>
> (a) to claim damages or compensation of any kind, including, without limitation, damages or compensation for injurious affection, from the Crown, or
>
> (b) to obtain a declaration that the damages or compensation referred to in clause (a) is payable by the Crown, as a result of the enactment of this section.

Pore space is not defined in the Act, although the subsequent Carbon Sequestration Tenure Regulations defined it to mean "the pores contained in, occupied by or formerly occupied by minerals or water below the surface of land."[48] The Act gives mineral owners and permittees rights to work through pore space in winning access to their resources, subject to regulatory requirements. Alberta's focus on ownership of pore space is a reflection of much CCS discussion in North America.

The United States example is relevant but less immediate to New Zealand circumstances. In the United States, property is a state matter. Several states have passed legislation to say whether pore space is the property of the surface owner or the mineral owner, or part of the public domain.[49] The constitutional protection of property rights is an issue that could affect the permitting of CCS injection. It has been argued that CCS injection may not amount to a compensable taking, and that law reform should include, along with authorisation of regulators to issue pore space permits for CCS purposes, a federal declaration that the CO_2 sequestration is a public use undertaken in the national interest, and a declaration of a presumption that it is not a taking.[50]

47 Mines and Minerals Act RSA 1980 c.M-15 s15.1.

48 Carbon Sequestration Tenure Regulation, Alta Reg 68/2011 s 1.

49 M Granger Morgan and S McCoy, Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers (RFF Press, New York, 2012) at 96.

50 Granger Morgan and McCoy, at 120.

The United Kingdom is even less immediate to New Zealand circumstances in that the Energy Act 2008 of the UK only authorises CCS in the territorial sea and the EEZ, where land owners are few and far between. The Act asserts the Crown's rights to CCS at sea, and requires a developer to obtain a lease from the Crown Estate.

Targeted Thing or Activity. The examples of vestings in the Crown have the merit of dealing directly with property claims. However they are less clear or less harmonious in stating their target, whether it is:

- underground geological storage formations (Victoria)
- GHG storage reservoirs (Queensland)
- potential GHG storage formations and potential GHG injection sites (Western Australia)
- pore space (Alberta).

It seems more desirable to state the target as accurately as possible, avoiding questions such as the effect of the vesting for non-CCS purposes. Storage formations seems more on point than pore space, and CCS storage formations even more so. (If the reference is to CCS storage formations, then the definition should be wide enough to include the related cap rock.) In all these cases, however, the emphasis is on formations or space. That may not be as precise as it could be. An unclear declaration of ownership may leave as much uncertainty as before, for example about the implications with respect to actual management and control.[51] That is to be avoided.

A declaration of ownership or of vesting of rights in the Crown may be more precise and effective than a general statement if it specifically identifies its target and the activities that it is intended to authorise. Thus, the declaration could be a vesting in the Crown of the CCS storage capacity of land, because after all that is what is needed. It casts the net widely for CCS, but it will not catch other uses of the subsurface. Taken further, this argument for precision suggests, in fact, that the true target should not be spaces, objects or capacity, but the activities that the Crown wants to carry out and authorise in land. The vesting in the Crown should therefore be a vesting of all rights and powers necessary to explore for CCS capacity, to develop CCS capacity, to inject CO_2 and other greenhouse gases into the subsurface of land, and to sequester them there permanently; along with all necessarily incidental rights and powers. The difference is akin to that between a corporeal estate in a defined part of the land and an incorporeal right to use land in a certain way. This seems to have a higher probability of achieving the policy objectives and of avoiding unintended side effects. In spite of the apparent attractiveness of this route, we are not aware of any precedent; we do not know of any other jurisdiction developing CCS legislation has taken this route of vesting CCS rights in the in the public rather than storage formations or pore space.

We recommend that the legislation vest in the Crown all rights and powers necessary to explore for CCS capacity, to develop CCS capacity, to inject CO_2 and other greenhouse gases into the subsurface of land, and to sequester them there permanently; along with all necessarily incidental rights and powers.

51 For example, the declaration of ownership in the Water and Soil Conservation Act 1967 may have been less important than how one gets water rights and under what circumstances. The regional councils and not the Crown control water rights, and management rather than ownership is the focus of a co-management statute such as the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010.

Prevention of Legal Action by Landowner against Injection. One of the primary purposes in vesting rights in the Crown is to ensure that property rights claims are not an obstacle to the use of deep formations. It is important that the law reform clearly has that effect. Some of the legislation that has been enacted in other jurisdictions may not be entirely clear in having that effect. For example leakage or movement of CO_2 or other fluids out of what is defined as the storage formation may take it out of what was vested in the Crown. Or, a vesting of pore space may not preclude a surface owner's claim that solid rock under his or her property has been deformed because of the injection of CO_2 under high pressure into the pore space.

We consider it important, if this option of vesting rights in the Crown is used, that it be clear and not merely arguable that the land owner has no proprietary claim in trespass, nuisance, or any related action, against authorised CCS operations. (An action in negligence however should remain available to the land owner.)

One advantage of the proposal above to specify the activities rather than the spaces that are to be vested in the Crown is that there can be no argument that the activity is unauthorised.

The corollary alterations of rights of action, it might be added, is the prevention of interference with the rights granted. Other jurisdictions have not put effort in their law reform into preventing land owners from interfering with CCS (except Alberta, in relation to mineral operators). It is probably sufficient to include unauthorised interference with CCS activity or CCS storage as an offence under the CCS Act.

8.5 Compensation

The examples of statutory vestings of CCS storage formation rights in the Crown that we have considered rule out the payment of compensation. One can find a justification for this in the great depth at which injection will occur, the absence of any realistically-discernable effect on the use and enjoyment of the surface, and the absence of any effect on investment expectations. There seems to be very little rationale for compensation where the loss is comprehensible only in terms of abstract property rights without actual loss.

However we recommend the policy option of compensation where actual loss or diminution of value can be shown. Such compensation is helpful in improving the public perception that property owners will be dealt with fairly if they suffer adverse effects.

8.6 Discussion and recommendations

It is possible to marshal the issues relevant to law reform in relation to subsurface property rights. First, the land owner's rights extend vertically downwards, indefinitely, in a way that makes it likely that he or she can claim that CCS injection amounts to a trespass or nuisance. This is so even if the claim is made unreasonably, simply to be difficult, and even if there is no actual loss or effect at the surface. Secondly, a proposal to modify property rights is likely to attract attention from interest groups that are concerned with the erosion of property rights. A proposal will also attract attention from anyone concerned with the erosion of the guarantees of Māori property rights under Article 2 of the Treaty of Waitangi and the principles of the Treaty. A claim of a breach of the principles of the Treaty under the Treaty of Waitangi Act 1975 is foreseeable. Thirdly, the numbers of landowners involved in a single CCS operation, perhaps hundreds of them, mean that onshore CCS will probably be impossible unless a modification of property rights does take place. Something must be done if onshore CCS is to be possible in New Zealand.

We have explored four options:

(i) Compulsory acquisition using the requiring authority procedure under the RMA, along with restrictions to protect the project;

(ii) A right of access below the surface under section 57 of the Crown Minerals Act or a provision modelled on it;

(iii) An authority or immunity for a CCS operator from suit from a land owner for trespass or nuisance, accompanied by protection of the CCS operation from interference; and

(iv) A vesting of CCS storage rights in the Crown.

Neither (i) nor (ii) is intended to have a major role in the statutory scheme to which it belongs, and both appear to have limitations that would need to be removed in the process of adaptation to CCS. Option (iii) may not be explicit enough for an alteration of property rights (something that affects the first two as well) and aspects of it flow into (iv). Option (iv) is the most used in comparable jurisdictions internationally. Within it are several variations. The better variations would be targeted and would provide clarity – two attributes that are of great importance in the modification of property rights for policy purposes.

Our preferred option and recommendation is a vesting in the Crown of all rights and powers necessary to explore for CCS capacity, to develop CCS capacity, to inject CO_2 and other greenhouse gases into the subsurface of land, and to sequester them there permanently; along with all necessarily incidental rights and powers. It should be expressed in a way that makes it clear that the land owner has no right of action to vindicate property rights against the Crown or its permittee. Compensation should be payable for actual loss or diminution of value of the land.

While making this recommendation we do not rule other options out of consideration. Other options have attractive points that warrant further analysis. Within option (iv) of a vesting in the Crown, other variations, which have found favour in Australia and Canada, also deserve further scrutiny.

9 Recommendations

1. The requiring authority system under the RMA leading to a Public Works Act process should be made available for CCS pipeline and CCS injection operations for the compulsory acquisition of surface rights to land.

2. The definition of "network utility operator" in section 166 of the RMA should include a person who undertakes or proposes to undertake a CCS pipeline operation or a CCS injection operation.

3. In relation to injection operations, eligibility should be confined to persons holding injection permits for CCS operations.

4. A procedure should be introduced for the grant of an overlapping coastal permit for necessary infrastructure with a balancing of the interests of the two parties.

5. The new CCS Act should vest in the Crown all rights and powers necessary to explore for CCS capacity, to develop CCS capacity, to inject CO_2 and other greenhouse gases into the subsurface of land, and to sequester them there permanently; along with all necessarily incidental rights and powers.

6. The vesting of subsurface CCS rights by the Act should be expressed in a way that makes it clear that the land owner has no proprietary right of action against the Crown or its permittee for the effect of the Act. Compensation should be payable for actual loss or diminution of value of the land, but not otherwise.

CHAPTER 5
PERMITS

1 Introduction

At the centre of any law for carbon capture and storage must be a system for the granting of permits to engage in activities at the different stages of the CCS process. This Chapter considers the issues in establishing a permit system. It builds on the conclusions reached in Chapter 2 that the most suitable framework for legislation will be a stand-alone CCS Act.

In brief, we recommend a system for the granting of a CCS exploration permit and a CCS injection permit. An exploration permit will provide rights to search for storage formations and to examine their characteristics. An injection permit will allow a company to drill injection wells and inject CO_2 into storage. It is therefore the key element of the legal framework for CCS. Injection permits will include measurement, monitoring and verification (MMV) and the post-injection phase which leads up to the closure authorisation. Detailed regulation of injection and related activities will occur under the site plan that is explained in Chapter 6. The exploration permit and injection permit provide the legal right to carry out CCS operations. An injection permit will be granted only if the applicant satisfies the regulatory agency as to the permanence of storage and the protection of human health and the environment. (We do not consider it necessary for the legislation to have a CCS pipeline permit.) Aspects of a project other than injection and storage will be regulated under the Resource Management Act 1991, but the RMA procedures and the CCS injection permit procedures will be brought together.

The different CCS regulatory frameworks that have been recommended or enacted in different countries generally feature a system of permits. The nomenclature varies; in the IEA *Carbon Capture and Storage Model Regulatory Framework*, the term "authorisation" is used; in Victoria, "permit," in Queensland, "permit" and "lease;" in Europe, "permit." These frameworks are all useful points of reference for the design of the New Zealand permitting and regulatory regime. So too are the World Resources Institute *CCS Guidelines: Guidelines for Carbon Capture and Storage*. For New Zealand, the term "permit" is suitable, because it is familiar from the Resource Management Act 1991 and the Crown Minerals Act 1991, and because it avoids confusion with leases in property law.

2 Purposes of a Permit System

The purposes that a system of permits fulfils can be identified.

Regulation. The issue of a permit is the result of a process that confirms that the necessary regulatory requirements have been complied with. The effects of a proposal on private interests and a variety of elements of the public interest are therefore considered and safeguarded. The legislation states that no person may carry out prescribed CCS activities unless he or she is the holder of a permit that authorises those activities. Status as the holder of a permit, however, imposes additional regulatory requirements. At the same time, other regulatory requirements apply without reference to permit status. The more detailed regulation of CCS is dealt with in Chapter 6 of this report.

Allocation of public resources. A formal system for the allocation of rights to CCS recognises the value of reservoir formations as a publicly-controlled resource. It makes rights to formations available on terms that maximise the benefit to the public, and that are transparent and competitive.

Identification of a commercial asset. A permit is a public record of the rights of the permit holder, and others with interests in the project, such as equity or financial interests. The activities that the developer can proceed with are spelled out in legislation and in conditions attached to the permit. The right to carry out those activities will generally be exclusive in the permit area. The circumstances where the permit can be varied or cancelled are also spelled out. The grant of a permit therefore provides predictability that is conducive to investment decisions.

Ancillary rights and duties. Legislation can confer on the holder of a permit a variety of ancillary rights, such as rights of access to property. Additional duties can also be imposed, such as in relation to liability and third party access. In this sense the permits are the "backbone" to which other rights and duties are attached.

3 Principles for a Permit System

It is also possible to identify factors or values that are relevant to the design of a permit system.

Transparency. It is desirable that the system for the allocation and management of permits be transparent. The process, criteria, and relevant considerations should all be stated in the statute, subordinate legislation, or subsequent notices. A lack of clarity about such matters is a concern about CCS legislation in Alberta.[1] It is also desirable that the information needs of CCS proponents and of affected stakeholders be considered.

Flexibility. The regulatory framework should be performance-based rather than process-based, and should include a prescribed process for periodic review and revision.[2] Performance-based regulation does not prescribe specific methods that must be followed, but states the desired outcome that

1 N Bankes, The Developing Regime for the Regulation of Carbon Capture and Storage Projects in Canada, Appendix B.

2 M Granger Morgan and S McCoy, Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers (RFF Press, New York, 2012) at 81.

must be achieved. The reason for this is to ensure that regulation remains flexible to technological advancement and knowledge of the storage formation. The framework needs to be responsive to the uncertainties associated with CCS.[3] It needs to be open to changes in technology. Thus, the plans and conditions under permits need to be flexible to adapt to situations as they arise. This means that there will be greater regulatory oversight of CCS than activities under the RMA or CMA, resulting in regulation that is in effect continuous.

Investment certainty. The permitting system should provide suitable security of investment; not absolute certainty, but proper clarity about rights and duties over an adequate length of time.

Simplicity. The permitting system should not be any more complex than necessary. It should not ask for information that is not necessary. It should integrate related procedures to minimise duplication and overlap. It should be designed in the likelihood that for the foreseeable future CCS permit applications will only occur occasionally.

Phased approvals. The approval process needs to allow for the different stages of CCS activity; firstly, exploration, and secondly, injection. At an early stage of exploration and while searching for CCS storage sites, a company is not carrying out the operations such as injection that require close scrutiny, and, equally, the company will not be able to provide much details about the site or the operations that might be carried out there. (We noted this characteristic in Chapter 3 in relation to public participation.) The option of one single kind of permit to encompass both stages is therefore attractive for its simplicity, but is unlikely to produce good results. Similarly important to producing good results is a reasonable level of assurance of priority of right to the holder of an exploration permit that it can obtain an injection permit.

Protection of existing uses. A further principle that should guide the development of a permitting process is that the grant of CCS rights must be carried out with regard to the interests of any existing uses of the subsurface. There should be no undue adverse effect on existing rights such as under the Crown Minerals Act. The need for management and co-ordination in this respect is addressed further in Chapter 7.

4 Exploration Permit

4.1 General

The objective of the exploration phase is to establish the characteristics, extent, feasibility and suitability of a storage formation, and to ensure the exploration is conducted in a manner that protects the environment and human health.[4] The importance of this first phase of the CCS storage process cannot be underestimated, because site selection and characterisation are important in producing an information base and reducing risk levels. Much work has already been done to assess geological formations and their suitability for storing CO_2 in New Zealand. However it is at a general reconnaissance level and does not carry out the detailed analysis of a particular formation.

3 N Bankes and J Poschwatta, Australian Legislation on Carbon Capture and Storage: A Canadian Perspective (ISEEE Research Paper, June 2008) at 73.

4 See Greenhouse Gas Geological Storage Act (Vic), s 21.

Exploration can be defined as activities undertaken to locate and assess the suitability of prospective storage sites, and will involve technical assessment, geological data collection, and an environmental assessment.[5] These assessments establish a baseline which forms a point of comparison for the information obtained from MMV during and after injection.

The grant of exploration permits raises questions regarding the relationship of CCS storage formations with oil and gas and other subsurface resources, discussed in Chapter 7. One way to avoid difficulties between the two types of resources is not to issue CCS exploration permits where they would overlap with oil and gas permits, but it is more likely that better management tools will be found in the use of permit conditions and the approval of specific operations. Enhanced oil recovery (EOR) raises other questions about what can be done under a CCS exploration permit, and is also considered in Chapter 7.

4.2 Other possible permits

One option is to provide for a prospecting permit for early-stage reconnaissance, before an exploration permit. The CMA allows for prospecting permits, but they are not much used. Another option, after an exploration permit, is a retention permit. Retention leases or licences are encountered in Australian CCS law for the period between finding a storage formation and being able to put it into operation. This reflects retention licences in Australian mining legislation which accommodate fluctuations in market conditions. In neither case does it appear that there is a strong case for these additional permits; prospecting can occur either without any permit, or, if more intensive, under an exploration permit. Retention permits will not be necessary if renewals of exploration permits are available on reasonable terms.

4.3 Allocation

Different options are available for the disposition by the Crown of rights to publicly-controlled storage formations in the form of exploration permits. The Crown could allocate rights in a number of different ways:

(a) discretionary decision on general criteria;

(b) priority in time of application ("first in first served");

(c) tender or auction of blocks of land (ie cash bonus bidding);

(d) block offers to be evaluated on the basis of notified criteria (eg quality of the work programme).

One option is for the legislation to state the method. Victoria, for example, requires the Minister to make an invitation to tender, specifying the chief factors to be taken into account but it also states that the respective merits of the work programs and the likelihood that they will be carried out are chief factors.[6] However a statutory rule of tendering may be premature before there is some expectation that CCS operations can come forward and until some experience in handling applications for them

5 International Energy Agency, *Carbon Capture and Storage Model Regulatory Framework* (2010) at 57, 63, 66.

6 Greenhouse Gas Geological Sequestration Act 2008 (Vic) ss 22(2) and 24(2). Australian approaches generally are evaluated by the comparative report by R Pritchard in Appendix A.

has built up. A better option, therefore, may be to leave the matter open, as does the CMA, and say in the statute that the Minister may notify the policies and procedures to be used, and that the Minister shall issue permits only in accordance with those policies and procedures. The instrument for this purpose under the CMA is the "minerals programme," a form of delegated legislation. Such notices or delegated legislation can embody the results of a review of public interests in particular lands and particular strata, including environmental suitability, co-ordination with other subsurface users, and the release of acreage and deep rights that are not being pursued.

4.4 Process for application

The detailed requirements for making an application can be stated in delegated legislation. An applicant should be required to state the area that is sought, to submit information on its technical qualifications and financial resources.[7] The applicant should submit its proposed work programme, including details of the work proposed for site characterisation, the methods to be used, and the expected time-frames. A work programme should provide information about other subsurface activities and the intended methods of avoiding effects on them. When determining what is required for an application for an exploration permit, a balance is needed between protecting the interests of stakeholders and ensuring that regulatory complexity will not hinder investment.

The exploration phase offers a timely opportunity to engage the public through information sharing and education on the nature of CCS, and engaging with them about their perceptions of risk. In Chapter 3 we suggest that one option is to include as part of an application for an exploration permit that the applicant submit a Public Participation Proposal outlining the type of engagement that is proposed throughout the life of the project. We recommend that, as well as a work programme, an applicant be required to submit a proposal that identifies those likely affected by the project and which details the community engagement already undertaken, as well as the proposed engagement that will continue for the life of the project. This will include the public engagement and involvement that will be undertaken in drafting the proposed site plan as part of an application for an injection permit. However we also recommend that at the exploration stage there be no public hearing. In Chapter 3 we explained that exploration operations are often short-lived, unintrustive, and preliminary in character.

The participation of Māori is a particular aspect of procedure. While it can be argued that exploration is too early for useful participation, the option exists to follow the CMA and the Minerals Programmes made under it and require the agency to consult the iwi and hapu in the relevant area before a block offer is made or an exploration permit is granted.

The application should be made to the CCS regulatory agency, with the relevant RMA consents (e.g. access across streams, earthworks, taking and using water, and disposal of drilling wastes) made to the regional council.

An application for an exploration permit could be made by an applicant solely on its own behalf, or as operator for a multi-party joint venture of some kind; or the application could be made by multiple parties. The CMA has provisions that deal with those possibilities.

7 In Victoria, for example, an applicant must supply details of the relevant technical advice available to it: Greenhouse Gas Geological Sequestration Act 2008, s 23.

4.5 Criteria for determining an application

The legislation should state the criteria that are to govern the decision to grant an exploration permit. The criteria should include an obligation to give effect to, or take into account, the purpose and principles of the Act. It should be necessary to give effect to the policies and procedures that were notified to govern the allocation of permits. In Victoria, the chief factors to be taken into account are the merits of the work programme, the likelihood that it will be carried out, and the factors notified in the tender process.[8]

Since exploration is at an early stage, with an emphasis on data collection and analysis and few operations on the ground, it is desirable to leave the criteria relatively open. Stricter and more protective criteria are better at the injection stage.

4.6 Rights and obligations

4.6.1 Exclusivity

An exploration permit will give its holder the exclusive right to explore the area specified for potential storage sites.

Options are possible on different aspects:

(a) The legislation can state a maximum size for an exploration permit, but it may be better to leave the matter discretionary.

(b) Permit rights can be limited to a particular stratum, identified by depth or by geological formation.[9] Such stratum limits can help protect the interests of other subsurface resource users.

(c) Non-exclusive permits are possible but are likely to be complicated to administer and unattractive to operators.

4.6.2 Priority for an injection permit

An exploration permit should confer on its holder the right, for part or all of the land it encompasses, to apply for an injection permit in priority to any other applicant. The right to proceed is important in providing investment certainty for the explorer company, so that no one else can take advantage of its efforts.

One option is to confer not merely a priority right, but a substantive right to be granted an injection permit upon application, subject to compliance with the Act and the terms of the exploration permit. Section 32 of the Crown Minerals Act operates this way, as does the minerals legislation of many other countries. However the RMA does not operate so as to provide a right to a further permit.

8 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 24.

9 The Greenhouse Gas Geological Storage Act (Vic), s29 makes such a provision.

4.6.3 Site characterisation

An exploration permit gives the holder the right to undertake activities to carry out a site characterisation, which is an essential component of an application for an injection permit. The site characterisation process is crucial. As the IEA *Model Regulatory Framework*[10] points out, it underpins all other activities that follow and in particular the long-term security of the CO_2 stored. While site characterisation work will be carried out under an exploration permit, its evaluation and approval is carried out in the process of deciding on an application for an injection permit. The IEA *Model Regulatory Framework* recommends that site characterisation requirements be stated in terms of performance characteristics to be achieved, rather than in requiring that particular techniques or processes be used. It also recommends that the details of the required steps and information be stated in regulations rather than the primary legislation, so that amendment to keep up with technical innovation and understanding of best practice as experience is gained with CCS projects internationally. Both recommendations are in accordance with New Zealand practice and expectations.

According to the IEA, the technical requirements for the site characterisation process include data collection, performance assessment, sensitivity analysis, risk assessment, and a definition of appropriate modes of operation. The IEA *Model Regulatory Framework* can be followed on these matters.[11] The IEA Model Text suggests that legislation state what the process must show (sufficient capacity, free of faults, fractures, wells etc. that are likely to lead to unintended migration) and also state the characteristics that make a storage site unsuitable (indications of a significant risk of unintended migration, leakage, environmental or health risks, or risk to other resources).[12]

Part of the site characterisation should include a risk assessment covering the matters suggested in the WRI Guidelines, which are included in **Figure 3**.

FIGURE 3: Recommended Guidelines for Risk Assessment

(a) For all storage projects, a risk assessment should be required, along with the development and implementation of a risk management and risk communication plan, should be required for all storage projects. At a minimum, risk assessments should examine the potential for leakage of injected or displaced fluids via wells, faults, fractures and seismic events, and the fluids' potential impacts on the integrity of the confining zone and endangerment to human health and the environment.

(b) Risk assessments should address the potential for leakage during operations, as well as over the long term.

(c) Risk assessments should help identify priority locations and approaches for enhanced MMV activities.

10 International Energy Agency, *Model Regulatory Framework* above n 5, at 70-74.

11 At 71-74.

12 At 70.

(d) Risk assessments should provide the basis for mitigation/remediation plans for response to unexpected events; such plans should be developed and submitted to the regulator in support of the proposed MMV plan.

(e) Risk assessments should inform operational decisions, including setting an appropriate injection pressure that will not compromise the integrity of the confining zone.

(f) Periodic updates to the risk assessment should be conducted throughout the project life cycle based on updated MMV data and revised models and simulations, as well as knowledge gained from ongoing research and operation of other storage sites.

(g) Risk assessments should encompass the potential for leakage of injected or displaced fluids via wells, faults, fractures, and seismic events, with a focus on potential impacts on the integrity of the confining zone and endangerment to human health and the environment.

(h) Risk assessments should include site-specific information, such as the terrain, potential receptors, proximity of USDWs, faults, and the potential for unidentified borehole locations within the project footprint.

(i) Risk assessments should include non-spatial elements or non-geologic factors (such as population, land use, or critical habitat) that should be considered in evaluating a specific site.

World Resources Institute (2008) Storage Guideline 2.

It should be a condition of an exploration permit that exploration activities are conducted in the manner in the work programme.

4.6.4 Test injection

At an advanced exploration phase, a CCS company may wish to drill a well, or use an existing well, to inject a small quantity of CO_2 in order to evaluate the storage formation rock and other characteristics of the site. It is consistent with comparative legislation that test injections be allowed under an exploration permit, although some jurisdictions require approval before any substance is injected. This is our preferred approach. A good example is the Victorian legislation, which requires the holder of an exploration permit to prepare an injection testing plan that is to be approved before any injection occurs.[13] The injection testing plan is to include information about where and how the testing will be conducted, the type and volume of substance to be injected, how any risks to public health or the environment will be prevented, a monitoring and verification plan, a risk management plan, and information about potential leakage and the migration path of the substance.[14] Test injections may be important as a method of determining the characteristics of a formation, but need to be closely controlled.

13 Greenhouse Gas Geological Sequestration Act 2008 (Vic), ss 37, 39.

14 Section 38.

4.7 Commonality in CCS exploration and petroleum exploration

One option relevant here is whether the rights and obligations under a CCS exploration permit should include rights to explore for petroleum as well as storage formations. There is substantial commonality in the exploration work for the two kinds of target – although there are differences as well. Conversely, the holder of a petroleum exploration permit could be given the right to explore for CCS storage formations. The matter is complex, but within it one sees a significant policy objective, the encouragement of the search for CCS formations. At this exploration stage, differences between the two activities are fewer than at the later stage of injection / extraction. The matter is considered in more detail in Chapter 7.

4.8 Term

The legislation should require that the regulator state the term of the exploration permit, subject to a maximum possible stated in the legislation.[15] The term should be long enough to allow for the execution of the work programme that is stated in the application. Extensions may be allowed, with clear provisions to say who decides and on what grounds, to continue the work programme. Extensions should be available on a reasonably favourable basis where exploration has been successful but where injection cannot yet begin, for example where capture and pipeline arrangements are incomplete. However, term requirements should generally be guided by the principle of "use it or lose it" to prevent CCS rights from being tied up without being put to good use.

4.9 Cancellation

An exploration permit should be subject to cancellation by the regulator for non-performance. Non-performance of different kinds is more amenable to action by cancellation at the exploration stage than at the injection stage. The options for both stages are dealt with together below.

5 Injection Permit

A permit that authorises injection of CO_2 to geological storage or sequestration is the key element of a legal framework for CCS. The next most important decision point is the decision to authorise the closure of a site. An injection permit will authorise activities from the well-drilling and construction phase until post-closure and the transfer of liability.

An application for an injection permit should include information about the applicant and its technical and financial capabilities, the proposed site plan (or matters required in the regulations), the proposed public engagement, and proof of financial assurance. A board of inquiry should decide the application (including applications under the RMA and HSEA). The process should be a formal assessment of the entire project and include a public hearing.

15 The Alberta evaluation permit has a term of five years, Victoria's exploration permits are also for five years with a renewal of a further five years, and the Commonwealth of Australia's GHG assessment permit is for six years, with a right of renewal for three years. The EU Directive says "[t]he duration of a permit shall not exceed the period necessary to carry out the exploration for which it is granted".

Just as with an exploration permit, an application for an injection permit will be made to the CCS regulatory agency, discussed in Chapter 3, and could be made by a sole applicant or by or for a group of co-venturer parties.

5.1 Eligible applicant

We envisage two phases in the consideration of applications for injection permits. The first phase identifies the eligible or preferred applicant. Provisions similar to those described for exploration permits, above, would operate, to say that the Minister may notify the policies and procedures to be used, and that the Minister shall issue permits only in accordance with those policies and procedures. It is likely however that the preferred applicant will simply be the holder of an exploration permit, exercising its priority right to an injection permit, as outlined above.

5.2 Process for application

The second phase will involve a detailed examination of the application. Its general purpose is to gain assurances over the short, medium and long term on the security and safety of the proposed storage operation.[16] What character it should have is a significant policy issue in the design of the CCS legislation. It is closely connected to the choices that are made about the relationship between the CCS legislation and the RMA. In Chapter 2, the main option that emerged was that injection should be removed from the RMA, but that other RMA matters should be considered along with injection and other related CCS matters, and that the process overall should be no less protective than the RMA. If that option is to be adopted, then the process for the examination of an application for an injection permit will have some of the character of an RMA application for a resource consent.

5.2.1 Proposed site plan

An integral part of an application for an injection permit is the applicant's proposed site plan for the project. The site plan and its components provides a full analysis of all technical details of the project including site characterisation, environmental assessment, work plan, monitoring, corrective measures, and site closure. This material provides the basis for the key regulatory decision to approve or refuse a CCS project. The grant of the injection permit requires the approval of the site plan. The proposed site plan should be drafted following informal consultation with the community, as identified in the Public Participation Proposal which forms part of the exploration permit application. The details of the site plan are discussed in Chapter 6.

5.2.2 Procedural integration: Applications to be determined by a board of inquiry

An application for an injection permit (and also an application for a pipeline permit, if one is provided for in the legislation, and is applied for) should be processed at the same time and in the same procedure as all associated RMA resource consent applications. A board of inquiry should be established with the relevant expertise, conducting one hearing for all such matters.

16 International Energy Agency, *Model Regulatory Framework* above n 5, at 77.

It will be necessary for the legislation to state that when an application for an injection permit is received, the Minister must appoint a board of inquiry to decide the matter. The legislation should state the procedure of the board of inquiry. The legislation should either state or guide the composition of the board; it is an opportunity to provide for Māori input and for input from the regional council in particular. That would ensure that Māori and regional council expertise and concerns are properly considered. There is a range of options available for this purpose; for example, the legislation could require representatives to be appointed to the board, or could require the advice of iwi and the regional council to be sought and particularly taken into account by the board.

An option is for the board of inquiry also to consider any plans or information required by the Health and Safety in Employment Act 1992, such as the safety case and the emergency response plan. The advantage of having these requirements approved at the same time is that an integrated assessment of design and construction details will be more efficient and more effective. The newness of CCS internationally and in New Zealand would suggest those benefits. However this would be a departure from existing arrangements for the regulation of health and safety of projects in New Zealand.

5.3 Criteria for determining an application

The decision to grant an injection permit is central to the entire structure of CCS legislation. In the legislation that we propose, the grant of an injection permit authorises the applicant to proceed with a CCS project, and injection for geosequestration in particular. There would be other requirements to be fulfilled in respect of detail, but the approval of an injection permit entails approval of the site plan, site characterisation, and project plan. It entails, in the option that we recommend, the grant of the necessary environmental permits.

Because of this centrality, the provisions stating the criteria for the approval of an application for an injection permit require particularly careful consideration. They bring together in legislative form the expectations of the community about the proper management of CCS operations. The public will expect the decision maker to approve a CCS project only if all relevant criteria are met. An injection permit is very different from an exploration permit in ways that affect the criteria that the CCS legislation should state. It is of first importance that the legislation give the decision maker clear guidance on what to look for and to require before approving a project.

One option is to give the decision maker a broad, open discretion ("the Minister may grant or refuse to grant an application"), and make that discretion subject to a statutory purpose and subject to principles or matters to be taken into account, such as proposed in Chapter 3. The purpose, principles and matters would guide the decision maker about the questions that the community, through the legislator, regards as significant in authorising a CCS project. The decision maker is left with considerable discretion and flexibility in giving effect to that guidance, which may suit the exigencies of particular cases.

The second option, which we prefer, is to retain the guidance provided by a statutory purpose and by principles and matters to be taken into account, as proposed in Chapter 3, but also to state a statutory test or threshold that must be passed before a CCS injection permit can be granted. A threshold test means that the applicant must provide evidence that its project will meet certain standards.[17]

17 An open discretion is seen in a decision on a discretionary activity under the RMA, and a threshold in one on a non-complying activity: Resource Management Act 1991, ss 104B and 104D.

Several examples of a threshold test are seen in CCS laws. One of the clearest is the European Union Directive of 2009.[18]

> A geological formation shall only be selected as a storage site, if under the proposed conditions of use there is no significant risk of leakage, and if no significant environmental or health risks exist.

Before it issues a storage permit, the competent authority of the Member State must be satisfied that all requirements of the Directive and other relevant Community law are met, and the above is the chief requirement, imposing a clear test that must be met as to leakage, the environment, and health.

The IEA *Model Regulatory Framework* is very similar, even though it puts the threshold test into the site selection and characterisation activity process.[19]

3. To be a suitable storage site, the site characterisation process must indicate that a proposed storage site:
   (a) has sufficient storage capacity for the intended quantity of CO_2 to be stored;
   (b) has sufficient injectivity for the intended rate of CO_2 injection; and
   (c) is free of faults, fractures, wells or other features that are likely to allow unintended migration.
4. A proposed storage site is not suitable where the site characterisation process indicates that it poses significant:
   (a) risk of unintended migration;
   (b) risk of leakage;
   (c) environmental risks;
   (d) health risks; or
   (e) risk to other resources.

A similar pattern is seen in the state of Victoria.[20] The Minister has a broad discretion to grant or refuse to grant an injection and monitoring licence, but he or she must be satisfied that the underground geological storage formation is likely to be geologically suitable for the injection and permanent storage of GHGs, and that the GHG is likely to be permanently contained. This addresses the permanence of storage that is dealt with as leakage in the two preceding examples. In addition, at the stage of approval of the injection and monitoring plan the Minister must not give approval unless he or she is satisfied that the formation is suitable for permanent storage, that the project will not present a significant risk of contaminating or sterilising other resources within the licence area; that the GHG will be contained; and that injection will not present a risk to public health or the environment.

We believe that these examples, especially the EU Directive and the IEA Model, are good precedents for New Zealand to follow.

Other examples are less clear or show other priorities. For example, Alberta is concerned that there be no interference with the recovery or conservation of oil or gas or with an existing storage operation.[21] The Australian Commonwealth OPGGSA exhibits the same concern, in respect to a significant risk of a significant adverse impact on petroleum exploration or operations.[22]

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18 EU Directive 2009/31/EC on Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Articles 4(4) and 8.

19 International Energy Agency, *Model Regulatory Framework* above n 5, at 70. Although this is part of the site characterisation process in the IEA Model, it is separate from the authorisation of activities.

20 Greenhouse Gas Geological Sequestration Act 2008 (Vic), ss 83(1), 96.

21 See Bankes, Appendix B. Note however that environmental approvals are given separately.

22 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), ss 362 and (as to determining the existence of a serious risk) 28.

In shaping the legal test or threshold, one may note two different aspects.

(i) The substantive matters, that is, the matters that are subject to the test. Those that form the core are:

- Permanence of storage
- Health and safety
- Environment.

In some jurisdictions, effects on other subsurface resources are the subject of a threshold test. The subject is addressed in detail in Chapter 7. The matter may lend itself to a balancing exercise rather than a threshold test.

(ii) The standard of proof to be met, e.g. satisfied that there is no significant risk. A standard can be set in a basic way, e.g. that the project is unlikely to present a serious risk. On the other hand, the standard can be set high, e.g. satisfied beyond reasonable doubt that there will be no identifiable risk whatsoever. Setting the standard that high would go well beyond what is found in other legislation, and would make it difficult to approve any project at all. We believe that a suitable standard is that the regulatory agency should be satisfied, and that the risks that it should concern itself with are significant risks. However other ways of expressing the standard could be acceptable and workable.

While this threshold test is at the heart of the criteria to be applied to the decision to grant an injection permit, it would not be the only matter legally relevant to the decision. In particular, the decision would also be affected by:

- A statement of the purpose of the Act, as discussed in Chapter 3;
- General principles stated for the administration of the Act;
- Matters stated to be recognised and provided for, to be taken into account, or to which particular regard is to be had in the administration of the Act, and in particular those identified in Chapter 3;
- Criteria concerning particular issues (e.g. effects on other subsurface resources) that are stated elsewhere as imposing a threshold test or consideration.
- Requirements for an injection permit that are less central than those noted above. For example, the financial and technical capability of the applicant, access to a stream of CO_2 or GHGs,[23] likelihood that storage operations will begin within five years of the grant,[24] provision of financial assurance.[25]
- Compliance with formal requirements. For example, payment of fees, supply of information.

23 Greenhouse Gas Storage Act 2009 (Qld), ss 117 and 118; Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 83(1). The requirement for commercial viability may need a generous interpretation until the price on GHGs is high enough to obviate government support.

24 Greenhouse Gas Storage Act 2009 (Qld).

25 International Energy Agency, *Model Regulatory Framework* above n 5, at 76.

We therefore recommend that the CCS Act provide that a board of inquiry shall not approve an application for an injection permit unless it is satisfied that the CCS project applied for will not present significant risk of leakage from permanent storage, significant risk to health and safety, or significant risk to the environment.

5.4 Rights and obligations

An injection permit authorises the permitee to develop the storage site, to inject CO_2 for storage, to leave the CO_2 in storage permanently, and to undertake activities incidental thereto. It includes rights to carry out exploration activities. It includes activities such as building and operating local pipelines for the distribution of CO_2 to wellheads in the injection site. The permit holder has ancillary rights such as rights to use Crown-controlled storage capacity, and rights to use or take private land (Chapter 4). The permittee accepts various obligations such as performance of the measurement, monitoring and verification (MMV) programme.

5.4.1 Site plan

The permit holder shall ensure that an approved site plan is in place, and is to undertake its operations in compliance with the site plan. Details of the technical operations of the project should be in the site plan, not the permit. The site plan can be varied through a process that is less comprehensive procedurally than the variation of a permit. Site plans are more fully considered in Chapter 6.

5.4.2 Conditions

Other rights and obligations can be stated as conditions on a permit. The CCS Act should contain a provision (similar to section 108 of the RMA) stating what conditions may and may not be imposed.

Conditions of the permit should include the location and boundaries of the storage site, including the storage complex (the primary and secondary containment systems), having regard to the movement of the CO_2 plume and the associated pressure front. Conditions should state the total quantities of CO_2 to be stored, maximum annual and daily quantities to be injected, operating pressures, and the allowable operating limits for other components in the CO_2 stream.

The decision maker should be authorised to impose conditions on review and updating the site plan and on any of its contents in order to provide site-specific regulation.

Conditions for financial assurance are dealt with below.

The permit should not state conditions relating to operational matters, methods of operation in particular. This is important to provide flexibility. Such matters should be addressed in the site plan, which can be varied and updated without affecting the permit itself.

Obligations will exist under other legislation, notably the Climate Change Response Act 2002, which will impose requirements for reporting and for the surrender of credits if leakage from storage should occur.

5.5 Term

There should be no maximum term stated in the legislation for an injection permit, or in the permit itself. The ordinary course of events should be that an injection permit stays in force until site closure is approved. Site closure is discussed below. Surrender or cancellation should be possible only in limited circumstances, also discussed below. From the point of view of the public interest, what is important is that the injection project be carried out properly, and that the site be closed properly, with no risk to the public or to the environment, at the expense of the operator.

6 Pipeline Permit

It is possible in the CCS Act to declare that a company must apply for a pipeline permit in order to build and operate a CCS transmission pipeline. The Act would make it clear that the permit holder has authority for the pipeline, and has the ancillary powers necessary, in particular the right to enter on or to take land, or to use the marine and coastal area. The pipeline permit and the injection permit need not be held by the same company. One option therefore is that the legislation provide for a pipeline permit. An application for a pipeline permit could be made and considered alongside an application for an injection permit. The legislation could attach obligations such as third party access to the permit. (However, pipelines that are part of injection operations at a storage facility would be authorised by the injection permit.)

The alternative is for the CCS Act not to require pipeline permits, and to rely instead on existing legislation and procedures, especially the procedures that the operator can follow as a requiring authority under the RMA (see Chapter 4). Pipelines for other purposes are regulated under the RMA and the HSEA without the need for permitting arrangements and we see no reason why CO_2 pipelines should be any different (see Chapter 8). The IEA *Model Regulatory Framework* observes that the main issue in reform in respect of pipelines is to analyse the application of existing regulations to CO_2, so that modifications of existing laws is more likely than the introduction of a large tranche of specific new measures.[26] This is the pattern that in Chapter 8 we consider suitable for New Zealand. Obligations concerning third party access can be imposed generally on any person who operates a CCS pipeline, without reference to holding a permit. Environmental and safety concerns can be dealt with in the course of the RMA procedures for a requiring authority to obtain a designation. Other health and safety requirements would be imposed directly under the HSEA without reference to holding a permit. The pipeline company need not be the company that is carrying out injection operations. On the whole we do not consider that it is necessary to institute a CCS pipeline permit.

26 International Energy Agency, *Model Regulatory Framework* above n 5, at 51-53.

7 Site Closure

7.1 General

The most important decision under CCS legislation, after the grant of an injection permit, is the approval of the closure of an injection site. It is peculiar to CCS; ordinarily there is little public interest in a regulated activity once it comes to an end, but in the case of CCS the closure procedures are important to ensure that the project has been safely concluded, that the operator can be discharged from its obligations, and that long-term stewardship, monitoring duties and any residual liability can be assumed by the public. Closure is closely tied to liability (discussed in Chapter 10) and indeed the main point of the final closure authorisation is the transfer of obligations and liability to the public, rather than the actual cessation of operations, which may have happened years earlier.

Closure procedures may be triggered in different circumstances:

(i) The conclusion of injection as planned;

(ii) Agreement between the permit holder and the regulator to close early;

(iii) Decision of the regulator, on default, or in the event of leakage, significant irregularity, or risk of significant irregularity.

The third situation is dealt with under the heading of Cancellation of a Permit, below. It exposes the regulatory agency to the burden of completing closure, remediation, corrective measures and monitoring.

7.2 Procedure for site closure

7.2.1 Notification of closure and start of closure period

The first step in site closure, if one follows most of the CCS models internationally, is that the permit holder notifies the agency that injection operations have come to an end. This could be at the end of the planned programme of injection, or it could be earlier at the request of the permit holder. This will also be a requirement under health and safety regulations. The closure period, as the IEA *Model Regulatory Framework* terms it, therefore begins with the notification of the end of injection operations, and ends when the closure authorisation is granted. During the closure period, the permit holder proceeds in accordance with the closure plan to decommission the site, to remove equipment, and to carry out full plugging and abandonment operations on all wells. It continues with monitoring and the reporting of results. It carries out any remediation or corrective measures that are required. It may be obliged to provide a financial contribution to the anticipated costs for the post-closure period.

Some jurisdictions require that the closure period have a minimum length, in order to provide time to show that the injected CO_2 is permanently contained and is behaving as predicted. One view is that to shift liability when a set number of years have passed is too simple and would undermine the importance of ensuring that all operational tasks are fully completed.[27] There is no technical or safety reason why

27 R Campbell "Long-term Liability for Offshore Geosequestration" [2006] AMPLA Yearbook 515, at 521.

a minimum period is needed; the greatest level of risk is during injection, and following closure the risk of future leakage is "as good as ruled out".[28] Such a minimum time may provide increased confidence, even if there is no technically obvious reason for it. The IEA Model indicates such a minimum period as an option, without recommending it.[29] The EU Directive seems to take a hybrid approach and requires a minimum of 20 years unless all evidence indicates the CO_2 is completely and permanently contained.[30] An analysis of the application of the EU Directive raises some important questions that will need to be considered to provide certainty to a CCS operator, and which can be applied to any regulatory regime for transferring liability. Jonker asks what evidence must there be for liability to be transferred, and who will assess the evidence? What happens if the CCS operator and the entity to which liability is transferred do not agree?[31] We do not attempt to answer the first question as it relates to scientific matters. However, where an operator and a regulatory agency do not agree the onus should be on the operator to show that the conditions for site closure authorisation are met. An option is third party verification. In comparison to the EU approach, the Australian OPGGSA provides for a site closure certificate to be issued on the cessation of operations but then requires a closure assurance period of at least 15 years after the site closure certificate is granted.[32] We do not make a recommendation for a minimum duration for the closure period between the end of injection and the issue of a closure authorisation. The emphasis should be on the technical quality of the analysis of an application for a closure authorisation. But we accept that requiring a minimum period may provide a greater sense of reassurance to the public.

7.2.2 Application for a closure authorisation

Closure authorisation is the termination of the injection permit, and the final sign-off for the permit holder company. The company provides the agency with the material that it requires in order to consider the criteria for a closure authorisation. It provides information about the operation and state of the storage site generally, decommissioning, well plugging and abandonment, and any other information required by regulations. It provides updated information about the storage itself, in a post-closure plan that includes evidence of CO_2 plume stabilisation, forward modelling of CO_2 plume development, risk assessment, and a long-term monitoring plan, including costs to cover the monitoring requirements in the plan.[33]

One issue is how long monitoring should continue for. For example, the EU Directive says that once responsibility has been transferred monitoring may be reduced to a level which allows for detection of leakages or irregularities and if any are detected monitoring shall be intensified as required.[34] But what is this level? The Directive is silent as to what this should be, although it does say that the financial contribution for monitoring costs must cover at least 30 years. Considering

28 T Jonker Permitting Process: Special Report on Getting a CCS Project Permitted (Maasvlakte CCS Project C.V., January 2013) at 56.

29 International Energy Agency, *Model Regulatory Framework* above n 5, at 96.

30 Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Article 18. The IEA *Model Regulatory Framework* builds on the Directive in many respects. The Guidance Documents which accompany the Directive provide further detail on obligations and procedures.

31 See Jonker, above n 28, at 57.

32 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 399.

33 International Energy Agency, *Model Regulatory Framework* above n 5, at 95 and 99. Also see Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 170; Greenhouse Gas Storage Act 2009 (Qld), s 177.

34 Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Article 18.

the costs involved with on-going monitoring there should be a point at which, say, after 30 years of no leakage or unexpected migration, the competent authority is no longer required to undertake monitoring activities.

Public participation in consideration of an application for a closure authorisation has some merit, even if only in a limited form such as public notice and an opportunity to comment or make submissions. More elaborate procedures such as a board of inquiry are possible, although do not seem necessary. Some public participation would be fitting in light of the significance of the closure process and could be as simple as involving the public in tree planting for site rehabilitation.

7.2.3 Alternative procedures for closure

The above approach, which we recommend, follows the IEA *Model Regulatory Framework* in providing for closure through a closure authorisation. An alternative is found in the OPGGSA of Australia, which uses an elaborate scheme requiring application for site closure within 30-90 days after cessation of injection, followed by issuance of a pre-certificate notice by the Minister, and then a site closing certificate once all conditions are met. The legislation requires the Minister's decision to be made within 5 years.

Another option (used in the Victorian legislation) is that site closure occurs where after injection ceases and closure responsibilities have been undertaken the permit is simply surrendered. The framework requires that on completion of injection activities all infrastructure is to be removed and the site rehabilitated, and the right to inject a substance is to be surrendered. It must be noted this is not a surrender of the permit yet, just the right to inject. The Minister must be notified and will amend the permit to remove the right to inject. It is not until the injected substance is behaving as expected and will continue to behave in a predictable manner and all risks are reduced to as low as practicable (and storage will not present a risk to public health or the environment) that the permit may be surrendered (additional criteria must also be met, such as details on the site and substance, assessments of potential leakage, and a risk management plan). The decision to consent to the surrender of an authority does not wholly rest with the Minister; binding recommendations can be made by the Ministers administering the Environment Protection Act 1970 and the Water Act 1989 or recommendation may be sought from an independent panel or relevant public authority.[35] The approach is results-driven, rather than the legislation imposing a minimum time until the permit may be surrendered. One point to note, however, is that long-term liability is not addressed in the Victorian legislation. Although a long-term monitoring and verification plan must be submitted as part of the application to surrender a licence and costs to undertake the plan must be paid. However, there is no minimum time stated that monitoring shall continue for. Interestingly, the OPGGSA also does not have a specified time for monitoring, which contrasts with the EU CCS Directive that seems to envisage monitoring to continue for a period of at least 30 years.[36]

Whichever procedure is adopted the substantive requirements remain the same; these requirements are stated below as the criteria for a site closure authorisation.

35 Greenhouse Gas Geological Sequestration Act 2008 (Vic), ss 171, 172.

36 Directive 2009/31/EC on the Geological Storage of Carbon Dioxide does not require monitoring for a period of at least 30 years but requires the financial contribution to cover post-transfer obligations to cover at least the anticipated cost of monitoring for a period of 30 years; Article 20.

7.3 Criteria for a site closure authorisation

We consider that before it grants a closure authorisation the regulatory agency must be satisfied of the following matters:

- There is no significant risk of future leakage or irregularity in the storage site;
- The site has been decommissioned as required by the site closure plan and by the regulatory agency;
- The CO_2 is conforming with the behaviour anticipated in modelling, and the site is evolving to long-term stability;
- A long-term monitoring plan has been provided;
- Financial obligations have been fulfilled, eg that the costs of long-term monitoring have been paid for;[37]
- Overall, the operations must have resulted in safe and permanent storage of CO_2.

7.4 Effect of a closure authorisation

The grant of the closure authorisation brings an injection permit and obligations under it to an end. It also effects the transfer of liability to the Crown, not only civil liability for loss or damage experienced by a third party, but also climate liability or carbon liability, in the event that a leakage should occur. These matters are dealt with in Chapters 10 and 11.

8 General Permit Provisions

The effective functioning of a permitting system requires a number of ancillary provisions. These provisions are required for both exploration permits and injection permits, although sometimes in different form. The CMA and RMA often provide examples for CCS legislation.

8.1 Notifiable events

The legislation should state matters that the permit holder must notify to the responsible agency. Events that should be notified are the commencement of injection, significant changes to the rate of injection, and temporary and final cessation of injection. These events are also likely required to be notified to the Secretary of Labour under the HSEA. The agency is also to be notified of any significant irregularity in the storage site, including leakage and unexpected migration of fluid.[38] In regards to notification requirements under an exploration permit, the permit holder should be required to report any success in identifying a viable CCS storage complex. What is required can be prescribed by regulation.

37 International Energy Agency, *Model Regulatory Framework* above n 5, at 95.

38 International Energy Agency, *Model Regulatory Framework* above n 6 at 79; Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Art 16.

8.2 Reporting

Periodic reporting obligations will be required. The EU CCS Directive, for example, requires reporting by the operator at least once a year.[39] Details of the quantities of CO_2 injected, including the composition of the stream, the results of monitoring, proof of financial security, and other information necessary for ensuring compliance with the permit should be reported.[40] The agency should have the power to provide copies of the report to other regulatory agencies, such as the Health and Safety Regulator or a regional council, and to the public.[41] The operator will also be obliged to report to the Environmental Protection Authority in respect of removals and emissions for the New Zealand Emissions Trading Scheme, as discussed in Chapter 11.

8.3 Inspection

It is necessary that the regulator is given power to inspect exploration activities and storage sites to verify that storage projects are performing as intended, that the operator is complying with all statutory requirements, and to investigate any complaints. Even though the HSEA includes inspections its scope is limited to health and safety matters. The RMA provides that enforcement officers may make inspections to ensure compliance with that Act, and the CMA is similarly limited. Thus, provision should be made under the CCS Act to allow inspection of exploration and storage sites to ensure compliance with the CCS Act.

The IEA says the objectives of inspection are to verify records, review monitoring results, examine surface facilities, and review any routine or unplanned shut-downs. It also says:[42]

> [G]ood practice would suggest combinations of the following:
>
> - At least annual reporting of operational activities and review by the relevant authority. This should be enforced via the storage authorisation process.
> - At least annual or biannual routine inspections of operations.
> - At least annual third-party verification, with oversight from the relevant authority.
> - Non-routine inspections, in order to investigate any reports of leakage, unintended migration or other significant irregularity, complaints or other situations as necessary.
>
> Inspections should continue through the closure period, although the frequency of inspections may be modified during this phase according to site-specific considerations and the level of confidence in storage site performance achieved by the relevant authority.

Clearly, the inspections during the closure period will be for the monitoring obligations, rather than the injection facilities, which would have been decommissioned.

The findings from inspections should be reported to the operator, regional council, and the health and safety regulator, and a copy should be available on the CCS Information Database, as explained below in this Chapter at 8.10.[43]

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39 Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Art 14.

40 These are the requirements as stated in Article 14.

41 The Crown Minerals Act 1991, ss 90 and 90E-90G are examples.

42 International Energy Agency, *Model Regulatory Framework,* at 81.

43 See Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Article 15; International Energy Agency, *Model Regulatory Framework* at 80, 81.

8.4 Variation

The CCS law should provide for a permit to be varied in certain circumstances. Different situations could make a variation desirable. For example, the area covered by a permit and the strata identified (if any) should be changed if improvements in geological knowledge give a different picture of the storage formation, including the associated seal rocks, the likely plume of CO_2 and the likely pressure front. Exploration permits will tend to last for shorter periods and are less likely to need variations, but the possible long terms of injection permits make a variation procedure necessary. Where a variation may result in a substantially changed permit or in different effects on other parties, the agency should require a procedure that resembles that for the initial application for a permit. Provisions should provide procedural fairness for the permit holder and for other affected parties, especially where cancellation is one of the possible outcomes.

8.4.1 Variation on application by the permit holder

It should be possible for a permit holder to apply for a change of the permit. Precedents are found in the RMA and the Crown Minerals Act.[44] If the variation could substantially change the permit or the effect of operations on third parties, the agency should require a procedure that resembles that for the initial application for a permit. Otherwise a less elaborate process is likely to be sufficient.

8.4.2 Variation initiated by the agency

It should also be possible for the agency to initiate a process for a variation of a permit, even though the permit holder does not seek it, if it is desirable to do so in order to safeguard some aspect of the public interest. Just as with the power to make directions, the power to require variations should be carefully circumscribed.

The agency should be able to initiate a variation where it is desirable for the efficient administration of the Act, such as for adjustments of permit boundaries and the like and where there is new information about the storage site.

8.5 Cancellation

It is necessary that the regulator has power to cancel a permit, although cancellation should be seen as the last resort. It should be possible to close an operator down and cancel its permit for non-compliance with the CCS Act. It may also be necessary for the regulator to cancel a permit where new information shows that a geological formation is not suitable for CCS storage. Another case again is the failure of the permit holder to proceed with the project. (There are precedents for this under the RMA and CMA.) However the conditions for exercising the power of cancellation must be carefully specified, in order to maintain confidence of security of tenure for the permit holder.[45] There should also be careful consideration of the effects of a cancellation on an upstream party, such as a company that is producing CO_2 and relying on access to the injection facility without having alternative facilities available.

44 Resource Management Act 1991, s 127 (as to conditions only); Crown Minerals Act 1991, s 36.

45 A good example of a cancellation provision is the Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 175.

Cancellation should not be looked to as an ordinary means of addressing non-compliance with the requirements of a permit. It will be an unattractive option for a regulator during the injection phase, when there is a significant public interest in ensuring that the permit holder proceeds with injection and closure operations without interruption. In most cases it will be more important to keep the permit holder in place and performing its operations properly, and other enforcement methods will be preferred. Directions made by the Minister or responsible authority and financial penalties will often provide better options for enforcement. Variation to the permit may be another better alternative than cancellation. But cancellation is a backstop where necessary, and the taking of adequate financial assurance allows the regulator to put it in play without immediately exposing the Crown to the financial burden of taking the project over.

What is important is ensuring that closure obligations are fulfilled, and, where the agency carries out the work to fulfil those obligations itself, the cost will be recovered from the operator. It is also important to ensure that where required the monitoring obligations will continue.

8.6 Financial assurance

Financial assurance is required to make sure that if an operator is unable or unwilling to carry out its obligations the expense does not fall on the public, especially in relation to corrective measures, proper closure of an injection project, rehabilitation, and ETS obligations. Financial assurance is similarly required of operators of many kinds of project under the RMA in accordance with good regulatory practice. Financial assurance is also important with respect to enforcement, the cost of remedial action, and liability. Without sound financial assurance, the regulator may struggle to obtain compliance from a company, especially a small one that has the choice of abandoning a project or going into liquidation.[46]

For financial assurance in CCS law, the two main issues are the form of assurance, and the amount. Examples can be found in the EU CCS Directive[47] and the Greenhouse Gas Storage Act 2009 of Queensland.[48] The Victorian legislation is somewhat different and requires an authority holder to obtain insurance to cover expenses or liabilities in relation to the operation of an authority,[49] a bond to be paid for rehabilitation work, and as a condition of an injection and monitoring licence annual instalments are to be paid of an estimated cost for long-term monitoring and verification.[50] Further, royalties are to be paid in respect of the volume of greenhouse gas substance injected.[51] The South Australian approach is different again and states that it is a mandatory condition of every licence that the licensee has adequate technical and financial resources to ensure compliance with environmental obligations.[52] This is similar to our own Crown Minerals Act which requires an applicant to include a statement of its financial resources as part of the application process for a mining permit.[53] The

46 For a thorough analysis, see European Commission, Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide Guidance Document 4 Article 19 Financial Security and Article 20 Financial Mechanism (2011).

47 Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Article 19.

48 Greenhouse Gas Storage Act 2009 (Qld), s 270.

49 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 218.

50 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 112.

51 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 224.

52 Petroleum and Geothermal Energy Act 2000, s 75.

53 Crown Minerals (Petroleum) Regulations 2007, reg 19.

CMA also makes provision for the administration of bonds and deposits made in relation to mining under other Acts,[54] although no bond or financial security is required under the CMA. Under the RMA, a bond may be required in order to ensure that conditions of a resource consent are complied with, as mentioned above.

An ancillary issue is whether there should be ministerial discretion to require additional security or assurance. Another is whether the assurance is for the life of the operation, or only for the operation period. It is appropriate that the regulator require bonds and guarantees to be provided according to the characteristics and circumstances of each project.[55]

The European Commission's Guidance Document on the implementation of the CCS Directive provides a useful overview and discussion of options for financial security.[56] Options identified include setting aside funds, such as deposits, an irrevocable trust fund, or escrows. Other mechanisms include bank guarantees, letters of credit, bonds, or insurance. The Guidance Document is a useful resource for assessing the different options in respect of criteria such as certainty, liquidity, duration, flexibility, cost, and administrative complexity.[57] Mechanisms that involve setting funds aside have a high cost and administrative burden compared with guarantees, letters of credit and bonds. Some instruments such as trust funds or industry-wide solutions are attractive in large jurisdictions such as in North America or Europe, but are likely to be unduly complex in New Zealand where for a long period there might only be one or two CCS operators.

We recommend that there be sufficient power granted by the CCS Act to require financial assurance of a character and size that will protect the interests of the public and the capability of the regulatory agency in respect of enforcement.

8.7 Enforcement

In order to manage a permit system the regulating agency requires a suite of enforcement measures to deal with different situations and different kinds of non-compliance. Inspections and directions have been dealt with elsewhere. Search and seizure and prosecution for interference and injecting without permission must also be provided for. Education, communication, and liaison will often be the most effective means of improving performance, but prosecution is a necessary option for the most serious cases of non-compliance. Enforcement measures under the RMA include enforcement orders and abatement notices; the equivalent here is directions and withdrawal of approval of the site plan. In the case of CCS, the threat of cancellation will not always be a desirable or an effective enforcement tool; at some point a recalcitrant operator may be willing to disregard enforcement efforts, forfeit the permit and leave the project. Financial assurance is therefore vital to make sure that the regulator can obtain proper performance from such an operator without performance immediately becoming a burden on the taxpayer. Cancellation was discussed above at 8.5.

54 Crown Minerals Act 1991, s 109.

55 See ResourcesLaw International, Appendix A.

56 European Commission Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide, Guidance Document 4, Article 19 Financial Security, and Article 20 Financial Mechanism.

57 At 26.

8.8 Transfer

The legislation should provide that a permit, and the rights and obligations contained therein, may be transferred from one party to another, but that no permit, no interest in a permit, and no change in control of a company holding a permit shall occur or be effective without the consent of the agency. The main policy reason is that the particular company holding the permit has been chosen carefully with regard to its ability to carry out the injection and site closure successfully, without imposing risk or liability on the public. The model of sections 41-41D of the CMA is a suitable one.

8.9 Nature of the Rights

It is desirable to include a provision that a CCS permit is neither real nor personal property, in the same manner as in the RMA section 122 and the CMA section 92. The provision should carry on to state, as in those Acts, how the permit may be dealt with as to personal property security, company liquidation, etc. The provision will limit the suggestion (which has arisen in some countries) that the permit confers a right to pollute.

Some care should be taken to ensure that the rights and duties that are granted under the legislation and held under a permit are not merely those initially granted but as modified from time to time by any direction, variation, or alteration of the site plan. It is important to make it clear that the package or bundle of rights of a permit holder are inherently subject to change within the statutory framework. A permit holder should not be able to argue that its initial rights have some kind of preference over subsequent alterations, or that the exercise of powers to issue directions or to vary a permit are intrusions on its vested rights. Rather, it should be clear from the outset that CCS rights are adaptable. A long-term CCS project is sure to see significant changes in circumstances over time, and the legislative framework is designed so that the permit holder's rights and duties will change in consequence where the regulator agency requires it. Clarity about change over time, and clarity in the relationship between the different parts of the regulatory fabric, will help avoid claims of expropriation or absence of fair and equitable treatment in dealing with investment.

8.10 Register

Register of permits. A register should be maintained of the different CCS permits that have been granted (along with any closed storage sites), including maps, and any dealings. The register should also contain a summary site plan, and the reports that are required to be submitted as part of the reporting requirements mentioned in section 8.2 above. This information should be publicly available to ensure transparency and increase public confidence.

One additional option is that the existence of a storage operation should be drawn to the attention of persons dealing with lands in which they lie, by notation on certificates of title in the Land Transfer Act register, and/or in property information memorandums or land information memorandums. That may be thought unnecessary, however, where there is no likelihood of any effect on the surface. A more obviously desirable option is for such notations to be made only where CCS operations have surface facilities or require access for long-term monitoring.

Public access to information. Geological, geophysical and other technical information provided by permit holders should become publicly available, in a controlled manner, in order to contribute to a public information base about storage complexes. This is common in petroleum and mining legislation: See CMA sections 90-90D. It ensures additions to the shared basis of information about relevant subsurface resources. However, the collection of such information by seismic and drilling operations is expensive, and the data is often valuable commercially, especially in competitive situations. Data can help ascertain the value of land outside a permit boundary, and data obtained in the course of CCS exploration can be valuable for petroleum and other subsurface purposes. Rules for public disclosure must therefore be fair to the company collecting the data. Under the CMA, the general rule is that such information remains confidential for 5 years from the date that it was obtained, or upon the expiry of the permit and any subsequent permit if that is earlier.[58] In Alberta, this area of CCS law has been identified as one where improvement is needed.[59]

Thus, we recommend that the CCS Act establishes a register to contain the above information and to act as a portal to information for the public.

8.11 Dispute resolution and appeal

Regulatory decisions concerning permits should not generally be subject to a dispute resolution mechanism or right of appeal, but should be final. For the most part, they deal with administrative or executive matters that are properly the province of a government agency, and they should not be subject to renegotiation. They do not ordinarily lend themselves to judicial determination. Under the Crown Minerals Act, dispute resolution procedures and appeals only appear in specific situations. The same goes for mineral legislation and CCS legislation in other countries. One bears in mind, of course, that a decision that is taken unlawfully, unfairly, or unreasonably, in the sense of administrative law can be challenged in judicial review proceedings.

However there are two situations where there are reasons for appeals or dispute resolution. The first is to maintain parity with the RMA in relation to the grant of an injection permit. Our recommendation for injection permits is that an application will be decided by a board of inquiry that is similar to a board of inquiry under the RMA call-in procedures, and which would also decide related RMA applications such as in respect of surface activities. The RMA provides an appeal from such a board of inquiry to the High Court on a question of law.[60] If the scrutiny of an application for an injection permit under the CCS legislation is to be similar to the RMA, then there should be a similar appeal from the board of inquiry. Such an appeal seems to be suitable in any event as a procedural safeguard and a form of access to justice as public participation. It is not common in CCS legislation overseas, but in some of that legislation environmental scrutiny occurs separately.

The second rationale for an appeal or dispute resolution system is the inevitable special closeness of the long-term relationship between a CCS operator and its regulatory agency, and the need to assure the operator that key decisions by the regulator that affect its existing investment can be scrutinised. If a decision by the agency could jeopardise a sunk investment of the permit holder, there is a case

58 Crown Minerals Act 1991, s 90(6). Different rules apply to certain prospecting permits: ss 90, 90C, 90D.

59 N Bankes, Appendix B.

60 Resource Management Act 1991, s 149V.

for providing further consideration of what would otherwise be an entirely unilateral action. Relevant decisions would be those in the administration of an existing permit where the permit holder has made a significant investment; decisions to cancel a permit, to vary a permit, to vary a site plan, to make a direction, or to require more or different financial assurance. (Not included would be decisions about the initial grant of a permit and site plan; after all, the applicant can decline to accept the terms offered.) For these decisions, there could either be an appeal or some form of compulsory dispute resolution. Cancellation of a permit may be particularly suitable for an appeal on point of law.[61] Without specifying detail, we recommend that there be limited appeal or dispute resolution rights in respect of key decisions in the administration of injection permits where the permit holder is likely to have made a significant investment.

These recommendations are consistent with CCS legislation elsewhere. In Victoria and the EU Directive, neither appeals nor relevant dispute resolution procedures are to be seen. They do not appear in the IEA Model Framework either, although that document tends not to concentrate on the more legal and jurisdiction-specific matters of this kind. In Queensland the CCS law provides for appeals to the Land Court by a person whose interests are affected by a decision listed in Schedule 1.[62] That Schedule lists variations, modifications, and cancellations of the kind discussed above, so it is a useful precedent. In Alberta, decisions of the Alberta Energy Regulator are subject to a regulatory appeal and appeal to the Court of Appeal (with leave of the Court) on a question of jurisdiction or law.

9 Recommendations

1. We recommend a system for the granting of a CCS exploration permit and then a CCS injection permit. (We do not consider it necessary to have a CCS pipeline permit.) The permit system will facilitate the regulation of different aspects of the public interest, the allocation of public resources, the identification of a commercial interest, and various ancillary rights and duties.

Exploration Permit

2. An exploration permit gives the holder the exclusive right to explore a specified area for storage formations for a limited time and to undertake the work necessary to complete a site characterisation, which is necessary for an application for an injection permit. Test injections may be carried out with approval. The exploration permit gives a priority right to an injection permit.

3. An application for an exploration permit will include details about the technical qualifications and financial resources of the applicant, and its proposed work plan. It will include a public participation proposal detailing the level of public engagement proposed for the life of the project, including consultation with Māori. There will be no formal hearing. The Act will state the criteria for determining an application.

61 Such an appeal is provided by the Crown Minerals Act 1991, s 39(5). Before the 2013 amendment it was a general right of appeal. Other examples exist in the CMA; a Minister's proposal to change a work programme for a subsequent permit to which an applicant has a right is subject to arbitration (ss 44 and 99); and a Minister's proposal to change a petroleum mining permit to maximize economic recovery is subject to determination by an independent expert: s 37 and 38.

62 Greenhouse Gas Storage Act 2009 (Qld), ss 395 et seq, Schedule 1.

Injection Permit

4. An injection permit will allow a company to drill injection wells, to inject CO_2 for permanent storage, and to undertake activities incidental thereto. The holder of an exploration permit will have priority to apply. An application will provide a full analysis of the project in a site plan.

5. An application for an injection permit will be considered by a board of inquiry modelled on RMA procedures, with a hearing that allows for public participation, including representation or other means of involving Māori and the regional council. The procedure will bring related RMA and EEZ Act resource consent applications together with the injection permit application to be heard together.

6. A board of inquiry shall not approve an application for an injection permit unless it is satisfied that the CCS project applied for will not present significant risk of leakage from permanent storage, significant risk to health and safety, or significant risk to the environment. Approval of a permit will be subject to conditions, will include approval of the site plan, and will require measurement, monitoring and verification.

7. The detailed regulation of CCS activities will be governed by an approved site plan, rather than by permit conditions. The site plan will include site characterisation, environmental impact assessment, work programme, monitoring plan, corrective measures plan, and site closure plan. The site plan will be approved by the board of inquiry initially but the permit holder can vary it subsequently with approval by the regulatory agency. The site plan will be subject to review. Approval may be withdrawn and reinstated on terms stated in the Act. An approved site plan must be in place in order to carry out injection activities.

8. The regulatory agency will have the power to make a direction to the permit holder where significant leakage, unexpected migration or other irregularity occurs, in order to protect the environment, human health, other resources, or third-party assets.

9. An injection permit will not be issued for any specific term, and will remain in effect until a closure authorisation is given, or (in limited circumstances) the permit is surrendered or cancelled.

Site Closure

10. The regulatory agency shall not grant a closure authorisation unless it is satisfied that there is no significant risk of future leakage or irregularity in the storage site, that the site has been decommissioned as required by the site closure plan and by the regulatory agency, that the CO_2 is conforming with the behaviour anticipated in modelling, that the site is evolving to long-term stability, that a long-term monitoring plan has been provided, that financial obligations have been fulfilled, and overall that operations have resulted in safe and permanent storage of CO_2.

11. We do not make a recommendation for a minimum duration for the closure period between the end of injection and the issue of a closure authorisation.

12. A closure authorisation will signify the end of liability for the CCS operator.

General Permit Provisions

13. The permitting regime will contain ancillary provisions common in permitting systems, such as notifiable events, inspections, reporting, transfers, variations, cancellation, enforcement, and dispute resolution procedures. A register will be established for information on existing and previous permits, and to provide an information portal to the public.

14. The legislation will confer the power to require financial assurance of a character and size that will protect the interests of the public and the functioning of the regulatory agency in respect of enforcement.

CHAPTER 6
DETAILED REGULATION OF INJECTION AND STORAGE ACTIVITIES

1 Introduction

To ensure effective and safe storage of CO_2, a detailed regime of regulation is required to cover the injection phase of operations. Under the CCS legislation that we recommend, the basic permission to undertake these operations will be obtained by acquiring an injection permit. Chapter 5 deals with injection permits in depth, including the application process, rights and obligations, and closure. The focus of this Chapter is on the more detailed regulation of injection activities under an injection permit and under health and safety legislation.

For the reasons that we explained in Chapter 5, the regulation of CCS projects must be flexible, site-specific and performance-based or outcome-focused. The legislation and the regulations under it should state the level of performance or the outcome that is required, and allow a project developer to select the technical methods, procedures and technology that will best meet that level of performance for the particular project, in light of the project's particular characteristics. The CCS developer will be obliged to satisfy the regulatory agency that its proposed methods will meet the required standards of performance. The focus on outcomes rather than methods and technology is particularly suitable for CCS as an industry that is growing and changing in different parts of the world, that may adopt widely differing technologies, and that must adapt to business, engineering and geological circumstances that vary widely.[1]

2 The Site Plan

Under the CCS legislation that we recommend, the key mechanism for this detailed regulation is the site plan that is approved by the board of inquiry upon the grant of an injection permit. The objective of the application and approval process is to demonstrate that the project will result in safe and permanent storage. The site plan can be varied subsequently, but it must be in place at all times, and it controls the activities that the operator may carry out. Where an operator fails to follow the site plan, maintain a site plan, or review it when required, the regulator can withdraw approval of the plan, meaning that injection operations are prohibited. Approval may be reinstated by the regulator once the operator's obligations are fulfilled. The CCS legislation will need to state that injection activities are prohibited unless an approved site plan is in place. A summary of the site plan should be available on the CCS register, which was discussed in Chapter 5.

1 M Granger Morgan and S McCoy, Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers (RFF Press, New York, 2012) at 81.

The site plan has been described as the most critical element of the regulatory scheme.[2] It is separate from the permit in the way that it must be reviewed and varied where and when necessary. Where approval of the site plan is withdrawn, the permit remains intact, although the permit holder is not able to conduct injection activities until the plan is reinstated.

2.1 Content of a site plan

We recommend that the site plan contain the following components.

(i) **Site characterisation**, including site model, baseline monitoring, risk assessment, and an assessment of the anticipated capacity;

(ii) **Environmental impact assessment (EIA)**, including an assessment of the effects on other resources;

(iii) **Work programme**, including locations of injection facilities, quantity of CO_2 to be stored, injection rates, and actions to prevent leakage, unintended migration, or other irregularities;

(iv) **Monitoring plan of the entire storage site**, that covers the injection phase until liability is transferred. This is known as Measurement, Monitoring and Verification (MMV);

(v) **Corrective measures plan**, to deal with contingencies such as where the CO_2 is not behaving as expected, and in case of well failure etc.

(vi) **Site closure plan**, covering decommissioning of facilities and rehabilitation of the site.

Each of these components will be discussed separately below.

This recommendation is based on an analysis of the IEA *Model Regulatory Framework,* the EU Directive, and the Australian legislation. They can be referred to for a full discussion of the requirements of each of the components to be included in the detailed regulation. Emerging standards and guidelines are equally important. As mentioned elsewhere in this Report, important standards and guidelines are being written specifically for CCS. Leading examples are the standards from the Canadian Standards Association and the International Standards Organisation, and guidelines from the World Resources Institute, the Intergovernmental Panel on Climate Change and Det Norske Veritas.

A degree of connection between the components of the site plan will be apparent. For example, risk assessments will inform the corrective measures plan and the measurement, monitoring and verification (MMV) plan. If monitoring under a MMV plan shows that a leak is occurring, that result will trigger the provisions in the corrective measures plan, and may trigger the activation of the closure plan.

2 N Bankes and J Poschwatta, *Australian Legislation on Carbon Capture and Storage: A Canadian Perspective* (University of Calgary Institute for Sustainable Energy, Environment and Economy Research Paper, June 2008) at 13. A detailed consideration of the issues is European Commission, *Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide Guidance Document 2 Characterisation of the Storage Complex, CO_2 Stream Composition, Monitoring and Corrective Measures* (2011).

2.2 Approval of a site plan

An applicant for an injection permit will submit a proposed site plan as part of its application. Approval of the site plan is a central part of the decision to grant the injection permit. Once approved, it will govern activities from injection until stewardship is transferred to the agency.

The detail that is required for a site plan must be sufficient to enable regulatory oversight, but not so exact as to stifle the development of a project. What is required should be stated in regulations. The EU Directive has been criticised for requiring plans to be fully ready at the time that a company applies for a permit. It is said that a full design with all the necessary data should only be required once a final investment decision is made, but in order to make this decision a developer needs to have a storage permit.[3] It has therefore been suggested that the level of detail required in an application be reduced, with an updated and more detailed plan to be furnished before injection begins. On the other hand, the regulator and the affected parties have a right to know, in some detail, what project they are being asked to consider. The applicant must put up a reasonably specific and detailed proposal, even though it is not the final construction plans. Granting an injection permit on the basis of a draft site plan or outline site plan is therefore undesirable. We consider the legislation should require an applicant to provide a complete site plan in order to obtain an injection permit.[4]

One option that should be mentioned is whether approval of the proposed site plan is given by the same decision maker as that deciding the application for an injection permit. An example is the Queensland legislation, which says that the Minister may not approve a proposed plan unless approval is first given to the plan by the Water Act Minister, insofar as the plan relates to potential groundwater issues. This is unique, and is not found in other legislation internationally. For New Zealand, given that our recommendation is that an application for an injection permit will be determined by a board of inquiry (which will be established with the relevant expertise, and will have representation or input from the regional council) there seems little reason to require different decision makers for permits and site plans. Further, the framework we recommend sets a threshold test, so that where there is a significant risk to other resources a permit can not be granted. (See the criteria for determining an application for an injection permit, Chapter 5.)

2.3 Review and variation of a site plan

The operator shall review the site plan regularly and update it accordingly, with approval of the regulator, to take into account any changes to the MMV plan or work plan, or other components. The legislation should require review and any subsequent variation on a regular basis, such as every 5 years, and when there is unexpected behaviour of the injected CO_2, or where the operator considers it necessary. An application for variation of a site plan should be accompanied by an Environmental Impact Assessment (EIA) which will include an assessment of the risks associated with the proposed variation.[5] Variations should not involve any public consultation or other participation unless the proposed variation significantly changes the nature of the project.

3 T Jonker Permitting Process: Special Report on Getting a CCS Project Permitted, Maasvlakte CCS Project C.V. (GCCSI, January 2013) at 50.

4 See R Pritchard Carbon Capture and Storage – A Review of the Australian Legal and Regulatory Regime, Appendix A.

5 This requirement is included in the Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 54.

2.4 Directions

The power for the regulatory agency to make directions is desirable to maintain public confidence in the management of CCS operations, and to give the agency full authority over operations in the public interest. For example, the agency should have the power to issue directions immediately in a time-critical situation. On the other hand, the power should not be couched in terms so wide that it allows unnecessary interference with the work of the operator. CCS operations will have gone through a process of careful evaluation leading up to the issue of a permit, and that evaluation is the primary safeguard that a project is well-conceived. Too broad a power could be unfair, inefficient, and adverse in its effect on confidence in the investment climate for CCS. The circumstances in which it can be exercised, and its consequences, should therefore be clearly stated.

In the IEA *Model Regulatory Framework* and the EU Directive, the power to issue directions is phrased in terms of corrective measures. In the IEA *Model Regulatory Framework*, the responsible agency has the power to determine corrective measures and remediation measures that the operator must undertake in order to protect the environment, human health, other resources or third party assets.[6] Corrective measures are measures taken to address significant leakage, unintended migration, or other irregularity at a storage site. Remediation measures are to rectify any damage caused by such events. In the EU Directive, the agency has power at any time to require the operator to carry out the necessary corrective measures to respond to leakages and significant irregularities and measures related to the protection of human health.[7] In both cases the agency can make its directions whether or not the particular measure was stated in the approved corrective measures plan, and can carry out the corrective measures itself if the operator does not do so, at the operator's cost.[8] In Queensland where a serious situation exists the Minister can make directions to stop or suspend injection, or take steps reasonably necessary to remedy the situation. A serious situation is defined as where the reservoir has leaked, or there is a significant risk of leakage, or where the GHG stream injected is not behaving as predicted.[9] Victoria and the Commonwealth give very similar powers, with the direction being confined to reasonable steps as in Queensland except as to halting injection.[10] In comparison, broad powers are given to the Minister in the South Australian legislation, which says the minister may direct the licensee to carry out specified obligations under the Act or licence, or to cease specified activities that are contrary to the Act or licence. If the direction is not complied with in the time allowed, the Minister may take the required action (or arrange for it to be taken) and recover the cost, as a debt, from the licensee.[11] However these powers apply generally and seem more of a compliance mechanism than a mechanism to ensure the safety or integrity of the CCS project. (Directions can also be given under most enactments in relation to special matters, such as

6 International Energy Agency, *Model Regulatory Framework* at 89 and 93, Model text 6.8.2.

7 EU Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Art 16. Significant irregularity, significant risk and leakage are all defined in art 3. Corrective measures is defined as "any measures taken to correct significant irregularities or to close leakages in order to prevent or stop the release of CO_2 from the storage complex".

8 International Energy Agency, *Model Regulatory Framework* at 89 Model Text 6.8.2; EU Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Art 16:4-5.

9 Greenhouse Gas Storage Act 2009 (Qld), ss 363, 364.

10 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 182; Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 380.

11 Petroleum and Geothermal Act (South Australia), s 88.

protection of geological formations containing petroleum,[12] maximising the volume of GHGs that can be stored,[13] or accommodating a third party.[14])

We therefore recommend that the regulatory agency have power to make a direction to the permit holder, where significant leakage, unintended (or unexpected) migration or other irregularity occurs, in order to protect the environment, human health, other resources, or third-party assets. The direction can require or prohibit an act. Non-compliance is subject to enforcement measures and to a power in the agency to carry out (or have carried out) the necessary operations itself, at the expense of the permit holder and with recourse to the financial assurance. The permit stays on foot notwithstanding the making of directions. The direction should be reviewable.

2.5 Withdrawal of approval of a site plan

The circumstances that may allow the Minister or regulatory agency to withdraw the approval of a site plan must be stated. They should include failure to review a plan as necessary, failure to comply with a direction, and activities carried out contrary to the site plan. The withdrawal of an approval will mean that injection and other operations are prohibited until the permit holder obtains reinstatement of the approval. The injection permit itself will remain in force. If operations continue despite the withdrawal of approval then cancellation of the permit would become possible. Procedures for the withdrawal of an approval should require due regard to be given to the consequences of the withdrawal on upstream parties relying on access to the injection facility for their CO_2.

2.6 Enforcement

As with the permitting regime, the primary enforcement measures will be penalties that are imposed under the Act. This will progress to the withdrawal of approval where necessary, and eventually cancellation of the permit. The primary objective will be to encourage the operator to fulfil its obligations.

3 Environmental Impact Assessment

A CCS operator must provide an assessment of the effects of its proposed operations on the environment. In CCS literature, and environmental literature generally, this is often referred to as an environmental impact assessment (EIA). In the RMA it is called an assessment of effects on the environment (AEE). The EIA will build on the information gained from the site characterisation process. The environment to be considered should be given a broad interpretation and include the effect on people and their communities, other resources, and amenity values. (The RMA definition may provide some guidance.) The EIA should include the actual and possible effects. It should require an assessment in such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.[15] An EIA for CCS purposes will focus on the environmental

12 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), ss 376, 377. See Chapter 7.

13 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 89.

14 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 114.

15 Resource Management Act 1991, s 88 and Schedule 4.

impact of injection operations. The subsurface elements of CCS may present new issues in regards to usual practice for environmental effects assessments. Best practice procedures are being developed for EIAs for CO_2 storage sites.[16] An EIA for CCS operations should include a risk-based approach with assessments of worst-case scenarios and an analysis of the consequences of leakage and unintended migration on potential receptors.[17] It should particularly consider groundwater and other subsurface resources, and the risk management processes that will be undertaken. Corrective measures and the detailed monitoring plan should remain as separate components of the site plan. The EIA will be an important part of the application for an injection permit. As noted above, a further EIA should be required with an application for a material variation of a site plan.

The environmental assessment needed under the RMA and under the CCS legislation can probably be one document or one set of documents, and the legislation should at least make that possible. It will be recalled from Chapter 2 that we consider that injection and storage formation activities should be managed under the new CCS Act rather than under the RMA, but that the RMA would continue to apply to the other environmental effects of a CCS operation, such as incidental discharges to air or water or earthworks. Between the two Acts the environmental effects of all aspects of a CCS proposal will be considered. They will be considered in an integrated process. The requirements for the environmental assessment under the two Acts should be closely aligned. The main differences are likely to come from the fact that the requirements under the RMA are general while those under the CCS Act will be for one industry and will therefore be more specific.

4 Work Programme

As mentioned above, the work programme will include details of the locations of injection facilities, the quantity of CO_2 to be stored, character of the CO_2 stream, operational limits for injection, and actions to prevent leakage, unintended migration and other irregularities. It could include maps and geological cross-sections, the expected migratory pathway of the CO_2, and other appropriate information about the site.[18] It could also include an expected timeframe for work to be completed.

5 Measurement, Monitoring and Verification Requirements

Measurement, monitoring, and verification (MMV) has been described as "the interface between the project and regulators, insurers, carbon markets, and the public".[19] It comprises a substantial part of a regulatory framework and is necessary to ensure the permanent storage of CO_2, protection of adjacent resources, sustainability of the environment, community support and assurance, and

16 International Energy Agency, *Model Regulatory Framework* at 44.

17 At 43.

18 These are the requirements for a site plan in the Greenhouse Gas Storage Act 2009 (Qld), s 142.

19 World Resources Institute, CCS Guidelines: Guidelines for Carbon Dioxide Capture, Transport, and Storage (2008) at 64.

stakeholder confidence. It is also essential for reporting requirements in regards to the emissions trading scheme. It is not desirable that the CCS legislation, or even subordinate legislation under it, prescribes the methods and procedures for monitoring.[20] Geological formations are variable, so the MMV tools that are suitable at one project may not be right for another; flexibility is needed in methods, and it should be the performance or outcomes that are prescribed. This is particularly important for New Zealand with its complex geology. An MMV programme which is fitting for a region with large homogeneous geological units with little folding, faulting or recent tectonic activity may be quite unsuitable for New Zealand, and what is satisfactory in one part of New Zealand may be unsuitable in another part of the country.

Monitoring will need to cover the entire storage site and the surrounding environment and will need to span from the injection phase through post-closure until liability is transferred to the agency. From this point, a separate long-term monitoring plan will need to be submitted to the regulatory agency as part of the site closure process with sufficient financial resources for the agency to undertake monitoring requirements. This is discussed in Chapter 5 on permits.

Just as with the other plans that are required as part of the detailed regulation of the site, the monitoring plan must also be reviewed and varied where necessary. This is to allow for technological advancement, altering monitoring frequencies, change with spatial locations, and to respond to leakage or migration or other irregularity.[21] This will be triggered by the review requirements mentioned above at 2.3. The agency should also be able to request that a monitoring plan be updated where there are changes to the assessed risk or improvements in knowledge or technology.[22]

5.1 Objectives of MMV

Much research has been conducted on the monitoring requirements for CCS and best practice guidelines have been formulated to assist regulators and operators alike.[23] As part of the site plan, a monitoring plan is to be included, the components of which have been identified by the IEA as follows.[24]

> The monitoring plan must outline a monitoring programme and monitoring methods sufficient to:
>
> (a) continue the baseline survey for the storage site until injection commences;
>
> (b) monitor the injection facilities, the storage site (including the CO_2 plume) and the surrounding environment;
>
> (c) compare the ongoing monitoring results with the baseline survey for the storage site;
>
> (d) compare the actual behaviour of the storage site with the anticipated behaviour of the storage site based on the results of the site characterisation process and monitoring results;
>
> (e) detect and assess significant leakage, unintended migration or other irregularity in the storage site;

20 At 64.

21 International Energy Agency, *Model Regulatory Framework* at 86, 87.

22 At 83.

23 See World Resources Institute *CCS Guidelines: Guidelines for Carbon Capture, Transport, and Storage* (2008); IPCC *Guidelines for Greenhouse Gas Inventories* (2006) Volume 2: Energy, Chapter 5: Carbon Dioxide Transport, Injection and Geological Storage at 5.13-5.20.

24 International Energy Agency, *Model Regulatory Framework* at 83.

(f) quantify, as required by the relevant authority, the volumes of CO_2 associated with significant leakage or unintended migration;

(g) detect migration of CO_2;

(h) detect significant adverse effects for the surrounding environment; and

(i) assess the effectiveness of any corrective measures taken.

These requirements for a monitoring plan appear to be suitable for New Zealand. Further guidance is provided by the World Resources Institute.[25]

a. MMV requirements should not prescribe methods or tools; rather, they should focus on the key information an operator is required to collect for each injection well and the overall project, including injected volume, flow rate or injection pressure, composition of injectate, spatial distribution of the CO_2 plume, reservoir pressure, well integrity, determination of any measurable leakage, and appropriate data (including formation fluid chemistry) from the monitoring zone, confining zone, and underground sources of drinking water (USDWs).

b. Operators have the flexibility to choose the specific monitoring techniques and protocols that will be deployed at each storage site, as long as the methods selected provide data at resolutions that will meet the stated monitoring requirements.

c. MMV plans, although submitted as part of the site permitting process, should be updated as needed throughout a project as significant new site-specific operational data become available.

d. The monitoring area should be based initially on knowledge of the regional and site geology, overall site-specific risk assessment, and subsurface flow simulations. This area should be modified as data obtained during operations warrant. It should include the project footprint (the CO_2 plume, the extent of injected or displaced fluids, and any areas of significantly elevated pressure). Groundwater quality monitoring should be performed on a site-specific basis based on injection zone to USDW disposition.

e. MMV activities should continue after injection ceases as necessary to demonstrate non-endangerment, as described in the post-closure section (see Storage Guideline 7d).

These guidelines provide for a flexible, outcome-focussed MMV plan. The general purpose is to ensure that the behaviour of CO_2 and other fluids is closely watched and clearly understood, and that any event of significant leakage is detected, measured and verified, in order to facilitate risk management and to ensure effective GHG accounting under the New Zealand Emissions Trading Scheme. The data produced under the MMV plan will be used for the calculation of removal credits (and credits to be surrendered in the event of leakage) under the NZETS: see Chapter 11.

5.2 Reporting and verification

As mentioned in the previous Chapter, the results of monitoring should be reported to the regulatory agency regularly. Reports should be made public on the CCS information database. Procedures for the verification or auditing of the monitoring activity are also important as part of the regulatory framework. The IEA considers that third party verification can provide assurances as to the quality, credibility, reliability, completeness, accuracy, and veracity of monitoring results, which are important to the integrity of the emissions trading scheme.[26] Third party verification is certainly be desirable at key points such as when considering whether to approve a site closure, or when there is significant irregularity in the behaviour of fluids in the storage formation.

25 World Resources Institute CCS Guidelines: Guidelines for Carbon Capture, Transport, and Storage (2008) at 70.

26 International Energy Agency, *Model Regulatory Framework* at 88.

5.3 Variation and review of the monitoring plan

Just as with the other plans that are required as part of the detailed regulation of the site, the monitoring plan must also be reviewed and varied where necessary. This is to allow for technological advancement, altering monitoring frequencies, change with spatial locations, and to respond to leakage or migration or other irregularity.[27] The agency should also be able to request that a monitoring plan be updated where there are changes to the assessed risk or improvements in knowledge or technology.[28]

6 Corrective Measures Plan

A corrective measures plan is necessary to identify the procedures that will be undertaken in the event that leakage or significant irregularities occur with the storage formation or the behaviour of the CO_2. Whether this forms part of the AEE (as discussed above at 3) or is a separate requirement will be a policy choice. The advantage of having a separate plan outside of the AEE is the clarity that will be achieved, and that corrective measures for situations that do not pose actual or potential risks to the environment will be included, although these situations would be few, if there are any. There may be a possibility that corrective measures to protect third party assets may not be adequately addressed if left in an EIA. For these reasons, this is our preferred approach.

It will be necessary for the legal framework to identify who is responsible for performing the corrective measures and who will be financially liable. The common arrangement is that liability rests with the operator, however, the IEA identify that discretion is often conferred on the regulatory agency to determine when corrective measures are necessary and what they entail.[29] For example, the EU CCS Directive states that in cases of leakage or significant irregularities the operator must notify the competent authority and take the necessary corrective measures. But the Directive further states that the competent authority may at any time require the operator to take the necessary corrective measures, and additional measures not laid out in the corrective measures plan, or the competent authority may take the corrective measures itself and recover the costs by drawing on the financial security posted by the operator.[30]

We recommend that in the event of leakage or significant irregularities it should be possible for the regulatory agency to require the operator to undertake corrective measures, or to be able to undertake those measures itself and recover the cost from the permit holder.[31]

27 At 86, 87.

28 At 83.

29 At 89.

30 Directive 2009/31/EC, on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Article 16.

31 In the EU CCS Directive the competent authority can take corrective measures to deal with significant leakage etc and recover the costs by drawing on the financial security provided by the operator: Art 16.

7 Site Closure Plan

A site closure plan will specify how the operator intends to decommission and rehabilitate the site, including how the wells will be plugged and abandoned, what facilities will be removed, and how the land will be rehabilitated. It should state what international standards it relies on for the design and execution of that work.

Site closure will also be addressed under the Health and Safety Act 1992. In Chapter 2 we concluded that CCS operations should be subject to the HSEA as are other industrial operations. The Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013 make particular rules for oil and gas operations, and in the next section of this Chapter we examine their adaptability to CCS. If they are adapted or extended, regulation 68 will apply to closure:

> A well operator must ensure that a well is designed and constructed so that, as far as is reasonably practicable,—
>
> (a) the well can be suspended or abandoned in a safe manner;
>
> and
>
> (b) after its suspension or abandonment, there can be no unplanned escape of fluids from the well or from the reservoir to which it led.

In addition the operator must supply a notice of well operations with a detailed programme of abandonment, details of standards that have been applied, and the verification by an independent and competent person.[32] This will not duplicate a CCS site closure plan if it is applied to CCS, because it is not supplied as part of the project design, it does not require approval, and it is focussed only on human health and safety. The two requirements will be complementary.

8 Health and Safety Regulation

The general applicability of the Health and Safety in Employment Act 1992 (HSEA) was considered in Chapter 2, and we concluded that the HSEA is suitable as part of the existing legal framework for the regulation of CCS safety, with appropriate amendment where necessary. The HSEA imposes a number of general duties on employers.[33] We turn here to its role in the detailed regulation of safety matters pertaining to the injection and storage operations. Abandonment and closure were discussed above.

Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013. The HSE (Petroleum Exploration and Extraction) Regulations 2013 supersede Regulations made in 1999. They impose obligations on owners and operators of petroleum production and non-production installations, especially to take all practicable steps to ensure that the installation is safe. Except for

32 Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013, reg 73 and Schedule 7.

33 The recent 2013 *Workplace Exposure Standards and Biological Exposure Indices* (2013) at 40 provide guidelines for employers to implement their general duties under the HSEA, although they do not represent "compliance" with the HSEA, They state a maximum exposure standard of 5,000 parts per million for CO_2 over the course of 8 hours, or 30,000 parts per million for exposure over 15 minutes.

smaller installations,[34] a safety case must be prepared, which is detailed safety management system. In contrast to the former Regulations, the safety case must be approved by the Secretary and must be revised if the Secretary requires it. Well operations are subject to requirements for the assessment of conditions below ground, design and construction, well control, well examination schemes by an independent and competent person, and notification of specified well operations including drilling, suspension and abandonment. An emergency response plan must be prepared and maintained. Safety on offshore installations is addressed by a number of provisions.

It is reasonably clear that these Regulations were not intended to cover CCS operations. Their overall purpose, even their title, is directed at petroleum, i.e. oil and natural gas. The workers concerned are called "petroleum workers." A "well" means "a borehole drilled for the purpose of exploring for, appraising, or extracting petroleum" which excludes CO_2 and CCS. It is true that a "production installation" is defined as a structure or vessel used for (among other things) the injection of gas into underground geological formations, and that "gas" is not defined and so could include CO_2. But the argument is tenuous. The Regulations in their present form do not provide a satisfactory basis for controlling CCS.

Adaptation for CCS. The Regulations could be amended to include CO_2 exploration and injection operations. The definitions and related provisions could be amended to include CCS installations, gases, wells, and workers. These amendments would not be unduly complex. The result would be regulations that could properly be entitled the Health and Safety in Employment (Petroleum Exploration and Extraction and Carbon Dioxide Injection) Regulations.

New provisions can be added to deal with the particular character of CO_2. While CCS operations may involve the compression of fluids to higher pressures than encountered in most petroleum operations, CO_2 presents no risk of fire or explosion, so that the protection of human health and safety should not need many new provisions.[35] New provisions could relate HSE requirements to the standards emerging internationally for CCS activity (although the Regulations make little use of the petroleum industry equivalents). The Det Norske Veritas guidelines address risk management as well as site selection and monitoring.[36] The International Standards Organisation also has a technical committee working on standards for CCS. The Canadian Standards Association has recently issued a standard on CCS.[37]

Some requirements of the HSE Petroleum Regulations may appear at first sight to be duplicated by proposals we make for the new CCS legislation. One example is a power to inspect. Another is a power to require an emergency response plan. However the two regulatory frameworks have different purposes. An HSEA emergency plan, for example, is purely concerned with the personal safety of workers, while a CCS corrective measures plan is concerned with the integrity of CO_2 storage generally, not only for human health and safety but also for the environment and the permanent sequestration of greenhouse gases.

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34 "Lower-tier production installations" are smaller onshore installations eg producing less than 820 barrels of oil per day. For them the operator must establish a major accident prevention policy instead of a safety case: Regs 3, 16-20.

35 Benson believes that existing health and safety regulations provide adequate protection for workers on CCS sites, in the context of United States legal framework: S Benson, *Carbon Dioxide Capture and Storage in Underground Storage Formations* (2004) Centre for Climate and Energy Solutions 10-50 Workshop Proceedings <www.c2es.org>, at 9. One may note that CCS drilling could hit oil or natural gas, which would present a fire and explosion hazard if it came to the surface.

36 See Det Norske Veritas CO2QUALSTORE, CO2WELLS, CO2PIPETRANS, and CO2RISKMAN <www.dnv.com>.

37 CSA Group "CSA Group and IPAC-CO2 Research Inc Announce World's First Bi-national Standard For Geologic Storage of Carbon Dioxide" (news release, 15 November 2012).

Options and Recommendation as to HSE (Petroleum) Regulations. In Chapter 2 we noted the pervasiveness of the regulatory regime under the HSEA. It would be very strange for an industry like CCS to be exempted from the Act and dealt with under industry-specific CCS legislation, and we make no such recommendation. The two options appear to be to amend the Petroleum Regulations as considered above, or to make new ones specific to CCS.

New HSE (CCS) Regulations would have the benefit of being tailored specifically for the needs and characteristics of CCS and of CO_2. They would bring visibility to CCS; CCS would not be buried in an unexpected corner of the nation's regulations.

Amending the Petroleum Regulations to include CCS would have as its main advantage the avoidance of duplication. A close analysis of the HSE issues involved is likely to find a high degree of overlap between petroleum drilling and CCS drilling and related operations, in the work environment, in the equipment, and in the techniques employed. Against the background of an enormous range of diverse workplaces regulated for HSE purposes, petroleum and CCS workplaces are very similar to each other. Visibility for CCS can be achieved by other means, such as a guide that outlines the regulatory requirements and procedures for an industry.[38] Our recommendation therefore is for amendment of the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013 to include CCS operations.

9 Recommendations

1. The detailed regulation of CCS activities is governed by a site plan, approved by the board of inquiry upon the grant of an injection permit, and subject to review by the regulator. The permit holder may vary it subsequently with approval by the regulator. Injection activities may not occur without an approved site plan. The regulatory agency may withdraw the approval if there is a significant risk of leakage or risk to human health, the environment, or other resources, or if there is non-compliance with the CCS Act.
2. The site plan will contain the following components:
   (i) Site characterisation
   (ii) Environmental impact assessment
   (iii) Work programme
   (iv) Monitoring plan
   (v) Corrective measures plan
   (vi) Site closure plan.

38 Petroleum industry examples are *Guide to Government Management of Petroleum* from New Zealand Petroleum and Minerals, and the Taranaki Regional Council's *Guide to Regional Plans in Taranaki: for Oil and Gas Exploration Activities* that explains the requirements under the RMA.

3. The regulatory agency shall have power to make a direction to the permit holder, where significant leakage, unintended (or unexpected) migration or other irregularity occurs, in order to protect the environment, human health, other resources, or third-party assets.

4. In the event of leakage or significant irregularities the regulatory agency may require the operator to undertake corrective measures or may undertake those measures itself and recover the cost from the permit holder.

5. The Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013 should be amended to include CCS operations.

CHAPTER 7
RELATIONSHIP WITH OTHER SUBSURFACE RESOURCES

Other subsurface resources may be affected by carbon capture and storage operations. Oil and gas, coal, formations suited to natural gas storage, saline aquifer minerals, geothermal energy, potable groundwater and wastewater disposal can all exist at similar depths and localities as formations suitable for CO_2 storage. A recent New Zealand-led study shows that these interactions can be beneficial or undesirable, depending on the geology and the economic potential.[1] The interactions may have occurred before CCS begins; oil and gas activity may have left wells that were not completed in a way that will properly contain CO_2; hydraulic fracturing may have compromised the seal caprock essential for containment. Other interactions may occur after CCS begins, for example where the injection of CO_2 migrates or increases pressure so as to affect the production of oil or gas or geothermal energy. In some formations, pressure effects can be felt many kilometres away. Beneficial interactions may occur where CO_2 injection assists oil recovery in enhanced oil recovery (EOR). The study recommends that relevant resources, including useable pore space, are identified and mapped, even if there is little solid information. It identifies the need for CCS legislation to establish priority rules, to ensure that CCS proposals include an assessment of other subsurface resources, and to ensure that injection plans and site closure plans address other resources as well.

These issues can be significant for CCS. Subsurface resources have a number of different values. The economic value of different resources changes as demand changes and as technology changes to enable new uses. For example, horizontal drilling and hydraulic fracturing have become more economic, and resources like coal bed methane have only recently attracted attention in New Zealand. EOR has not got under way in New Zealand to any significant degree. Geothermal resource development has grown rapidly in the central North Island, and groundwater, usually at much shallower depths than CCS storage formations, is increasingly an issue in parts of the country. The co-ordination of such uses raises a general policy issue about the management of New Zealand underground resources that goes well beyond this Report.

The main issues that are addressed below, in respect of a legal framework for CCS, are protection of existing rights and priority rules generally, and methods to avoid and manage conflict between different subsurface resources and resource users. (At times the issue is the effect of CCS on a resource, whether or not it is under permit and in current use, while at other times the issue is the effect of CCS on a resource user company and its commercial interests.) In addition it is desirable to address two other matters, the use of CO_2 in EOR, and the shared use of facilities. A general theme that emerges is the need for a suitable balance to be found between an emerging CCS industry and the established petroleum industry. In finding that balance, it seems desirable from a policy point of view that CCS be able to develop on its own path as a climate change imperative, rather than as an offshoot of the petroleum sector, while recognising and harnessing the considerable shared interests that the two industries will have in geological, engineering, technical, and indeed commercial matters.

1 Field, B, Bachu, S, Bunch, M, Funnell, R, Holloway, S, and Richardson, R, *Interaction of CO_2 Storage with Subsurface Resources* (CO2CRC Report RPT12-3562, November 2012, IEAGHG Report 2013-08, April 2013).

1 Protection of Existing Rights

One of the most important factors to be taken into account in dealing with different interests in the subsurface is the desirability of the security of tenure of existing resource rights. There is a general national interest in maintaining a reputation for a stable investment climate. While regulatory flexibility and sovereign rights necessarily pose the possibility of change, it is desirable to minimise alterations of existing rights such as permits under the Crown Minerals Act (CMA). It is all the more important to avoid changes that are unpredictable and that come at a late stage in the development of a project. In the balancing of the interests of subsurface users, it is therefore desirable to ensure that CCS law give a reasonable degree of protection to the interests of existing rights.

- Weight should be given to the interests of the holder of a permit that was in existence before the new CCS legislation comes into force.
- Weight should also be given to the interests of the holder of a permit who has made a substantial investment to develop its permit.

Where the permit is a petroleum mining permit under the CMA, its origin and existence should be dated back to the issue of any preceding prospecting permit or exploration permit for that acreage.

The protection of existing rights can be given effect in different ways. An absolute protection would be given by preventing the issue of a CCS permit for land covered by a relevant CMA permit; or it could be a right of veto; or it could be a preference in regulatory decisions about the management of operations under each permit. The choices are significant and are discussed further below.

Reform in Australia was especially marked by efforts to accommodate the existing interests of the petroleum industry and the interests of the future CCS industry. The result in the Offshore Petroleum and Greenhouse Gas Storage Act 2006 was an intricate set of provisions to balance the different interests.[2] These provisions gave special priority to "pre-commencement" petroleum titles, that is, permits where the permit or its predecessor had come into existence before the new CCS law came into effect. In limited circumstances this amounted to a power to veto CCS operations. In others, the Minister holds a power to order a CCS operator to make changes if its operations pose a serious risk of a serious adverse impact on petroleum operations.[3] The petroleum title holder has preferential rights

2 M Gibbs, "Greenhouse Gas Storage in Offshore Waters: Balancing Competing Interests" (2009) 28 Australian Resources and Energy Law Journal 52 provides a careful analysis. Also see S Barrymore and A Mathison, "Offshore Petroleum Amendment (Greenhouse Gas Storage) Bill 2008 (Cth)" (2008) 27 ARELJ 348; J Fahey and L McMurtrie, "Carbon Capture and Storage Bill before Senate" Mallesons Stephen Jaques Newsletter, October 2008.

3 This formulation, sometimes called a SRSAI, is used a number of times in the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth).

to CCS titles in certain circumstances. Among the states, Queensland conferred significant discretion on the Minister in determining grants.[4] South Australia requires GHG grant applications to pass a compatibility test, but Victoria has not restricted the grant of permits so as to prevent overlaps.

2 Priority Rules Generally

Where there is no issue of existing rights before new CCS legislation comes into force, the question of accommodating the different interests is a broader one, on a more level playing field. Three main options for a priority rule can be identified.[5]

Preferred Industry. It is possible to give one industry a consistent priority over the other. For example, CCS permits could only be granted where there is no petroleum activity, and CCS operations could be approved only where there is no likely effect on petroleum activity. (Or, CCS could proceed if the petroleum permit holder agrees.) Alberta has followed this path. The regulator may not approve a CO_2 injection scheme unless it is satisfied that injection will not interfere with the recovery or conservation of oil and gas, and will not interfere with an existing oil or gas storage facility.[6] A similar priority is stated in the province's Mines and Minerals Act. However this option requires an a priori judgement to be made about which industry is to be preferred. It may not be easy to make defensible judgement of that kind that will be valid for all circumstances, and for all industries – it is not only petroleum that would need to be considered. A poor signal would be sent for investment in the industry getting lower priority. There would be much greater uncertainty in that industry about the possibility of the exercise of priority rights against it. If petroleum is granted preference in a manner that prevents CCS permit applications from being made for land that is subject to a petroleum permit, then substantial areas of suitable geology would be closed off to CCS investigation, because petroleum exploration permits cover large areas of New Zealand and its EEZ. Areas under block offer would presumably be closed off in the same way.

Priority by Time. A different rule is priority by time, such as priority by time of making an application for a permit for an area – first in, first served. While this does not make a general expression of preference for one industry or the other, it would operate for some time to give priority to existing permits in the petroleum sector. While priority by time gives clear results in individual cases, as it does in relation to land title registration and in relation to water resources, its results from the perspective of national policy would be haphazard, almost random. In addition, a first-in-first-served rule increases the pressure on companies to apply before competitors do, earlier than would otherwise be logical.

Discretionary Priority. The third option is for applications to be decided on an individual basis, having regard to overlap and interaction issues, but without regard to any general rule of priority. A decision would be made under a criterion of the public interest, the merits of the different

4 S Singleton and R Gawrych, "Overlapping Land Interest Issues for GHG Grants and Activities" [2009] AMPLA Yearbook 283. The paper includes a useful tabular analysis of the OPGGSA and three State Acts.

5 This section particularly draws on the Report by Pritchard, Appendix A.

6 Oil and Gas Conservation Act RSA 2000 c. O-6, s 39(1.1). The Carbon Sequestration Tenure Regulation requires an analysis of the likelihood that the operations will interfere with mineral recovery with an application for a CCS evaluation permit and again in more detail with an application for a CCS sequestration lease: Alta Reg 68/2011 ss 7(1) and 15(b). See N Bankes, *The Developing Regime for the Regulation of Carbon Capture and Storage Projects in Canada* Appendix B.

applications, the most valuable use of subsurface resources generally, or some such general rubric. It would be necessary to ensure that the decision is not be governed by the purpose of one Act if its intention is to manage conflicts between activities under two different Acts. Although a public interest test is open to criticism for vagueness and vulnerability to capture for particular purposes, it is open to the legislature to be more specific, and below we identify principles that could provide real guidance to the decision maker.

In Australia, the OPGGSA follows this approach in providing a level playing field in respect of 'post-commencement' petroleum titles. Where there is overlap, CCS operators are restricted in a number of ways, but petroleum operators may be restricted in respect of their own activity. There is no automatic priority for either industry. The Minister is often directed to employ a 'public interest' test. The public interest test is also important in Queensland, South Australia and Victoria.[7] In New Zealand, a 'public interest' test is used in section 66 of the Crown Minerals Act 1991 for the very similar balancing of the interests of a mineral operator and a land owner.

A procedure for notification of potentially affected subsurface resource users, and comment by them, could precede the exercise of this discretionary power. The procedures in some of the Australian legislation are more complex than is perhaps desirable as a precedent. An alternative is to allow other resource users simply to use the general mechanisms for public participation, but that may be insufficient especially if there is limited public participation in the consideration of an application for an exploration permit.

This option of discretionary priority, to be decided on the basis of what is in the public interest, appears to be the best option, and is our recommendation.

3 Methods to Avoid and Manage Conflicts

A range of methods can be identified to avoid and manage interference between CCS and other subsurface resource interests. They could be implemented under the different rules for priority, above. They would take effect at different stages of a permitting and development continuum.

Exactly who would exercise such powers is an issue in itself, depending of course in part on what agency has overall responsibility for CCS, but depending also on how any inter-agency questions about responsibility for different resources is addressed. For the moment we will refer to the "Minister." A procedure for a decision by two ministers jointly could be very effective.

3.1 Spatial separation

In deciding whether to grant a permit (or to make a block offer) the Minister avoids overlap in order to avoid adverse effects on another subsurface resource. In particular, a policy of spatial separation can keep petroleum and CCS operations out of each other's way. In making the key decision about opening acreage open for bidding, both CCS and petroleum would need to be considered. The Minister takes into account the different subsurface resources and the likelihood that they will be used.

7 In some cases "public interest" is given an expanded meaning: Singleton and Garwych, above n 4 at 316.

This option would operate effectively in preventing interference between different subsurface operations. However it would amount to a division or carving up of land into areas allocated to the different industries. It is a relatively crude measure, and it is one that will be difficult to employ without very good information about subsurface resources. At early stages of exploration programs, such information is scarce. Spatial separation vertically, by geological formation, may also be possible, but again, without enough information, the risk of an erroneous long-term allocation to different purposes may be high. Permits and block offers in petroleum can be large, and if they exclude CCS altogether then the effects on CCS could be considerable. In the 2013 block offer process, five onshore blocks covering a total of 1,562.7 km^2 were offered, and three offshore release areas covering a total of 189,000 km^2.

Just as with an *a priori* preference for one industry or the other, spatial separation presents a risk that opportunities in one industry will be unintentionally foregone in return for a lesser opportunity in the other industry. Spatial situation is not the preferred solution in Australian legislation.[8]

3.2 Permit applications and permit conditions

A second method of addressing conflict is in the permitting process. A CCS applicant can be required to provide an analysis of possible interference with other subsurface resources. That possibility would then be a relevant consideration for the decision maker to take into account, firstly, in deciding whether to grant the permit, and secondly, in deciding what conditions to impose in order to avoid or mitigate the risk of adverse effects on another subsurface resource.

Power to deal with different subsurface resource interests through decisions on individual permits and on permit conditions is likely to be an effective management tool. It is likely to be more flexible over time as knowledge of resources increases, and to be more targeted to specific concerns than would be a blanket ban on one industry operating in an area. It accommodates and addresses the need for a system of overlapping permits.

3.3 Control of specific activities

A third method is the approval of site plans, work programmes, and particular activities, and the giving of directions. For example, a difficulty for another resource user could be avoided by a well design that isolates a particular zone. In addition, corrective measures should be put in place, and insisted on, where desirable to protect other resources and other resource users. The Australian OPGGSA identifies a number of activities such as drilling a well and injection (even for appraisal purposes) as "key GHG operations" which require particular approval. Again, this appears to be an effective management tool for dealing with conflict possibilities.

From the point of view of oil and gas affecting CCS, one issue is that the CCS potential of subsurface formations puts a different emphasis on the quality of oil and gas well completions, in order to maintain the sealing capacity of the cap rock formations that are necessary to keep CO_2 in permanent storage. Well completions in areas with CCS potential may need to be completed with additional durability, resistance to corrosion and resistance to pressure. Additional expense may be the result.

8 Singleton and Gawrych, above n 4, at 285.

4 Powers to Avoid and Resolve Subsurface Resource Conflicts

Different approaches can be taken to the drafting of legislation to deal with subsurface resource conflicts. One is to follow the Australian offshore legislation, the OPGGSA, and set detailed rules and tests to apply for a number of different situations. This pattern seems to be necessary to deal with the complexities of State-Commonwealth relations, but there is a risk that a framework to deal with every contingency may not in fact accurately reflect the few cases that actually arise. CCS is in its early stages, and few applications are likely in the foreseeable future. Moreover, subsurface resource use in New Zealand is not yet intensive.

A more suitable approach, which we recommend, is to vest discretionary powers of a brief and reasonably general kind in the Minister or Ministers to evaluate the merits of the competing proposals, and to make decisions in the public interest in order to avoid and resolve subsurface resource conflicts. The powers would particularly relate to the three methods noted above:

(i) spatial separation (although it is unlikely to be the preferred option);

(ii) permit applications and permit conditions; and

(iii) control of specific activities.

General discretionary powers along these lines should allow for flexibility as projects emerge, as information improves, and as the relative significance of CCS and petroleum operations evolves. They would allow for the possibility of commercial agreements to be explored and endorsed as acceptable compromise solutions.[9]

5 Equivalent Powers in Other Legislation

Similar powers should exist in one form or another in both the CCS legislation and the other relevant subsurface resources legislation. Otherwise the accommodations and adjustments necessary in the overall public interest would all come from the one industry. We have already noted the special premium that CCS potential puts on the quality of the completion of oil and gas wells in order to prevent leakage from old wells and to maintain the sealing capacity of cap rock formations. This is significant because depleted oil and gas reservoirs offer some of the most likely CCS storage possibilities in New Zealand. The plugging and abandonment of oil and gas wells after use is only regulated with notice requirements.[10] Certain oil and gas or coal activities can be important for CCS; both hydraulic fracturing and coal seam gasification have the capability to cause damage to formations that could reduce CCS possibilities. Such techniques present special needs for provisions to avoid present and future subsurface resource conflicts.

9 See ResourcesLaw International, Appendix A.

10 Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013, regs 73, 74 and Sched 7 (notice of operations in advance); Crown Minerals (Petroleum) Regulations 2007 reg 47 (well abandonment report to be supplied afterwards).

There is no power under the CMA at present to require other subsurface resource uses to be accommodated. The Minister has a general power to issue permits, and on such conditions as he or she thinks fit (section 25) but the protection of CCS is unlikely to be a valid reason for its exercise, especially in the light of the new statutory purpose in section 1A, that the purpose of the Act is "to promote prospecting for, exploration for, and mining of Crown owned minerals for the benefit of New Zealand." That probably prevents the Minister from taking CCS matters into account in making decisions such as when making a block offer or issuing a permit.

We recommend that the powers to avoid and resolve conflicts will apply to both CCS and CMA activities and are the subject of provisions in both Acts. An amendment to the CMA will ensure that the Minister and other decision-makers may, and are required to, take into account CCS matters in making decisions under the CMA on permits, permit conditions and regulations. The amendment should ensure that the purpose of the CMA stated in section 1A does not prevent decision-makers from taking CCS considerations into account in the administration of the Act.

While such new powers may appear to add a complication to petroleum activity, they appear in the Australian OPGGSA and state legislation, and seem to be a necessary part of finding a place for CCS as a new subsurface activity. It is difficult to see a rational basis for a policy of imposing all the conditions and constraints necessary to prevent conflict on CCS. The simple fact that CCS is new cannot be a reason.

6 Co-ordination Agreements and Dispute Resolution

Another desirable option is procedures to encourage consensual adjustment of interests, with formal dispute resolution if necessary. A procedure can be established for the ratification of co-ordination agreements made between a CCS operator and another subsurface resource user.[11]

Another procedure that appears desirable is that the Minister (or other decision-maker) have power to resolve disputes between CCS permittees and other specified permittees such as CMA permittees, subject to an appeal on point of law to the High Court. This option may be preferable to leaving such matters to the parties to take to the courts. If they go to the courts, they may well find that there are no clear legal rules to determine the dispute. It is quite possible that *lacunae* exist where it is unclear whether the holder of a permit under one Act has a right of action against a permittee under another Act, especially where neither negligence nor intent to cause harm are established. The prospect of disputes without any reasonably clear means of resolving them would probably have an adverse effect on operations and on the investment climate in the different industries.

11 For example, Greenhouse Gas Storage Act 2009 (Qld), s 186.

7 Principles

It is likely that a common set of principles or matters to be taken into account would help to inform the exercise of the above discretions. They would provide guidance but would also provide reassurance to the different parties involved. Possible principles or matters are as follows.

(i) Activity in both CCS and other subsurface resource uses is to be facilitated.

(ii) Unreasonable interference with potentially useful subsurface resources should be avoided.

(iii) Consultation and agreement among operators is to be encouraged.

(iv) No operator should have a veto over the activities of another operator or permit holder.

(v) The Minister (or other decision maker) is to make decisions in the public interest. The public interest can be left as a broad criterion to be applied in particular cases, or the legislation can make an effort to explain, define, and confine it.[12]

(vi) Due regard should be had to the importance of investment certainty. Rights under permits granted before new CCS legislation comes into effect should be altered only where necessary in the public interest. Rights under permits where significant investments have been made in project development should be altered only where necessary in the public interest.

We recommend that these matters and principles be taken into account in the making of decisions on permits and conditions under the CMA and the CCS Act.

8 CCS Explorers Discovering Petroleum, Petroleum Explorers Discovering Storage Formations

At this point we turn to an issue that is only broadly related, but which needs attention. It can be framed by asking, what happens if a programme to delineate CCS storage formations under a CCS exploration permit finds oil or gas? And what happens if an oil and gas exploration programme under a petroleum exploration permit finds that a formation is ideal for CO_2 storage?[13] There is a substantial commonality in the kinds of geology likely to be targeted by each activity. There is substantial commonality in the exploration work that is carried out for the two kinds of target, even if operations in the production / injection stage are very different. (There are exploration differences as well; for example, CCS needs more information about cap-rock seal formations and the closure of storage than does petroleum exploration.) From the general policy perspective of encouraging CCS, it would appear to be desirable to give a CCS operator a pathway to benefit from any petroleum discovery that it makes. It would appear equally desirable to give a petroleum operator some incentive to include CCS-relevant data collection in its geophysical and drilling programme.

12 Singleton and Gawrych, above n 4, at 289.

13 Similar questions can be asked about coal resources, and possibly about geothermal energy, but for the sake of simplicity the discussion will focus on petroleum.

There are likely to be complications in bringing the two different kinds of activity together. It is not desirable to allow "back door" access to petroleum production or to CCS injection if the requirements for that activity have not been met.[14] A more specific problem will arise if CCS and CMA permits can overlap, so that the two permit holders are in competition, for example both seeking the right to put the petroleum into production.[15] Overseas legislation does not come up with any clear path through these complications.

Three options seem to present themselves.

(i) It should be lawful for an operator in either CCS or petroleum to gather and use information about the other resource. This minimum option seems viable.

(ii) A pathway is provided in both the CCS Act and the CMA for the holder of an exploration permit to apply for a permit for development under the other. The holder of a CCS exploration permit who finds petroleum could have a streamlined process to apply for a petroleum mining permit under the CMA. The holder of a CMA petroleum exploration permit who finds a good CCS storage possibility has a similar process to apply for an injection permit under the CCS law. Some kind of conversion programme may be required to ensure that requirements are properly met. This option is therefore somewhat more complex.

(iii) Reciprocal rights are held by CCS and CMA exploration permits. Both have rights to explore for both possible uses of the subsurface. In Australia the holder of a petroleum exploration permit is authorised to explore for geological storage formations.[16] However priorities and compliance with the two different statutes could become complex.

The issues are complex and we do not make a specific recommendation except to observe that possibilities of encouraging both CCS and petroleum discovery should be pursued in the design of the legislation.

9 Shared Facilities

The use of shared facilities is another issue in relations between different subsurface resource users. For example, a petroleum operator could be asked to accommodate CCS operations on an offshore production platform. It is rare for New Zealand law to require operators in any industry to share facilities – telecommunications may be one of the few examples. At least in the early stages of the evolution of CCS, it may not be desirable to take special powers to give another company access to such facilities. If such arrangements are desirable, they may better emerge by agreement. Regulatory arrangements should avoid erecting any barrier to such agreements.

14 On the other hand, the CMA does not rule out an application for a petroleum mining permit by a person who does not hold a petroleum exploration permit.

15 In such a case the competition may be resolved through commercial means, if one party agrees to sell its data and transfer its permit rights to the other.

16 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 98.

10 Other Issues

Our discussion has not covered all the policy questions that concern new uses of subsurface resources, and the new possibilities of dispute that accompany them. CCS is but one of a number of emerging technologies. It is fair to say that up to five or ten years ago few of them had drawn any attention in New Zealand. There is no general process for the management of conflicts over subsurface resources in New Zealand. Even though the foregoing discussion has been focussed on petroleum, other resources and possible resources may require analysis in relation to CCS:

- Coal and coal seam methane
- Natural gas storage
- Subsurface disposal of waste fluids
- Geothermal energy
- Deep potable water aquifers
- Minerals in deep saline aquifers.[17]

11 CCS and Enhanced Oil Recovery

A particular situation where CCS and petroleum activity come together is the use of CO_2 as a solvent in enhanced oil recovery (EOR).[18] CO_2 or CO_2-rich gases can be injected into an oil-bearing formation in order to stimulate oil recovery, after more conventional methods of production are no longer effective. Injected supercritical CO_2 is miscible with petroleum, and allows more petroleum to be released from rock pores and flow towards a well for extraction. In some formations EOR with CO_2 may recover an additional 25 to 40 per cent of the oil; but not all formations are amenable to CO_2-EOR. Approximately 50 per cent of the injected CO_2 is returned to the surface with the produced oil and can be recycled for further use and the remainder is stored; this is known as "incidental" storage. This is to be distinguished from "incremental" storage which results where the depleted oil formation is later used for CO_2 storage.[19] Even though there is no substantial record of EOR operations in New Zealand, experience over some decades internationally demonstrates the feasibility of sequestering CO_2 in the producing formation. The Weyburn Project in Saskatchewan is an example.

17 Generally on such matters see Field et al, above n 1.

18 There is also enhanced gas recovery (EGR) and the term enhanced hydrocarbon recovery (EHR) is in use as well. EOR is a tertiary production method.

19 The range of 30–50% CO_2 left in formations is referred to by R Macrory and others, *Legal Status of CO_2-Enhanced Oil Recovery* (UCL Carbon Capture Legal Programme, 2013) at 8. One study suggests that the Permian Basin in West Texas can sequester 3 kg of CO_2 per 1 kg of oil produced, and that the net sequestration is about 47% of what is injected; A Aycaguer, M Lev-on and A Winer, "Reducing Carbon Dioxide Emissions with Enhanced Oil Recovery Projects: A Life-cycle Assessment Approach" (2001) Energy Fuels 15: 303-308. But see S Hovorka, *EOR as Sequestration: Geoscience Perspective* (White Paper for Symposium on Role of EOR in Accelerating Deployment of CCS, 2010) who cautions that sequestration potential is very site-specific. The same caution is stated by P Marston and P Moore, "From EOR to CCS: The Evolving Legal and Regulatory Framework for Carbon Capture and Storage" (2008) 29 Energy Law Journal 421, 427.

Five different scenarios have been identified:[20]

(i) Incidental storage during a "pure" EOR operation.

(ii) Incremental storage during EOR operations, maximising the quantity of CO_2 injected for a given amount of oil production.

(iii) Incremental storage following termination of EOR operations.

(iv) Storage during buffering or balancing operations.

(v) Long-term CCS storage for emission reduction purposes, ie with no EOR component.

Key issues from a regulatory point of view are the management of incidental storage from normal EOR operations, the transition from incidental storage to incremental storage, and the determining of incremental storage after the cessation of oil production.[21]

Combining EOR with CCS is an attractive strategy. The combination could make CCS economically viable where the price of carbon and other incentives are insufficient to encourage companies to embark on projects. It could well be how New Zealand's first CCS projects come into existence. The amount of CO_2 that can be sequestered depends on a number of variables, including the location of injection wells, injection pressure, reservoir temperature, and the amount of water flooding that is used. A CCS element also requires EOR planning to investigate the integrity of the cap-rock more closely, the viability of higher injection pressures, and the state of existing abandoned wells. New EOR research is focussed on making a shift from the optimisation of petroleum recovery alone to the co-optimisation of petroleum recovery and CO_2 storage.

11.1 International experience with CO_2-EOR

The usual pattern in most countries is that CO_2-EOR projects are regulated under the petroleum legislation, with little alignment to the CCS or climate change aspects of the matter. In Alberta, for example, there is detailed regulation of EOR under the petroleum legislation, which states a clear objective of optimisation of petroleum recovery.[22] There is no focus on emissions or monitoring, and the granting of offset credits under the climate change legislation is performed by a different agency that has no role in the design of the project. A CCS project without EOR is not regulated under the EOR provisions. Notable differences appear between the two kinds of regulation, for example, as to the baseline evaluation of the security of storage, the measuring, monitoring and verification (MMV) requirements, and the rules for post-closure liability.[23] This creates a significant regulatory gap. In Saskatchewan CO_2-EOR (including the Weyburn Midale projects) is regulated under the Oil and Gas Conservation Act with no special provisions for CCS.[24] In the European Union, the 2009 CCS Directive

20 R Macrory and others, *Legal Status of CO_2-Enhanced Oil Recovery* (UCL Carbon Capture Legal Programme, 2013) at 8.

21 J Garrett and S McCoy, 4th IEA International CCS Regulatory Network Meeting: Workshop Report 2012 (2012) at 21.

22 Alberta is an example: Energy Resources Conservation Board (now the Alberta Energy Regulator) Directive 065: Resources Applications for Oil and Gas Reservoirs, s 2.1.2, made under the Oil and Gas Conservation Act RSA 2000 c. O-5. In Alberta, there are six CO_2-EOR projects approved.

23 See S Bonham and I Chrysostomidis, Regulatory Challenges and Key Lessons Learned From Real World Development of CCS Projects: Final Report (CO2 Capture Project, 2012).

24 RSS 1978 c. O-2.

requires its provisions to apply to EOR if combined with geological storage.[25] In the United Kingdom, the Energy Act 2008, foreshadowing the 2009 Directive, gives the Minister power to make orders extending the CCS regime to EOR for the purposes of the Emissions Trading Scheme, and makes efforts to harmonise and integrate the petroleum and CCS regimes, but inconsistencies remain and the effect is not clear.[26]

Texas, which has long experience in regulating EOR, appears to be at the forefront in developing specific geological storage rules which explicitly contemplate permitting a project as both an EOR project and a CO_2 geological storage project. The rules provide for regulation of EOR, of CCS, or both simultaneously. The Director may require an operator to apply for a permit for CO_2 storage if the well is no longer needed for EOR.[27]

One difficulty that has been identified with the transition from EOR to CCS, or from incidental to incremental storage, is that the EOR operator will have had no obligation to carry out a full site characterisation to CCS standards. There will have been no compulsory baseline monitoring and site selection, although it may have been carried out voluntarily. This may not be careful enough, especially as to cap-rock formations. The EU Guidance Document on characterisation of the storage complex says:[28]

> Reliance on a simplistic assumption that hydrocarbons have previously been trapped to prove the effectiveness of the seal will not be a prudent approach to characterisation of a potential storage complex and surrounding area.

Ensuring that CO_2 storage will be permanent requires a sufficient cap rock covering the area, whereas oil and gas operations have no great need to investigate the cap rock.

Overseas experience shows that a regulatory framework that brings the petroleum and the CCS aspects of CO_2-EOR together is not easy to devise. There are few precedents to follow. That suggests that in New Zealand it is too early to get ahead of international practice and devise an elaborate fully-integrated statutory framework. What we propose are some limited measures to provide alignment and to eliminate barriers.

25 In Europe, an EHR / EOR project is not in itself within the scope of the EU Directive 2009/31/EC on CCS, but a mixed or combined project is: recital 20 of the Preamble. See H C Bugge, *An Overview about Status of CCS and CCS Regulation, and Legal and Regulatory Change with Respect to CCS in Norway*, Appendix C. There are very limited provisions in Australian legislation: Singleton and Garwych, above n 4, at 314.

26 Macrory and others, above n 20 at 23–24.

27 Texas Administrative Code, Title 16 Economic Regulation, Part 1 Railway Commission of Texas, Chap 5 Carbon Dioxide (CO_2), Subchap B Geologic Storage and Associated Injection of Anthropogenic Carbon Dioxide (CO_2), Rule § 5.201; <www.sos.state.tx.us/tac/index.shtml>.

28 European Commission, Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide: Guidance Document 2: Characterisation of the Storage Complex, CO_2 Stream Composition, Monitoring and Corrective Measures (2011) at 17.

11.2 CO_2-EOR in New Zealand

In New Zealand, EOR activity is probably authorised under the general rights granted to the holder of a petroleum mining permit under the CMA, subject to the acquisition of resource consents as necessary under the RMA. There is no specific provision for EOR with or without CO_2.[29]

A CO_2-EOR project could well be an early opportunity for a CCS operation in New Zealand. The economic benefits from enhanced oil production could combine with modest price pressure on greenhouse gas emissions in order to make a project attractive. The matter therefore appears to be a priority for attention. There is a CCS rationale for development of the regulatory framework for EOR operations under the Crown Minerals Act, in order to provide a measure of clarity and certainty about how such operations may be planned. We think it necessary that a company operating EOR and wishing to gain credits under the Emissions Trading Scheme should be required to come under the CCS regulatory regime. This will require it to undertake a site characterisation assessment prior to an injection permit being granted, and to ensure that measuring, monitoring and verification occurs, and that long-term liability will be provided for; however, it may be possible to devise a co-ordinated and appropriate path towards obtaining a CCS injection permit.

As to the proposed CCS legislation, we recommend:

- The proposed CCS legislation should be written so as to be open to the prospect of an EOR project providing geosequestration.
- The regulation of CCS injection operations should be expressed in a manner that avoids making the use of CO_2 for petroleum EOR purposes unlawful.
- The responsible Minister should have power, jointly with the Minister of Energy if that is a different minister, to recommend regulations for a co-ordinated approach to EOR with CCS characteristics. Regulations could co-ordinate the processes of the CCS legislation and the CMA, in ways that ensure that the objectives and the substantive requirements of both statutes are met. Processes will need to deal with projects that are from the start planned for both EOR and CCS purposes, and also with projects that start as EOR and only later pursue CCS purposes.

29 The Crown Minerals (Petroleum) Regulations 2007 reg 34B require notice to be given before conducting "well stimulation operations" which are defined to include "any operation performed on a hydrocarbon reservoir in order to restore or enhance the reservoir's productive potential by improving the flow of hydrocarbons into the well bore." However this bare notice provision is very different from the detailed regulation found in most jurisdictions. RMA questions and land ownership questions about injection would need to be addressed as they were for CCS in Chapters 3 and 4. Such questions open up the possibility that the CCS legislation once enacted could provide a better regulatory pathway than the CMA, until such time as the latter Act addresses EOR thoroughly.

As to the Crown Minerals Act we recommend:

- CMA decision-makers can, and should, take CCS matters (the desirability of geological storage of CO_2) into account in making decisions under the CMA. This is necessary, for example, to ensure that an EOR project can be evaluated both for its production of petroleum and for its sequestration of CO_2. Without changes to the CMA, especially its stated purpose in section 1A, it will not be possible for CCS matters to be taken into account at all. Such changes would not require EOR projects to have a CCS character, they would simply ensure that if they are presented with that character then their appraisal can take that into account. This change would also open the door to the Minerals Programme stating that "good industry practice" can include CCS or sequestration.
- The definition of "mining" (ie production) under the CMA should be amended to include CCS storage incidental to an authorised EOR activity.

As to the Climate Change Response Act we recommend:

- It should be possible for the operator of a CO_2-EOR project to become a voluntary participant in the Emissions Trading Scheme in order to claim credits in NZUs for removal activities, but only if an injection permit has been issued for the project under the CCS legislation. The operator of a CO_2-EOR scheme who is operating only under the CMA should not be able to claim credits.[30]

12 Recommendations

1. Conflicts between CCS activities and CMA activities should be avoided and resolved by vesting discretionary powers of a brief and reasonably general kind in the Minister or Ministers to evaluate the merits of the competing proposals, and to make decisions in the public interest. The powers will use methods of spatial separation (although it is unlikely to be the preferred option), permit applications and permit conditions, and the control of specific activities.
2. The powers of the Minister or Ministers to avoid and resolve conflicts between CCS and CMA activities will apply to both CCS and CMA activities and will require provisions in both Acts. An amendment to the CMA will ensure that the Minister and other decision-makers may, and are required to, take into account CCS matters in making decisions under the CMA on permits, permit conditions and regulations. The amendment should ensure that the purpose of the CMA stated in section 1A does not prevent decision-makers from taking CCS considerations into account in the administration of the Act.
3. The legislation should provide for the recognition of co-ordination agreements between resource users and should provide procedures for dispute resolution where necessary.

30 Carbon accounting is a major issue in law reform for EOR-CO_2 in some jurisdictions especially ones with a baseline-and-credit scheme for GHG management. In those places a difficult question is whether a life cycle assessment should include the consumption of the additional oil produced. Fortunately such problems do not seem to arise under the NZ ETS: see Chapter 11.

4. The following matters and principles should be taken into account in the making of decisions on permits and conditions under the CMA and the CCS Act:

   (i) Activity in both CCS and other subsurface resource uses is to be facilitated.

   (ii) Unreasonable interference with potentially useful subsurface resources should be avoided.

   (iii) Consultation and agreement among operators is to be encouraged.

   (iv) No operator should have a veto over the activities of another operator or permit holder.

   (v) The Minister or Ministers are to make decisions in the public interest. The public interest can be left as a broad criterion to be applied in particular cases, or the legislation can make an effort to explain, define, and confine it.

   (vi) Due regard should be had to the importance of investment certainty. Rights under permits granted before new CCS legislation comes into effect should be altered only where necessary in the public interest. Rights under permits where significant investments have been made in project development should be altered only where necessary in the public interest.

5. The proposed CCS legislation should be written so as to be open to the possibility of encouraging both CCS exploration and petroleum discovery.

6. The proposed CCS legislation should be written so as to be open to the prospect of an EOR project providing geosequestration.

7. A company operating EOR and wishing to gain credits under the Emissions Trading Scheme should be required to come under the CCS regulatory regime.

8. The regulation of CCS injection operations should be expressed in a manner that avoids making the use of CO_2 for petroleum EOR purposes unlawful.

9. The responsible Minister should have power, jointly with the Minister of Energy and Resources if that is a different Minister, to recommend regulations for a co-ordinated approach to EOR with CCS characteristics.

10. The regulatory framework for EOR operations under the CMA should be developed, in the light of a CCS rationale, in order to provide a measure of clarity and certainty about how such operations may be planned.

11. The definition of "mining" (ie production) under the CMA should be amended to include CO_2 storage incidental to an authorised EOR activity.

12. It should be possible for the operator of a CO_2-EOR project to become a voluntary participant in the Emissions Trading Scheme in order to claim credits in NZUs for removal activities, but only if an injection permit has been issued for the project under the CCS legislation.

CHAPTER 8
TRANSPORTATION OF CARBON DIOXIDE

1 Introduction

Carbon capture and storage operations and enhanced oil recovery operations (EOR) will commonly transport CO_2 by pipeline from the sources where it has been captured to the storage site or EOR project. Pipelines involve questions of land access, safety, industry regulation, and decommissioning, which are dealt with in the following sections. Transportation of CO_2 by pipeline is reasonably well understood technically, and poses few unknown risks. Although it is not risk free, it does not present the same explosion and pollution risks of petroleum or natural gas. On such matters and other engineering issues we draw on the study by Transfield Worley, *Carbon Dioxide Transport and Pipelines - Engineering Requirements for Design, Construction and Operation*,[1] carried out in parallel with this study. In this examination of pipeline regulation we include the directly associated fittings, meters, valves, and compressor stations, but not pipes that form part of a capture facility or form part of an injection facility. We proceed on the assumption that pipeline operators may be the same companies that are carrying out injection operations, but that they just as well may be different companies.

Moving CO_2 by road or rail is unlikely to be important for CCS because of the cost and the complexity involved, having regard to the large quantities involved; according to the IPCC, transport of CO_2 by tank truck or rail costs more than twice as much as by pipeline.[2] Carbon dioxide is routinely transported by road for use in industry, and is covered by existing safety legislation, which will be adequate for if CCS road transport occurs. Moving CO_2 offshore by ship is also less likely than by pipeline. (Transport offshore is also discussed in Chapter 9.) The generally-agreed preference is underground pipeline.[3] Underground pipelines are more commonly accepted and are familiar in New Zealand, and undergrounding assists with stable process conditions, insulation, buffering, access costs, mechanical protection and protection from human interference.[4] Because CO_2 has been transported by pipeline for many years overseas, there is a well-understood base of engineering expertise in this area.[5] Operations, maintenance and monitoring are also well understood, and technology is available and routine.[6] The main cause of CO_2 pipeline incidents overseas appears to be material failure, followed

1 Transfield Worley, Carbon Dioxide Transport and Pipelines - Engineering Requirements for Design, Construction and Operation, 170212-RPT-X0001, (July 2013).

2 Intergovernmental Panel on Climate Change, *Special Report on Carbon Dioxide Capture and Storage* (2005) at 184.

3 M Roggenkamp and A Haan-Kamminga "CO_2 Transportation in the European Union: Can the Regulation of CO_2 Pipelines benefit from the Experiences of the Energy Sector" in I Havercroft, R Macrory and R Stewart (eds) *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Hart, Oxford, 2011) at 108; Transfield Worley *CCS in New Zealand – Case Studies for Commercial Scale Plant Final Report* (September 2010) at 20.

4 Transfield Worley, above n 1 at 79.

5 Intergovernmental Panel on Climate Change, *Special Report on Carbon Dioxide Capture and Storage* (2005) at 185.

6 At 186.

by corrosion and outside force, especially vandalism.[7] According to the IPCC, the risks could be similar to or lower than those already posed by pipelines used for oil and gas.[8]

CCS projects will probably require new pipelines. It is unlikely that existing natural gas pipelines can be re-used, if they were available, because CCS pipelines operate at a higher pressure and have different design requirements. Natural gas pipeline maximum design ratings in New Zealand are 70 bar,[9] and operating pressures are usually 35 to 40 bar, depending on the age and quality of the asset, while CO_2 in a supercritical phase is generally transported in a pressure range of 86 to 151 bar.[10]

The nature of a future New Zealand CO_2 pipeline network is not easy to predict.[11] At the simpler end of a spectrum of possibilities is a point-to-point pipeline connecting one capture facility to a single storage facility. At the other end of the spectrum, a nationally planned multi-point source network or 'hub' could emerge. Building a network will be complicated by the uncertainty of the commercial drivers for CCS, the small number of projects, and the need to co-ordinate the plans and ambitions of multiple players. If there is a long interval between projects, it will not be easy to develop a network by scaling up; if a pipeline is built with surplus capacity for the future, there may be a long wait before the next project produces additional demand that will justify the underutilised capacity.[12]

New Zealand does not have a specific Pipeline Act, and regulation of pipelines takes place primarily under the Resource Management Act 1991 (RMA) and the Health and Safety in Employment (Pipelines) Regulation 1999. One possibility is to integrate transport regulation with capture and storage legislation.[13] Overseas approaches vary; some jurisdictions offer a comprehensive statute on pipelines, and other jurisdictions include provision in the CCS regime. For example, Queensland and South Australia have integrated some aspects into CCS legislation; the OPGGSA requires a pipeline licence to be obtained for the construction, reconstruction, alteration, or operation of a pipeline.[14] In contrast, the Barrow Island Act of Western Australia extended the application of the Pipelines Act by including CO_2 into the definition of petroleum. A separate new regime for CO_2 pipelines has its attractions, but on the whole we consider it preferable to rely on existing legal constructs where they can be amended and adapted to deal effectively with the new technology. The IEA observes that transport is particularly an area where the CCS regulatory framework will involve the modification of existing laws rather than the introduction of new measures.[15] Below we go in detail into our recommendation that the Health and Safety in Employment (Pipeline) Regulations 1999 should be extended to CO_2 pipelines.

7 World Resources Institute, CCS Guidelines: Guidelines for Carbon Dioxide Capture, Transport, and Storage (2008) at 47.

8 Intergovernmental Panel on Climate Change, *Special Report Carbon Dioxide Capture and Storage* "Summary for Policymakers" at 12.

9 Transfield Worley, CCS in New Zealand – Case Studies for Commercial Scale Plant. Final Report (September 2010) at 21, 35.

10 World Resources Institute, above n 7 at 44.

11 See the investigation by Transfield Worley, above n 1.

12 Global CCS Institute, Carbon Dioxide (CO_2) Distribution Infrastructure: The Opportunities and Challenges Confronting CO_2 Transport for the Purposes of Carbon Capture and Storage (CCS) – An Observation Paper (August 2012) at 9.

13 Baker and McKenzie, Strategic Analysis of the Global Status of Carbon Capture and Storage: Report 3: Policies and Legislation Framing Carbon Capture and Storage Globally. Final Report (the Third Foundation Report) (Global CCS Institute, 2009) at 28.

14 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 210.

15 International Energy Agency, Carbon Capture and Storage Model Regulatory Framework (2010) at 53.

2 Siting and Land Access

The route of a CCS pipeline needs to be approved, and the pipeline operator needs rights to lay the pipeline across private and public property. In some jurisdictions this approval is described as route approval or siting authority. In New Zealand the matter appears to be a clear candidate for applying the principle of using existing law as much as possible. The RMA provides for both aspects in a manner that seems effective for CCS, and consistent with the use of the RMA for other CCS purposes. Under the RMA a pipeline operator, as a network utility operator, can obtain approval for land-use planning purposes and can obtain necessary property rights for access to land. Using the RMA would also treat CCS consistently with other pipeline projects; a new pipeline for natural gas would come under the RMA. The Gas Act 1992 is not relevant; even if it were amended to include CO_2, it provides rights of entry onto private land only in relation to existing gas fittings, not a new pipeline, and it applies to supply, distribution, compression, and use of gas, not transmission. There does not appear to be any need for a new statute.

A CO_2 pipeline project may be part of a CCS injection project, or it may be separate. The law should make either possibility available, without trying to predict the evolution of the CCS industry, but it should promote procedural integration where possible. If an RMA notice of requirement for a designation for a pipeline is made along with a CCS injection permit, then it should be called in, and heard and processed with the injection permit and all ancillary applications. If a notice of requirement is made separately from an injection permit, then it will be a prime candidate for an RMA call-in anyway, along with ancillary applications, especially the applications made to regional councils.

2.1 Pipeline siting and access approval under an RMA designation

The RMA was considered in detail in Chapter 2 in its application to CCS. The chief background point in relation to siting and land access is that under the RMA district councils and city councils (known as territorial authorities) have the power to control the use of land, including the use of land for a pipeline. The district plans of cities and districts are likely to require a pipeline proponent to obtain a resource consent for its project. However the role of the territorial authorities is affected by the power of a network utility operator to apply for a designation for a pipeline.

Pipelines are one of a set of utility activities that are addressed by RMA provisions concerning network utility operators, requiring authorities, and designations. These provisions are discussed in more detail in Chapter 4, because of their importance to acquiring rights to property. A "network utility operator" is defined in section 166 to include a person who undertakes, or proposes to undertake, the distribution or transmission by pipeline of natural or manufactured gas, petroleum, biofuel, or geothermal energy. A network utility operator may apply to be approved as a "requiring authority." A requiring authority may proceed to give a notice of requirement to a territorial authority requiring a designation in a district plan for a specific project. The notice must give details of the project in a similar manner to an application for a resource consent. The authority can state its requirements for safety zones as part of the notice. The procedure that must be followed provides for an open hearing with a right of appeal. As we noted above, the procedure may be modified and accelerated if the Minister calls in the designation. Once the designation is confirmed, the project becomes part

of the district plan so that the requiring authority need make no application for a land use consent to the district council. The procedure in effect gives notice to the community of the intended project, its route and its use of land. A designation protects the land from any use that would prevent or hinder the project.[16] A requiring authority may use the Public Works Act 1981 to acquire land for a pipeline, or an interest in land such as an easement of pipeline right of way, unless it is able to obtain the necessary rights by agreement.

A designation may be confirmed subject to conditions, in much the same way as a resource consent.[17] Conditions can ensure environmental protection in a number of ways, but in relation to a pipeline they can particularly impose requirements for environmental rehabilitation when a pipeline is decommissioned.

As we recommended in Chapter 4, section 166 of the RMA should be amended so that a company that undertakes, or proposes to undertake the distribution or transmission by pipeline of CO_2 has the status of a network utility operator (along with a company undertaking CCS injection operations). We consider that this provides an effective means of approving the selection of a pipeline route and making land acquisition possible, especially because its procedures can include a call-in and integration with injection permit procedures.

2.2 RMA controls outside a pipeline designation

The designation procedure under the RMA concerns territorial authorities, district plans, land use, and land acquisition. It does not limit the powers of regional councils, and it does not affect the obligation of a pipeline operator to apply for a resource consent for a number of activities associated with pipeline construction such as earthworks, stream crossings, vegetation clearance, and incidental discharges of gas or liquids to land, water, or air. If a pipeline goes out to sea, it will require a coastal permit for the occupation of space, disturbance of the seabed, and incidental effects. Marine pipelines are dealt with in Chapter 9.

The application of RMA environmental controls of this kind to CCS pipelines raises many of the same questions about the application of the RMA generally that were addressed in Chapter 2. The recommendations that we made there and in other parts of this Report appear to be equally applicable to CCS pipelines. In particular:

(i) Pipelines can be included in the procedures we propose for the integrated processing and hearing of an application for a CCS injection project. The law should allow an application for an injection permit to be considered along with an associated pipeline, and should equally allow applications for a pipeline and for injection separately. The procedures, modelled on RMA call-in procedures, will ensure co-ordinated decision-making.

(ii) A National Policy Statement and a National Environmental Standard for CCS should extend in their provisions to CCS pipelines.

16 Resource Management Act 1991, s 176.

17 Resource Management Act 1991, ss 168A(4), 171(2), and 174(4). An outline plan of the work must show any other matters proposed to avoid, remedy or mitigate any adverse effects on the environment: s 176A(3).

3 Safety

As noted above, the safety requirements of CO_2 pipelines are well known. The effects of a CO_2 pipeline accident on the environment or on human health and safety are likely to be less serious than those from natural gas, petroleum, and hazardous liquid pipelines. Regulating the safety of pipelines covers the construction, design and operation of the system, and includes maintenance and inspection.

There is much international writing on the design and operational standards for CO_2 pipelines. The Australian standard "AS 2885 – Pipelines – Gas and Liquid Petroleum" was revised in 2012 to incorporate guidelines for transport of CO_2. Its application in New Zealand is discussed below. Another expression of current best practice is *Design and Operation of CO_2 Pipelines: Recommended Best Practice* by Det Norske Veritas.[18] The International Standards Organisation has announced its intention to develop a standard covering the full life-cycle of a CCS project.[19] New Zealand participates in that work as an observer.

3.1 Health and Safety in Employment Act 1992

The Health and Safety in Employment Act 1992 was outlined in Chapter 2. It is relevant to CCS pipelines as well as CCS injection facilities. The general obligation to take all practicable steps to ensure that a place of work does not present a hazard to non-employees and people in the vicinity of the place of work is particularly relevant to pipelines.[20] Before the HSEA was enacted, natural gas pipelines and their like were regulated by authorisations under the Petroleum Act, which were equivalent to a licence and prescribed in detail how the pipeline could be constructed and operated.[21] Under the HSEA the control of pipelines is not prescriptive in that way; instead, the chief mechanisms are the HSE (Pipelines) Regulations 1999, compliance with approved standards, and a certificate of fitness issued by a recognised inspection body.

3.1.1 Health and Safety in Employment (Pipelines) Regulations 1999

The Health and Safety in Employment (Pipelines) Regulations 1999 appear to be suitable for the regulation of the safety aspects of a CCS pipeline carrying CO_2, including pipeline design and operation. We consider different aspects in turn. The first is whether the Regulations apply as they stand to a CCS pipeline carrying CO_2, most probably supercritical CO_2. Regulation 2 defines a pipeline as:

> [A]ny pipeline or proposed pipeline likely to be permanent and used or intended to be used for the conveyance of any mineral, petroleum, geothermal fluid, natural gas, or any other fluid that, at ambient conditions, has inherent properties that may create a significant hazard[.]

18 In particular, see Det Norske Veritas, *Design and Operation of CO_2 Pipelines: Recommended Best Practice DNV-RP-J202* (April 2010). See Global CCS Institute, *Global Status of CCS* (2012) at 125 for a table of existing standards.

19 Global CCS Institute, *Global Status of CCS* (2012) at 125.

20 Health and Safety in Employment Act 1992, ss 6 and 16. The duties are restricted to taking "all practicable steps" to ensure that there is no hazard. The duty to persons in the vicinity of the place (relevant to pipelines) is expressed in broad terms; the duties to persons in the work place who are not employees or invitees vary in character.

21 Department of Labour, Guidelines for a Certificate of Fitness for High Pressure Gas and Liquids Transmission Pipelines (OSH 3430, February 2002) at 8, 9.

Is CO_2 a fluid that, at ambient conditions, has inherent properties that may create a hazard? Ambient conditions relate to the temperature and pressure of the surrounding environment. Carbon dioxide is benign at low concentrations, as part of human respiration for example, but unless it is diluted it is dangerous; walking into a room filled with pure CO_2 is hazardous, if not lethal. A CO_2 pipeline is therefore probably subject to the Regulations, although it is not as clear as it should be. The definition of a pipeline in regulation 2 includes compressors and related fittings. However it excludes a bulk storage operation, a pipeline within a plant, and a pipeline offshore that forms part of an offshore petroleum operation. This is consistent with industry norms, but arguably it leaves us with a lack of consistency for CO_2 pipelines that form part of an offshore petroleum installation, because they will not be regulated under the Pipeline Regulations. There is also a lack of clarity on the point where the pipeline forms part of the offshore installation, but again one might expect that industry expectations would apply. There also seems to be some inconsistency for EOR operations.

We recommend an amendment to make it clear that a CO_2 pipeline is included in the Regulations. The amendment should include CO_2 pipelines for EOR purposes as well as CCS purposes. The amendment should make it clear that the Regulations apply to pipelines in the territorial sea, the exclusive economic zone, and on the extended continental shelf.[22]

We recommend that the Regulations are clearer on exactly what facilities constitute a pipeline for the purposes of the Regulations. They should ensure that it is clear at what point, at what flange, the overall regulatory system ceases to control the CCS system as a capture facility, and, at the other end, at what point does the system cease to be a pipeline and becomes an injection facility. For CCS, it is important that there is a clear chain of custody, and a clear intermeshing of regulatory responsibility.

The second issue is whether the Regulations can sufficiently regulate the safety aspects of CO_2 pipelines for CCS. The Regulations impose a general duty that complements those under the Act itself. Regulation 6 states:

> An employer must take all practicable steps to—
> (a) prevent the uncontrolled release of hazardous liquids, vapours, and gases; and
> (b) prevent the uncontrolled accumulation of hazardous vapours and gases; and
> (c) detect any hazardous accumulation of vapours or gases; and
> (d) protect pipeline workers working in areas where hazardous liquids, vapours, or gases may exist, particularly in confined spaces.

Other general duties of an employer company are to have an identified manager supervising health and safety aspects, to mark the pipeline location, to keep land owners notified of hazards and contact persons, and to ensure that work around a pipeline causes no hazard. The company must give notice to the Secretary before beginning pipeline construction, operation, or abandonment.[23]

22 Generally see Chapter 9 on the offshore legal framework. Ensuring that the Regulations apply beyond the territorial sea may require an amendment of the statute, not only the Regulations.

23 Health and Safety in Employment (Pipelines) Regulations 1999, reg 12.

The notice must include full details of the company, the pipeline, plans, details of the material to be transported, working pressure, and hydrostatic test records. These notification requirements are light, in being qualified by the "all practicable steps" and in not requiring the approval of the Secretary for the activity.[24]

Standards, design requirements and operation requirements are central parts of the regulation of pipeline safety, dealt with under regulation 8. An employer company must take all practicable steps to ensure that the pipeline is designed, constructed, operated, and maintained, and suspended or abandoned, in accordance with the appropriate part or parts of one of the four standards listed in the regulation. Regulation 8 goes on to say that if no standards are applicable then the work must be in accordance with generally accepted and appropriate industry practice. Promulgated international standards would certainly be a guide to such practice. Fortunately, much work has been done in this area and many international standards for CO_2 pipelines are becoming available.[25] Standards covering design and operation include inspection, monitoring and testing, and integrity assessments.[26] We recommend that the Regulations give clear guidance to CCS pipeline designers and operators by ensuring that suitable up-to-date international standards apply in New Zealand.

One of the four standards stated in regulation 8 as available for an employer (pipeline company) to use is "NZS/AS 2885, Pipelines – Gas and Liquid Petroleum." The Australian version of this Standard was revised in 2012 to cover the transport of CO_2. However it is not clear that this revision is available under the regulation, because the regulation does not state that it includes amendments or updates made from time to time. The regulation lists the three parts of the Standard, which are dated 1995 and 1997. In addition it does not appear that Standards New Zealand has adopted the Australian 2012 amendments. The Transfield Worley study has identified possible problems if the new Australian standard is applied in New Zealand without modification of the current pressure limitations.[27]

The general law does not appear to provide any route for deeming a reference to a standard to be a reference to a standard as revised or amended from time to time.[28] This is a shortcoming in our legal arrangements for the use of standards generally and not only in relation to CCS.

A certificate of fitness, issued by a recognised inspection body, is required for a pipeline before it can be operated: regulation 11. The Secretary may recognise a body as an inspection body if it operates effective and relevant quality assurance programmes, and is properly accredited. The inspection body

24 It may be prudent to see a possibility that this will change. The Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 1999 had a number of such provisions, but in the 2013 Regulations many of them have changed to direct requirements. The emphasis on general performance standards has shifted with the requirement that a safety case be submitted and approved.

25 In particular, see Det Norske Veritas *Design and Operation of CO_2 Pipelines: Recommended Best Practice DNV-RP-J202* (April 2010). See Global CCS Institute *Global Status of CCS* (2012) at 125 for a table of existing standards. However, this research has not included examination of the standards themselves.

26 See Det Norske Veritas Design and Operation of CO_2 Pipelines: Recommended Best Practice DNV-RP-J202 (April 2010).

27 Transfield Worley (2013) above n 1 at 29.

28 The Health and Safety in Employment Act 1992, s 23(3) is quite clear that an amendment to material incorporated by reference after the commencement of the regulations shall not have effect until the regulations are changed. (However it is not clear that the Health and Safety in Employment (Pipelines) Regulations reg 8 is incorporation by reference; it may simply be reference.) The Standards Act 1988 s 23 says much the same thing: "A New Zealand standard may (...) be cited in an Act, regulation, or bylaw by the title and number given to it by the Council, and any such citation shall (unless the context otherwise requires) be deemed to include and refer to the latest New Zealand standard with that citation (together with any modifications to it) promulgated by the Council before the Act was passed or the regulation or bylaw made." The sting is in the tail. Stability and clarity of the law is thereby promoted, but at a possible cost unnecessary obsolescence.

examines the pipeline and related equipment, and issues a certificate of fitness authorising the use of the pipeline. The employer must cease operations if the pipeline or equipment no longer complies with the certificate, unless it is allowed to operate under reduced pressures and other limitations.[29]

A pipeline company must take all practicable steps to develop procedures for dealing with emergencies.[30] A thoroughly-prepared set of emergency procedures is essential. We consider that the requirement should be a simple and direct obligation, not qualified as to all practicable steps. Such a qualification is not characteristic of emerging best international practice for the management of CCS.[31]

In fact, a number of obligations in the Regulations are stated as an obligation to take "all practicable steps" rather than simply as an obligation to do the thing. This formula should be reconsidered to ensure that the regulation of CO_2 pipelines in New Zealand is of the same standard of quality as in other countries. While "all practicable steps" is suitable for a general duty to ensure safety or to provide a safe working environment, it is less defensible for an obligation to comply with a standard, or to hold a current certificate of fitness for a pipeline. In other parts of the New Zealand legal system, such obligations are imposed directly, and questions of practicability are taken into account in enforcement for non-performance of the obligation. In comparison to equivalent CCS legislation overseas "all practicable steps" stands out as setting an undemanding level of performance. It is good to see that "all practicable steps" is less of a feature of the recent HSE (Petroleum Exploration and Extraction) Regulations 2013.

In summary, it should be made clear that the HSE (Pipelines) Regulations apply to CO_2 pipelines, both onshore and offshore; modern standards (with necessary modifications) for CO_2 should be made applicable; and obligations to maintain certification and compliance with standards should be imposed directly without qualification as to all practicable steps. This also applies to the role of the Regulations in decommissioning, as noted below in this Chapter.

3.1.2 Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999

The Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 apply to the controller of pressure equipment (among other kinds of equipment), and pressure equipment includes a pressure vessel or the fittings, piping components and pressure piping for gases or liquids at pressures exceeding 50 kPag.[32] At first sight it appears to include a pipeline for transporting CO_2. Schedule 2 of the Regulations excludes from its operation pipelines under the Petroleum Act 1937 and those under the Gas Act 1992, and pressure vessels used in connection with compressors that compress natural gas or biogas for transmission. These exclusions do not seem to extend to new transmission pipelines for either natural gas or CO_2. There is provision to apply for an exemption.[33]

29 Health and Safety in Employment (Pipelines) Regulation 1999, reg 11.

30 Regulation 17.

31 For example, section 126 of the Pipelines Act 2005 (Vic) requires safety management plans to be prepared before carrying out operations; the UK Pipelines Safety Regulations, reg 12 state that an operator shall ensure that no fluid is conveyed unless adequate arrangements have been made dealing with accidents, damage, or emergencies.

32 Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999, Schedule 1. 'Pipeline' is also defined there.

33 Reg 5.

These HSE (PECPR) Regulations require the controller of equipment to which the Regulations apply to comply with a number of safety obligations; to obtain and have accessible certain information;[34] to take all practicable steps to ensure that the equipment is safe, is operated safely and within the limits it was designed to operate in, that it is maintained in a safe condition, and not operated unless it has a current certificate of inspection.[35] The Regulations provide for inspection bodies, design verifiers and equipment inspectors, and for certification procedures.[36]

It is unclear whether these HSE (PECPR) Regulations and the HSE (Pipeline) Regulations overlap.[37] There are differences between the two sets of Regulations, in that the former ones focus on the equipment used, inspection, and the prohibition of any unsafe equipment, while the focus of the latter is design, construction, operation and maintenance of a pipeline. However there are many aspects of overlap that do not seem desirable, at least in the case of a CCS pipeline, if not generally.

The HSE (PECPR) Regulations are likely to apply to the capture aspects of a CCS operation, but we recommend that their effect be clarified. We have not examined whether they are suitable for that purpose as this is more a matter of general regulation of safety matters than the design of a specific CCS regulatory framework. If the PECPR Regulations are not suitable for the capture aspects of CCS, the legal option exists of applying for an exemption under the provision noted above, which would leave CCS capture facilities regulated for health and safety purposes only under the general provisions of the HSEA.

3.2 Other legislation

We discussed in Chapter 3 that other legislation can be identified as likely to be applicable to pipelines, and generally to CCS operations. The Hazardous Substances and New Organisms Act 1996 (HSNOA) is one such Act. Its main application will be in labelling requirements.

If CO_2 were to be transported in containers the Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004 would apply, as would the Hazardous Substances (Compressed Gases) Regulations 2004, and the Land Transport Rule: Dangerous Goods 2005. (The Maritime Rules under the Maritime Transport Act 1994 have further requirements for marine transport.)

The Building Act 2004 also has application to CCS pipelines. A pipeline is not a building within the meaning of the Act if it is part of a network utility operation system owned or controlled by a network utility operator, who is defined as a person who inter alia undertakes or proposes to undertake the distribution or transmission by pipeline of natural or manufactured gas, petroleum, biofuel, or geothermal energy.[38] We recommend that a pipeline for CO_2 is added to this the definition.

34 Reg 8.

35 Reg 10.

36 Regs 24, 25, 26, 27, Part 5.

37 The question may not have come up in practice if no new natural gas transmission line has been constructed since the repeal of the Petroleum Act 1937 in 1992.

38 Building Act 2004, ss 7 and 9. The definition of a network utility operator makes no reference to the same status under the Resource Management Act 1991, so RMA status does not govern the Building Act status.

3.3 Conclusions on pipeline safety

In general we believe that CCS pipeline safety regulation can be carried out satisfactorily under the HSEA, with minor changes to bring CCS under it as recommended above.

Although organisational matters are not central to the purpose of this analysis, we make two points in relation to the organisational arrangements for the regulation of CCS pipeline safety. First, there is a good case from an administrative point of view for the High Hazards Unit (HHU), or any successor of it, to have jurisdiction over CCS pipelines. The HHU will move from the Ministry of Business Innovation and Employment with other workplace safety regulators to WorkSafe New Zealand. In the petroleum industry, wellsite operations come under the HHU but natural gas pipelines do not. At least in CCS, we consider that a better-integrated result will come from the inclusion of CCS pipelines as well as CCS injection sites within the work of the HHU, even though there is not a good case for describing CO_2 pipelines as presenting high hazards. Secondly, we believe that the emphasis on co-operation and information-sharing between agencies that has been renewed after the Pike River Coal Mine disaster should extend to CCS.[39] This emphasis is a welcome departure from the tendency of the last two decades to keep departmental functions separate, in silos, and to keep information gathering under one Act restricted to the purposes of that Act alone. Provisions inserted in the Crown Minerals Act 1991 in 2013 are examples to follow.[40]

4 Industry Regulation Including Third Party Access and Price Control

A CCS project is a system of parts, in capture, transport and injection, that need to be co-ordinated, in respect of matters such as the despatch of CO_2 from capture facilities, the provision and cost of pipeline services, and decisions about future investment in pipeline capacity. A CCS project that only involves one company, or one consortium or joint venture, will be able to co-ordinate such matters internally, without reference to external parties. That may be common in the early stages of CCS activity in New Zealand. However, it is desirable to look ahead to a more complex future, where pipelines are carrying gas from multiple capture facilities to multiple injection sites. In such circumstances, with multiple parties, more effort would be required to co-ordinate industry functions, and to make decisions on the management and extension of the system. In addition, it is possible that a major transmission pipeline would have an effectual monopoly.

Experience of Industry Regulation in Electricity and Natural Gas. There is a good deal of experience in dealing with such matters in relation to electricity and natural gas. In both industries, the provision of services is through a system that co-ordinates production, transmission, distribution and demand. The co-ordination exists on a general level, with respect to investment in new construction, and on a minute-by-minute level to match supply and demand. Transmission and distribution have monopoly characteristics.

39 Royal Commission on the Pike River Coal Mine Tragedy: Volume 1 (October 2012) at 29.

40 For example, ss 90E and 90G, and s 33D.

Electricity is regulated under the Electricity Industry Act 2010 and the Electricity Act 1992. For some years in the 1990s and early 2000s, there was no formal regulation of industry issues in either electricity or gas. Self-regulation under multiparty contracts was able to deal effectively with metering and reconciliation. In the electricity industry self-regulation established and maintained the New Zealand Electricity Market at the wholesale level. Third party access issues were resolved in 1998 by the separation of electricity distribution functions from generation and retail, so that Transpower (owner of the national grid) and the local distribution companies could not compete with their customers in selling energy while running the monopoly transport system as well. The NZEM provided despatch and reserve functions, broadly equivalent to balancing and nominations. However self-regulation reached its limits and in 2003 the electricity industry became subject to statutory regulation by the Electricity Commission, which was succeeded by the Electricity Authority. Under statutory regulation there is now a clear procedure for the approval of new projects, especially transmission lines, that includes statements of opportunities, a grid investment test, and evaluation of grid upgrade proposals. For the allocation of costs among multiple users, the Transmission Pricing Methodology can be put in place after consultation. These procedures are complex, but they provide a pathway for decisions on proposals to invest capital in shared infrastructure projects and on payment for their use. Under self-regulation it was not easy or even possible to reach agreement on such matters.

In the natural gas industry, a different path was taken. No wholesale market like the NZEM was established, and instead of statutory regulation a form of co-regulation was adopted. The Gas Industry Company was established in 2004 as an industry body with considerable authority to conduct industry self-regulation, but within the framework of the Gas Act 1992 to express the public interests in the matter and to give statutory backing to the system. This co-regulation has achieved a number of successes, but there have been several difficulties with balancing arrangements and in the availability of genuine third party access. The system may also struggle if a gas discovery outside Taranaki should require multiple parties to be involved in building and operating a major new pipeline.[41]

In both industries, the prices of transmission and distribution are controlled by the Commerce Commission under Part 4 of the Commerce Act 1986. Initially a system of targeted price control was employed, bringing control in to effect only if thresholds of price and quality were breached. However this presented difficulties, and transmission and distribution are now generally regulated for price under a system that is called 'default/customised price-quality path regulation.'

Issues. From an overview of experience in the electricity and natural gas industries, one can identify industry regulation and governance issues that are likely to arise in relation to CCS.

(i) Metering and reconciliation – rules to record the movement of quantities of gas.

(ii) Gas quality. The quality of CO_2 that can be injected into a shared pipeline system must be specified.

41 International Energy Agency, *Energy Policies of IEA Countries: New Zealand 2010 Review* (2011) at 88; B Barton, "Law and Regulation for Energy Networks in New Zealand" in M Roggenkamp, L Barrera-Hernández., D Zillman, I del Guayo (eds), *Energy Networks and the Law: Innovative Solutions in Changing Markets* (Oxford University Press, Oxford, 2012) at 274-291.

(iii) Balancing – day-to-day management of the inventory of gas in a pipeline in relation to nominations by shippers of quantities of gas for transport

(iv) Allocation of capacity rights, especially where spare pipeline capacity is low.

(v) Third party access – the rights of shippers to use a monopoly pipeline to sell gas in competition with the owner of the pipeline. Access to other essential facilities may also be an issue. Regulation can apply if negotiation is not successful.

(vi) Approval of new projects involving more than one party.

(vii) Allocation of the costs for the use of shared infrastructure.

(viii) Price control of pipelines and other infrastructure with monopoly characteristics.

Gas Quality. Gas quality, point (ii) above, is significant for the safety, design and cost-effectiveness of a CO_2 pipeline and storage system. Gases other than CO_2 in the gas stream entering a pipeline can present technical challenges.[42] Non-condensable gases such as oxygen, nitrogen, and methane can make it difficult to compress CO_2 so as to enter its supercritical phase. Oxygen in the CO_2 can lead to overheating at the injection point,[43] and water in the CO_2 stream increases the risk of corrosion of steel.[44] Which of these issues will arise will vary; different industrial and natural sources and processes will produce different quality gas streams, and different engineering solutions will be possible to produce safe and cost-effective results. So flexibility is required. A single-project pipeline linking one source to one injection point may need no elaborate rules, and only notification of gas quality to the CCS regulator. A more complex network may require rules. We recommend a power in the CCS Act to require notification and to make regulations for gas quality.[45] Regulations can deal with odourisation, which is favoured in some jurisdictions. The power to make regulations should be constrained to ensure conformity for marine CCS with the amendment of the London Dumping Protocol in 2006 to authorise CCS injection into the seabed only if the gas stream consists "overwhelmingly" of CO_2.[46] This applies to the territorial sea or coastal marine area as well as the EEZ. The Protocol obligation has been followed in law in Europe and in Queensland.[47]

Third Party Access. An example of a third party access provision for CCS is found in South Australia where the Minister may require the holder of a pipeline licence to convey a regulated substance for another person on terms mutually agreed by the parties, and failing agreement the Minister may determine the terms and conditions.[48] The Pipeline Act 2005 of Victoria provides for third party

42 Global CCS Institute, above n 12, at 33.

43 World Resources Institute, above n 7, at 45.

44 See Transfield Worley (2013) above n 1. The Intergovernmental Panel on Climate Change *Special Report* includes an example of quality specifications from the Canyon Reef Carriers, which was the first large CO_2 pipeline in the United States. The pipeline was built in the 1970s and conveys 12,000 tonnes of CO_2 daily. The specifications state the CO_2 content shall be at least 95%, with permitted maximum amounts of water, hydrogen sulphide, total sulphur, nitrogen, hydrocarbons, oxygen, and glycol, and a maximum permitted temperature for the CO_2. Intergovernmental Panel on Climate Change *Special Report on Carbon Dioxide Capture and Storage*, above n 5, at 182.

45 An example is section 45 of the Gas Act 1992; all gas supplied shall be of a quality and pressure prescribed under regulations.

46 London Dumping Protocol, Annex 1, Article 4.

47 Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Article 12; Greenhouse Gas Storage Act 2009 (Qld), s 12.

48 Petroleum and Geothermal Energy Act 2000 (Sth Australia), s 49.

access by saying that a licensee may enter into an agreement, but where there is failure to agree an application may be made to the Minister for a direction. In contrast, the Australian Commonwealth legislation simply says that a pipeline licence is subject to regulations that may be imposed for third party access.[49]

Price Control. The control of the prices and tariffs of CO_2 gas transmission and related services could be carried out under Part 4 of the Commerce Act 1986. The power already exists under section 52N of that Act for the making of an Order in Council to impose Part 4 regulation on particular goods or services.

Options. In relation to the character of regulation to address these matters, options include self-regulation, co-regulation, and conventional regulation. The first two of those are suited to mature industries, and would need to be implemented in a way that would avoid the challenges that have accompanied them in other network industries. In relation to the level of detail of regulation, the possible options range from a simple approach that might include doing nothing, to an elaborate regulatory framework ready to handle all kinds of industry issues. The problem with an elaborate framework can be simply stated; until an actual CCS system appears in New Zealand, with more than one party involved in a connected network, it is hard to say what regulation should be put in place. It is undesirable to try to look too far ahead and enact legislation on the basis of what would be little more than conjecture. However some basic provisions in the CCS law will be beneficial, indeed necessary. They will give answers to some of the questions most likely to arise in the medium term. They will signal the likely future development of the law, and that will increase investment certainty.

Recommendations. We recommend therefore that the CCS legislation should authorise the making of regulations for industry regulation and governance, including metering and reconciliation, third party access to pipelines and other essential facilities, and the allocation of costs for shared facilities.

5 Decommissioning

Decommissioning, although it will not arise for many years, is an important part of the regulatory framework for pipelines. It could be covered by the HSEA and the RMA, with or without amendments, or it could be addressed under the CCS Act either through a pipeline permitting regime or by being directly imposed.

Decommissioning generally involves the removal of surface facilities and restoration of the site following cessation of operations. Some jurisdictions also provide for removal of the pipelines, but this may not be essential and may cause more harm to ecological systems than if the pipelines were to remain where they lay.[50] Indeed, pipelines conveying substances that pose more significant risks and hazards than CO_2 are not required to be removed, and it is quite possible that it is not necessary or desirable to excavate the entire pipe. The alternative is to leave the pipe in place, fill with water or inert material, plug it, and remove all surface equipment. A CO_2 pipeline will leave far less residue than an oil or gas pipeline. There is little New Zealand experience with the removal or decommissioning of pipelines.

49 Offshore Petroleum and Greenhouse Gas Storage Act (Cth), s 212.

50 An example is s 55 of the Petroleum and Geothermal Energy Act 2000 (South Australia) which provides that where the pipeline has not been in use for a continuous period of more than three years the Minister may require its removal.

The situation offshore is different; the New Zealand Coastal Policy Statement states a policy of promoting the efficient use of occupied space in the coastal marine area by requiring the removal of any abandoned or redundant structure that has no heritage, amenity or reuse value.[51] This could readily be interpreted to require removal only of structures on or close to the surface of the seabed. However, if the complete removal of a pipeline was insisted on, it would require a resource consent from the regional council.

Ideally, a legal framework will not only prescribe decommissioning requirements but will also ensure that financial assurance is provided by a bond or otherwise for remediation and rehabilitation expenses.

5.1 Health and Safety in Employment (Pipelines) Regulations 1999

The Health and Safety in Employment (Pipeline) Regulations do not specifically require a pipeline to be abandoned on cessation of operations. Nor do they state what abandonment involves. They do, however, require an employer to take all practicable steps to ensure that no hazard is created when a pipeline operation is being abandoned, and to notify the Secretary before abandonment of a pipeline of the name and address of every employer and manager appointed under the Regulations, the estimated date of abandonment, details of depressurisation, purging, cleaning and sealing, any details of changes to any existing cathodic protection system, and the details as to the practicable steps to be taken to ensure no hazard is created. There is no requirement that the Secretary approve these details. The Regulations require an employer to take all practicable steps to ensure that abandonment is in accordance with appropriate part or parts of the standards stated in regulation 8.[52] We consider that our recommendation at 3.1.1 of this Chapter, above, should apply here, to impose the obligation to comply with standards directly without qualification as to all practicable steps.

5.2 Environmental rehabilitation under the RMA

The environmental aspects of decommissioning a CO_2 pipeline on land will be dealt with under the RMA. (The environmental effects of pipelines beyond the territorial sea are regulated under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 and are considered in Chapter 9.) A CCS pipeline of any size is likely to be approved by the making of a designation, accompanied by the grant of a number of ancillary regional council resource consents for earthworks, stream crossings, vegetation clearance, and incidental discharges of gas or liquids to land, water, and air. Conditions on the designation and the ancillary resource consents can include requirements for the rehabilitation of the environment when the pipeline is decommissioned. These requirements are likely to be stated in general terms, because any detail is likely to be obsolete by the time that a pipeline has reached the end of its useful life.

51 New Zealand Coastal Policy Statement 2010, policy 6(e).

52 The *Recommended Practice DNV-RP-J202 Design and Operation of CO_2 Pipelines* (April 2010) does not include decommissioning, but the CO2PIPETRANS project covers the pipeline life-cycle and will include decommissioning. Whether the ISO standards will include decommissioning is unknown.

A National Policy Statement for CCS can play a role in pipeline decommissioning by requiring decision makers (including those deciding on a designation) to have particular regard to relevant matters. A National Environmental Standard can go further, specifying that a disused CO_2 pipeline is a controlled activity and then proceeding to impose requirements for rehabilitation and financial assurance. The requirements should be flexible and performance-based in their character so as to apply effectively to different sites and different technologies. Section 43D of the RMA states the relationship between a designation and an NES.

We recommend that a National Environmental Standard and a National Policy Statement under the RMA make provision for the decommissioning of a CO_2 pipeline.

5.3 A different option: the CCS Act

For the sake of completeness, however, we note another option of dealing with decommissioning under the CCS Act. The CCS Act could institute pipeline permits, with decommissioning requirements imposed as conditions of the permit. Or the CCS Act could simply impose decommissioning requirements directly, without the need for a pipeline permit. A permitting regime provides clarity and a sense of simplicity. This option is discussed below, as it would provide a comprehensive approach to pipeline regulation. However we do not consider that decommissioning questions alone require such an approach; the HSEA and the RMA seem to provide an adequate framework.

6 The Form of Pipeline Regulation

It is apparent from the discussion in this Chapter that a number of options are available.

(i) A new Pipeline Act with a permitting regime, including access to land, decommissioning, construction, operation and management, industry regulation and third party access. This option would involve a complete change to the New Zealand regulatory framework for pipelines and change of this magnitude is not necessary nor desirable.

(ii) A CCS Act with pipeline permits. This option may look tidy, and there are plenty of international examples, however, the result would be regulation of pipelines for CCS purposes differently from that of other kinds of pipelines. That is also undesirable.

(iii) A CCS Act working with the HSEA and RMA. The CCS Act would cover matters that are not dealt with under the HSEA or RMA, imposing obligations directly on any person who operates a CCS pipeline, but relying primarily on the existing legislation for health and safety and for the environment. This option is equally tidy, and has many international precedents.

As will be evident, in our view the best option is option (iii), the CCS Act working with the HSEA and RMA, and relying on them as much as possible. It is consistent with the principle that the existing regime for petroleum pipelines apply to CCS pipelines as far as possible.[53] The key elements that cannot be provided for under existing legislation are industry regulation, including gas quality and third party access. Apart from those matters, our existing legal framework provides an adequate means of regulating pipelines for CO_2.

We reiterate that it should be possible for a company to obtain permission for a CCS pipeline separately from, or together with, permission for an injection project.[54] Applications for approvals for either the transport phase or the injection phase should be able to stand independently or together.

7 Emissions Accounting from the Transportation Phase

We propose in Chapter 11 of this Report that the CO_2 emitter and the injection facilities be participants under the Emissions Trading Scheme.[55] That appears to eliminate the need for transport facilities to be included separately under the scheme. Any discharge of CO_2 or leakage from transportation would be accounted for by the fact that the capture facility has surrendered obligations for the total amount of CO_2 that it has emitted, and that the injection facility receives credits only for the amount of CO_2 that it actually injects.

8 Recommendations

1. As also recommended in Chapter 4, the RMA should be amended so that a company that undertakes, or proposes to undertake, the distribution or transmission of CO_2 has the status of a network utility operator in order to be able to obtain a designation and rights of land acquisition.

2. Where an RMA notice of requirement for a CO_2 pipeline is made along with a CCS injection permit, it should be called in and heard and processed with that application and all ancillary applications, in order to provide procedural integration; but a separate application for a pipeline designation should also be possible. A National Policy Statement and a National Environmental Standard for CCS should extend in their provisions to CCS pipelines, and in particular decommissioning requirements.

53 R Pritchard, Carbon Capture and Storage – A Review of the Australian Legal and Regulatory Regime (June 2013) Appendix A.

54 Although permission is not required to construct a pipeline *per se*, consent will be needed by the regional council for ancillary activities covered by the RMA and details under the HSE Pipelines Regulations are to be provided to the Secretary before a pipeline is constructed or operated.

55 See Chapter 11 on the Emissions Trading Scheme, particularly 4.2: Losses During Transport.

3. The Health and Safety in Employment (Pipelines) Regulations 1999 should be amended:

   (a) to include pipelines carrying CO_2, including pipelines in the territorial sea, the exclusive economic zone, and on the extended continental shelf;

   (b) to clarify at what point a pipeline becomes part of an offshore petroleum installation and more generally exactly what facilities constitute a pipeline;

   (c) to ensure that suitable up-do-date standards covering CCS pipelines specifically apply, without relying on a broad reference to generally accepted practice;

   (d) to ensure that obligations to maintain certification and compliance with standards are imposed directly without qualification as to "all practicable steps;"

   (e) to ensure that the effect of the HSE (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 on the CCS stages of capture, transport, and injections is clarified.

4. The Building Act 2004 should be amended to include a CO_2 pipeline operator as a network utility operator.

5. The new CCS Act should include a power to require the notification of pipeline gas quality and a power to make regulations for pipeline gas quality. The power to make regulations for gas quality should refer to the requirements of the London Dumping Protocol.

6. The new CCS Act should authorise the making of regulations for industry regulation and governance, including metering and reconciliation, third party access to pipelines and other essential facilities, and the allocation of costs for shared facilities.

7. We recommend that a National Environmental Standard and a National Policy Statement under the RMA make provision for the decommissioning of a CO_2 pipeline.

CHAPTER 9
OFFSHORE LEGAL FRAMEWORK

This chapter concerns the regulation of carbon capture and storage at sea, or marine CCS – CCS in New Zealand's territorial sea, exclusive economic zone (EEZ), and extended continental shelf. It first examines the significance of international law, then the effect of existing domestic legislation in the EEZ and extended continental shelf, and then addresses the impact of existing legislation in the territorial sea. It then examines regulation of the transport phase of marine CCS, which is most likely to be by submarine pipeline. The technical possibility of storing CO_2 in deep ocean water is not considered because it is prohibited under international law.[1] Although the physical, biological and regulatory environment in which marine CCS will occur is different from that onshore, many of the issues are the same. This chapter addresses the specifically marine aspects of the law. We note in passing the possible application of other marine legislation to a particular project, such as the Marine Mammals Protection Act 1978, Marine Reserves Act 1971, and Wildlife Act 1953. We also note that the application of laws of general application to either the territorial sea or to the exclusive economic zone and continental shelf may need to be examined carefully.

Globally, two of the 17 large scale integrated CCS projects presently operating or under construction are offshore, the Sleipner and Snøhvit projects, both off Norway. Of the 68 projects operating or under construction, or identified as in earlier stages of planning and evaluation, 13 are offshore.[2] The offshore storage capacity for CCS injection in New Zealand is not currently well understood, although potentially suitable formations have been identified – particularly off Waikato between the Manukau and Kawhia Harbours,[3] and in the partially depleted Maui[4] and Pohokura[5] oil and gas fields off Taranaki.

1 It is a form of marine dumping prohibited under the London Dumping Protocol.

2 Global CCS Institute, *The Global Status of CCS Update January 2013* (Global CCS Institute, 2013); Global CCS Institute, *Status of CCS Project Database*, available www.globalccsinstitute.com as at 30 June 2013.

3 V Stagpoole, H Bushe and M Milner, Opportunities for Underground Geological Storage of CO_2 in New Zealand: Report CCS-08/4 – Offshore Waikato Region (GNS Science, Report 2009/57, 2009).

4 The distance of the site from land and proximity to an active fault have been seen as barriers; PR King, KJ Bland, RH Funnell, R Archer and L Lever, *Opportunities for Underground Storage of CO_2 in New Zealand: Report CCS-08/5 – Onshore Taranaki Basin Overview* (GNS Science, Report 2009/58, 2008) at 92.

5 The continued use of the field for natural gas production is seen as a limitation to its use for CCS; King and others, above n 4, at 95.

1 The Impact of International Law on Marine CCS Injection and Post-Injection

1.1 Introduction

Although international law is not directly binding in the New Zealand domestic legal system, it remains important for marine CCS for two reasons. First, New Zealand is obliged on a state level to honour its international obligations by legislating consistently with them. Second, international law can be directly referenced or incorporated in legislation and thus become domestically binding, or aid in the interpretation of legislation where there is ambiguity, or where the implementation of international obligations is part of the purpose of the statute.[6]

Two kinds of international law, both treaty based, are relevant to marine CCS regulation. First, the United Nations Convention on the Law of the Sea (UNCLOS)[7] provides jurisdiction for states to regulate various matters depending on the marine zone in question. Second, UNCLOS and other treaties provide substantive rules on environmental protection. Globally, no treaties specifically prohibit marine geological CCS, nor do they regulate it in detail.[8] This is largely because the treaties affecting CCS the most have a primary purpose of preventing or mitigating the impacts of dumping, in the sense of the deliberate disposal at sea of waste and material of all kinds, and have not been developed to facilitate CCS. International developments have largely focused on removing barriers rather than imposing active regulation.[9]

1.2 The United Nations Convention on the Law of the Sea: jurisdiction

The most important jurisdictional provisions in UNCLOS for the purposes of marine CCS are in Parts 2, 5 and 6. They divide coastal waters, broadly speaking, into four zones: internal waters (on the landward side of the baseline which runs along the low water mark and across bays), the territorial sea (extending from the baseline to 12 nautical miles), the contiguous zone (an overlay on the EEZ

6 *Police v Teddy* [2013] NZHC 432, [2013] NZAR 299 at [20].

7 United Nations Convention on the Law of the Sea 1833 UNTS 3 (opened for signature 10 December 1982, entered into force 16 November 1994).

8 Guidelines and risk assessment guidance developed under the London Dumping Protocol provide some detail, but are not binding as a matter of international law.

9 Intergovernmental Panel on Climate Change (IPCC), *Special Report on Carbon Capture and Storage* (2005) at 254.

extending to 24 nautical miles from the baseline) and the EEZ (which extends to 200 nautical miles from the baseline and includes the underlying seabed). The jurisdiction provided to coastal states diminishes in each zone according to how far it is from the baseline. For all practical purposes, the regime in UNCLOS relating to the "EEZ" (which includes both to the water column and its underlying seabed and subsoil) is identical to the separate and overlapping regime in UNCLOS relating to the "continental shelf" (which includes only the seabed and subsoil). These regimes are provided for separately for historical reasons. The regimes are different only to the extent that the continental shelf extends beyond the EEZ, where this is labelled as the "extended continental shelf" and where the overlying water column is subject to the high seas regime.[10]

As for the territorial sea, Article 2 of the Convention provides that a coastal state's sovereignty extends to its territorial sea, including its seabed and subsoil, but that sovereignty is subject to the Convention. In particular, the Convention provides a right of innocent passage through the territorial sea to the vessels of other states, and more generally Part 12 requires that the marine environment be protected and preserved. Sovereignty in the territorial sea is contingent on compliance with Part 12.

As to the EEZ, Article 56 sets out the rights, jurisdiction and duties of a coastal state. The jurisdiction is more limited than in the territorial sea, and does not amount to full sovereignty.[11] Pore space in the continental shelf underlying the EEZ appears to amount to a "natural resource" for the purposes of CCS, which seems to provide a reasonable jurisdictional basis in international law for New Zealand national law for CCS in the EEZ.[12] Jurisdiction also exists under UNCLOS in relation to offshore installations.[13] Coastal states also have sovereign rights in relation to the protection of the marine environment from pollution,[14] and under UNCLOS have exclusive jurisdiction to engage in or authorise others to engage in dumping.[15] As discussed below, CCS injection amounts to dumping under international law, which furnishes an additional and very clear jurisdictional basis for New Zealand law on the matter. Domestic regulation must, however, recognise the rights of other states in the EEZ, including the freedoms of navigation, overflight, and the laying of submarine cables and pipelines.[16] Article 79(4) affirms exclusive coastal state jurisdiction over pipelines where they are used in connection with the exploitation of the continental shelf, which would include CCS pipelines. A safety zone established around a CCS installation cannot interfere with recognised sea lanes essential to international navigation.[17] Other provisions concern the extended continental shelf, beyond the 200 nautical mile limit and the international seabed area beyond the EEZ and the extended continental shelf.[18] Under UNCLOS, states are not permitted to appropriate areas of the international seabed area, and thus CCS injection here is currently prohibited under international law.[19]

10 In 2008, New Zealand received recommendations on the extent of its extended continental shelf from the Commission on the Limits of the Continental Shelf. This area is subject to an overlay by which payments have to be made for its exploitation to the International Seabed Authority under Part XI of UNCLOS.

11 A full discussion of New Zealand's jurisdiction to regulate CCS in its EEZ is contained in Appendix F, Part 1.

12 R Purdy and R Macrory, *Geological Carbon Sequestration: Critical Legal Issues* (Tyndall Centre, London, 2004), at 12.

13 United Nations Convention on the Law of the Sea, Articles 58 and 60.

14 Article 56(1)(b)(iii).

15 Article 210(5).

16 Article 58.

17 Article 60(7).

18 Refer to Appendix F, Part 1.

19 Baker and McKenzie, Strategic Analysis of the Global Status of Carbon Capture and Storage Report 3: Policies and Legislation Framing Carbon Capture and Storage Globally (Global CCS Institute, Canberra, 2009) at 85.

1.3 United Nations Convention on the Law of the Sea and the marine environment

Part 12 of UNCLOS addresses the protection and preservation of the marine environment. Although CCS was not foreseen when the Convention was done in 1982, Part 12 is broadly stated and imposes obligations that are of general relevance to CCS.[20] Perhaps most importantly, Part 12 encourages more detailed rules to be developed internationally on pollution control, including dumping, which is addressed below. In summary, states have a general obligation to protect and preserve the marine environment under Article 192. Under Article 193, states have the sovereign right to exploit their natural resources in accordance with this duty. Article 195 provides that states must not transform one type of pollution into another. In practice, CCS injection is not likely to amount to pollution under UNCLOS, and has not been treated as such by the international community. However, the escape of injected gas into the water column may amount to pollution. If so, Article 204(2) would require that a permit for CCS be subject to monitoring to identify and respond to any leakage that is likely to cause harm. This is potentially significant in the domestic context, as there are questions over the extent to which limited duration consents under the EEZ Act and RMA are capable of imposing monitoring in the long term.[21]

Article 197 calls on states to cooperate on a global and regional basis. In the context of CCS, which internationally has been treated as a form of dumping, cooperation has been achieved through the London Dumping Convention (LDC)[22] and Protocol (LDP)[23] (to which New Zealand is a party) and the Dumping Protocol to the Noumea Convention.[24] Marine CCS has generally been treated as a dumping under international law, rather than a land-based source of pollution. However, where injection occurs from pipelines and remotely controlled devices on the seafloor (rather than conventional "platforms") most academic opinion appears to be of the view that this will not amount to dumping, and will instead be regulated under the less stringent requirements of international law on land based sources of pollution.[25] However, this view is not unassailable, and it is recommended that the New Zealand law for all forms of marine CCS be conform to LDP and its related guidelines.

Article 210(5) of UNCLOS imposes an obligation on states to require express approval for dumping, including CCS. That rules out what under the RMA and EEZ Act is termed permitted activity status. Article 210(6) also imposes an obligation on New Zealand to regulate dumping in a manner no less effective than the relevant "global rules and standards", which for New Zealand would be those contained in the LDP.

20 A full discussion of Part 12 is contained in Appendix F, Part 2.

21 This issue is discussed in general terms in Chapter 2.

22 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1046 UNTS 120 (signed 29 December 1972, entered into force 30 August 1975).

23 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 36 ILM 1 (signed 7 November 1996, entered into force 24 March 2006).

24 Protocol for the Prevention of Pollution of the South Pacific Region by Dumping [1986] PITSE 16 (signed 24 November 1986, entered into force 22 August 2005).

25 Purdy and Macrory, above n 12 at 20; J Friedrich, "Carbon Capture and Storage: A New Challenge for International Environmental Law" [2007] 67 Zeitschrift fur auslandisches offentliches Recht und Volkerrecht 211 at 219; International Energy Agency, *Legal Aspects of Storing CO_2: Update and Recommendations* (2007) at 64; IPCC above n 9, at 255.

1.4 London Dumping Convention and Protocol

The London Dumping Convention addresses deliberate disposal of material at sea as a form of marine pollution. For New Zealand, the London Dumping Protocol effectively replaces its parent Convention.[26] It defines "dumping" as including:[27]

> [A]ny deliberate disposal into the sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea; [and] … any storage of wastes or other matter in the seabed and the subsoil thereof from vessels, aircraft, platforms or other man-made structures at sea.

This is plainly wide enough to encompass the geological sequestration of CO_2 in the seabed, and has been understood as such in international discussions. However dumping does not include the disposal or storage of wastes or other matter directly arising from or related to the exploration, exploitation and associated offshore processing of seabed mineral resources. Carbon dioxide injection that is for enhanced oil or gas recovery (EOR) is not subject to the Protocol, nor arguably is the injection of CO_2 that has been stripped from offshore natural gas,[28] such as at the Sleipner CCS project in the North Sea.

Importantly, the requirements of the LDP apply to all dumping at "sea", which includes all marine waters (and underlying seabed and subsoil) other than internal waters.[29] In other words, the LDP applies to the territorial sea, EEZ, the extended continental shelf and high seas,[30] but not to waters on the landward side of the baseline. The LDP also applies to ships where they are loaded in the territory of a state party and the matter loaded is intended for dumping at "sea".[31] The Protocol implements a precautionary approach to dumping, by requiring parties to prohibit the dumping of wastes or other matter into the sea or seabed, unless they are contained within a list of substances in Annex 1 (described as a reverse list). Parties are obliged to require a permit for the dumping of Annex 1 substances.[32] Parties are obliged to adopt administrative measures to ensure that issuance of permits and permit conditions comply with provisions of Annex 2. They are also to seek opportunities to avoid dumping in favour of environmentally preferable alternatives.

Prior to 2006, CO_2 was not included in the reverse list of Annex 1, and marine CCS was thus prohibited under international law for those parties to the LDP. In 2006 the Parties to the Protocol decided to remove this obstruction to CCS. Annex 1(1) of the Protocol was amended to add CO_2 to the list of materials that can be considered for dumping.[33] Annex 1 is reproduced in full in Appendix F, Part 4. Annex 1(4) of the Protocol now imposes restrictions:

26 London Dumping Protocol, above n 23, Article 23. The impact of the LDP on CCS regulation in New Zealand is discussed fully in Appendix F, Part 3.

27 London Dumping Protocol, above n 23, Article 1.

28 Intergovernmental Panel on Climate Change, above n 9, at 255.

29 London Dumping Protocol, above n 23, Article 1.

30 Although a coastal state only has international legal jurisdiction on the high seas in relation to its own ships and installations.

31 London Dumping Protocol, above n 23, Article 9(2).

32 Article 4.

33 Resolution on the Amendment to Include CO_2 Sequestration in Sub-Seabed Geological Formations in Annex 1 to the London Protocol Res LP.1(1) (2006).

Carbon dioxide streams referred to in paragraph 1.8 may only be considered for dumping, if:

1. disposal is into a sub-seabed geological formation; and
2. they consist overwhelmingly of carbon dioxide. They may contain incidental associated substances derived from the source material and the capture and sequestration processes used; and
3. no wastes or other matter are added for the purpose of disposing of those wastes or other matter.

As well as the restrictions listed above, Annex 2 imposes obligations for dump-site selection, assessment of effects, monitoring, permitting, and conditions. (Annex 2 is reproduced in Appendix F, Part 4.) In summary, parties are obliged, when receiving an application to engage in CCS, to:

(i) make attempts to reduce the necessity for dumping;

(ii) conduct a waste prevention audit (assess alternatives to dumping, including an evaluation of the types of wastes generated, the details of production processes, and the feasibility of waste prevention techniques);

(iii) require a waste prevention strategy if an opportunity exists for waste prevention;

(iv) consider whether appropriate opportunities exist to re-use, recycle or treat waste;

(v) characterise the waste according to its chemical, physical and biological properties;

(vi) develop a national action list to provide a mechanism for screening wastes on the basis of their potential effects on human health and the marine environment, and categorise wastes into one of three possible categories;

(vii) require information on dump-site selection, including its characteristics, the location of other uses and amenities, an assessment of fluxes, and feasibility;

(viii) require a comparative assessment of potential effects;

(ix) provide for monitoring; and

(x) impose specified permit conditions, and provide for regular review of conditions.

Marine CCS is also subject to the LDP's permitting and reporting requirements in Article 9, which is reproduced in full in Appendix F, Part 4. In short, Article 9 requires parties to:

(i) designate appropriate permitting, record keeping and monitoring authorities;

(ii) issue permits in accordance with the Protocol; and

(iii) report on certain matters to the IMO and other parties.

To a large degree the above requirements in Annex 2 and Article 9 are reflected in existing provisions in the RMA and EEZ Act regimes. However, in providing for CCS in these regimes and/or dedicated CCS legislation, care is needed to ensure compliance. The requirements should not be difficult to meet in the approval process.

The LDP, as it currently stands, prohibits the dumping of CO_2 into the water column because it falls outside of the specific forms of dumping allowable in Annex 1.

It is recommended that New Zealand legislation on CCS in marine areas comply with the rules and criteria of the LDP for CCS as a form of dumping within the meaning of the Protocol.

Some aspects of the LDP are relevant to the form of New Zealand legislation on CCS in marine areas. Article 4(1) requires that, in granting permits for Annex 1 substances, particular attention must be paid to opportunities to avoid dumping in favour of environmentally preferable alternatives. Article 4(2) requires notice to be given to the International Maritime Organisation if a form of dumping like CCS is prohibited. Annex 2(6) requires that a permit must be refused if the waste can instead be treated without undue risks. In each of these cases, CCS injection under the generic RMA / EEZ Act regimes would be problematic. The option recommended in this report for an overall approach of separate CCS legislation is therefore strengthened.

For wider climate change policy, it is significant that the LDP stipulates that the acceptance of dumping does not remove the obligation to make further attempts to reduce the necessity for dumping.[34] New Zealand would therefore be obliged to accompany marine CCS with measures to reduce greenhouse gas emissions such as by promoting renewable energy and energy efficiency. We recommend that this obligation be taken into account in policy making and law reform.

1.5 Protocol for the Prevention of Pollution of the Pacific Region by Dumping and Protocol on Hazardous and Noxious Substances Pollution, Preparedness, Response and Cooperation in the Pacific Region

Article 12 of the LDP provides that Parties shall cooperate on a regional basis to address dumping. This has led to the development of an amended Protocol for the Prevention of Pollution of the Pacific Region by Dumping, under the Noumea Convention.[35]

The Dumping Protocol entered into force on 22 August 1990. It does not prohibit CCS, because it takes the LDC approach that all dumping may be allowed as long as it does not fall within those substances in Annex 1. Annex 1 does not include CO_2. An amended version of the Protocol as at 2006 (although not in force) takes the opposite approach, and reflects the "reverse list" approach of the LDP. Under Article 4 it prohibits the dumping at sea[36] of all matter[37] other than those substances in Annex 1. Annex 1 of this version of the Protocol does not include CO_2 for CCS injection. Further amendments to Annex 1 of the amended Noumea Dumping Protocol[38] have also not entered into force. These amendments reflect the 2006 changes to Annex 1 of the LDP, thereby enabling CCS to the same extent as the version of the LDP currently in force. This version would reflect New Zealand's existing obligations under the LDP but impose no more onerous obligations.

34 London Dumping Protocol, above n 23, Annex 2(1). The preamble to Resolution LP.1(1) (above n 33) explicitly provides that the enabling of the technology does not remove the need to address the root cause of CO_2 production.

35 Convention for the Protection of Natural Resources and Environment of the South Pacific Region [1986] PITSE 15 (signed 24 November 1986, entered into force 22 August 1990). A detailed discussion of the effect of the Convention and its Protocols is contained in Appendix F, Part 5.

36 "Sea" is defined to include seabed and subsoil.

37 Defined in the Noumea Convention to include material and substances of any kind, form or description.

38 See Agenda Item 8.4, 11th Meeting of Parties to the Noumea Convention (30 August 2012) at 1.

Parties to the Noumea Convention are also required to take all appropriate measures to prevent, reduce and where practicable eliminate pollution by the dumping matter at sea. As discussed earlier, injection would not likely amount to pollution. However, pollution may more likely include the escape of sequestered gas from the seabed into the water column, and thus New Zealand may be obliged to take appropriate measures to prevent such escapes. It is recommended that such requirements are contained within new dedicated CCS legislation, as discussed in Chapters 5 and 6.

Another potentially relevant Protocol to the Noumea Convention is the Protocol on Hazardous and Noxious Substances Pollution, Preparedness, Response and Cooperation in the Pacific Region. This Protocol is not yet in force in any form. Broadly, parties would be required to set up systems for responding to pollution incidents. It is unlikely that CCS injection would amount to a pollution incident, but an escape of CO_2 from a storage complex may do so. The Protocol would impose an obligation to prepare for an escape of CO_2, and to engage in measures to respond to such an escape if it occurred.[39] Irrespective of New Zealand's international obligations on this matter, it is recommended that such measures be included in new CCS legislation (as discussed in Chapter 6).

1.6 Summary in relation to international law

In this section of this Chapter, we have concluded that international law provides an adequate jurisdictional basis for New Zealand to regulate marine CCS in the territorial sea, EEZ and extended continental shelf, but that it does not allow CCS injection to occur beyond the extended continental shelf in the international seabed area. New Zealand law for all kinds of marine CCS must conform to the London Dumping Protocol, specific requirements of which have been noted. New Zealand should also follow LDP guidelines. On the whole these requirements are manageable. They indicate the desirability of regulating the injection of CO_2 under a new CCS Act, rather than under the RMA and EEZ Act. Our recommendations are listed at the end of this Chapter.

The next parts of the Chapter turn to New Zealand national law.

2 Legislation for the Exclusive Economic Zone, Continental Shelf, and Extended Continental Shelf

2.1 Introduction

As on land, some aspects of CCS at sea are already regulated under domestic legislation. However, none of this law has been developed to target CCS specifically. This section considers law that is relevant to CCS in the EEZ and beyond. The EEZ extends two hundred nautical miles from the coastline, although the territorial sea (out to the twelve nautical mile limit, and considered later in this Chapter) is excluded. We include the extended continental shelf over which New Zealand has rights beyond the two-hundred

39 Protocol on Hazardous and Noxious Substances Pollution, Preparedness, Response and Cooperation in the Pacific Region, Article 6.

mile limit, although its legal character is slightly different from that of the EEZ. New Zealand has one of the world's largest EEZs. We identify existing provisions that affect marine CCS activities, and the extent to which they are adequately regulated already. Problematic provisions are identified, and options and recommendations are provided.

2.2 Territorial Sea, Contiguous Zone and Exclusive Economic Zone Act 1977

The Territorial Sea, Contiguous Zone and Exclusive Economic Zone Act 1977 has only passing relevance to marine CCS. In short, the Act is concerned with the establishment of international law maritime zones for the purposes of domestic law, and with the setting of the geographical extent of these zones. It is not discussed further in this Report.

2.3 Continental Shelf Act 1964

The Continental Shelf Act 1964 asserts New Zealand's jurisdiction over its continental shelf, in accordance with the jurisdiction available under UNCLOS.[40] The "continental shelf" under the Act is broadly similar to the EEZ, and includes the seabed and subsoil beneath the EEZ. It is different from the EEZ because it excludes the overlying water column and includes the "extended continental shelf".[41] It does not include the seabed and subsoil beneath the territorial sea.[42] All rights exercisable by New Zealand with respect to the continental shelf and its natural resources for the purpose of exploring and exploiting those natural resources are vested in the Crown. The resources relevant to CCS are "the mineral and other natural non-living resources of the seabed and subsoil". The Continental Shelf Act does not provide an environmental management regime. It does not regulate mineral exploration or extraction other than making the Crown Minerals Act 1991 apply,[43] and other than providing for payments to be made under Article 82 of UNCLOS for the exploitation of the natural resources of the extended continental shelf, beyond 200 nautical miles. Any installation or device constructed on the continental shelf in connection with the exploration of the continental shelf or the exploitation of its natural resources is subject to the law of New Zealand. The Act also authorises the establishment of safety zones around installations or devices on the continental shelf or on the seabed beneath the territorial sea.

For CCS operations to proceed on the continental shelf, we consider that no amendment of the Continental Shelf Act is required. This is consistent with other operations on the continental shelf such as petroleum operations.[44] The only question that seems to arise is whether the Continental Shelf Act provides a secure enough basis for the extraterritorial application of New Zealand law to CCS installations, platforms, and pipelines in or on the EEZ or continental shelf; under section 7 the

40 For more details, see Appendix F, Part 10.

41 An area of seabed and subsoil beyond the 200 nautical mile limit of the EEZ, extending throughout the natural prolongation of the land territory of New Zealand (Continental Shelf Act 1964, s 2(1)).

42 Except for the limited purpose of making certain forms of regulations under section 8 of the Act.

43 Continental Shelf Act 1964, ss 5, 5AA, and 5A, which reflect different stages in the application of the CMA to the EEZ. From 24 May 2013 the CMA applies equally to petroleum and non-petroleum minerals activities in the EEZ.

44 See ResourcesLaw International, Appendix A, Chapter 14, where it is recommended that such issues be regulated in the same way as with the existing petroleum industry.

installation must be constructed in connection with the exploitation of the natural resources of the continental shelf for jurisdiction to apply. This seems to be adequate to include the exploitation of geological storage capacity or pore space as "natural resources". Any amendment to include CCS more explicitly would need to take international law into account.

As for the extended continental shelf, CCS there is not likely in the foreseeable future, so we consider that no action is needed for now to address the issue of payments required under Article 82 of UNCLOS.

2.4 Law reform under way

At the time of writing, the Marine Legislation Bill is expected to make substantial changes to two of the Acts most significant for CCS, especially in regard to discharges and dumping: the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (EEZ Act) and Maritime Transport Act 1994 (MTA).[45] In the interests of simplicity and coherence, we consider the EEZ Act and the MTA as if the Marine Legislation Bill is enacted in its present second reading form, as reported back from the Select Committee.[46] Care is plainly needed with that assumption.

A summary of the present position under the EEZ Act and MTA, prior to Marine Legislation Bill amendment, is as follows.[47]

- CCS is likely classified as "dumping" under the EEZ Act and MTA, and is thus subject to the MTA regime, and excluded from the EEZ Act regime.
- Because a CCS injection platform would not amount to an "offshore installation" under the MTA, no permit is currently required for injection in the EEZ under that (or any) Act, and that absence of permitting may amount to a breach of New Zealand's international obligations under the LDP.
- Part 19 of the MTA, concerning the discharge of harmful substances, is likely not to apply to CCS injection because any discharge that amounts to "dumping" is excluded from the Act's scope.
- An escape of CO_2 from a CCS injection platform or storage formation does not amount to dumping or a harmful substance, and is not currently restricted under the MTA or the EEZ Act.

45 Since the text was written, the Bill was enacted, on 22 October 2013, as the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Amendment Act 2013 and the Maritime Transport Amendment Act 2013. Different provisions will come into force on different dates.

46 The EPA has intimated that the transfer of discharge and dumping functions will occur towards the end of 2013: stakeholder workshop on offshore mining, NIWA Offices, 20 June 2013, response of A-J Millward (EPA) to an oral question.

47 A detailed analysis is provided in Appendix F, Part 6.

2.5 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012

The EEZ Act is New Zealand's main environmental protection legislation for the EEZ. The need to enact legislation to protect the environment beyond the twelve nautical mile limit had long been recognised.[48] The purpose of the Act is to promote the sustainable management of the natural resources of the EEZ and continental shelf, and (to summarise) to protect the environment from (among other things) pollution by controlling discharges and dumping.[49] "Natural resources" are defined to include the seabed and subsoil in relation to the EEZ, and the mineral and other non-living resources of the seabed and subsoil in relation to the continental shelf.

Control of activities under the EEZ Act. Section 20 specifies a number of the activities that are controlled by the Act, including activities relevant to CCS; the construction of structures or submarine pipelines on or under the seabed, the removal of non-living natural material from the seabed or subsoil, the disturbance of the seabed or subsoil, and the deposit of any thing in on or under the seabed. However this section does not apply to the discharge of harmful substances, or to the dumping of waste or other matter, both of which are separately controlled.[50] If the activity in question for a project is listed in regulations as "permitted" then no permission is required; otherwise, with few exceptions, it requires the project proponent to apply for and obtain a marine consent under the Act.

The Act relies extensively on the making of regulations to provide detailed management of activities. Regulations can classify activities as permitted (requiring no marine consent), discretionary (requiring consent to be obtained from the Environmental Protection Authority), or prohibited. (A non-notified discretionary activity has been proposed as well.) It is reasonably clear that a marine CCS project will require a marine consent even if many particular activities of low environmental effect are classed as permitted, and even before getting to the status of the CCS injection itself.

Rights of occupation of coastal space are not allocated under the EEZ Act. They are allocated by resource consent under the RMA in the territorial sea. Similar rights are also allocated to mineral and petroleum operators under the Crown Minerals Act 1991. Although we have not gone into the matter in detail, we recommend that the proposed CCS Act ensure that a CCS operator has a statutory basis for its occupation of marine space. (Safety zones can be provided under the Continental Shelf Act 1964 for installations on the seabed below both the EEZ and territorial sea, although this would not provide an adequate legal foundation for the initial occupation by the installation.)

Control of dumping and discharges under the EEZ Act. One of the main changes made by the Marine Legislation Bill is a transfer of most of the provisions on dumping and discharges in the EEZ from the MTA to the EEZ Act. As for discharges, the MTA will continue to regulate discharges from ships, with the exception of mining discharges. All other discharges will be regulated under the EEZ Act.

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48 Atkins Holm Joseph Majeury and ERM NZ Ltd, *Comparative Review of Health, Safety and Environmental Legislation for Offshore Petroleum Operations* (Ministry of Economic Development, Wellington, 2010); B Barton, "Offshore Petroleum and Minerals" [2011] NZLJ 211; K A Palmer, "Environmental Management of Oil and Gas Activities in the Exclusive Economic Zone and Continental Shelf of New Zealand" (2013) 31 JERL 123.

49 Marine Legislation Bill, cl 92 inserting a new s 10 in the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012.

50 Marine Legislation Bill, cl 96 inserting a new s 20 in the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012.

Of the term "discharge" the Act says, in terms that are materially the same as the MTA, that "[d]ischarge includes any release, disposal, spilling, leaking, pumping, emitting, or emptying; but does not include dumping".[51] The scheme is that anything that amounts to dumping is not subject to the discharge provisions of the Act. "Dumping" is defined in the same section of the EEZ Act:[52]

> **Dumping–**
> (a) means,–
> (i) in relation to waste or other matter, its deliberate disposal or storage; and
> (ii) in relation to a ship, an aircraft, or a structure, its deliberate disposal or abandonment; but
> (b) does not include–
> (i) the disposal into the sea of waste or other matter from a ship, an aircraft, or a structure, or the equipment of a ship, an aircraft, or a structure, if the disposal is incidental to, or derived from, the normal operation of the ship, aircraft, structure, or equipment; or
> (ii) the disposal or storage of waste or other matter directly arising from, or related to, a mining activity

This new definition of dumping is plainly wide enough to include the geological sequestration of CO_2, as is its source in the London Dumping Protocol described above. The definition is broadly the same as it was in the MTA.[53] There is a minor difference relevant to CCS where it excludes the disposal or storage of matter arising from or related to a "mining activity", while the old MTA definition requires it to be related to associated offshore processing of seabed mineral resources. Under the old definition, CO_2 stripped out of natural gas produced offshore and sequestered offshore would therefore not be dumping if the processing was on an offshore platform, while the new definition excludes from the definition of dumping both that and onshore processing with a return of CO_2 to the sea for reinjection.[54] The distinction seems unintended and anomalous, and we recommend that both kinds of CCS activity are regulated without distinction. The exception for disposal arising from mining activity also extends to the injection of CO_2 for the purposes of enhanced oil recovery or enhanced gas recovery (EOR).

Although CCS injection that did not fall within the definition of dumping could be regulated as a discharge under the EEZ Act, in practice the Act only restricts the discharge of "harmful" substances. Regulations have yet to be promulgated to classify what qualifies as a harmful substance, but it seems at least possible that CO_2 would not be classified as such (due to the fact it is unlikely to have adverse effects on the marine environment in most cases). If CO_2 were not classified as a harmful substance (and were of a kind that did not amount to dumping), it is most likely that CCS injection in the EEZ would not be restricted under New Zealand law.[55] This is an undesirable state of affairs.

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51 Marine Legislation Bill, cl 90 inserting new items in s 4 of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012. The interpretive aid is not an exclusive definition.

52 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, s 4.

53 Maritime Transport Act 1994, s 257 before the Marine Legislation Bill becomes law.

54 In Norway, the Sleipner CCS project is the first kind, and Snøvit the second. Both are managed under petroleum law rather than dedicated CCS legislation (see H-C Bugge, Appendix C).

55 It is arguable that if it were not the discharge of a harmful substance, CCS would be the "deposit of any thing … in, on or under the seabed" regulated under section 20 of the EEZ Act. Section 20 expressly does not apply to the discharge of a "harmful" substance, but arguably could apply to the discharge of a non-harmful substance. However, it seems more likely that the intention of the Act is for non-harmful discharges to fall outside the Act. The deposit of things in, on or under the seabed is more likely designed to encompass the placement of objects, such as artificial reefs, rather than discharges.

There is a power in the EEZ Act to make regulations to prescribe substances as toxic or hazardous waste. If this is used for CO_2, then CCS in the EEZ will be ruled out completely.[56] What is toxic or hazardous is not defined except by the regulations, but statutory interpretation and international law instruments are likely to ensure that the term is not unduly strained to apply it to CO_2. Previous experience with the MTA suggests that CO_2 is unlikely to be classified as toxic or hazardous.

CCS Injection Presently Regulated as Dumping. In summary, the injection of CO_2 into the seabed of the EEZ for CCS purposes, with few exceptions, is dumping within the meaning of the EEZ Act; it is illegal until regulations are made and a marine dumping consent for a project as a discretionary activity is obtained from the Environmental Protection Authority.[57] The Act, implementing the London Dumping Protocol, does not authorise regulations that would classify dumping as a permitted activity.[58] However, for domestic law purposes, CCS fits uncomfortably within the concept of either a dumping or a discharge. As recommended in Chapter 2, injection should be managed as a separate activity under dedicated CCS legislation rather than a dumping or discharge under the EEZ Act (or the RMA).

CCS Leakage from Storage or from an Installation as a Discharge. In contrast to the injection of CO_2, the escape of CO_2 from a storage complex or installation is classified as a discharge and not dumping. However, the Marine Legislation Bill proposes to continue the approach of the MTA that only discharges of harmful substances are restricted under the EEZ Act.[59] As in the case of toxic or hazardous substances, there is no real definition of what is a harmful substance except for what is specified in EEZ Act regulations. No such regulations exist yet. The present situation under the MTA is that the discharge of CO_2 from an installation is not the discharge of a harmful substance.[60] If CO_2 were classified as a harmful substance under the EEZ Act, section 24A would restrict discharges from an injection installation into the water column, but not into the water column from a geological storage formation, which is not a "structure." The result is not a strong framework for the management of the integrity of CCS storage formations. In fact it leaves the real possibility that CO_2 leakage from formations would not be regulated. While such leakages are a remote possibility, and unlikely to be harmful if they occur (except to the overall intention of removing CO_2 from the atmosphere), there is no doubt that they should be under statutory oversight. We recommend that there be stronger control of leakages from marine CCS storage formations outside of the EEZ Act.[61] Jurisdiction for the management of storage formations should not be divided but should stay under new CCS legislation,

56 Marine Legislation Bill, cl 100 inserting s 29A(3)(e) in the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, definition in cl 90 inserting s 4, and cl 96 inserting s 24E. For the purpose of transport by ship, CO_2 is considered to be a hazardous substance under the Maritime Transport Act regime. However, this is for ship safety purposes only (under the Maritime Rules) and does not mean CO_2 is treated as a hazardous substance for the purposes of the Marine Protection Rules.

57 Marine Legislation Bill, cll 96 and 107, inserting ss 24F and 87B in the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012. Special provisions govern the granting of a marine consent for dumping. Because it is dumping, CCS is not the discharge of a harmful substance, and is not the deposit of a thing under the seabed: cl 96 inserting ss 20 and 24AA.

58 Marine Legislation Bill, cl 100 inserting s 29A(2)(c) in the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012.

59 Marine Legislation Bill, cl 90 inserting s 4 definition in the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012; cl 96 inserting s 24A; cl 100 inserting s 29A(3).

60 Marine Protection Rules, Part 200. Compare with Parts 24A and 150, but they deal with ship safety.

61 For example, the EU CCS Directive provides that an operator must take corrective measures in the event of leakage, and imposes a duty on the regulator to do so if the operator fails to do so (see Bugge, Appendix C). Also see ResourcesLaw International, Appendix A, Chapter 7.

covering both land based and marine operations. This is because detailed, industry-specific, and responsive regulation is needed for on-going management of CCS formations, and because the escape of gas from a formation is intimately connected to the regulation of the site selection and injection processes, already governed under CCS specific legislation.

We make the same recommendation of stronger control of leakages or discharges of CO_2 from CCS operations on offshore installations, under the new CCS legislation. Although this results in stricter regulation of CCS operations than of petroleum operations offshore, and boundary issues will arise where a project has both petroleum and CCS characteristics, we consider it more important to enable the CCS regulatory agency to be aware of and to be able to manage all CO_2 leakages and discharges from CCS operations.

Recommendation. CCS is unsuited in many respects for the legislative framework of the EEZ Act. CCS does not fit comfortably within the concept of a dumping or a discharge. A number of limitations in the legislation suggest that the new CCS law should govern the injection of CO_2 for CCS, the movement of CO_2 within a storage formation, any leakage of CO_2 from a storage formation, and any discharge or leakage of CO_2 from a CCS operation on an offshore installation. Those matters should be removed from the EEZ Act entirely, and from its requirement for a marine consent to dump CO_2, to discharge CO_2, and to place matter under the seabed. Consent should continue to be required under the EEZ Act for incidental discharges and the construction and placement of structures and pipelines. This is similar to what we have found in relation to other legislation such as the RMA, and we make the same recommendation for the EEZ Act.

New Law to Conform to London Dumping Protocol. We recommend that new CCS legislation conform to the requirements of the London Dumping Protocol in respect of marine CCS. The Protocol requires that injection into the seabed be prohibited to the extent it does not meet the criteria specified in Annex 1 of the Protocol (reproduced in full in Appendix F, Part 4). National legislation must also require some form of authorisation to be obtained for marine CCS injection, equivalent in the EEZ Act and RMA to a discretionary activity; a requirement that will be met under the CCS legislation that we propose.[62] The procedural requirements of Annex 2 of the LDP must also be reflected in national legislation, as noted above. Subordinate CCS legislation could usefully refer to formal guidelines produced under the LDP, as matters with which decisions should be consistent.[63]

Ancillary Effects on the Environment. As on land, some activities ancillary to CCS injection will require environmental approval. Under the EEZ Act, section 20 provides the main statement of activities that are controlled. It puts aside, as we have seen, dumping and the discharge of harmful substances to other sections, but it will catch CCS operations such as the construction and use of an injection installation as a structure, construction and use of a pipeline, and drilling as a disturbance of the seabed or subsoil. As in other parts of this Report, especially in relation to the RMA, we consider that ancillary effects

62 The EEZ Act would have to classify CCS as a discretionary activity for it to be enabled.

63 SG Intersessional Technical Working Group on CO_2 Sequestration London Protocol: Specific Guidelines for Assessment of Carbon Dioxide Streams for Disposal into Sub-Seabed Geological Formations (2007), adopted by the 2nd Meeting of Contracting Parties under the London Protocol; SG Intersessional Technical Working Group on CO_2 Sequestration Risk Assessment and Management Framework for CO_2 Sequestration in Sub-Seabed Geological Structures (CS-SSGS)(2006), adopted at the joint session of the 28th Consultative Meeting of Contracting Parties under the London Convention and the 1st Meeting of Contracting Parties under the London Protocol. Part 180 Maritime Rules, Rule 180.8 is an example of such a reference. CCS literature has recognised the value of adapting international frameworks to national contexts: Parsons Brinckerhoff, *Development of a Measurement, Monitoring and Verification Technical Framework for Geological Storage of CO_2 in Australia* (Global CCS Institute, June 2012).

on the environment from a CCS project should remain under ordinary environmental management, while the core CCS functions of CO_2 injection, management in the storage formation, and movement and leakage contingencies are moved to the CCS Act. In making that division it will be necessary to decide on some boundary matters, such as whether disturbance of the seabed and subsoil by drilling is under one Act or the other. The questions under the EEZ Act will be different from under the RMA. We have not sought to resolve all such boundary matters.

Relationship between EEZ and CCS Acts. We emphasise the importance of an aligned and unified procedure for CCS exploration and injection that brings together all the main questions about a project, whether under the RMA, EEZ Act, or CCS Act. For the main approval of a CCS project, we recommend a single board of inquiry that will determine whether to grant a CCS injection permit, and all marine consents and resource consents required for the project.

We also consider it important to ensure that CCS decision-making under the EEZ Act is supported by suitable statutory guidance, standards and policy guidance in order to facilitate CCS while subjecting it to proper scrutiny. This guidance and direction should mirror the statutory amendments, NES and NPS that we consider should occur with respect to the RMA. Given the centralised nature of decision making under the EEZ Act, this may be easier to achieve politically than under the RMA. Just as with the RMA, amendments to the EEZ Act should direct a decision maker to have regard to the positive effects of CCS on climate change, and should prevent CCS from being obstructed by the direction in section 59(5)(b) not to have regard to the effects on climate change of discharging greenhouse gases into the air.

Development of EEZ Act Regulations. With the statutory framework for the environmental management of the EEZ in place, more activity in making regulations can be expected. As we have noted, the EEZ Act makes much use of regulations to implement it in different industries and different circumstances. Oil and gas operations will be one of the first industries involved, for its exploration, development and production phases. Many oil and gas operations are similar to those required for CCS in their marine environmental effects. Examples are geophysical exploration, drilling rigs and wells, the construction and use of platforms and subsurface installations, and platforms. CCS is obviously different in handling a less environmentally harmful substance, but the similarities are such that there is considerable overlap. We recommend that CCS be part of the regulatory programme under the EEZ Act.

A new "non-notified discretionary" activity status in the EEZ Act has been proposed as an option for oil and gas operations, and for dumping.[64] It may be suitable for some CCS operations. For a full CCS injection project, however, our recommendation in this Report is that a proposal is subject to notification and a public board of inquiry. In addition, a Regulatory Impact Statement on EEZ Act regulations has considered CCS briefly, noting its predictable and low effects on the marine habitat.[65] The Statement suggests that permitted activity status would be in line with the Act, although this appears to overlook the LDP's requirement that CCS be subject to obtaining an authorisation. But the Statement gives CCS low priority and leaves it out of the present round of regulations.

Recommendations in relation to the EEZ Act are found at the end of this Chapter.

64 Minister for the Environment (A Adams) "Next steps for new law to protect the environment" (press release, 18 April 2013). Since the text was written, the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Amendment Act 2013 has been enacted, introducing that activity, although regulations implementing it have not yet been made.

65 Ministry for the Environment, Regulatory Impact Statement: Regulations under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act (December 2012) at paras 101-104.

2.6 The Maritime Transport Act 1994

The Maritime Transport Act 1994 embodies rules and principles of maritime law. It implements a number of international conventions relating to shipping and marine matters. It contains a number of provisions, many of which also implement international law, on marine pollution. Maritime and Marine Protection Rules are made under it. Like the EEZ Act, it is expected to be affected by substantial amendments proposed in the Marine Legislation Bill. Three aspects of the MTA are particularly relevant to marine CCS.

Dumping beyond Continental Waters. The MTA will continue to regulate the dumping of matter in certain cases.[66] One of these is emergencies, which is not important in CCS, and the other is dumping from New Zealand ships or installations beyond the extended continental shelf, which for CCS is only a distant possibility, and is currently unlawful under international law.[67] It is recommended that, in the proposed CCS Act, New Zealand prohibit the injection of CO_2 by New Zealand structures or vessels beyond the extended continental shelf. The result will be greater clarity, and is in accordance with the IEA Model Framework and what is likely to be a prohibition under UNCLOS.[68]

Structures. Hazardous offshore installations and hazardous pipelines in the territorial sea and EEZ are regulated by Maritime New Zealand (MNZ) under Part 20 of the MTA.[69] In summary, the powers under Part 20 do not currently apply to a CCS injection installation, because it is not a hazardous offshore installation or hazardous pipeline, in that it does not discharge and is not likely to discharge a harmful substance into water or the seabed. In Rules relating to Part 20, CO_2 is not classed as harmful substance. The regulation of escapes of gas from storage formations or installations therefore could not be achieved through the exercise of the Director's Part 20 powers to take action regarding hazardous structures. We consider that this is appropriate. If a risk of leakage of CO_2 from an injection installation meant that the installation became "hazardous" under Part 20, it would unfairly penalise CCS operators for the discharge of CO_2 more than other CO_2 emitters (who are not currently restricted under the MTA or EEZ Act).

Civil Liability for Pollution Damage from Ships and Structures. Part 25 of the MTA implements relevant international conventions on civil liability for pollution damage from ships and structures. The Marine Legislation Bill proposes to add Part 26A to the MTA, addressing civil liability for pollution of the marine environment from marine structures, and partially replacing Part 25.[70] In summary the effect of these two parts is as follows.

66 Marine Legislation Bill, Sched 3 inserting new ss 262 and 262A in the Maritime Transport Act 1994. Earlier we considered the transfer of other dumping to the EEZ Act.

67 See Appendix F, Part 8. It would also need a licence under s 6 of the United Nations Convention on the Law of the Sea Act 1996. International Energy Agency, *Carbon Capture and Storage: Model Regulatory Framework* (2010) at 55. The model text says that CCS should not occur beyond the EEZ but a more correct reading of UNCLOS is that CCS is not permitted beyond the extended continental shelf (where a state has one). Subject to payment to the ISBA, a state's sovereign rights in relation to the extended continental shelf are co-extensive with rights in relation to the continental shelf proper. Note that it is only CCS that is unlawful beyond continental waters, not all dumping.

68 A state cannot appropriate an area of the international seabed area.

69 Part 20 is discussed in detail in Appendix F, Part 19. On definitions see Maritime Transport Act 1994, ss 222, 225 and 247.

70 A detailed discussion of Part 25 and proposed Part 26A is contained in Appendix F, Part 9, based on the Select Committee report. The Maritime Transport Amendment Act 2013 now enacts these proposals, although different provisions come into effect on different dates.

(i) A CCS injection installation is not a "structure" as currently defined in the Act, but it seems at least possible that a purposive approach could conclude otherwise.

(ii) CCS injection, as long as a harmful escape of gas is not likely, would not amount to "pollution damage" and not trigger Parts 25 or 26A. We consider this to be appropriate.

(iii) An escape of CO_2 from a storage formation, if it caused damage and if a structure were interpreted to include an injection installation, may be subject to uncapped liability under Parts 25 and 26A, depending on whether injection is to be characterised as dumping.

(iv) An escape of CO_2 from a CCS injection platform would not be subject to either Part 25 or Part 26A, because (unless a purposive approach concluded otherwise) the platform will not amount to an offshore installation under the Act, and because CO_2 would not amount to a harmful substance.

Liability under these Parts of the MTA will only accrue if damage actually occurs. It is generally thought that escapes of CO_2 from an injection facility or a storage formation are unlikely to cause environmental damage; CO_2 dissipates more rapidly than oil, it is not toxic, and it is not explosive. Marine pollution control under the MTA is aimed at oil and like pollutants, and does not appear to be well suited to the case of CCS. We have not carried out a full analysis of the possibilities of civil and monetary liability. What we consider important is that CCS installations be effectively managed to prevent leakage and discharge. We recommend that escapes of CO_2 from a storage formation after injection, and escapes of CO_2 from an injection installation in the EEZ, should be subject to the CCS legislation. This is because once the CO_2 is stored it must remain underground if the CCS operation is to be effective. The EEZ Act would not be effective to achieve this kind of oversight. The CCS Act should provide a means to manage an operation, and if needs be to shut it down or prosecute for infringements of permit conditions, including conditions relating to leakage from a storage formation.

Our recommendations in relation to the Maritime Transport Act 1994 are summarised at the end of this Chapter.

3 Legislation for the Territorial Sea

In its territorial sea, extending out to the twelve nautical mile limit, New Zealand enjoys full sovereignty. It is a part of New Zealand for the purposes of the application of New Zealand law. The only material constraints are the right of innocent passage under UNCLOS, the provisions for the protection of the marine environment under Part 12 of UNCLOS, and the London Dumping Protocol, discussed above (which applies equally to the territorial sea and EEZ). The terminology used in relation to the territorial sea can be confusing and complex. For present purposes, the terms territorial sea, coastal marine area and marine and coastal area, used in different legislation, have slightly different meanings but refer to roughly the same area and are broadly interchangeable. In the context of this part of the chapter concerning domestic law, we mainly use the Resource Management Act 1991 term "coastal marine area" for simplicity.

Some legislation relevant to the coastal marine area applies to CCS on land as well, notably the RMA. Such Acts are considered only to the extent that they apply specifically to the sea. The EEZ Act does not apply to coastal marine area. Aspects of the MTA, such as Part 20 (discussed above), apply to the coastal marine area.

3.1 The Resource Management Act 1991 in the coastal marine area

The Resource Management Act 1991 and its significance for CCS was considered in Chapter 2 of this Report. The conclusion reached there was that the RMA did not provide a legal framework under which CCS would be possible. It recommended that new CCS legislation should be enacted to regulate the injection and storage of CO_2, while the exploration phase, pipeline transport, and incidental aspects of a CCS operation would continue to be dealt with under the RMA. This section considers the special application of the RMA to the coastal marine area, and evaluates and applies the general recommendations to the matters that arise there.

The coastal marine area is the area of foreshore, seabed and coastal water between the mean high water springs tide mark and the twelve nautical mile limit of the territorial sea. It is therefore much the same area as the territorial sea. The coastal marine area does not include the exclusive economic zone (EEZ) beyond the twelve nautical mile limit. Under the RMA, regional councils have primary responsibility for the regulation of activities in the coastal marine area. Regional councils have particular responsibility for discharges of contaminants into land, air or water in the coastal marine area, the dumping of matter in the coastal marine area, and rights of occupation of the coastal marine area.[71] Discharges and dumping in the coastal marine area are restricted by sections 15A to 15C, as well as section 15. Special regulations also apply. Occupation of any part of the coastal marine area, and any construction in it or disturbance of it are restricted by section 12. In both cases a coastal permit, which is a kind of resource consent, can be obtained to authorise the activity, unless it is already authorised under a regional coastal plan as a permitted activity.

The New Zealand Coastal Policy Statement is a national level instrument that provides policy guidance to the making of regional policy statements and coastal plans, and to the granting of coastal permits. Under section 58, the NZCPS can include objectives and policies relating to New Zealand's international obligations affecting the coastal environment. A full discussion of the impact of the NZCPS is contained in Appendix F, Part 13. In summary, the present NZCPS, made in 2010, produces a protection-focused approach to the coastal marine area, with no specific provisions for CCS, and seems likely to discourage the granting of consent for CCS injection.

Regional policy statements and regional coastal plans also contain objectives and policies that are relevant in determining whether a CCS proposal would meet the purpose of the RMA. They must give effect to the provisions of the NZCPS,[72] but can provide policies that are more detailed and regionally specific. Regional coastal plans also contain the rules that trigger the need for a resource consent in a particular situation. Rules and policy guidance therefore vary from region to region, in much the same way as they do on land.

71 Resource Management Act 1991, s 30.

72 Resource Management Act 1991, ss 62(3) and 67(3)(b).

Two general sets of issues about the operation of the RMA in the coastal marine area present themselves for consideration in turn; discharges and dumping (relating both to CCS injection and also to ancillary emissions) and the occupation of coastal marine area space by a CCS operation.

3.1.1 Discharges and dumping in the Coastal Marine Area

The RMA controls pollution in the coastal marine area in three different ways that are relevant to CCS, in addition to the general coastal permits required under section 12 for the use of the coastal marine area (such as erecting structures and disturbing the seabed).[73]

The first is in sections 15A-15C, which impose controls on discharges and dumping in the coastal marine area, in order to implement certain obligations under the London Dumping Protocol and other instruments. Of these sections section 15A, controlling dumping, appears at first sight to affect the injection of CO_2 into the seabed in the coastal marine area, as it requires a resource consent to be obtained for dumping from an offshore installation (that is, in accordance with the LDP, dumping cannot be provided for as a permitted activity). However, the definition of an "offshore installation" in section 2 of the RMA (which refers to section 222(1) of the MTA) currently includes only those installations that are used for the purpose of exploration for, or the exploitation or associated processing of, any mineral, which appears to exclude CCS installations. Similarly, a CCS project would not currently require a consent under section 15B, (discharges of contaminants from installations), or 15C (dumping or storage of hazardous and noxious substances from installations). The result of this is that CCS injection in the coastal marine area would instead require consent under section 15 of the RMA (discharges generally).

This restricted definition presents difficulties for the regulation of a non-mineral activity such as CCS that are apparent at several points in this analysis. It is quite likely that the exclusion of non-mineral installations was inadvertent, so that the complications for CCS operations come by way of a side wind rather than as a deliberate legislative choice. One might advance a purposive interpretation that the legislature spoke of the exploration and exploitation of minerals in a sense that was intended to include CCS, but that interpretation does seem to run counter to the express words used. We consider that the result is artificial and contrary to the overall intention and design of the RMA for the Act to draw a distinction between CCS installations and mineral installations for the purposes of its general regimes on discharges and dumping. In particular, the fact that an installation is used for a non-mineral purpose should not serve to allow the dumping of matter or the storage of radioactive or hazardous waste, which would otherwise be restricted or prohibited (as required by international law, and as provided for in section 15C and in regulations relating to dumping under section 15A). Section 15 alone would not impose the restrictions on CCS required by the LDP. We therefore recommend that the definition of an "offshore installation" in section 222(1) of the MTA be amended to include all man-made structures in the coastal marine area. The revised definition would automatically be imported into the RMA, and no amendment would be required to the definition in section 2 of the Act.

73 The consents likely to be required under the Act are more fully discussed in Appendix F, Part 11.

Assuming this amendment was made, CCS injection would, as a form of dumping under the Act, require consent under section 15A of the RMA.[74] Section 15B, concerning the discharge of contaminants from offshore installations, would not apply to the core activities of CCS injection, although incidental activities may trigger the section depending on the particular project. Section 15C is unlikely to apply to CCS operations.

The second way the RMA controls pollution in the coastal marine area is under the Resource Management (Marine Pollution) Regulations 1998[75] which control dumping and discharges from ships and offshore installations, and which impose further restrictions on the matters to which sections 15A and 15B apply. Section 360(ha) of the RMA empowers these regulations to deem any activities to which section 15A of the Act applies (dumping) to be prohibited activities. This prohibition is then deemed to be included in all regional coastal plans, with the result that a person cannot apply for resource consent for that activity.

In relation to dumping, the Regulations largely import the substantive requirements of the LDP into New Zealand law, and require applications to dump to comply with the matters in Schedule 3 of the Regulations.[76] However, they do not include the amendments made to the LDP in 2006 regarding CCS. Regulation 4 deems certain dumping to be either prohibited or discretionary. The effect of regulation 4 is that the dumping of waste or other matter, other than the waste or other matter specified in subclauses (2) and (3) (in terms that do not include CO_2), in the coastal marine area from an offshore installation is deemed to be a prohibited activity in any regional coastal plan or proposed regional coastal plan.[77] Injection of CO_2 in the coastal marine area amounts to dumping under the Act.[78] Marine CCS would therefore be prohibited in the coastal marine area, assuming that the definition of an offshore installation was expanded to include an injection installation.

One way to remove this prohibition and facilitate CCS is to amend the Resource Management (Marine Pollution) Regulations by updating them in line with the 2006 amendment of the London Dumping Protocol that provided a path forward for CCS. However our preferred route is to remove CCS injection from the RMA and the Regulations altogether, consistently with our recommendations for onshore and for the EEZ.

Certain kinds of ancillary discharges under section 15B that are dealt with in the Marine Pollution Regulations will be subject only to the Regulations rather than the provisions of the relevant regional plan (unless provided otherwise in the Regulations).[79] These include oil (more specifically, those substances listed in Schedule 1 of the Regulations), noxious liquid substances (those substances listed in Schedule 2 of the Regulations), grade A and B treated sewage, garbage, and ballast water, along with discharges "made as part of normal operations of ship or offshore installation" (as described in Schedule 4 of the Regulations).

74 And be subject to the prohibition in the Marine Pollution Regulations, discussed below.

75 Made under Resource Management Act 1991, s 360(1)(ha) to (hh). See an analysis of the Marine Pollution Regulations in Appendix F, Part 12.

76 Marine Pollution Regulations, reg 5.

77 Because it takes the approach (as did the LDP before amendment) that only the listed substances are eligible to be dumped.

78 Resource Management Act 1991, s 2.

79 Marine Pollution Regulations, reg 16; RMA, s 15B(3); *Wood v West Coast RC* [2000] NZRMA 193 (EnvC).

The third way that the RMA restricts marine pollution is in section 15, which just as on land prevents a person from discharging a contaminant to land or water. It applies to the coastal marine area, but not to anything to which section 15A or section 15B applies.[80] In practice, this exception would limit the relevance of section 15 in the coastal marine area (assuming again that the definition of an offshore installation were expanded), because section 15B restricts the discharge of all contaminants from offshore installations. Section 15 would apply to leakages from pipelines, which is discussed later. A related issue is the extent to which the RMA regulates the leakage of CO_2 from an offshore storage formation out of the seabed into the water column, during or after injection.[81] Here, section 15 might apply and require consent to be obtained, because the discharge would not be from an offshore installation or ship, and therefore sections 15A and 15B would not apply.

These provisions do not deal with the particular characteristics of CCS in a desirable way. In particular, the prohibition in the Regulations has only a general intent and should not be allowed to prevent CCS, especially as it has failed to keep up with the relevant international agreement. The injection of CO_2, its storage in geological sequestration, and any possible leakages from storage, should therefore all be dealt with under the proposed CCS legislation rather than under the RMA, just as appears to be desirable onshore. Offshore the Act must give effect to Annexes 1 and 2 of the LDP, in the same way as the EEZ Act must.

Ancillary discharges from CCS operations in the coastal marine area should continue to be regulated under the RMA, as they are with petroleum operations. We recommend that the definition of an offshore installation under the MTA (and therefore the RMA) be extended to include a CCS injection installation. This would ensure that ancillary discharges from CCS operations are governed under section 15B and the Marine Pollution Regulations, and would ensure compliance with obligations under the LDP.

3.1.2 Coastal occupation

While onshore rights to occupy land must be obtained as a matter of property law, offshore in the coastal marine area the matter is controlled by the RMA and the Marine and Coastal Area (Takutai Moana) Act 2011. The latter Act declares that the common marine and coastal area (which is most of the coastal marine area)[82] is owned neither by the Crown nor by any other person. Rights of occupation are obtained under the RMA through administrative procedures managed by regional councils. Designations, which we believe can play a major role for CCS onshore, are not available in relation to land in the coastal marine area.

The first of the land occupation needs of a CCS project in the coastal marine area is likely to be for a pipeline. A CCS pipeline will probably be buried beneath the foreshore and seabed, especially near the shoreline, in order to minimise risks to the pipeline from interference. This will also ease interference with other uses of the coastal marine area, but the routing of a pipeline is still likely to be relatively constrained. The second use of coastal marine area land is for the wellhead and injection installations, including during drilling. Some installations may only be on the seabed; but in any event none of them will occupy much area. We consider the issues for these two kinds of coastal occupation below.

80 Resource Management Act 1991, s 15(3); also s 12(6).

81 This is discussed in full in Appendix F, Part 15.

82 The common marine and coastal area excludes Crown land and privately owned fee simple estates.

The third aspect of occupation can be dealt with briefly; occupation of the storage formation by sequestered CO_2. Subsurface geological formations are as much part of the coastal marine area as they are part of the land owned by an onshore land owner. We do not believe that CCS can usefully be managed by regional councils as part of their administration of coastal occupation under the RMA. We recommend that the use or occupation of the subsurface of the coastal marine area for CCS purposes, including storage formations and pore space, be removed from control under the RMA, chiefly section 12(2), in the same manner as it is removed from control by land owners on shore. A coastal permit under section 12 should not be required for the initial or on-going occupation of the subsurface by injected CO_2, but should still be required for the occupation of the surface of the coastal marine area (for example, for the footprint of the injection site and for the pipeline route). We recommend an amendment to section 12 of the RMA, to clarify that the presence of injected CO_2 under the seabed for the purposes of CCS does not amount to a coastal occupation for the purposes of the Act or require consent by virtue of section 12.

As the RMA stands at present, a CCS project using the common marine and coastal area for pipelines and injection facilities will require a coastal permit under section 12. The regional coastal plan states objectives, policies and matters to be taken into account in deciding whether to issue a coastal permit, just as plans do for other resource consents. The issue of a permit may also be affected by regulations, National Environmental Standards (NESs), National Policy Standards (NPSs), the New Zealand Coastal Policy Statement (NZCPS), and policy direction in regional policy statements. Policy 7(1)(b) of the NZCPS requires regional coastal plans to identify areas of the coastal environment where particular uses are inappropriate, or may be inappropriate without consideration of effects through the resource consent or plan change process.

The underlying scheme of the RMA for the grant of a coastal permit for occupation of the common marine and coastal area, under the provisions of the regional coastal plan, is reasonably straightforward, but it has been made more complicated by provisions aimed at solving problems in aquaculture arising out of the "first in first served" rule for the allocation of space. The Act provides alternative methods of allocation to be used on the initiative of the regional council or the Minister of Conservation.[83] Nonetheless, "first in first served" remains the default rule. While first in first served may not be suitable in a place and in an industry where there is competition for coastal space, the default rule may be quite adequate for a CCS project in a less busy area, especially when all that the project requires in an inshore area is a route for a buried pipeline, and few small installations at wellheads which might be inshore or well offshore. Tendering for authorisations to occupy for CCS projects would be inappropriate.

Coastal occupation raises reform questions that we have encountered at a number of points in the RMA about national consistency and the removal of undue barriers to CCS. The specific issues are whether a coastal permit should be required, and if so on what terms. One option is simply to take coastal occupation for CCS out of the RMA, and put it in the CCS Act; but that would not be consistent with what we have recommended for occupation rights onshore, which is to use RMA designation procedures. In fact, it seems quite proper that there should be scrutiny under the RMA of the siting of

83 Cash tenders, weighted-attribute tendering, auction and balloting are all contemplated: Ministry of Fisheries, *Aquaculture Legislative Reforms 2011, Overview*; Department of Conservation, *Technical Guidance Note 5 to Aquaculture Legislative Reforms 2011: Mechanisms for Managing Allocation of Coastal Space* (May 2012). A detailed analysis of Part 7A in the context of CCS is contained in Appendix F, Part 14.

a CCS project; industrial facilities would be unsuitable on a waahi tapu area or a popular swimming beach. However it may be better to make sure of national consistency by ensuring, through an NES or legislation, that CCS facilities are classified as discretionary activities in regional plans, and not non-complying or prohibited; and that they will be evaluated on a first-in-first-served basis rather than ill-fitting allocation methods.[84] Consistency will also be promoted by the call-in of all RMA applications to be heard together with the application for a CCS injection permit.

A further issue in coastal occupation for CCS purposes is the presence of existing coastal permits in the way of a CCS operation. While it is unlikely that a CCS injection platform would need to be constructed in waters occupied by a mussel farm, it is possible that a belt of coastal permits, especially for aquaculture, could straddle a route for a CO_2 pipeline. Section 122(5) lays down that a coastal permit does not grant rights of exclusive occupation unless it says so expressly and it is reasonably necessary to achieve the purposes of the permit to do so, but the matter has its complexities.[85] Where a coastal permit has been granted on an exclusive basis, it seems desirable that there be some equivalent of the powers onshore for the compulsory acquisition of the rights necessary for essential network operations. This could be specific to CCS, in the CCS Act, as a ministerial power to modify a coastal permit to allow CCS infrastructure to be constructed and operated, subject to the payment of compensation for losses if any. Alternatively, it could be general (because the issue seems wider than CCS alone) and take the form of a procedure under the RMA for the modification of the rights under an exclusive coastal permit to allow for network utilities or other necessary infrastructure, with a balancing of the interests of the two parties and compensation payable for losses if any. We do not choose between the alternatives, because one of them is general rather than CCS-specific, and simply recommend that provision be made to ensure that a CCS operation not be impeded by a coastal permit granted for exclusive occupation.

The exploration phase of CCS will generally have coastal occupation needs that are only transient, but advanced exploration may include the drilling of a test well, and test injections. Provision for CCS operations (such as through an NES or call in) should facilitate exploration as well as injection.

We therefore recommend that RMA requirements for a coastal permit for occupation of coastal space on the surface of the seabed apply to CCS operations (including exploration), subject to restrictions in an NES to prevent a CCS application from being classified in a regional plan as non-complying or prohibited; and to ensure that they are evaluated on a first-in-first-served basis rather than any other allocation method. Our more general recommendations for an NPS, an NES, and a call-in procedure to hear RMA matters along with CCS Act ones also apply. Changes to the NZCPS to acknowledge the useful possible role of marine CCS is also desirable.

Recommendations in relation to the RMA in the coastal marine area are summarised at the end of the Chapter. Our more general recommendations on the application of the RMA to CCS, in Chapter 2, are also relevant to the application of the Act in the coastal marine area: amendments to the RMA, an NPS, an NES, and a call-in procedure to hear RMA matters along with CCS matters.

84 There may be options in adapting the powers of the Minister to give directions on allocation methods under s 165K. However that section and related sections were not enacted to resolve CCS issues, and are not likely to provide properly for it. We have not explored a related question of a CCS pipeline needing to cross coastal space that is already occupied such as by a marine farm.

85 In particular note the definition of "occupy" in section 2.

3.2 The Marine and Coastal Area (Takutai Moana) Act 2011

The Marine and Coastal Area (Takutai Moana) Act 2011 provides for the recognition of Māori customary interests and title in the marine and coastal area. It declares that the "common coastal and marine area" has a special status, where neither the Crown nor any other person can own the land, and where navigation and recreational access are assured.[86] The Act repealed the Foreshore and Seabed Act 2004 and revived Māori customary interests which had been extinguished by that Act. The Act recognises three levels of interests. The first is a general right of a group exercising kaitiakitanga to participate in conservation processes, for example as to marine reserves or marine mammals. The second level is a "protected customary right" under section 51. A Māori group can obtain such a right if it can show that the right has been exercised since 1840, continues to be exercised, and is not extinguished. It can become protected if it is recognised by agreement with the Crown or by an order of the High Court. An application for an RMA resource consent in a protected customary right area cannot be granted if it will have adverse effects that are more than minor on the exercise of the right unless the right-holders have consented.

The third level of interest is "customary marine title" under section 58. A Māori group can obtain such title if it can show that it holds an area in accordance with tikanga, and has exclusively used and occupied it since 1840 without substantial interruption. This will be difficult for many groups to establish. The title can be recognised by agreement with the Crown and ratification by an Act of Parliament, or by an order of the High Court. An applicant for a resource consent such as a coastal permit for an activity within a customary marine title area will generally require an "RMA permission right" from the holder of the title. Under sections 66 to 68, this permission right is discretionary and not subject to appeal or objection.

The Act provides for infrastructure that may need to cross either of these protected areas to be an "accommodated activity" under sections 63 to 65. Without it, the holders of rights to an area could refuse permission for necessary resource consents to be granted. The pathway to accommodated activity status begins with a company being a network utility operator under the RMA. It proceeds to impose additional requirements; reasonable necessity for national or regional social or economic well-being, consideration of alternative routes, and the securing of agreement or a ministerial override.[87] Earlier in this Report, it was recommended that a CCS operator have the status of a network utility operator under the RMA, so the "accommodated activity" route is open.

We recommend that the use of the subsurface of land for CCS injection and storage purposes under both protected customary right areas and customary title areas should be vested in the Crown as are such rights elsewhere; see Chapter 4. Options are available, however. Such a vesting could apply to protected customary right areas only, if the size and number of customary title areas is unlikely to interfere with foreseeable CCS operations, with the possibility of obtaining accommodated activity rights instead.

86 The common coastal and marine area is identical to the coastal marine area under the RMA, except for the exclusion of privately owned land and certain Crown owned land: s 9. For navigation and recreation, see ss 26 and 27. A more detailed analysis of the impact of the Act on marine CCS is contained in Appendix F, Part 16.

87 Marine and Coastal Area (Takutai Moana) Act 2011, s 64(2)(h), 65(1)(a)(i), and Schedule 2. These provisions are complex. The requirement for national or regional social or economic well-being may be difficult to meet if the benefits of CCS are characterised as entirely in respect of climate change.

4 Health and Safety

The construction of offshore installations for petroleum activities is currently regulated under the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013. These Regulations were discussed in Chapter 6, and it was concluded that they do not currently apply to CCS operations, but are generally appropriate for CCS purposes, and should be amended to govern CCS.

In the marine context specifically, Part 5 of the Regulations impose requirements in relation to certificates of fitness and verification schemes for offshore installations.[88] These requirements are generally appropriate as a framework to regulate the construction of offshore CCS installations. In Chapter 6 it was noted that it may be useful to refer to or incorporate by reference specific international standards on the construction of CCS installations, rather than rely on the discretion of an inspection body when issuing a certificate of fitness, the approval of safety cases, or "generally accepted and appropriate industry practice".

It is not clear whether the HSE Petroleum Regulations apply to the EEZ and extended continental shelf, or are limited to the coastal marine area. The HSEA has express application to ships and aircraft beyond 12 nautical miles, but is silent as to its general extraterritorial effect. The Regulations themselves apply to "offshore installations", "offshore" being defined as "anywhere that is the seaward side of the mean high-water mark".[89] This shows an intention for the Regulations to apply in the EEZ and extended continental shelf. However, the matter should be clarified in the HSEA under which the Regulations are made.

We recommend that the construction and fitness of offshore CCS injection installations be regulated under the HSE Petroleum Regulations by extending their application, that reference be made to specific international standards on CCS, and that the application of the HSEA and its Regulations in the EEZ and the extended continental shelf be expressly confirmed by amending the Act.

5 The Transport Phase of Marine CCS

5.1 Introduction

The transportation phase of marine CCS involves the movement of purified, supercritical CO_2 from capture point to injection site, via either pipeline or ship.

The transport of CO_2 by ship for CCS purposes is a distant prospect for New Zealand. Research on the possibility is under way internationally, but the technology is in its infancy, and shipping is not a visible issue in CCS law reform. If it becomes a closer prospect in New Zealand, issues such as ship construction, manning, operation and the management of discharges will arise mainly under the Maritime Transport Act 1994 and the Maritime Rules made under it, and under the Hazardous Substances and New Organisms Act 1996. A number of international legal instruments will affect the legislation, such as MARPOL, SOLAS, and international codes on dangerous goods and the carriage of compressed gases.

88 Discussed further in Appendix F, Part 17.

89 Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013, reg 3.

5.2 International law on submarine pipelines

Pipelines are the most likely way that CO_2 will be carried to offshore CCS injection sites. International law has only a limited impact on the regulation of CO_2 pipelines. Article 79(4) of UNCLOS affirms coastal state jurisdiction over pipelines used in connection with the exploitation of the continental shelf. In allowing CCS pipelines to be constructed and used, a coastal state must also have regard to cables or pipelines already in position. The Basel Convention addresses the movement of hazardous wastes and other wastes for disposal across international borders, but is unlikely to apply to CCS transport.[90]

5.3 Pipelines under the RMA and EEZ Act

In the coastal marine area, a coastal permit will be required under section 12 of the RMA to lay a CCS pipeline. This has been discussed above.

In the coastal marine area, an unintended discharge of CO_2 from a CCS pipeline before injection will constitute a discharge of a contaminant into water under section 15 of the RMA, and if not permitted may be the subject of an abatement notice, enforcement order or prosecution; but such enforcement action is less likely to be important where CO_2 escapes have only minor or undetectable adverse effects on the environment. The environmental effects of an escape of CO_2 from a pipeline into the water column are not well understood but are thought to be minor.[91] The matter is discussed further in Chapter 8.

The more significant impact would be penalties or directions under health and safety legislation or dedicated CCS legislation, which should provide for design and operational standards of pipelines. This is discussed below.

In the EEZ, the laying of a submarine pipeline on or under the seabed requires a marine consent under the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012.[92] The application for a marine consent will initiate the process of examination of the environmental effects of the pipeline proposal. The siting of the pipeline would be part of that examination, although commercial questions about siting to serve multiple projects would not be considered. When a marine consent is issued, it will be subject to numerous conditions on the construction and operation of the pipeline. Conditions can authorise incidental disturbance and discharges of harmful substances from the pipeline.

90 Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal 1673 UNTS 57 (signed 5 May 1992, entered into force 5 May 1992); Bech-Bruun EOR/CCS 360 Degree Legal Review (Global CCS Institute, 2012) at 24; IPCC Special Report on Carbon Capture and Storage (2005) at 189. The Waigani Convention (which applies to the South Pacific Region specifically) mirrors the substantive provisions of the Basel Convention and thus would not restrict the transport of CO_2.

91 Intergovernmental Panel on Climate Change, *Special Report on Carbon Capture and Storage*, above n 9, at 188.

92 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, s 20(2)(b). The default position until regulations prescribe otherwise is that all activities in s 20 are discretionary and thus require consent. The Exclusive Economic Zone and Continental Shelf (Environmental Effects – Permitted Activities) Regulations 2013 class submarine cables as a permitted activity, but not pipelines. Pipelines, involving more disturbance of the seabed, are likely to remain discretionary activities needing a marine consent.

In the EEZ, it is desirable that regulations be made under the EEZ Act for pipelines. Regulations are the main way that the Act brings about the detailed management of activities, and reliance on the Act's general provisions should not continue indefinitely. The first main target of EEZ Act pipeline regulations will probably be natural gas pipelines. We recommend that the opportunity be used to provide for CO_2 pipelines as well. EEZ pipeline regulations can ensure suitable enforcement options for any environmental effects of pipelines that are restricted under the Act, including policy guidance around suitable alignments through sensitive areas.

However, in contrast to the position under the RMA (where the discharge of all contaminants is restricted and thus subject to enforcement action), the EEZ Act restricts only the discharge of harmful substances.[93] The Act does not empower regulations to be made for discharges of non-harmful substances.[94] This means that the escape of CO_2 from a pipeline would not be subject to the Act or regulations.[95] A condition on a marine consent to prohibit other discharges or leaks from a pipeline may be desirable in order to allow enforcement action to be taken for escapes of CO_2.[96] However, although the power of the Environment Protection Authority to impose a condition on a marine consent to lay a pipeline is wide, a condition must still relate to the adverse effects of the activity on the environment or existing interests, and not simply the effectiveness of a CCS operation. Thus it is possible that the EPA cannot validly impose a condition to prevent the escape of a non-harmful substance like CO_2 from a pipeline. This is a lacuna that needs to be addressed. In relation to CCS, we consider that regulation and enforcement of leakage is required even if no one is hurt, no other interests are damaged, and the environment suffers no adverse effects, to ensure the effectiveness of CCS operations. How this lacuna should be addressed is discussed in a moment.

As with the RMA, other significant regulatory tools to manage leakage in the EEZ are the health and safety legislation and the proposed dedicated CCS legislation, which will address design and operational standards for pipelines and prevent leakages before they occur.

5.4 Pipelines under the Maritime Transport Act 1994 and the EEZ Act

If the Marine Legislation Bill amendments are passed into law, authorisations to lay pipelines on the continental shelf will be made under the EEZ Act rather than the Maritime Transport Act. Furthermore (as detailed in Appendix F, Part 19), the power to take action or issue instructions under Part 20 of the MTA (regarding hazardous pipelines) would not apply to an escape of CO_2 from a CCS pipeline.

93 The Marine Legislation Bill in cl 96 proposes that a new s 24A in the EEZ Act restrict the discharge of a harmful substance from structures and submarine pipelines into the sea or into or onto the seabed of the EEZ. What is a harmful substance will be specified by regulations: cl 90.

94 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, ss 29A and 31, as amended by clauses 100 and 101 of the Marine Legislation Bill.

95 Although, as mentioned earlier, regulations are empowered to define what is included within the definition of a harmful substance. Such regulations have not yet been made. It would be open to include CO_2 as a harmful substance, but we consider that this would be artificial given that CO_2 in many cases is unlikely to cause more than minor environmental effects. The intention behind the transfer of discharge functions from the Maritime Transport Act to the EEZ Act does not appear to be a wholesale change in substantive direction: *Regulatory Impact Statement: Transfer of Discharge and Dumping Regulatory Functions from Maritime New Zealand to the Environmental Protection Authority* (September 2011). CO_2 is not, and would not fit comfortably, within the class of substances currently listed as harmful under the Maritime Transport Act.

96 The general duty to avoid, remedy and mitigate adverse effects in s 25 is not subject to enforcement; however a breach of a condition is through the issue of an abatement notice: ss 125 and 132.

It is better that the powers in Part 20 of the MTA do not apply to pipelines, as they would produce an undesirable overlap in jurisdiction.

Civil liability for marine pollution more broadly remains under the Maritime Transport Act, currently in Part 25 and in a new Part 26A to be inserted by the Marine Legislation Bill. This was discussed above in the context of discharges from injection installations.[97] In summary, a CCS pipeline operator is unlikely to be liable for an escape of CO_2 under Parts 25 or 26A because CO_2 is not a "harmful substance" under the MTA; however the Act does not prevent a person from taking other forms of civil action, such as an action in negligence for damages. If CO_2 were classified as a harmful substance for the purposes of Parts 25 and 26A then a pipeline owner would be subject to additional statutory liability for any escape of CO_2 that caused pollution damage. The case for doing so is not a strong one, in terms of likely slight environmental effects and in terms of unnecessarily disincentivising CCS. If it is done, it should be done for the purposes of Parts 25 and 26A only, and not for the wider purposes of the Act; that would cause an overlap of jurisdiction by enabling MNZ to take action in relation to hazardous pipelines under Part 20 of the MTA.

5.5 Pipelines under the Health and Safety in Employment Act

The Health and Safety in Employment (Pipelines) Regulations 1999, made under the HSEA, are relevant to the regulation of pipelines used in CCS. The effect of these regulations is discussed in Chapter 8, and the conclusions reached in that chapter apply equally at sea. The applicability of the HSEA itself is discussed in Chapter 2.

The HSE (Pipelines) Regulations provide a logical site for the detailed regulation (construction, design and technical standards) of CCS pipelines on land. We recommend that the detailed regulation of marine pipelines as places of work be included in the HSE Pipeline Regulations. We acknowledge that the application of the Act and Regulations to a submarine pipeline buried below the seabed isolated from people, in deep water and far from shore, and posing very little risk to health and safety, is somewhat artificial. The HSEA and its regulations are aimed at personal health and safety. However for many years New Zealand has chosen to use the HSEA as the main law for the safety and physical integrity of installations of this kind. There is no separate statute for pipelines or for oil and gas operational requirements. We prefer to recommend a solution that is compatible with the general legal framework rather than one that departs from it. Our recommendation will provide cohesion in the statutory and regulatory fabric, and will impose a single regime for CCS pipelines that traverse land and marine areas. The HSE Pipeline Regulations will form the primary means of addressing leakage from CCS pipelines, given that the RMA and EEZ Act are limited in this respect, as discussed above.

In short, we consider that the HSE Pipeline Regulations should be extended to address the design, construction and safety requirements of CCS pipelines through certifications of fitness, by extending the definition of a "pipeline" and incorporating CCS specific standards. The application of the Regulations in the EEZ should be clarified; at present the extraterritorial application of the HSEA in relation to structures is uncertain, and the HSE Pipeline Regulations do not clarify the position. We consider that it is desirable for the regulations and the Act to apply to pipelines and other structures in the EEZ which should be deemed to be places of work under the Act.

97 A detailed discussion of liability for escapes of CO_2 from pipelines is provided in Appendix F, Part 18.

However, even with a clarification that seabed structures in the EEZ are places of work under the HSEA and the extension of the HSE Pipeline Regulations, there remains the gap or lacuna in the EEZ Act in relation to escapes of CO_2 from a pipeline in the EEZ. The HSEA regime is not concerned with discharges which do not affect health and safety. In our view the underlying policy point is that leaks or discharges of CO_2 from all elements of the CCS system should be subject to regulatory management, whether or not an environmental or health and safety issue is present. The CCS regulator should have all necessary powers to regulate, even though it need not do so in all cases. We see three ways to fill this gap, each one of which has advantages and disadvantages.

First, it is possible to extend the EEZ Act to regulate discharges of CO_2, by amending the Act in this specific way or by extending the definition of harmful substances under EEZ Regulations. This would appear logical, because it is where other discharges to the marine environment are already regulated. However, making a special case for discharges of CO_2 could result in pressure for other special cases, and would not be in accordance with the basic approach that only truly harmful substances are intended to be regulated by the Act (as discussed above). Second, it is possible to extend the HSEA and its Pipeline Regulations to cover escapes of gas that do not affect health and safety. The regulation of the seabed in the EEZ would already be regulated here to the extent that it is a place of work. However, including the regulation of non-harmful discharges in an Act that does not generally address effects other than those on health and safety would disrupt the statutory scheme of the Act and make the regulation of CO_2 discharges less visible.

The third option, which on balance we prefer, is to include appropriate regulation within the proposed CCS Act. This is logical because the matter is peculiar to CCS. Admittedly, it places something of an outlier in an Act not otherwise concerned with discharges to the marine environment (other than from storage formations) and thus not particularly visible. But even if it is not a perfect fit, it goes in the CCS Act better than anywhere else. We conclude that the CCS Act should make it an offence to discharge CO_2 from a pipeline in the EEZ or extended continental shelf unless authorised under the Act.

5.6 Submarine Cables and Pipelines Protection Act 1966

The Submarine Cables and Pipelines Protection Act 1966 protects cables and pipelines from damage, particularly from trawling and anchoring. "Pipeline" is defined to include a pipeline for the conveyance of gas, including natural gas, so it probably encompasses CCS pipelines.[98] In short, a CCS operator laying a pipeline will strictly liable for any damage done to an existing pipeline or cable[99] and criminally liable if done negligently or wilfully.[100] However it will be equally protected for damage done to its own pipeline. Once a CCS pipeline is no longer needed or used, the owner is obliged to notify the Minister of this fact.[101] A pipeline can also be protected under the Act by the gazetting of a protected area in the territorial sea or EEZ, restricting fishing and anchoring.[102] We recommend that the Act remain applicable to marine CCS pipelines.

98 Submarine Cables and Pipelines Protection Act 1966, s 2.

99 Section 7.

100 Section 11.

101 Section 9. Similarly, Policy 6 of the NZCPS provides that an abandoned or redundant structure in the coastal marine area shall be removed.

102 Section 12. A number of protected areas have been implemented, including in parts of the Hauraki Gulf and around the Maui A and B pipelines.

5.7 Recommendations concerning transport by marine pipeline

Recommendations concerning transport of CO_2 by marine pipeline are broadly the same as those concerning transport via pipeline on land. The routing of pipelines will be governed under the RMA and the EEZ Act. The general health and safety legislation should apply. Only minor modifications are required to produce this result. Our recommendations are summarised below.

6 Recommendations

International law

1. International law provides an adequate basis for domestic jurisdiction to regulate marine CCS in the territorial sea, EEZ and extended continental shelf, but does not allow CCS injection to occur beyond the extended continental shelf in the international seabed area.

2. CCS operations that convey CO_2 from land by pipeline to an injection installation on the seafloor, with no platform above the surface of the water, should be required by New Zealand law to comply with the requirements of the London Dumping Protocol, even if strictly they do not need to do so.

3. New Zealand law for all forms of marine CCS must conform to the London Dumping Protocol, and in particular the following requirements:

   (a) Disposal must be into a sub-seabed geological formation, and not into the water column;

   (b) The material injected must consist overwhelmingly of CO_2, with no wastes added for the purpose of disposal; but it may contain incidental associated substances derived from the source material and the capture and sequestration process; and

   (c) The permitting process must involve the consideration of waste prevention, the treatment of waste, the characterisation and categorisation of waste, the provision of information on the selection of an appropriate dump (injection) site, a comparative assessment of effects, and the imposition of reviewable conditions specified in Annex 2.

4. Marine CCS injection should be governed under a new CCS Act, and removed from the RMA and EEZ Act regimes. It cannot be classified as a permitted activity within the meaning of those Acts.

5. New Zealand remains under a general obligation to accompany marine CCS with measures to reduce the need for CCS, such as by promoting renewable energy and energy efficiency, and this obligation should be taken into account in policy making and law reform.

6. A CCS Act and permits for CCS must provide for monitoring, measures to prevent escapes of CO_2 into the water column, and measures to respond to escapes if they occur.

Recommendations in relation to the EEZ Act

7. In relation to the EEZ Act, we make the following recommendations (assuming that the transfer of control of discharge and dumping from the Maritime Transport Act, pursuant to the Marine Legislation Bill, takes place). Regulation of CCS (including CO_2 injection, storage, and possible leakage) in the EEZ and the extended continental shelf should be removed from the EEZ Act and regulated instead under a new CCS Act. Regulation under the new CCS Act should include the injection of CO_2 arising from offshore natural gas processing.

8. The regulation of discharges of CO_2 from injection installations in the EEZ should occur under the new CCS Act, rather than through an extension of the EEZ Act's regime on harmful substances.

9. The new CCS Act should prohibit marine CCS injection that is not in accordance with Annex 1 of the London Dumping Protocol, and should require compliance with the processes in Annex 2 of the LDP. Reference should also be made to guidelines produced under the LDP, as instruments with which CCS operations should be consistent.

10. Until a CCS Act is enacted, dumping regulations under the EEZ Act must be consistent with the LDP (for example, not classifying CCS as a permitted activity) and provide an avenue for applications to be assessed, because in the interim CCS will be caught by the EEZ Act's provisions on dumping.

11. The CCS Act and the EEZ Act should remove the need for marine consent under the EEZ Act to dump CO_2, discharge CO_2, or place matter under the seabed. Consent should continue to be required under the EEZ Act for incidental discharges, the construction and placement of structures and pipelines, and disturbance to the seabed. Incidental discharges of CO_2 from installations in the EEZ should be controlled under the new CCS Act because they are unlikely to be restricted under the EEZ Act.

12. A single board of inquiry process should be utilised for decision making on authorisations under the RMA/EEZ Act and CCS legislation, without use of a non-notified discretionary activity status.

13. The EEZ Act should be amended to direct a decision maker to have regard to the positive effects of CCS on climate change, and should prevent CCS from being obstructed by the direction not to have regard to the effects on climate change of discharging greenhouse gases into the air.

14. CCS should be part of the regulatory programme under the EEZ Act.

Recommendations in relation to the Maritime Transport Act 1994

15. In relation to the Maritime Transport Act 1994, we make the following recommendations assuming that the transfer of control of discharge and dumping from this Act to the EEZ Act takes place, pursuant to the Marine Legislation Bill. Marine CCS injection by a New Zealand ship or structure beyond the EEZ and extended continental shelf should be prohibited, and the prohibition should be stated in the new CCS Act.

16. The regulation of CCS storage formations (including injection and any leakage of gas) should occur in the new CCS Act, and not Part 20 of the MTA (which concerns hazardous structures and operations).

17. The regulation of discharges of CO_2 from CCS injection installations should not occur under Part 20 of the MTA. In the EEZ they should be subject to the new CCS Act, and, in the coastal marine area, to the RMA. In both they should also be subject to the Emissions Trading Scheme.

18. CO_2 is not, and should not, be considered a "harmful substance" to be regulated under Part 20 of the MTA.

19. Legal recourse for pollution damage is required by UNCLOS, and Parts 25 or 26A of the MTA should remain unchanged. The main control of CO_2 leakage should be under the proposed CCS Act.

20. A CCS injection installation should be included within the definition of a "structure" under the MTA, to ensure that any discharges of harmful substances (such as incidental discharges of oil) are subject to Parts 25 or 26A.

Recommendations in relation to the RMA in the coastal marine area

21. The regulation of CCS injection (comprising dumping and discharge) in the coastal marine area should be removed from the RMA and controlled under new CCS legislation, which must conform to the requirements of Annexes 1 and 2 of the LDP.

22. The regulation of CCS storage formations after injection, including leakage, should also be removed from the RMA (and also Part 20 of the MTA) and controlled under new CCS legislation.

23. Ancillary discharges from CCS installations (including incidental discharges of CO_2 to air or water) should be regulated under the RMA by including a CCS injection installation in the definition of an offshore installation under the MTA and therefore the RMA.

24. RMA requirements for a coastal permit for occupation of coastal space should continue to apply to CCS surface operations (including exploration), subject to restrictions to prevent a CCS application from being classified in a regional plan as non-complying or prohibited; and to ensure that they are evaluated on a first-in-first-served basis rather than any other allocation method.

25. The use or occupation of the subsurface of the coastal marine area for CCS purposes, including storage formations and pore space, should be removed from control under the RMA, so that the initial and continued presence of injected gas does not amount to occupation.

26. Provision should be made to ensure that a CCS operation not be impeded by a coastal permit granted for exclusive occupation.

27. We recommend an amendment to section 12, to clarify that the presence of injected CO_2 under the seabed for the purposes of CCS does not amount to a coastal occupation for the purposes of the Act or require consent by virtue of section 12.

28. RMA requirements should continue to apply to incidental discharges from an injection installation (including escapes of CO_2 to air or water), noise effects, and the disturbance of the seabed in the coastal marine area.

29. The NZCPS should be amended to acknowledge the benefits of marine CCS.

Recommendations in relation to the Marine and Coastal Area (Takutai Moana) Act 2011

30. A CCS operation should have the status of an "accommodated activity" by reason of being a network utility operator under the RMA.

31. The use of the subsurface of land for CCS injection and storage purposes under both protected customary right areas and customary title areas should be vested in the Crown as are such rights elsewhere.

Recommendations in relation to health and safety

32. The construction and fitness of offshore CCS injection installations should be regulated under the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013 by extending their application, that reference be made to specific international standards on CCS, and that the application of the HSEA and its Regulations in the EEZ and the extended continental shelf be expressly confirmed by amending the Act.

Recommendations in relation to transport by marine pipeline

33. Those aspects of pipelines already regulated under the RMA (including the alignment of pipelines and any discharge of CO_2 from pipelines) should remain under the RMA. Those aspects of pipelines already regulated under the EEZ Act (including alignment of pipelines) should remain under the EEZ Act.

34. Regulations for pipelines, including CCS pipelines, should be made under the EEZ Act.

35. The Health and Safety in Employment (Pipelines) Regulations 1999 should be extended to apply to CCS pipelines in marine areas as well as onshore. Technical standards specific to CCS should be incorporated. The HSEA should be amended to clarify that it applies to pipelines and structures in the EEZ and on the extended continental shelf, and that submarine pipelines are places of work under the Act.

36. The proposed CCS Act should regulate the discharge of CO_2 from a pipeline in the EEZ or extended continental shelf.

37. The Submarine Cables and Pipelines Protection Act 1966 should continue to apply to CCS pipelines.

CHAPTER 10
LIABILITY

1 Introduction

Liability is a very general term, describing any number of obligations under the legal system; it may be imposed by civil or criminal law, or by statute. Liability will arise where harm is caused to persons, property, or the environment. Most aspects of existing law imposing liability apply without difficulty to a CCS project during its exploration and injection phases. It will be recalled from our discussion on the risks of harm from CCS in Chapter 1 that as time progresses the risk reduces, and that the main risks arise at injection or immediately after site closure. However, it is possible that the integrity of the storage formation will not be as anticipated or the CO_2 does not behave as expected and leakage results, causing harm long after injection has ceased and the site has been closed. This issue raises questions about the length of time that a CCS operator, and its insurers, may need to stand prepared to make good any harm caused and the possibility that the operator company may no longer be solvent or even in existence.

The focus of this chapter is on civil law as it applies to CCS. Some aspects of this civil law apply to proprietary or possessory rights to land and especially the subsurface, so they touch on matters addressed in Chapter 4. The main issue that follows, and the main issue from a policy and law reform perspective, is the question of long-term liability following CCS site closure, as this is where a gap exists in the legal framework.

The key issues for certain types of liability are that harm, or loss, must be proved, and must be shown to have been caused by the defendant's act or omission. Because of the nature of CCS, a claimant may not suffer harm until operations have ceased, and the operator may no longer exist or have the financial ability to make good any harm caused. Overseas, the risks associated with CCS have been managed for some years now in relation to enhanced oil recovery and similar activities. According to the IEA, there are no recorded injuries or fatalities caused by leakage from CO_2 pipelines, and there is no case law so far for liability arising from harm suffered by CO_2 injection for enhanced oil recovery.[1] Carbon dioxide is generally considered a safe and non-toxic substance, although at high concentrations it can be harmful and even fatal.[2]

1 International Energy Agency, *CO_2 Capture and Storage: A Key Carbon Abatement Option* (2008) at 82; M de Figueiredo, *The Liability of Carbon Dioxide Storage* (PhD thesis in Technology, Management and Policy, Massachusetts Institute of Technology, 2007) at 27; International Energy Agency, *Legal Aspects of Storing CO_2: Update and Recommendations* (2007) at 41.

2 A Ingelson, A Kleffner, and N Nielson, "Long-term Liability for Carbon Capture and Storage in Depleted North American Oil and Gas Reservoirs – A Comparative Analysis" (2010) 31 Energy Law Journal 431, at 436.

Before proceeding to consider the relevant civil law or private law matters, we can briefly dispose of questions of criminal and regulatory liability. Both cases deal with extreme situations, and in neither of them do we see a need for any change in the law. Criminal law punishes the wrong-doer, and does not restore the victim to the position they had been in but for the wrong. Criminal liability is of general application and not specific to activities associated with CCS. A person who has in his or her charge or under his or her control anything which, in the absence of care, may endanger human life is under a legal duty to take reasonable precautions against and to use reasonable care to avoid such danger.[3] The case law imports a wide meaning to the term "anything" and there is no reason to believe that it would not include CCS operations or the CO_2 itself.[4] A person is liable if the act or omission is a major departure from the standard of care expected of a reasonable person; and no more than ordinary negligence is required.[5] Further, a mistake or error of judgment does not necessarily constitute a failure to take reasonable care.[6] Criminal nuisance occurs when a person does any unlawful act or fails to discharge a legal duty which he knew would endanger the lives, safety, or health of the public or any individual.[7] An unlawful act may be a breach of legislation such as health and safety regulations.[8] If a failure to exercise this legal duty results in death of a person it is culpable homicide.[9] Therefore any CCS operator who fails to use reasonable care to avoid causing danger to human life will be liable if death results. It is not necessary to prove that the accused had sole, complete, or exclusive charge or control of an operation.

Regulatory liability arises out of the enforcement provisions of regulatory statutes such as the RMA, the EEZ Act, the Health and Safety in Employment Act 1992, or the Climate Change Response Act 2002. The proposed CCS Act will have its own enforcement provisions, which should be no less rigorous than equivalent legislation. Regulatory enforcement generally includes the possibility of criminal prosecution, enforcement orders, infringement notices, and the like.

An example is the RMA, where a defendant corporation is liable on conviction for an offence such as the unauthorised discharge of a contaminant to a fine not exceeding $600,000 and a fine not exceeding $10,000 every day for a continuing offence.[10] The offence is one of strict liability subject to prescribed defences. In addition the Environment Court has powers to make an enforcement order for a person to do or to cease doing something, to remedy or mitigate adverse effects on the environment, and to pay for costs and expenses associated with the offence. The Court can require the consent authority to review the resource consent with a view to cancellation.[11] For less serious non-compliance, an enforcement officer can issue an abatement notice or an infringement notice. There is no reason that regulatory provisions of this kind need alteration in their application to CCS operations; they are a normal part of compliance management in all businesses.

3 Crimes Act 1961, s 156.

4 *R v Turner* (1995) 13 CRNZ 142, at 149 (mussel processing factory).

5 Crimes Act 1961, s 150A; *Long v R* (1995) 13 CRNZ 124, at 127, 128; [1995] 2 NZLR 691.

6 *Long v R*, ibid.

7 Crimes Act 1961, s 145.

8 B Robertson (ed), *Adams on Criminal Law* (looseleaf ed, Brookers) at [CA145.02].

9 Crimes Act 1961, s 160(2)(b).

10 Resource Management Act 1991, s 339.

11 Resource Management Act 1991, ss 128, 314 and 339.

2 Civil liability

Civil liability for tortious actions raises issues for CCS operators under the heads of negligence, nuisance, and trespass. However, any claim raised under these heads will have to consider the elements of causation, remoteness, and any defences that may be available; a claim will turn on the facts of the case.

2.1 Negligence

Liability for negligence will arise where conduct of the defendant falls below the standard demanded for the protection of others against unreasonable risk of harm. So, for example, where a person claims negligence by a CCS operator, it must be shown that a duty of care was owed to the plaintiff, that the duty was breached, and that any damage resulting from the breach was not too remote.[12] The Supreme Court has recently held in *North Shore City Council v Attorney General* that to establish a duty of care in novel situations it is necessary for the plaintiff to show that:

(a) the loss was a reasonably foreseeable consequence of the defendant's act or omission;

(b) the loss occurred within a relationship that was sufficiently proximate; and

(c) there are no external factors negating a duty of care. This involves a balancing of the moral claims of the parties – whether it is fair, just and reasonable to impose a duty – and includes considering the wider effects of the decision on society.[13]

The previous approach of the House of Lords, determining whether a duty of care existed, provided a framework, but the Supreme Court considered that formulae, although helpful, can not provide answers.[14] Citing *South Pacific Manufacturing Co v New Zealand Security Consultants & Investigations Ltd*,[15] the Supreme Court said that to determine whether a duty of care exists involves a balancing exercise and that the important object is that all relevant factors be weighed.[16] Any issue of proximity will depend on the facts of the case but the main concerns for claims of negligence for CCS are in regards to foreseeability and the external, or policy reasons of why not to impose a duty of care.

The likely scenario for a claim in negligence is where CO_2 leaks from either the transportation or injection stage and causes harm to land, livestock, or persons. For a CCS operator to be found in breach a duty of care owed to an occupier or land owner above a geological storage formation or below transportation pipes, the key issue will be whether the defendant operator was exercising the skill expected from a skilful and experienced person in the profession, judged at the time the work was done.[17] This may raise issues where an operator is following current best practice, but (due to the

12 See S Todd (ed), *The Law of Torts in New Zealand* (Brookers, Wellington, 2009). See also C Sappideen and P Vines (eds), *Fleming's the Law of Torts* (10th ed, Thomson Reuters, NSW, 2011) at 123.

13 *North Shore City Council v Attorney General* [2012] NZSC 49 (27 June 2012) (The Grange) [2012] 3 NZLR 341, at 403, 404.

14 The Court was referring to the tests adopted in *Anns v Merton London Borough Council* [1978] AC 728 and *Caparo Industries plc v Dickman* [1990] 2 AC 605.

15 *South Pacific Manufacturing Co Ltd v New Zealand Security Consultants & Investigations Ltd* [1992] 2 NZLR 282 (CA) at 294.

16 *The Grange*, above n 13, at 404.

17 Todd, above n 12, at 370. *McLaren Maycroft & Co v Fletcher Development Co Ltd* [1973] 2 NZLR 100 (CA).

time-frame involved) technology or practice changes. In situations where an operator is following best practice, we must ask whether it was foreseeable that, should the CO_2 escape, it was likely to cause harm.

Perhaps the key policy issue in the Supreme Court's decision in *North Shore City Council* is the external reasons why no duty of care should be imposed. There is the argument that CCS is a public good and the benefit to society and the environment outweighs the harm to the plaintiff. This reasoning would imply that it would be unfair, unjust and unreasonable to impose a duty on an operator who was advancing technology to mitigate climate change. On the other hand, even if the operator is exercising best practice, is it foreseeable that seismic activity might occur and affect the storage formation so that CO_2 escapes? This point indicates the importance of careful site selection, including performance and risk assessment. Clearly, where an operator has failed to follow best practice and to undertake adequate site assessment, it could be said that it is foreseeable that harm may result. In this situation, even taking into account the policy reasons of not imposing liability, it could be unfair, unjust, and unreasonable to not impose a duty of care.

Any claim for negligence must result from actual damage, and can include property damage and economic loss. It is not the risk itself that needs to be foreseeable, but it is the harm that results from the risk that needs to be foreseeable. Any harm caused to property will give the plaintiff a claim for damages for the damaged or destroyed property, loss of profits, and non-pecuniary loss such as foreseeable worry and anxiety.[18] It must be remembered, however, that each case will turn on its facts.

The accident compensation scheme. New Zealand's accident compensation scheme means that there need be less focus on civil liability for personal accident and injury that in most other countries that are developing their CCS law. The Accident Compensation Act 2001 provides a comprehensive, no-fault scheme to cover any claims for personal injury caused by an accident whether inside or outside employment. The Act removes the right of a person injured through accident to sue any other person for compensation for wrongful death or personal injury, although in a few circumstances exemplary damages may be sought. Liability for accidents in New Zealand, especially from negligence, is therefore confined to liability for damage to property and consequential loss.

Despite the theory that the Accident Compensation Act eliminates payments of compensation or reparations for personal injury through accident, there is a trend of an increase in the use of the courts' powers to make awards of reparation to victims in criminal cases. This includes health and safety cases; the HSEA particularly refers to powers under the Sentencing Act 2002. Although this reparation is not the same in character as damages as a remedy in a civil claim, it can sometimes be significant.

2.2 Nuisance

There are two forms of nuisance in tort law, private nuisance and public nuisance. Private nuisance is a wrong against land and requires that a person has a sufficient interest in the land (possession or occupation) before an action can be brought against the defendant. It requires that there be an unreasonable interference, which can be indirect or consequential, with a right to use the land, or with

18 Sappideen and Vines, above n 12, at 297–299.

enjoyment of the land, and requires proof that there was actual or imminent harm.[19] Whether the interference is unreasonable turns on the nature of the harm, and will not take into account any abnormal sensitivity the claimant may have.[20] Also the time, intensity and duration of the nuisance must be unreasonable. Smillie explains that:[21]

> The nuisance standard [of reasonableness] is concerned with resolving the competing land use claims of private individuals, and the fact the defendant's operation benefits many people outside the range of its physical impact is irrelevant to that issue. If private rights are to be sacrificed to the general public welfare, this should be authorised by the legislature, preferably with express provision for compensation [footnotes omitted].

Liability for nuisance requires a continuing or recurring interference with the plaintiffs use or enjoyment of land.[22] Therefore in a situation where a CO_2 leak is continuous or intermittent but provides no more than an inconvenience it is unlikely a claimant would be successful. A successful claim for nuisance is shown by *Hawkes Bay Protein Ltd v Davidson,*[23] where the plaintiffs – the Davidsons – suffered loss and enjoyment of their land from an offensive odour that emanated from the defendant's rendering plant. Even though the business had a resource consent to discharge contaminants into air, the stench was so noxious that it made the Davidson property unusable. The Davidsons were awarded damages for loss of enjoyment and for the loss of value to the land. Another nuisance case in circumstances similar to CCS is *Gulf Oil Corp v Hughes,*[24] where a waterflood project for oil recovery caused salt water to enter a nearby fresh water well which was used for domestic and livestock purposes. The water was rendered unusable and the plaintiffs had to purchase and transport fresh water for their land. The Supreme Court of Oklahoma found the defendant liable for the damage caused, and held that where a lawful business creates a private nuisance causing substantial injury to property, the aggrieved party may be compensated for the injury sustained. If the leak can not be stopped and is of high concentrations to cause a loss of enjoyment to the land then an operator will be liable. However, any leak that is of low concentrations may even be beneficial to neighbouring plant life, and is unlikely to be more than an inconvenience as it will dissipate into the atmosphere.

The exception to the rule that nuisance requires an indirect or consequential, unreasonable interference with actual or imminent harm is where the defendant, or the person occupying or in control of the land, has bought something on his land or let it accumulate there and has made a non-natural use of the land, and the thing escapes. This is known as the rule in *Rylands v Fletcher*.[25] The distinction is that *Rylands v Fletcher* applies to a one-off event, rather than an on-going nuisance, and the defendant will be held strictly liable. However, for the rule in *Rylands v Fletcher* to apply a claimant would need to argue that CCS operations involve the non-natural use of the land. At first sight one may think that this argument would succeed, but the contrary can also be argued.[26] The case law is not clear

19 J Smillie "Nuisance" in Todd, above n 12, at 462.

20 *Bloodworth v Cormack* [1949] NZLR 1058.

21 Smillie "Nuisance" in Todd, above n 12, at 475.

22 At 477.

23 *Hawkes Bay Protein Ltd v Davidson* [2003] 1 NZLR 536.

24 *Gulf Oil Corp v Hughes* 371 P.2d 81 (Okla. 1962).

25 *Rylands v Fletcher* (1865) 3 H & C 774; 159 ER 737 (Ex); (1866) LR 1 Exch 265 (Ex Ch); (1868) LR 3 HL 330 (HL).

26 See *Rickards v Lothian* [1913] AC 263 at 280; *Irvine & Co v Dunedin City Council* [1939] NZLR 741, at 775; *Transco plc v Stockport Metropolitan Borough Council* [2003] UKHL 61; [2004] 2 AC 1 (HL) at para 10, per Lord Bingham; *Autex Industries Ltd v Auckland City Council* [2000] NZAR 324.

and legislative clarity is desirable. As a general rule, imposing strict liability is more appropriately a matter for Parliament than the courts.[27] The key question whether a CCS operation involves the use of a dangerous thing and is a non-natural use of the land is ultimately a question of law and fact to be determined by the judiciary. There are defences available under *Rylands v Fletcher* which include (a) default of the plaintiff; (b) act of God; (c) act of a stranger; (d) statutory authority; or (e) consent.

The second form of nuisance is public nuisance, which requires that a section of the public, or community, is affected rather than individuals. This would certainly be the case if environmental effects were found to have contaminated groundwater. In this case, the Attorney-General may bring proceedings against an operator, or private individuals may if they have suffered particular damage over and above that suffered by the public generally.[28] The only defence available to a claim for public nuisance is statutory authority.[29] However, in practice, such proceedings are now rare; public nuisance has largely been supplanted by statutory rules for the protection of the environment, such as under the RMA.

The likely scenarios of liability for a CCS operator include nuisance arising out of transporting the CO_2 which is likely to be a non-natural use, nuisance from leakage from the storage operations, or migration of CO_2 in a geological storage formation, which could be a natural use. In any case, any leakage is likely to be a continuous event that attracts liability under the general law of nuisance, rather than a one-off event that attracts strict liability under the rule in *Rylands v Fletcher*.

2.3 Trespass

Any unjustified, direct interference with land, including the subsurface below it, which is in the possession of another, is a trespass.[30] Liability occurs whether the act was intentional or negligent. Clearly, a claim of trespass will result from any above-ground interference where access arrangements have not been gained for any structures or pipelines that are required, but liability will also arise where underground pipes intrude onto neighbouring land.[31] Where CO_2 migrates to enter underneath the land of a plaintiff, a nuisance rather than a trespass occurs, as the migration is not a direct result but consequential. The same will be the result above ground, where a pipeline leaks and the wind blows CO_2 onto neighbouring land. The question will be whether the interference with the plaintiff's land is a necessary or natural consequence of the defendant's act,[32] or an inevitable result.[33] The key difference between a claim for trespass and nuisance is that there does not need to be any damage or imminent harm from the trespass, as is the case for nuisance.

In the United States and Canada there have been numbers of cases for trespass of substances, including gases, where the court has held that the entry of invisible gases where they do harm or

27 *Cambridge Water Co Ltd v Easton Counties Leather plc* [1994] 2 AC 264, at 305 per Lord Goff.

28 Smillie "Nuisance" in Todd, above n 12, at 508.

29 At 515.

30 Smillie "Trespassing on Land" in Todd, above n 12, at 424. See also *Waugh v Attorney-General (No 2)* [2006] 2 NZLR 812; *Bocardo SA v Star Energy UK Onshore Ltd* [2011] 1 AC 380; [2010] UKSC 35. Also see chapter 4 on property rights for a discussion on subsurface trespass.

31 *Bocardo SA v Star Energy UK Onshore Ltd* [2011] 1 AC 380; [2010] UKSC 35.

32 Smillie, "Trespassing on Land" in Todd, above n 12, at 435.

33 B Matheson, "Air" in D Nolan (ed) *Environmental & Resource Management Law* (4th ed, LexisNexis, Wellington, 2011) at 674. Matheson says that this makes it hard to prove liability for air pollution because of the unpredictability of air currents.

cause substantial interference is a trespass.[34] On the other hand Ragsdale has argued that a strong public policy of encouraging hydraulic fracturing operations has substantially shielded operators from liability for an injected fluids subsurface trespass.[35] He cites Summer's *The Law of Oil and Gas*, and says that although there may be a trespass, it is doubtful that an injunction should be issued where the trespass is irretrievable. He says public policy should favour good faith CCS storage efforts. Daintith has likewise observed that American courts are reluctant to impede productive development and new technology by the application without adjustment of long-established concepts of subsurface ownership and trespass.[36] There is certainly a good argument that public policy should favour CCS development because of its purpose as a climate change mitigation tool, but how far the New Zealand courts would go actively to shield operators from liability is much less clear.

A clear definition of rights to ownership of geologic storage formations is one option against a claim of trespass, and nuisance as well, as the likelihood of an interim injunction would be of critical concern to a CCS operator. Under current law a land owner could justifiably apply to the court for an order that operations be ceased, potentially causing extensive financial cost and delay to the operator of a CCS project. The different options to prevent this possibility are the subject of Chapter 4. One option, followed in Victoria, is for the legislature to grant to the government the ownership of geological storage formations,[37] so that a land owner cannot sue in trespass or nuisance for its use. Another option to defining ownership is to give authority for access by law, for if the law imputes an authority there can be no trespass.[38] What we have recommended in Chapter 4 is that statute vest in the Crown all rights and powers necessary to explore for CCS capacity, to develop CCS capacity, to inject CO_2 and other greenhouse gases into the subsurface of land, and to sequester them there permanently; along with all necessarily incidental rights and powers.

2.4 Remedies

2.4.1 Injunctions

The risk of an injunction is significant commercially, because an injunction can bring the development of a project to a halt. An unexpected interruption can have severe effects on the financing of the project.

There are two types of injunctions available. An interim injunction can be awarded quickly and without proof of damage in a full trial.[39] It may be awarded where harm is imminent and an urgent response is required before the plaintiff's claim can be heard in full on its merits. The applicant must meet a two-prong test: first it must show that there is a serious issue to be tried, and second, it must demonstrate that the balance of convenience lies in favour of granting the injunction.[40] An interim injunction requiring a CCS operator to cease operations until the substantive case can be heard would

34 Ingelson, Kleffner and Nielson, above n 2.

35 T Ragsdale, "Hydraulic Fracturing: The Stealthy Subsurface Trespass" (1993) 28 Tulsa Law Journal 311, at 336, 337 and 338.

36 T Daintith, "The Common Law of Underground Energy Resources in the United States" in D Zillman et al, *Energy Underground* (book forthcoming from Oxford University Press, 2014).

37 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 14.

38 See *R v Fraser* [2005] 2 NZLR 109, at 118.

39 A Barker, "Interim Injunctions" in P Blanchard (ed) *Civil Remedies in New Zealand* (2nd ed, Brookers, Wellington, 2011) at 294.

40 *American Cyanamid Co v Ethicon Ltd* [1975] AC 396 (HL).

cause extensive cost to an operator, just as would be an injunction ordering operations to stop because of interference with the plaintiff's right to its property. In contrast, a permanent injunction is awarded after a hearing of the substantive case in full on the merits, if it is the necessary remedy to protect a legal or equitable right.[41] The court will not grant an injunction if it would be futile to do so.

2.4.2 Damages

Compensatory damages are to place the claimant in the position they would have been in, had the tort not occurred.[42] An award of damages can include the cost of any consequential loss for any damage, loss in value of the land, wrongful use of the land, or general damages for interference with the plaintiff's privacy and quiet enjoyment of the property, and for distress and any anxiety caused.[43] Assessment of damages is a question of fact, but in *McElroy Milne v Commercial Electronics Ltd* Cooke P said:[44]

> [T]he ultimate question as to compensatory damages is whether the particular damage claimed is sufficiently linked to the breach of the particular duty to merit recovery in all the circumstances.

Generally, a claim for damages must include all losses past, present, and future, as any further claim arising under the same cause of action will be barred, despite the event that new loss has been suffered. However, in cases where the civil wrong is a continuing one and new and distinct damage occurs a new cause of action may exist.[45]

2.5 The Limitation Act 2010

The Limitation Act 2010 reforms the previous legislation, and provides a defence to claims for damages that are made six years after the date of the act or omission, unless the claimant has late knowledge of the claim, where the Act then provides for a further three years from the date of knowledge, or no longer than 15 years after the act or omission.[46] The Act defines the date when the claimant has late knowledge as the date when the claimant is aware of (or ought reasonably to be aware of) certain facts; that the act or omission on which the claim is based had occurred; that the act or omission was attributable to the defendant; and that (if relevant) the claimant has suffered loss.[47]

Thus, the Limitation Act prevents persons raising stale claims, and due to the "late knowledge" rules does not cause difficulties for a claimant who wishes to make a timely claim where harm is caused by CCS operations that have ceased some time ago. The key issue is who an aggrieved claimant can sue.

41 A Barker, "Permanent Injunctions" in Blanchard, above n 39, at 236.

42 *Attorney-General v Geothermal Produce New Zealand Ltd* [1987] 2 NZLR 348, at 359.

43 Smillie in Todd, above n 12.

44 *McElroy Milne v Commercial Electronics Ltd* [1993]1 NZLR 39, at 41

45 P Blanchard (ed), *Civil Remedies in New Zealand* (2nd ed, Brookers, Wellington, 2011) at 93, 94.

46 Limitation Act 2010, ss 11, 12.

47 Section 14. This summarises the full list.

3 Civil Liability During the Operational Phase of CCS

The general position under the common law is that a CCS operator is liable for any act of negligence, trespass or nuisance that it commits. This is the ordinary situation of any company in business. Companies reduce the risk of committing such acts, and for being liable for them, by good quality business practice and by risk management procedures. What needs to be considered is whether there should be departures from the ordinary position in order to accommodate the special character of CCS. Subsurface trespass and nuisance are candidates for different treatment where the CCS injection is so deep that it is unconnected to the enjoyment of the surface. Such different treatment is recommended and will be facilitated through arrangements regarding property rights (see Chapter 4) and not in changes to the general law or tort. These arrangements as to property rights will remove the ability of a land owner to claim subsurface trespass or nuisance.

Liability during the operational phase of CCS operations should remain with the CCS operator. This follows the approach overseas. Indeed, it is not usual for the regulation of an industry to exclude liability for negligence and other wrongs, and arguably the legal framework for CCS should be no different. It has been said that the only controversial issue about short-term CCS liability is when it ends and when long-term liability begins.[48]

As part of the process of granting an injection permit under the new CCS Act, financial assurance should be required in order to cover remedial activities, MMV responsibilities, and liability for leaked emissions under the ETS.

4 Long-term Liability for CCS

Long-term liability can be addressed in three ways; it can be either assumed by Government, it can remain with the operator, or it can be shared between government and industry. Pritchard provides a useful discussion in Appendix A on the different arrangements, including a summary of advantages and disadvantages. For this reason they will not be repeated here. Some challenging and complex issues are raised by long-term liability, and some jurisdictions provide a clear framework for it, others do not.

The issue of long-term liability is linked to the permitting process and requirements of site closure. It will be recalled from Chapter 5 that we recommend that an injection permit ends when a site closure authorisation is given, with the effect that the operator's regulatory liability and liability to account for GHG emissions also come to an end. The focus of this section is on liability after site closure and after the injection permit has come to an end. The issue is, if anything goes wrong, who will undertake remedial activities and who will pay? Will they also be liable for harm to the climate? Over long periods of time, it becomes more possible that a commercial company is no longer in existence when something goes wrong, or no longer has the financial ability to pay. We must therefore consider how long-term liability will be allocated, and whether government has a role in managing long-term risks.

48 R Campbell, "Long-term Liability for Offshore Geosequestration" [2006] AMPLA Yearbook 515, at 518.

Long-term liability has been considered more of a stewardship role because there is also a positive obligation to continue monitoring (although this is part of the site closure authorisation procedure) and to perform any remediation measures should they be required.[49]

A careful balancing of competing interests is required in assessing the liability framework for CCS. CCS is a key climate change mitigation tool, the benefits of which need to be weighed against the possible harm that may be caused to individuals. Operators need to have security of investment, but not at the cost of imposing financial burdens on land owners and the general public.

4.1 International thinking

At this point it is useful to return to the IEA *Model Regulatory Framework* on liability during the post-closure period. The model text is as follows.

1. Subject to the terms of this section …, where a closure authorisation has been issued for a storage site, responsibility for the storage site transfers to the relevant authority.
2. On transfer of responsibility for a storage site to the relevant authority, the relevant authority assumes:
    a) responsibility for any liabilities for damage caused by the storage site, including but not limited to:
        i. damage to the environment;
        ii. damage to human health;
        iii. damage to other resources;
        iv. damage to third-party assets;
        v. the cost of corrective measures required to limit the extent of the damage; and
        vi. the cost of remediation measures associated with the damage;
    b) responsibility for:
        i. monitoring the storage site;
        ii. undertaking any corrective measures; and
        iii. undertaking any remediation measures;
3. Despite paragraph 2 of this section …, in the post-closure phase an operator remains responsible for any liabilities for damage caused by a storage site if that damage results from fault or negligence of the operator during the project period.

Thus the IEA says that the relevant authority "assumes" responsibility for liability. The Australian offshore legislation states that the Commonwealth indemnifies the licence holder against claims for damages, unless the licensee no longer exists, when the liability is taken to be a liability of the Commonwealth.[50] There is no exclusion for claims arising from negligence, although the liability must be attributable to an act done or omitted to be done in the carrying out of operations authorised by the licence.

49 See M Granger Morgan and S McCoy, Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers (RFF Press, New York, 2012).

50 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), ss 400, 401. For a good general appraisal of the issues, see Minter Ellison, *Carbon Capture and Storage: Report to the Australian Greenhouse Office on Property Rights and Associated Liability Issues* (Canberra: Australian Greenhouse Office, 2005), and R Campbell, 'Long-Term Liability for Offshore Geosequestration' [2006] AMPLA Yearbook 515.

Similarly, in Alberta the Crown undertakes to indemnify the lessee against tort claims if the act was done or omitted to be done in the exercise of rights under the licence and that any other conditions in regulations are met (once promulgated). On issuance of a site closure certificate the Crown assumes liability for statutory obligations. Liability for emissions seems to remain with the licensee.[51]

In contrast, the EU Directive provides for a transfer of responsibility to the competent authority for monitoring, corrective measures, and ETS liability, but only (i) after the elapse of a minimum of twenty years from closure (unless the competent authority is convinced that (ii) is complied with), (ii) if all available evidence indicates that the stored CO_2 will be completely and permanently contained and (iii) on the making of a financial contribution for thirty years' monitoring.[52] But full exposure to liability is curbed. The Directive states that where there has been fault of the operator, concealment of information, negligence, wilful deceit or a failure to exercise due diligence the competent authority shall recover the costs from the former operator. This "claw back" has been much discussed as a limitation on the completeness of the transfer.

Interestingly, long-term liability is not provided for in Queensland or Victoria. In Queensland, injected GHGs become the property of the state after decommissioning, but the extent that liability is so transferred is unclear.[53] In Victoria, risk must be evaluated before an authority is cancelled, and long-term monitoring and verification must be paid for, but there is no provision for liability or its transfer.[54]

Granger Morgan and McCoy say, quite rightly, that the legal and institutional framework needs to ensure that a publicly governed and financially responsible entity will monitor closed geological storage sites, undertake any required remediation, and provide the public with the assurance that compensation will be paid for damage to persons or property.[55] We agree, and recommend that the CCS regulatory agency takes on the role of continued monitoring, paid for by the operator, and will be responsible for any remediation work required. In regards to how this will be funded, a number of options are discussed below.

4.2 Policy issues in a transfer of long-term liability to the Crown

The above discussion on the various approaches to long-term liability internationally shows there are a few options available. The first option is that long-term liability remains with the operator, which is the approach in Victoria and Queensland. Clearly this option is not realistic in the long term. Practically speaking, we must accept that companies do not last forever. It would not be reasonable to consider an entity to retain the finances necessary indefinitely on the assumption that harm may arise. Relying on this option is likely to leave an injured party without any recourse in the event that the CO_2 does not behave as expected after site closure.

51 See N Bankes, The Developing Regime for the Regulation of Carbon Capture and Storage Projects in Canada (2013) Appendix B.

52 Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Articles 18-20. For thinking on the detail of the criteria, see European Commission, *Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide Guidance Document 3 Criteria for Transfer of Responsibility to the Competent Authority* (2011).

53 Greenhouse Gas Storage Act 2009 (Qld), s 181. The section is entitled 'Responsibility for injected GHG streams after decommissioning' but ownership does not generally impose liability.

54 Greenhouse Gas Geological Sequestration Act 2008 (Vic), ss 112, 174 et seq. Section 187 deals with the occupiers' liability of the holder of an authority. The disparate approaches of the states, and of the Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), is a contentious issue in Australia, and efforts are under way to co-ordinate them.

55 Granger Morgan and McCoy, above n 49, at 133.

The option of government assuming liability raises a number of issues. One view is that the tax payer should not be liable for picking up the bill for any harm caused by a CCS operator; the principle of polluter pays should not be offended. Further, industry regulation does not generally extend to excluding liability for negligence and other wrongs, and the framework for CCS should not be any different. Also, any claim by companies to be relieved of liability is inconsistent with their claim that the risks are small. On the other hand, government needs to encourage and foster this new industry. It would also recognise the special long-term character of CCS storage.[56] Any problem with CCS injection is going to appear relatively soon, and the risk decreases quickly after the end of injection operations, so that a few years post-closure the residual risk to the government is very small. It will be necessary to identify what liability is actually being assumed. Is it liability for remedial operations only, or is it liability to compensate for harm to property and the climate too?

An alternative is a shared arrangement between government and industry. However, as Pritchard says, "mechanisms for this are unclear and would require significant new law and could set precedents for policy in other areas".[57]

4.3 Recommendations on long-term liability

We consider that New Zealand should follow the approach by the IEA, the EU, and the Australian offshore legislation, and recommend that the Crown assumes liability following site closure authorisation. This is not without limitations however. The Crown's liability is restricted to loss or damage arising out of operations authorised and carried out under an injection permit. The extent of liability is further curbed by the power of the Crown to recover costs from the former operator where harm has been caused by the fault or negligence of the operator, or where the operator has concealed information or deceived the regulator, or where the operator has failed to exercise due diligence. (Exactly what kinds of fault or negligence are grounds for recovery by the Crown will need refinement, lest the transfer of liability be undermined, but for the time being we follow the pattern of the IEA Model Framework and the EU Directive.) Claims against the Crown for exemplary damages should be prohibited. Liability of the Crown will not extend to harm caused by CO_2 from acts of a third party, such as interference with the integrity of a storage formation.

The Crown's liability also includes the obligation to perform remediation measures should they be necessary, and to fulfil any obligations regarding climate liability. The obligation to undertake MMV is also transferred to the Crown but this is dealt with as part of site closure (see Chapter 5) and is funded by the operator.

The regulatory framework will need to ensure that liability will only be transferred when stringent preconditions are met regarding granting a site closure authorisation. The onus is on the operator to satisfy the agency that the conditions for a site closure authorisation (discussed in Chapter 5) are met.

56 B Barton, "Carbon Capture and Storage Law for New Zealand: A Comparative Study" (2009) 13 NZJEL 1 reviews the Australian debate about the arguments on either side of a government assumption of liability.

57 R Pritchard, Carbon Capture and Storage – A Review of the Australian Legal and Regulatory Regime (June 2013) Appendix A.

No matter which of the above options to long-term liability is selected the tax payer will be shielded by a stringent regulatory procedure before liability will be transferred. The criteria that must be met before a site closure authorisation is granted will provide reassurance to the public that the government is not taking a high risk in assuming liability.

4.4 How should the transfer of liability expressed?

As can be seen from the discussion on international thinking, some jurisdictions provide an indemnity, others state that liability is assumed. An example of New Zealand practice that transfers responsibility can be found in the Environmental Protection Authority Act 2011. The Act transferred the responsibilities from the disestablished Environmental Risk Management Authority (ERMA) to the new Environmental Protection Authority (EPA). Section 30(1) provides:

> (e) all rights, liabilities, contracts, entitlements, and engagements of ERMA become the rights, liabilities, contracts, entitlements, and engagements of the EPA; and
>
> …
>
> (h) anything done, or omitted to be done, or that is to be done, by, or in relation to, ERMA is to be treated as having been done, or omitted to be done, or to be done, by, or in relation to, the EPA; and
>
> (i) the commencement, continuation, or enforcement of proceedings by or against ERMA may instead be carried out by or against to EPA without amendment to the proceedings; and
>
> (j) a matter or thing that would, but for this section, have been completed by ERMA may be completed by the EPA.

Whatever terminology is chosen, the key requirement for the legal framework for CCS is ensuring that long-term liability will be transferred to the Crown. We make no recommendation as to how this will be implemented. One recommendation we do make is that there should be a statement of the right of a person to sue the Crown instead of the permit holder where that person has suffered loss or damage.

4.5 Funding long-term liability

It is necessary at this point to define what is required to be funded. The legislative framework that we recommend requires long-term monitoring costs to be borne by the operator, as part of the site closure process. Any claim for personal harm will likely be covered by ACC. This leaves the costs of remediation, harm to property, and climate liability to be covered. We discuss three options below.

The first option for funding long-term liability involves establishing a fund based on levies gained from industry; it could be based on the amount of CO_2 injected, or a grading system based on site characterisation, or an annual fee. Trust funds have been used overseas and provide a mechanism by which the entities responsible for creating the risk pool funds to compensate any pre-determined injuries and possibly any remediation required. The key issues are determining the extent of injuries covered, calculating the appropriate level of payments required and what they are for, and defining the appropriate level of compensation. Methods for quantifying risk have been identified and are

available.[58] The IEA consider a public-private pooling structure is likely to be the most suitable option to provide long-term assurances, such as use of an insurance pooling model or a compensation (trust) fund model.[59] The approach in Alberta offers a useful example. Bankes says that the post-closure stewardship fund is funded by a fee per tonne of injected CO_2. The fund may be used for MMV, reclamation, re-abandonment and remedial activities but not for liability that the Crown has under its obligations to indemnify the licensee, nor to cover liability for emissions accounting.[60] The advantage of using a trust fund is the clear benefit to the tax payer, and that risk is spread across industry. The disadvantage is the administrative costs involved and the increased costs to the operator by having to set aside funds. This option may be unduly complex for New Zealand, because of the likely low number of CCS projects in the foreseeable future.

The second option is for government to charge a rent on the use of the subsurface which can fund any possible liability. This is similar to the above option, but the difference being that it appears a simpler and possible less costly arrangement than establishing a trust fund to be administered by an agency. Instead, the payments go into general Crown funds. Queensland uses such a mechanism, and requires an annual rent to be paid.[61] South Australia also charges an annual fee which is based on the licence area.[62]

The final option is that the Crown is to meet liability if and when it occurs without any fund or levy system required. Effectively, the tax payer will be funding long-term liability. Reassurance is gained from the complexity of the regulatory system, which not only will minimise the risk of harm arising in the first place but will ensure that liability will not be transferred until the risk is extremely low.

This is a difficult issue. On one hand, the polluter should pay. On the other hand, the complexities and costs involved in establishing and maintaining a funding mechanism and the reality that the risk that government will be exposed to will be minimal weighs against requiring such a mechanism. Thus, we recommend that because of the overall benefit of CCS, a CCS operator should not have additional costs imposed on it, and that assumption of liability by the Crown includes the responsibility to pay for any harm caused, subject to the limitations discussed at 4.3 above.

58 See C Trabucchi, M Donlan, M Huguenin, M Konopka, S Bolthrunis, *Valuation of Potential Risks Arising from a Model, Commercial-Scale CCS Project Site* (Industrial Economics Incorporated, June 2012).

59 International Energy Agency, *CO_2 Capture and Storage*, above n 1, at 131.

60 Bankes, above n 51, Appendix B.

61 Greenhouse Gas Storage Act 2009 (Qld), s 86.

62 For example, the current annual fee for a gas storage licence is AUD3,365.00 or AUD618.00 per km^2 of the total licence area, whichever is the greater; Petroleum and Geothermal Energy Regulations 2013, Schedule 1.

5 Recommendations

1. Liability during the operational phase of CCS operations should remain with the CCS operator, although liability for underground trespass and nuisance will be restricted as part of the property rights arrangements under the new CCS Act. As part of the process of granting an injection permit under the new CCS Act, financial assurance will be required in order to cover remedial activities, monitoring, measurement and verification responsibilities, and liability for leaked emissions under the ETS.

2. After the regulator grants a site closure authorisation, the Crown should assume civil claims against the CCS operator that arise out of operations authorised and carried out under the injection permit. The Crown may recover costs from the operator where the operator has been at fault or negligent, has concealed information or deceived the regulator, or has failed to exercise due diligence. The Crown will not be liable for exemplary damages, or for the acts of a third party. The assumption of liability should make it clear that a person who has suffered loss or damage can sue the Crown instead of the former operator.

3. The operator should remain liable for monitoring, measurement and verification until there has been no significant migration, leakage, or unexpected behaviour for a specified time. The operator should be required before site closure to pay the costs of implementing a long-term monitoring plan.

4. After the regulator grants a site closure authorisation, liability for remediation and emissions accounting should be assumed by the responsible agency.

CHAPTER 11
CCS AND THE EMISSIONS TRADING SCHEME

1 Basics of the ETS

The New Zealand Emissions Trading Scheme (NZ ETS) under the Climate Change Response Act 2002 (CCRA) is New Zealand's main policy instrument for the reduction of emissions of greenhouse gases (GHGs) including CO_2. The NZ ETS is unique because it applies to all GHGs covered by the Kyoto Protocol and includes all sectors. The principle 'all gases, all sectors' is ambitious by world standards. It imposes some complexity on the design of the system, and in addition transitional measures for a phased implementation of the Scheme mean that some sectors still remain outside it.

Policy pressure on GHG emissions under the NZ ETS has been reduced by the phased implementation of the Scheme, by a cap on prices, by a reduction of surrender obligations in energy and liquid fossil fuels to one unit for every two tonnes of emissions, and other measures. If, at some stage in the future, new policy pressure is to be put on GHG emissions, it is likely to come through changes to the ETS and amendments of the CCRA. The result would be a higher price on CO_2, and an increased commercial attractiveness for CCS. However the question of promotion of CCS by such a policy lies outside this Report.

The need to ensure effective accounting for emissions makes clear the need to have a thorough site plan for a CCS operation, in order to identify potential leakage pathways, provide adequate monitoring, and require an effective reporting system to validate consistent and reliable data and information. The same need applies to CCS pipelines.

2 Two Main Approaches to Accounting for CCS

International thinking sees two main possibilities for the place of CCS under an ETS, and for the removal of CO_2 that it performs. The first of them has not been followed in New Zealand but is explained briefly for the sake of clarity.

2.1 CCS as a reduction of emissions or an avoided emission

This first approach to emissions accounting is centred on the idea of CCS as a reduction an avoidance of emissions, which needs to be measured against what would have been emitted. This is the approach that the European Union has taken, and which is adopted in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* and the International Standards Organisation's ISO 14064 Standard on GHG accounting. It requires the CO_2 emitter to estimate a baseline of emissions that would otherwise

have been emitted, had the CO_2 not been sequestered, and to compare that to actual emissions. The emitter then must pay only for the emissions that have not been sequestered. Each company in the chain of CCS operations, from capture, transport and injection, must be participants, so that each operation can account for leaked emissions. The approach entails complexity and the risk of inaccuracy, because of the difficulty of defining a baseline to estimate avoided emissions, especially as to the "parasitic load" which is the extra energy required to power the processes of capture, transmission and injection.[1] Issues regarding accounting for leakage recur in the literature, but are often not relevant to New Zealand because of the different method adopted here.

2.2 CCS as a separate sink function with an entitlement to credits of units for CO_2 removal

New Zealand has adopted the second approach of separate credits for removals such as CCS, with consequences that lead to a simpler and more reliable approach to CCS. The producers of CO_2 must either satisfy their obligations by surrendering units (NZUs) or by fixed price option for the emission produced. The operators of CCS injection facilities receive credits for the CO_2 that they store.[2] This approach still accounts for each step of the CCS chain, but it does not differentiate between captured and emitted CO_2. It is left to the operators of the installation and storage facility to distribute the value from the credits obtained. This approach does not need transport to be included as any discrepancy between the amount of CO_2 emitted and the amount injected will be accounted for as a loss during the transport phase; to include transport would result in double-counting the emissions. Any losses that do arise will be subject to contractual arrangements between the pipeline operator and the storage operator or emitter. This approach has a lower administrative burden, simpler monitoring, and lower costs. It is considered more reliable because it does not require the estimation of a baseline of emissions that would have been generated without the CO_2 capture process. An additional and important advantage is that offering credits for carbon sequestration may help establish an independent CCS industry.

1 M Granger Morgan and S McCoy, Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers (RFF Press, New York, 2012) at 142.

2 See I Guddas, T Hohmuth, and L Schafer, "Crediting CO_2 Sequestration – An Alternative Approach to Integrating CCS into the EU ETS" (2008) Carbon and Climate Law Review 387.

3 The NZ ETS Structure

New Zealand's ETS treats geologically sequestered CO_2 as a removal activity, thus crediting the injector for emissions successfully sequestered. Its general architecture is conducive to CCS.

3.1 Points of obligation generally upstream

NZ ETS obligations are determined in relation to activities, which are described in Schedules 3 and 4 of the Climate Change Response Act 2002. Companies carrying out some activities are mandatory participants, and others are voluntary participants.

The NZ ETS was designed so that the activities that come under it are upstream in the supply chain. Thus, for natural gas, the activity caught for the ETS is at the production wellhead, rather than at the power station or the retail gas customer. This reduces the number of participants in the scheme and simplifies its administration. (Forestry is an exception.) In addition, large users such as electricity generators tend to participate voluntarily, in order better to manage their ETS obligations. The eligible activities are identified in Schedule 4 parts 3 and 4.

Participants in the stationary energy sector are required to monitor and report their emissions in accordance with the Climate Change (Stationary Energy and Industrial Processes) Regulations 2009. Because of the strategy of upstream points of obligation, the Act and Regulations generally require participants to account for emissions at the point of production of coal or gas, or, for large users, at the point of purchase. Power stations therefore must account for their CO_2 when they buy their fuel, not when they burn it, and not when they release the CO_2. They are however allowed to make "stockpile adjustments."

3.2 Participants under the ETS

The CO_2 captured for CCS may come from various sectors, including the stationary energy and industrial processes sector or agriculture. Whether the emitter is required to surrender for its obligations of its emissions becomes important because of the wording of the section that provides for CCS, which we will come to shortly.

Mandatory participants are listed in Schedule 3; participants from the stationary energy sector include those that mine coal and natural gas, refine petroleum, and generate electricity or industrial heat from geothermal fluids (this does not include all participants, only those that meet certain thresholds). The participants from the industrial processes sector include producers of iron steel and aluminium.[3] Manufacturers of fertilisers containing nitrogen are included from the agricultural sector. Producers of bioenergy are not required to surrender units for CO_2 that results from the combustion of used oil, waste oil, and waste.[4]

3 Climate Change (Stationary Energy and Industrial Processes) Regulations 2009.

4 Climate Change Response Act 2002, s 206.

Section 60 allows participants listed in Schedule 3 to apply for an exemption by Order in Council. The order must not materially undermine the environmental integrity of the scheme, unless the Crown has signed a Negotiated Greenhouse Agreement (NGA). One such arrangement is in place with the New Zealand Refining Company. It exempts the company from being a participant under the scheme in respect of the activity of refining petroleum, listed in Part 3 of Schedule 3 until the end of 2022, or on the day after the NGA is terminated.[5] Instead, the NGA places an obligation on the company to maintain best practice in energy efficiency to reduce the amount of GHG emissions per unit of product. This is important because New Zealand Refining Company is the country's only oil refinery, and the main supplier of petroleum products to the New Zealand market, and the exemption effectively eliminates the emissions from the refinery from receiving any credits should the CO_2 be sequestered. This will be explained below. It should also be noted that the General Exemption Orders exempt certain activities that do not meet the desired thresholds for participation.

Voluntary participants are listed in Schedule 4; they include forestry removal activities, other removal activities (including CCS) and purchasers of certain liquid fossil fuels, coal or natural gas.

3.3 Surrender and allocation of NZUs

In accordance with section 63 of the CCRA, a participant is liable to surrender 1 unit for each whole tonne of emissions from each activity listed in Schedule 3 or 4 that the participant carries out, as calculated in accordance with the Act and at the times required by the Act. But the following section modifies this, and states a person who carries out an activity in parts 2-6 of Schedule 3 (certain activities from the liquid fossil fuels, stationary energy, industrial processes, agricultural, and waste sectors) and activities from the liquid fossil fuels and stationary energy sectors listed in Schedule 4 is only liable to surrender 1 unit for each 2 whole tonnes of emissions from the activity. These industries must purchase their NZUs from the domestic market.[6]

In an effort to reduce the cost of compliance to those industries that may suffer from having to compete within the international market, the Government makes free allocations of NZUs. Manufacturers of iron and steel from iron sand, aluminium, carbon steel from cold ferrous feed, cementitious products, and clay bricks and field tiles receive free allocations of emission units which they are then able to trade. The cost of emissions is therefore reduced for these industries.

3.4 Removal activities

Some participants in the NZ ETS carry out "removal activities." They therefore have entitlements under the ETS to claim a credit in NZUs for each tonne that they remove from the atmosphere. This is in contrast, of course, to the position of most NZ ETS participants who have liabilities to surrender emissions units for the GHG emissions from their activities. The main class of removal activity is forestry, but others are listed in Schedule 4 Part 2.

5 Climate Change (The New Zealand Refinery Company Limited) Exemption Order 2009.

6 Following the amendments to the ETS in 2012, certain Kyoto units (ERU and CERs) can not be surrendered to meet NZ ETS obligations.

The manufacture of methanol is the only industrial process activity at present that has an entitlement to receive units. The manufacture of methanol embeds natural gas (which is mainly methane). The embedding is classified as a removal activity under Schedule 4 part 2, subpart 1. If one looks at the supply chain, the result of this entitlement under the ETS becomes clear. The natural gas producer incurs ETS liability on production of the gas. It passes the cost of doing so on to its purchasers, including the methanol company. The methanol company is reimbursed for this cost by being issued NZUs. It reports its manufacture of methanol and claims NZUs periodically under the Climate Change (Other Removal Activities) Regulations 2009.

If natural gas is lost in the course of processing or transmission from the natural gas field to the methanol company, then the ETS retains its integrity; units have been surrendered for that gas, and no removal credits are issued for it. Similarly, if the methanol company itself loses the gas before embedding it in the methanol, then it will have no claim for removal credits.

However, as a policy matter we consider it generally desirable that the proposed CCS legislation help keep track of CO_2 in CCS operations, rather than disregard losses from leakage and fugitive emissions.

4 How the ETS applies to CCS

Carbon capture and storage is referred to in the CCRA as a removal activity in Schedule 4, Part 2, Subpart 2, which reads:

> Storing of carbon dioxide after capture, where—
>
> (a) a person is required to surrender units under this Act in respect of the emissions that would result if the carbon dioxide was not captured and stored; and
>
> (b) the result of the carbon dioxide being captured and stored is a reduction from emissions reported in New Zealand's annual inventory report under the Convention or Protocol or any emissions report from New Zealand under a successor international agreement; and
>
> (c) any prescribed threshold is met.

This provision, the only reference to CCS in the Act, is not yet in force and will apply on and after a date set by Order in Council.[7] In the NZ Emissions Unit Register, no participants are registered at the present as engaged in CCS. When it comes into force, Schedule 4 Part 2 Subpart 2 will authorise a company to register as a voluntary participant for a CCS projects.[8] At the time that it comes into force, two ancillary provisions may be resorted to:

(a) section 168(1)(m), for the making of a regulation to set a threshold, as stated in paragraph (c) – most likely if it is thought that the ETS should not apply to small CCS projects. It could apply for example to exclude test projects.

(b) Section 168(1)(n), for criteria for registering as a participant in relation to CCS, and for criteria for "the type of carbon capture and storage" in respect of which a person may register as a participant.

7 Climate Change Response Act 2002, s 2A(14).

8 Section 57.

Both of these powers may be resorted to in order to provide more fully for CCS under the ETS, but neither of them provides for any significant tailoring of the provision; they are both essentially restrictive.

Restriction on eligibility to obtain credits for removal. Schedule 4 of the CCRA says that for CCS to qualify as a removal activity, it must be where "a person" *is required to surrender units in respect of the emissions* that would have occurred without the CCS. This important point was mentioned above. While allowing the emitter and the injector to be different entities, this has the effect of restricting the issue of credits to CO_2 that was covered by the ETS, and on which a surrender obligation would have otherwise fallen. For those industries that are not required to surrender an obligation (biofuels producers, the New Zealand Refining Co) no credit can be given to them for CO_2 from them that is geologically sequestered. It appears that the NZ ETS gives those companies no incentive to consider CCS when it becomes possible. This appears undesirable from a policy point of view. We recommend that the CCRA be amended to allow companies that are not required to surrender units in respect of emissions to be eligible for credits for CCS as a removal activity.

It should be noted that when CCS uses emissions from bioenergy (BECCS) it creates negative emissions by reducing the amount of carbon in the atmosphere. However, it is undesirable to prevent producers of bioenergy from receiving credits for any CO_2 stored from their operations and to withhold an incentive to that kind of technology. The IPCC Guidelines recommend including negative emissions from BECCS in national inventories.[9]

Enhanced oil recovery. Enhanced oil recovery (EOR or enhanced hydrocarbon recovery) involves injecting CO_2 or other liquids into an oil or gas reservoir to mobilise the oil or gas and increase the amount that is recovered. The CO_2 is mixed with the oil or gas and some is retrieved with the oil and gas. However some of the CO_2 is retained in the storage reservoir, and this gives EOR some characteristics of CCS or a removal activity. In the EU, EOR is not listed in Annex 1 of the ETS Directive so is therefore not included, but in a combined EOR and CCS project the storage installation would be covered by the scheme.[10] We consider the matter in more detail in Chapter 7. At this point we note the policy question of recognising EOR as a removal activity under the NZ ETS. Our recommendation is it should be possible for the operator of an EOR-CO_2 project to become a voluntary participant in the NZ ETS, but only if an injection permit has been issued for the project under the CCS legislation. This will ensure that the long-term storage capability of the exercise is properly scrutinised.

4.1 CCS reporting

The Climate Change (Other Removal Activities) Regulations 2009 provide for the measurement, reporting, and claiming of NZUs for methanol and for synthetic gases. Amendments to these Regulations appear to be necessary in order to make similar provisions for CCS. The alternative is parallel regulations for CCS specifically as a removal activity.

9 S Holloway, A Karimjee, M Akai, R Pipatti and K Rypdal, *2006 IPCC Guidelines for National Greenhouse Gas Inventories*: Volume 2 Energy, Chapter 5 "Carbon Dioxide Transport, Injection and Geological Storage" at 5.8.

10 See Bech-Brunn, *EOR/CCS 360-Degree Legal Review* (Global CCS Institute, November 2012).

It is desirable to co-ordinate such regulations for CCS reporting under the NZ-ETS with the measurement, monitoring and verification (MMV) requirements that we recommend for CCS projects. (See Chapter 6.) The MMV data will include data and calculations of fugitive emissions and any leakage from the storage complex. The MMV data will be reported to the CCS regulator and to the Environmental Protection Authority (EPA) in respect of the NZ ETS. The MMV data should be the basis of the ETS reporting and claiming of NZUs. There should be co-ordination in the making of NZ ETS regulations and the CCS MMV regulations. It could be informal or it could be formal with regulations made on the joint recommendation of the different ministers responsible.

The IPCC Guidelines provide valuable guidance on how national inventories should account for CO_2 transport, injection and geological storage. They address accounting for leakage from a CCS storage complex, suggesting that emissions be estimated from the MMV results. The International Standard Organisation's ISO 14064 on GHG accounting is another point of reference for reporting requirements.[11]

Generally, we consider that the proposed CCS legislation should ensure that CCS operations record and report in enough detail to support the operation of the NZ-ETS.

Measurement of venting. Currently, under the Climate Change (Stationary Energy and Industrial Processes) Regulations 2009, participants that mine natural gas are to measure and report emissions from venting, flaring, and own use need. If a company is required to report the amount of CO_2 that is vented and flared into the atmosphere and combusted before the point of sale by using a hydrocarbon accounting system (prescribed in regulation 17) then imposing measurement, monitoring and verification requirements on CCS operators seems fair. Even though the *IPCC Guidelines* suggest estimation of these "fugitive" emissions, whether they should in fact be measured is worthy of further consideration.

4.2 Losses during transport

The design of the NZ ETS emphasises the use of upstream points of obligation, with subsequent entitlements to credits where removals occur. This has positive consequences for CCS in relation to transport and the possibility of leakage and other losses of CO_2 in the chain before final geological storage. Where CO_2 is derived from the burning of coal or natural gas, for example, the activity that attracts the obligation to surrender units is the production of coal at the mine, or gas from the wellhead. NZUs are surrendered by the coal company or the gas company. Where the power company or industrial user that buys the fuel is a voluntary participant, it surrenders units when it makes the purchase. From there on, the fuel is paid for, as it were, in the ETS. If some of the CO_2 resulting from it is lost in transit to a CCS facility, then there is no harm done to the integrity of the ETS. There is no need to make special provision for losses of CO_2 at different stages in the CCS chain before its final geological storage. The case is the same as that of methanol described above.

11 M McCormick *A Greenhouse Gas Accounting Framework for Carbon Capture and Storage Projects* (Center for Climate and Energy Solutions, February 2012) provides guidance on the calculation of emissions with respect to CCS projects that is consistent with the ISO standard.

4.3 Leakage from a storage formation

It is possible that a CCS storage project may not perform as planned and leak CO_2 into the atmosphere.[12] Such a leakage could occur after NZUs under the NZ ETS have been granted for the removal by injection. The data showing a leakage and its extent would come from the measurement, monitoring and verification (MMV) programme under the CCS Act. A substantial leakage would affect the integrity of the ETS; the escaped CO_2 for which NZUs had been issued would not in fact have been removed. In order to maintain the integrity of the ETS, it is necessary for those NZUs to be reversed or cancelled, or for NZUs to be paid back.

Under the NZ ETS as it stands at present, participants are not exposed to a specific process for the reversal of NZUs credited to their accounts. There is a process in the CCRA to bring about an effective reversal by an amendment of an emissions return, if the chief executive of the EPA is satisfied that the information contained in the emissions return is incorrect.[13] However he or she can only go back 4 years in making such amendments,[14] which will be insufficient where leakage results well into the closure period. In addition, the power to amend because "the information contained in an emissions return is incorrect" may be interpreted to be confined to amendment where the return was incorrect at the time that it was submitted, without including incorrectness because of a subsequent event, such as leakage. These provisions could be strengthened to provide a review of credits, by extending the 4-year period, and making it clear that the Chief Executive has power to amend because of a subsequent event, and the power to cancel NZUs issued to a CCS company. However it may not be desirable to confine the matter to one of amendment of a return.

We consider that there should be a more explicit provision for the event of leakage from a CCS storage operation. In international analysis and discussion, the question has been in debate, most recently at UNFCCC meetings in early 2013. No agreement was reached on the matter. It should be remembered that New Zealand's approach to GHG accounting for CCS is different than other approaches. Fortunately, our approach seems to simplify the matter. In our view the overriding objective must be to maintain the integrity of the ETS, and that a CCS operation that is not performing as it should is not entitled to retain credits for CO_2 that has escaped. Information about a leakage would come from the MMV programme, and would be reported under the Climate Change (Other Removal Activities) Regulations 2009 or parallel regulations made for CCS. The Regulations (or the Act, if necessary) should be amended to require NZUs for the leakage to be surrendered.

The CCS operator will be subject to this obligation to surrender units for any leakage during the injection period, and during the closure period that follows it. However upon the issue of a site closure authorisation, the operator's liability to surrender such units for leakages comes to an end. This is dealt with in detail in Chapters 5 and 10. We recommend that in addition the CCS operator must continue to be a participant in the NZ ETS until the site closure authorisation is issued. This requires the CCS operator to continue to have a holding account even though the removal activity has ceased.

12 It should be noted that leakage only includes unanticipated discharge of CO_2 to the atmosphere. This is different than leakage outside of the storage formation but still contained underground; this is referred to as migration of the CO_2 It may be desirable for the CCRA to define what constitutes leakage for the purposes of the NZ ETS.

13 Climate Change Response Act 2002, s 120.

14 Section 127.

After the site closure authorisation, which can only be after it is shown that the injected CO_2 is behaving as expected and may be some years after the last injection has taken place, the CCS operator is no longer obliged to surrender units for any leakage, and the obligation is transferred to the Crown.

5 Recommendations

1. Storing CO_2 after capture should be a removal activity under the NZ ETS whether or not a person is required to surrender units in respect of the emissions that would result. Paragraph (a) in Schedule 4 part 2, Subpart 2 of the Climate Change Response Act 2002 can simply be deleted.

2. The Climate Change (Other Removal Activities) Regulations 2009 should be amended (or complemented with parallel regulations) for CCS, in order to provide for measurement, monitoring and reporting of CO_2 that is sequestered, and for any other matters required for the management of CCS as a removal activity. The MMV requirements under the proposed CCS legislation should form the basis for data and reporting of injection and any leakage from CCS storage sites.

3. The Climate Change Response Act 2002, Schedule 3 should be amended to include CO_2 geosequestration as an activity for which a person must be a participant under the NZ ETS. This will place the obligation on a CCS operator to surrender NZUs for any leakage from a storage site. The CCS operator will be subject to this obligation during the injection period and during the closure period.

4. The CCS operator must continue to be a participant in the NZ ETS until the site closure authorisation is issued.

CHAPTER 12
POLICY MATTERS REQUIRING EARLY ATTENTION

In this Chapter we identify and briefly discuss three aspects of carbon capture and storage that, judging by experience overseas, are likely to emerge early on the New Zealand policy agenda.

1 Improving Public Awareness and Understanding

A lack of public acceptance and understanding of CCS has been identified in many countries as one of the key barriers to CCS projects.[1] Public acceptance and understanding of CCS will be important during the process of application for a permit for a CCS operation. We have identified the compelling case for public participation in such applications. There is growing experience and analysis of public engagement with different results for different projects. Some projects, such as Barendrecht in the Netherlands and FutureGen in the United States, were rejected or cancelled because of public opposition; others, such as Wallula in the United States and Otway in Australia, have had public support.[2] A public awareness programme should emphasise the role of CCS in climate change mitigation and greenhouse gas emission reductions; it is an effort to do something about climate change. A focus on the bigger picture of climate change mitigation may help public perception and the reality that we must do something about our emissions, and that CCS is part of the answer. A public awareness programme will also have to be entirely open about the nature of a CCS project and its actual and possible impact on human health and safety and on the environment. Generally, New Zealanders care about the environment,[3] and CCS can be shown to be an effort to protect the environment rather than to harm it.

In Chapter 3 we noted the desirability of separate institutions for CCS advocacy and for CCS regulation, in order to minimise the possibility, or the perception of a possibility, that a regulatory agency has a preference for CCS.

1 Environmental Non-Government Organisation (ENGO) Network on CCS, *ENGO Perspectives on Carbon Capture and Storage (CCS)* (Global CCS Institute, 2012) at 6.

2 World Resources Institute, CCS and Community Engagement: Guidelines for Community Engagement in Carbon Dioxide Capture, Transport, and Storage Projects (2010) at 40.

3 See Report of the Green Growth Advisory Group Greening New Zealand's Growth (December 2011) at 2.

2 CCS Ready

"CCS Ready" (CCSR) is the term being used in some countries for a policy that encourages or requires industry to prepare for CCS during the design and planning of new facilities (such as a thermal power plant) in order to enable a CCS retrofit in the future, even though CCS is not possible or not required at the present.[4] A key advantage is that it is more economical in the long term to plan for and provide for CCS at the outset. It may mean that plant design choices are made to facilitate carbon capture at some future date. A disadvantage, however, is that it may lock in technology, especially carbon-using technology, that may ultimately prove not to be the best option and may end up as stranded assets.[5] For New Zealand, our ETS and low fossil fuel dependence means that expectations for CCS may not be so high and a stringent level of CCSR may not be so easily justified. Very few new thermal power plants are being built, and there are no new coal power plants on the horizon.

Different policy mechanisms to promote CCSR are as follows.

Mandating CCSR. Any new plants or plants undergoing significant modification would have to accommodate CCS. This has been the approach by the European Union, where all new fossil-fuelled power plants of a specified size are to have the space available for a retrofit if a storage site is available and transport and capture is technically and economically feasible.[6] In New Zealand this approach would not be inconsistent with prevailing approaches to government policy that favour market mechanisms rather than direct regulation.

Emission standards. Requiring companies to limit the amount of CO_2 that is emitted could spur innovation and encourage industry to introduce CCS and plan on a CCSR basis. An example California, where emission standards apply to all new electricity generators. One point that should be noted is that the Bill that introduced the emission performance standards also combined the standards with fiscal policy and prohibited long-term investment in the entity unless the emission performance standards were met.[7] This exemplifies the use of diverse policy tools to pursue an objective. There is a difference between emission standards to reduce GHGs and those to improve air quality, although in some sectors the effect is generally the same. For example, the Air Emission Standards for Electricity Generation in Alberta in Canada do not include CO_2 and only apply to sulphur dioxide, nitrogen oxides and primary particulate matter emissions.[8] Again, as noted above, this type of regulation is not suited to present New Zealand policy approaches, especially approaches to greenhouse gas emissions.

4 ICF International CCS Ready Policy: Considerations and Recommended Practices for Policymakers (Global CCS Institute, 17 February 2010).

5 Global CCS Institute, CCS Ready Policy and Regulations – The State of Play: Progress Towards the Implementation of CCS Ready Policy and Regulatory Frameworks (August 2012), at 8.

6 Directive 2009/31/EC on the Geological Storage of Carbon Dioxide [2009] OJ L 140/114, Article 33 amends Directive 2001/80/EC.

7 Senate Bill 1368, California Public Utilities Code §8340-8341.

8 Alberta Environment Alberta Air Emission Standards for Electricity Generation and Air Emission Guidelines for Electricity Generation (December 2005) at 1.

Economic incentives. Encouraging industry through the use of tax exemptions or reductions, grants, or an emissions trading scheme (ETS) is not new. Under an ETS one option is to provide credits for investment in CCSR, or to increase the cost of emissions over time so that the cost of abatement reduces. One well known problem with utilising this type of policy instrument is ensuring that the level of tax, or cost of carbon, is set at the correct level to be effective. The prevailing wisdom is that a price in excess of £35-40 (NZD 57-65) per tonne is required to really drive investment in low carbon technologies, which shows a case for a back-stop policy such as CCSR.[9] Since New Zealand already has a functioning ETS it would not prove unduly complicated to offer additional credits (at a level prescribed in regulations) for industry participants that upgrade to CCSR. Canada offers a similar incentive.[10]

Information measures. A CCSR certification programme can provide information to consumers and industry, and can act as a marketing tool to promote CCSR as a desirable attribute. However, before CCS is promoted as desirable it may be necessary to run education programmes to inform the public on the characteristics and advantages of CCS and CCSR; otherwise the effect may be the opposite of that desired.

We make no recommendation for CCSR policy. The matter lies somewhat outside our brief of devising and recommending a legal and regulatory regime to allow CCS proposals to be evaluated and put into effect if thought suitable. Additionally, mandating CCSR or emission standards would cut across policies and usual policy approaches in New Zealand. Nevertheless it is important to note the presence of CCSR in policy action concerning CCS in a number of countries. It could have a niche application, or a more general one if a wider range of policy instruments to address climate change were to be sought. CCSR could be a transition tool towards a low-carbon economy. The Climate Change Response Act 2002 could be used to advance CCSR, since its purpose is to enable New Zealand to meet its obligations under the UNFCCC and the Kyoto Protocol.

3 Enhanced Oil Recovery and CCS

In Chapter 7 we identified enhanced oil recovery using CO_2 (CO_2-EOR) as a leading contender for the first CCS activities in New Zealand, because the economic benefits of increased oil production can complement other drivers such as the price of carbon in the Emissions Trading Scheme. EOR has not occurred in New Zealand on any substantial scale, and there is virtually no regulation aimed specifically at it. (It is likely to be authorised under the Crown Minerals Act 1991 as an operation incidental to the mining of petroleum, subject no doubt to obtaining resource consents under the RMA.) There is a strong case for early action in policy and law reform in order to facilitate CO_2-EOR. We made a number of recommendations for this purpose in Chapter 7.

9 Global CCS Institute, *CCS Ready Policy and Regulations*, above n 5 at 25.

10 See N Bankes, Appendix B.

CHAPTER 13
SUMMARY OF RECOMMENDATIONS

The recommendations on each topic have been gathered together at the end of each Chapter. Here, we restate the recommendations under the heading of each statute, proceeding alphabetically, with general recommendations at the front and international law at the end. Under the heading of each statute we have where possible restated the recommendations in the order of the sections that will be affected. We have left repetition and overlap where it occurs, for the sake of clarity, and have repeated recommendations in cases where they apply equally to two Acts. We hope that this will make it easier to see the implications of the recommendations for existing law and the proposed CCS Act.

After each recommendation in brackets is the number of the Chapter from which it came, and after the colon the number of the recommendation as stated at the end of that Chapter.

1 General

1. A stand-alone CCS statute should be enacted. (2:12)

2. The injection and storage of CO_2 should be authorised under the new CCS Act, while the RMA continues to apply to other aspects of CCS operations. (2:1)

2 Building Act 2004

3. The Building Act 2004 should be amended to include offshore installations used for CCS, and to include a CO_2 pipeline operator as a network utility operator so that a CO_2 pipeline is not treated as a building. (2:16)

4. The Building Act 2004 should be amended to include a CO_2 pipeline operator as a network utility operator. (8:4)

3 Proposed Carbon Capture and Storage Act

General

5. We do not make a recommendation as to the title of the legislation. (3:1)

6. We recommend that public participation be initiated at an early stage of CCS development, and that it continues throughout the life of the project with varying levels of engagement. Nonetheless, there should only be one formal public hearing, which also covers RMA applications, as part of the permitting process for an application for an injection permit. Special provision should be made for Māori participation. (3:6)

7. We do not make any recommendation as to what agency should regulate CCS activities. (3:7)

Purpose and principles

8. We recommend that the purpose of the Act be to facilitate and to regulate the permanent geological sequestration of CO_2, as part of efforts to reduce the emission into the air of greenhouse gases, in such a way as to protect the environment and human health and safety. (3:2)

9. We recommend that the proposed CCS Act include an obligation for all decision makers under it to have particular regard to:

   (i) the protection of underground sources of drinking water;

   (ii) the management of conflict between CCS and other uses of subsurface resources; and

   (iii) the protection of market confidence in emission reductions through regulatory clarity and proper GHG accounting. (3:3)

10. We recommend that decision makers be obliged to have regard to, or to take into account, the principles of the Treaty of Waitangi (Te Tiriti o Waitangi). (3:4)

11. We recommend that the relationship between these principles and the purpose of the Act be stated clearly to ensure that the principles support the purpose but are not capable of being read down or dismissed by giving undue priority to the purpose. (3:5)

Property rights

12. The new CCS Act should vest in the Crown all rights and powers necessary to explore for CCS capacity, to develop CCS capacity, to inject CO_2 and other greenhouse gases into the subsurface of land, and to sequester them there permanently; along with all necessarily incidental rights and powers. (4:5)

13. The vesting of subsurface CCS rights by the Act should be expressed in a way that makes it clear that the land owner has no proprietary right of action against the Crown or its permittee for the effect of the Act. Compensation should be payable for actual loss or diminution of value of the land, but not otherwise. (4:6)

Permits

14. We recommend a system for the granting of a CCS exploration permit and then a CCS injection permit. (We do not consider it necessary to have a CCS pipeline permit.) The permit system will facilitate the regulation of different aspects of the public interest, the allocation of public resources, the identification of a commercial interest, and various ancillary rights and duties. (5:1)

Exploration permit

15. An exploration permit gives the holder the exclusive right to explore a specified area for storage formations for a limited time and to undertake the work necessary to complete a site characterisation, which is necessary for an application for an injection permit. Test injections may be carried out with approval. The exploration permit gives a priority right to an injection permit. (5:2)

16. An application for an exploration permit will include details about the technical qualifications and financial resources of the applicant, and its proposed work plan. It will include a public participation proposal detailing the level of public engagement proposed for the life of the project, including consultation with Māori. There will be no formal hearing. The Act will state the criteria for determining an application. (5:3)

Injection permit

17. An injection permit will allow a company to drill injection wells, to inject CO_2 for permanent storage, and to undertake activities incidental thereto. The holder of an exploration permit will have priority to apply. An application will provide a full analysis of the project in a site plan. (5:4)

18. An application for an injection permit will be considered by a board of inquiry modelled on RMA procedures, with a hearing that allows for public participation, including representation or other means of involving Māori and the regional council. The procedure will bring related RMA and EEZ Act resource consent applications together with the injection permit application to be heard together. (5:5)

19. A board of inquiry shall not approve an application for an injection permit unless it is satisfied that the CCS project applied for will not present significant risk of leakage from permanent storage, significant risk to health and safety, or significant risk to the environment. Approval of a permit will be subject to conditions, will include approval of the site plan, and will require measurement, monitoring and verification. (5:6)

20. The detailed regulation of CCS activities will be governed by an approved site plan, rather than by permit conditions. The site plan will include site characterisation, environmental impact assessment, work programme, monitoring plan, corrective measures plan, and site closure plan. The site plan will be approved by the board of inquiry initially but the permit holder can vary it subsequently with approval by the regulatory agency. The site plan will be subject to review. Approval may be withdrawn and reinstated on terms stated in the Act. An approved site plan must be in place in order to carry out injection activities. Approval may be withdrawn and reinstated. (5:7)

21. The regulatory agency will have the power to make a direction to the permit holder where significant leakage, unexpected migration or other irregularity occurs, in order to protect the environment, human health, other resources, or third-party assets. (5:8)

22. An injection permit will not be issued for any specific term, and will remain in effect until a closure authorisation is given, or (in limited circumstances) the permit is surrendered or cancelled. (5:9)

Site closure

23. The regulatory agency shall not grant a closure authorisation unless it is satisfied that there is no significant risk of future leakage or irregularity in the storage site, that the site has been decommissioned as required by the site closure plan and by the regulatory agency, that the CO_2 is conforming with the behaviour anticipated in modelling, that the site is evolving to long-term stability, that a long-term monitoring plan has been provided, that financial obligations have been fulfilled, and overall that operations have resulted in safe and permanent storage of CO_2. (5:10)

24. We do not make a recommendation for a minimum duration for the closure period between the end of injection and the issue of a closure authorisation. (5:11)

25. A closure authorisation will signify the end of liability for the CCS operator. (5:12)

Detailed regulation

26. The detailed regulation of CCS activities is governed by a site plan, approved by the board of inquiry upon the grant of an injection permit, and subject to review by the regulator. The permit holder may vary it subsequently with approval by the regulator. Injection activities may not occur without an approved site plan. The regulatory agency may withdraw the approval if there is a significant risk of leakage or risk to human health, the environment, or other resources, or if there is non-compliance with the CCS Act. (6:1)

27. The site plan will contain the following components:

    (i) Site characterisation

    (ii) Environmental impact assessment

    (iii) Work programme

    (iv) Monitoring plan

    (v) Corrective measures plan

    (vi) Site closure plan. (6:2)

28. The regulatory agency shall have power to make a direction to the permit holder, where significant leakage, unintended (or unexpected) migration or other irregularity occurs, in order to protect the environment, human health, other resources, or third-party assets. (6:3)

29. In the event of leakage or significant irregularities the regulatory agency may require the operator to undertake corrective measures or may undertake those measures itself and recover the cost from the permit holder. (6:4)

General permit provisions

30. The permitting regime will contain ancillary provisions common in permitting systems, such as notifiable events, inspections, reporting, transfers, variations, cancellation, enforcement, and dispute resolution procedures. A register will be established for information on existing and previous permits, and to provide an information portal to the public. (5:13)

31. The legislation will confer the power to require financial assurance of a character and size that will protect the interests of the public and the functioning of the regulatory agency in respect of enforcement. (5:14)

Liability

32. Liability during the operational phase of CCS operations should remain with the CCS operator, although liability for underground trespass and nuisance will be restricted as part of the property rights arrangements under the new CCS Act. As part of the process of granting an injection permit under the new CCS Act, financial assurance will be required in order to cover remedial activities, monitoring, measurement and verification responsibilities, and liability for leaked emissions under the ETS. (10:1)

33. After the regulator grants a site closure authorisation, the Crown should assume civil claims against the CCS operator that arise out of operations authorised and carried out under the injection permit. The Crown may recover costs from the operator where the operator has been at fault or negligent, has concealed information or deceived the regulator, or has failed to exercise due diligence. The Crown will not be liable for exemplary damages, or for the acts of a third party. The assumption of liability should make it clear that a person who has suffered loss or damage can sue the Crown instead of the former operator. (10:2)

34. The operator should remain liable for monitoring, measurement and verification until there has been no significant migration, leakage, or unexpected behaviour for a specified time. The operator should be required before site closure to pay the costs of implementing a long-term monitoring plan. (10:3)

35. After the regulator grants a site closure authorisation, liability for remediation and emissions accounting should be assumed by the responsible agency. (10:4)

Pipelines, industry regulation and third party access

36. The new CCS Act should include a power to require the notification of pipeline gas quality and a power to make regulations for pipeline gas quality. The power to make regulations for gas quality should refer to the requirements of the London Dumping Protocol. (8:5)

37. The new CCS Act should authorise the making of regulations for industry regulation and governance, including metering and reconciliation, third party access to pipelines and other essential facilities, and the allocation of costs for shared facilities. (8:6)

Relationship with other subsurface resources

38. Conflicts between CCS activities and CMA activities should be avoided and resolved by vesting discretionary powers of a brief and reasonably general kind in the Minister or Ministers to evaluate the merits of the competing proposals, and to make decisions in the public interest. The powers will use methods of spatial separation (although it is unlikely to be the preferred option), permit applications and permit conditions, and the control of specific activities. (7:1)

39. The powers of the Minister or Ministers to avoid and resolve conflicts between CCS and CMA activities will apply to both CCS and CMA activities and will require provisions in both Acts. An amendment to the CMA will ensure that the Minister and other decision-makers may, and are required to, take into account CCS matters in making decisions under the CMA on permits, permit conditions and regulations. The amendment should ensure that the purpose of the CMA stated in section 1A does not prevent decision-makers from taking CCS considerations into account in the administration of the Act. (7:2)

40. The legislation should provide for the recognition of co-ordination agreements between resource users and should provide procedures for dispute resolution where necessary. (7:3)

41. The following matters and principles should be taken into account in the making of decisions on permits and conditions under the CMA and the CCS Act:

    (i) Activity in both CCS and other subsurface resource uses is to be facilitated.

    (ii) Unreasonable interference with potentially useful subsurface resources should be avoided.

    (iii) Consultation and agreement among operators is to be encouraged.

    (iv) No operator should have a veto over the activities of another operator or permit holder.

    (v) The Minister or Ministers are to make decisions in the public interest. The public interest can be left as a broad criterion to be applied in particular cases, or the legislation can make an effort to explain, define, and confine it.

(vi) Due regard should be had to the importance of investment certainty. Rights under permits granted before new CCS legislation comes into effect should be altered only where necessary in the public interest. Rights under permits where significant investments have been made in project development should be altered only where necessary in the public interest. (7:4)

42. The proposed CCS legislation should be written so as to be open to the possibility of encouraging both CCS exploration and petroleum discovery. (7:5)

43. The proposed CCS legislation should be written so as to be open to the prospect of an EOR project providing geosequestration. (7:6)

44. A company operating EOR and wishing to gain credits under the Emissions Trading Scheme should be required to come under the CCS regulatory regime. (7:7)

45. The regulation of CCS injection operations should be expressed in a manner that avoids making the use of CO_2 for petroleum EOR purposes unlawful. (7:8)

46. The responsible Minister should have power, jointly with the Minister of Energy and Resources if that is a different Minister, to recommend regulations for a co-ordinated approach to EOR with CCS characteristics. (7:9)

Marine CCS

47. CCS operations that convey CO_2 from land by pipeline to an injection installation on the seafloor, with no platform above the surface of the water, should be required by New Zealand law to comply with the requirements of the London Dumping Protocol, even if strictly they do not need to do so. (9:2)

48. New Zealand law for all forms of marine CCS must conform to the London Dumping Protocol, and in particular the following requirements:

    (a) Disposal must be into a sub-seabed geological formation, and not into the water column;

    (b) The material injected must consist overwhelmingly of CO_2, with no wastes added for the purpose of disposal; but it may contain incidental associated substances derived from the source material and the capture and sequestration process; and

    (c) The permitting process must involve the consideration of waste prevention, the treatment of waste, the characterisation and categorisation of waste, the provision of information on the selection of an appropriate dump (injection) site, a comparative assessment of effects, and the imposition of reviewable conditions specified in Annex 2. (9:3)

49. Marine CCS injection should be governed under a new CCS Act, and removed from the RMA and EEZ Act regimes. It cannot be classified as a permitted activity within the meaning of those Acts. (9:4)

50. A CCS Act and permits for CCS must provide for monitoring, measures to prevent escapes of CO_2 into the water column, and measures to respond to escapes if they occur. (9:6)

51. The regulation of discharges of CO_2 from injection installations in the EEZ should occur under the new CCS Act, rather than through an extension of the EEZ Act's regime on harmful substances. (9:8)

52. The proposed CCS Act should regulate the discharge of CO_2 from a pipeline in the EEZ or extended continental shelf. (9:36)

53. Marine CCS injection by a New Zealand ship or structure beyond the EEZ and extended continental shelf should be prohibited, and the prohibition should be stated in the new CCS Act. (9:15)

54. The regulation of CCS storage formations (including injection and any leakage of gas) should occur in the new CCS Act, and not Part 20 of the MTA (which concerns hazardous structures and operations). (9:16)

55. The regulation of discharges of CO_2 from CCS injection installations should not occur under Part 20 of the MTA. In the EEZ they should be subject to the new CCS Act, and, in the coastal marine area, to the RMA. In both they should also be subject to the Emissions Trading Scheme. (9:17)

General

56. The proposed CCS Act should include a general power to make regulations to give effect to the purpose of the Act, especially for health and safety reasons, and powers for the inter-agency exchange of information. (2:14)

4 Climate Change Response Act 2002

57. It should be possible for the operator of a CO_2-EOR project to become a voluntary participant in the Emissions Trading Scheme in order to claim credits in NZUs for removal activities, but only if an injection permit has been issued for the project under the CCS legislation. (7:12)

58. Storing CO_2 after capture should be a removal activity under the NZ ETS whether or not a person is required to surrender units in respect of the emissions that would result. Paragraph (a) in Schedule 4 part 2, Subpart 2 of the Climate Change Response Act 2002 can simply be deleted. (11:1)

59. The Climate Change (Other Removal Activities) Regulations 2009 should be amended (or complemented with parallel regulations) for CCS, in order to provide for measurement, monitoring and reporting of CO_2 that is sequestered, and for any other matters required for the management of CCS as a removal activity. The MMV requirements under the proposed CCS legislation should form the basis for data and reporting of injection and any leakage from CCS storage sites. (11:2)

60. The Climate Change Response Act 2002, Schedule 3 should be amended to include CO_2 geosequestration as an activity for which a person must be a participant under the NZ ETS. This will place the obligation on a CCS operator to surrender NZUs for any leakage from a storage site. The CCS operator will be subject to this obligation during the injection period and during the closure period. (11:3)

61. The CCS operator must continue to be a participant in the NZ ETS until the site closure authorisation is issued. (11:4)

5 Crown Minerals Act 1991

62. A new CCS Act should be enacted separately from the Crown Minerals Act 1991. (2:11)

63. The definition of "mining" (ie production) under the CMA should be amended to include CO_2 storage incidental to an authorised EOR activity. (7:11)

64. The powers of the Minister or Ministers to avoid and resolve conflicts between CCS and CMA activities will apply to both CCS and CMA activities and will require provisions in both Acts. An amendment to the CMA will ensure that the Minister and other decision-makers may, and are required to, take into account CCS matters in making decisions under the CMA on permits, permit conditions and regulations. The amendment should ensure that the purpose of the CMA stated in section 1A does not prevent decision-makers from taking CCS considerations into account in the administration of the Act. (7:2)

65. The regulatory framework for EOR operations under the CMA should be developed, in the light of a CCS rationale, in order to provide a measure of clarity and certainty about how such operations may be planned. (7:10)

6 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012

66. In relation to the EEZ Act, we make the following recommendations (assuming that the transfer of control of discharge and dumping from the Maritime Transport Act, pursuant to the Marine Legislation Bill, takes place). Regulation of CCS (including CO_2 injection, storage, and possible leakage) in the EEZ and the extended continental shelf should be removed from the EEZ Act and regulated instead under a new CCS Act. Regulation under the new CCS Act should include the injection of CO_2 arising from offshore natural gas processing. (9:7)

67. The regulation of discharges of CO_2 from injection installations should occur under the new CCS Act, rather than through an extension of the EEZ Act's regime on harmful substances. (9:8)

68. The new CCS Act should prohibit marine CCS injection that is not in accordance with Annex 1 of the London Dumping Protocol, and should require compliance with the processes in Annex 2 of the LDP. Reference should also be made to guidelines produced under the LDP, as instruments with which CCS operations should be consistent. (9:9)

69. Until a CCS Act is enacted, dumping regulations under the EEZ Act must be consistent with the LDP (for example, not classifying CCS as a permitted activity) and provide an avenue for applications to be assessed, because in the interim CCS will be caught by the EEZ Act's provisions on dumping. (9:10)

70. The CCS Act and the EEZ Act should remove the need for marine consent under the EEZ Act to dump CO_2, discharge CO_2, or place matter under the seabed. Consent should continue to be required under the EEZ Act for incidental discharges, the construction and placement of structures and pipelines, and disturbance to the seabed. Incidental discharges of CO_2 from installations in the EEZ should be controlled under the new CCS Act because they are unlikely to be restricted under the EEZ Act. (9:11)

71. A single board of inquiry process should be utilised for decision making on authorisations under the RMA/EEZ Act and CCS legislation, without use of a non-notified discretionary activity status. (9:12)

72. The EEZ Act should be amended to direct a decision maker to have regard to the positive effects of CCS on climate change, and should prevent CCS from being obstructed by the direction not to have regard to the effects on climate change of discharging greenhouse gases into the air. (9:13)

73. Those aspects of pipelines already regulated under the RMA (including the alignment of pipelines and any discharge of CO_2 from pipelines) should remain under the RMA. Those aspects of pipelines already regulated under the EEZ Act (including alignment of pipelines) should remain under the EEZ Act. (9:33)

74. Regulations for pipelines, including CCS pipelines, should be made under the EEZ Act. (9:34)

75. CCS should be part of the regulatory programme under the EEZ Act. (9:14)

7 Hazardous Substances and New Organisms Act 1996

76. The classification of CO_2 under the Hazardous Substances and New Organisms Act 1996 (not classified as hazardous) remain unchanged. (2:15)

8 Health and Safety in Employment Act 1992

77. The Health and Safety in Employment Act 1992 and regulations under it should apply to CCS operations. (2:13)

78. The Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013 should be amended to include CCS operations. (6:5)

79. The construction and fitness of offshore CCS injection installations should be regulated under the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013 by extending their application, that reference be made to specific international standards on CCS, and that the application of the HSEA and its Regulations in the EEZ and the extended continental shelf be expressly confirmed by amending the Act. (9:32)

80. The Health and Safety in Employment (Pipelines) Regulations 1999 should be amended:

    (a) to include pipelines carrying CO_2, including pipelines in the territorial sea, the exclusive economic zone, and on the extended continental shelf;

    (b) to clarify at what point a pipeline becomes part of an offshore petroleum installation and more generally exactly what facilities constitute a pipeline;

    (c) to ensure that suitable up-do-date standards covering CCS pipelines specifically apply, without relying on a broad reference to generally accepted practice;

    (d) to ensure that obligations to maintain certification and compliance with standards are imposed directly without qualification as to "all practicable steps."

    (e) to ensure that the effect of the HSE (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 on the CCS stages of capture, transport, and injections is clarified. (8:3)

81. The Health and Safety in Employment (Pipelines) Regulations 1999 should be extended to apply to CCS pipelines in marine areas as well as onshore. Technical standards specific to CCS should be incorporated. The HSEA should be amended to clarify that it applies to pipelines and structures in the EEZ and on the extended continental shelf, and that submarine pipelines are places of work under the Act. (9:35)

9 Marine and Coastal Area (Takutai Moana) Act 2011

82. A CCS operation should have the status of an "accommodated activity" by reason of being a network utility operator under the RMA. (9:30)

83. The use of the subsurface of land for CCS injection and storage purposes under both protected customary right areas and customary title areas should be vested in the Crown as are such rights elsewhere. (9:31)

10 Maritime Transport Act 1994

84. In relation to the Maritime Transport Act 1994, we make the following recommendations assuming that the transfer of control of discharge and dumping from this Act to the EEZ Act takes place, pursuant to the Marine Legislation Bill. Marine CCS injection by a New Zealand ship or structure beyond the EEZ and extended continental shelf should be prohibited, and the prohibition should be stated in the new CCS Act. (9:15)

85. The regulation of CCS storage formations (including injection and any leakage of gas) should occur in the new CCS Act, and not Part 20 of the MTA (which concerns hazardous structures and operations). (9:16)

86. The regulation of discharges of CO_2 from CCS injection installations should not occur under Part 20 of the MTA. In the EEZ they should be subject to the new CCS Act, and, in the coastal marine area, to the RMA. In both they should also be subject to the Emissions Trading Scheme. (9:17)

87. CO_2 is not, and should not, be considered a "harmful substance" to be regulated under Part 20 of the MTA. (9:18)

88. Legal recourse for pollution damage is required by UNCLOS, and Parts 25 or 26A of the MTA should remain unchanged. The main control of CO_2 leakage should be under the proposed CCS Act. (9:19)

89. A CCS injection installation should be included within the definition of a "structure" under the MTA, to ensure that any discharges of harmful substances (such as incidental discharges of oil) are subject to Parts 25 or 26A. (9:20)

11 Resource Management Act 1991

General

90. The drafting of CCS legislation should draw on the accrued capability and experience with the management of comparable activities under the RMA. (2:10)

91. The injection and storage of CO_2 should be authorised under a new CCS Act, while the RMA continues to apply to other aspects of CCS operations. (2:1)

92. The RMA will be amended so that the injection of CO_2 for permanent sequestration will not be the discharge of a contaminant. Injection and any migration or leakage from a geological storage formation will be dealt with under the proposed CCS Act and not the RMA. (2:2)

93. Incidental discharges from CCS injection activities and transport (for example occasional discharges of CO_2 to the atmosphere, or stormwater runoff from industrial facilities) will remain regulated under the RMA, and continue to be discharges to land, air or water under that Act, regulated by the regional council. (2:3)

Purpose and principles, NES and NPS

94. Section 7 will be amended to ensure that regard will be had to the benefits to be derived from the use and development of CCS. (2:4)

95. A National Policy Statement will be made under the RMA in order to provide nation-wide guidance and policy direction for CCS activities that remain subject to the RMA. Alternatively, provisions in the proposed CCS Act can be deemed to be an NPS. (2:6)

96. A National Environmental Standard should be considered to facilitate aspects of CCS operations, especially pipelines. (2:7)

97. We recommend that a National Environmental Standard and a National Policy Statement under the RMA make provision for the decommissioning of a CO_2 pipeline. (8:7)

Call in, matters to be taken into account

98. The powers of the Minister for the Environment to call in a proposal of national significance under sections 140 to 150AA of the RMA will be amended to provide that, where a person makes an application for an injection permit under the proposed CCS Act, the Minister shall exercise his or her powers to call in all RMA aspects of the proposal to be heard and decided in the same process as that for the injection permit. A board of inquiry will be empowered to decide the RMA resource consents along with the injection permit. The public participatory processes under each Act should be aligned so that submissions are processed and heard only once in relation to a single CCS proposal. (2:8)

99. Where an RMA notice of requirement for a CO_2 pipeline is made along with a CCS injection permit, it should be called in and heard and processed with that application and all ancillary applications, in order to provide procedural integration; but a separate application for a pipeline designation should also be possible. A National Policy Statement and a National Environmental Standard for CCS should extend in their provisions to CCS pipelines, and in particular decommissioning requirements. (8:2)

100. Sections 70A and 104E and related provisions will be amended to ensure that CCS is not unintentionally obstructed by the policy of removing from the RMA the consideration of the discharge into air of GHGs. A second exception can be added to sections 70A and 104E to allow councils and consent authorities to have regard to the extent that the use and development of CCS enables a reduction in the discharge into air of GHGs, either in absolute terms or relative to the use and development of non-renewable energy without CCS. (2:5)

Designation

101. The requiring authority system under the RMA leading to a Public Works Act process should be made available for CCS pipeline and CCS injection operations for the compulsory acquisition of surface rights to land. (4:1)

102. As also recommended in Chapter 4, the RMA should be amended so that a company that undertakes, or proposes to undertake, the distribution or transmission of CO_2 has the status of a network utility operator in order to be able to obtain a designation and rights of land acquisition. (8:1)

103. The RMA will be amended to extend the list of network utility operators in section 166 to a person who operates, or proposes to operate, a network for the purpose of carbon capture, the transmission of CO_2 and geological storage of CO_2. This will make a CCS company eligible to become a requiring authority with rights to designate and to acquire land and rights of way compulsorily, and will facilitate status as an accommodated activity under the Marine and Coastal Area (Takutai Moana) Act 2011. (2:9)

104. The definition of "network utility operator" in section 166 of the RMA should include a person who undertakes or proposes to undertake a CCS pipeline operation or a CCS injection operation. (4:2)

105. In relation to injection operations, eligibility should be confined to persons holding injection permits for CCS operations. (4:3)

Coastal Marine Area

106. The regulation of CCS injection (comprising dumping and discharge) in the coastal marine area should be removed from the RMA and controlled under new CCS legislation, which must conform to the requirements of Annexes 1 and 2 of the LDP. (9:21)

107. The regulation of CCS storage formations after injection, including leakage, should also be removed from the RMA (and also Part 20 of the MTA) and controlled under new CCS legislation. (9:22)

108. We recommend an amendment to section 12, to clarify that the presence of injected CO_2 under the seabed for the purposes of CCS does not amount to a coastal occupation for the purposes of the Act or require consent by virtue of section 12. (9:27)

109. The regulation of discharges of CO_2 from CCS injection installations should not occur under Part 20 of the MTA. In the EEZ they should be subject to the new CCS Act, and, in the coastal marine area, to the RMA. In both they should also be subject to the Emissions Trading Scheme. (9:17)

110. Ancillary discharges from CCS installations (including incidental discharges of CO_2 to air or water) should be regulated under the RMA by including a CCS injection installation in the definition of an offshore installation under the MTA and therefore the RMA. (9:23)

111. RMA requirements should continue to apply to incidental discharges from an injection installation (including escapes of CO_2 to air or water), noise effects, and the disturbance of the seabed in the coastal marine area. (9:28)

112. The NZCPS should be amended to acknowledge the benefits of marine CCS. (9:29)

113. RMA requirements for a coastal permit for occupation of coastal space should continue to apply to CCS surface operations (including exploration), subject to restrictions to prevent a CCS application from being classified in a regional plan as non-complying or prohibited; and to ensure that they are evaluated on a first-in-first-served basis rather than any other allocation method. (9:24)

114. The use or occupation of the subsurface of the coastal marine area for CCS purposes, including storage formations and pore space, should be removed from control under the RMA, so that the initial and continued presence of injected gas does not amount to occupation. (9:25)

115. Provision should be made to ensure that a CCS operation not be impeded by a coastal permit granted for exclusive occupation. (9:26)

116. A procedure should be introduced for the grant of an overlapping coastal permit for necessary infrastructure with a balancing of the interests of the two parties. (4:4)

117. Those aspects of pipelines already regulated under the RMA (including the alignment of pipelines and any discharge of CO_2 from pipelines) should remain under the RMA. Those aspects of pipelines already regulated under the EEZ Act (including alignment of pipelines) should remain under the EEZ Act. (9:33)

12 Submarine Cables and Pipelines Protection Act 1966

118. The Submarine Cables and Pipelines Protection Act 1966 should continue to apply to CCS pipelines. (9:37)

13 International Law Matters

119. International law provides an adequate basis for domestic jurisdiction to regulate marine CCS in the territorial sea, EEZ and extended continental shelf, but does not allow CCS injection to occur beyond the extended continental shelf in the international seabed area. (9:1)

120. New Zealand remains under a general obligation to accompany marine CCS with measures to reduce the need for CCS, such as by promoting renewable energy and energy efficiency, and this obligation should be taken into account in policy making and law reform. (9:5)

APPENDICES

A *Carbon Capture and Storage – A Review of the Australian Legal and Regulatory Regime*, Robert Pritchard

B *The Developing Regime for the Regulation of Carbon Capture and Storage Projects in Canada*, Nigel Bankes

C *An Overview of CCS Law and Regulation in Norway*, Hans Christian Bugge

D *Resource Management Act 1991 Issues*, Trevor Daya-Winterbottom

E *Treaty of Waitangi Issues in Respect of Carbon Capture and Storage*, Valmaine Toki

F *Supplementary Material on CCS Offshore for Chapter 9*, Greg Severinsen

APPENDIX A

Carbon Capture and Storage – A Review of the Australian Legal and Regulatory Regime

Robert Pritchard

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Introduction

(i) Purpose of Report

This report has been prepared by Robert Pritchard for the University of Waikato, Hamilton, New Zealand as part of a carbon capture and storage (CCS) legal and regulatory research project for the New Zealand Ministry of Business, Innovation and Employment.

This report reviews Australia's experience in the design and development of a CCS legal and regulatory regime for its offshore area (the regulatory regime). It has been prepared for the limited, albeit specific and important, purpose of identifying issues that may be of value to New Zealand in designing and developing a regulatory regime of its own to facilitate the development of CCS as a mechanism for reduction of greenhouse gas (GHG) emissions, both onshore and offshore.

(ii) The IEA Model Framework

The 2010 IEA publication *Carbon Capture and Storage Model Regulatory Framework* (the IEA Model Framework) has summarised the scope of regulatory issues that need to be addressed:

> Regulatory frameworks are required to ensure the effective stewardship of CO_2 storage sites over the long term, the protection of public health and the environment, and the security of CCS activities. Appropriate regulatory frameworks are also required to clarify the rights and responsibilities of CCS stakeholders, including relevant authorities, operators and the public. Additionally, regulations are needed to underpin performance and associated incentive schemes, commercial transactions relating to CCS operations, and also to build public confidence in, and acceptance of, the technology.

The IEA Model Framework identified 29 issues that it saw as critical to the regulatory regime. It focused primarily, as does this report, on the issues associated with CO_2 storage since issues associated with CO_2 capture and transport are likely to fall within existing regulatory frameworks. The IEA Model Framework also provided a model text for regulating the following activities:

(a) exploration for a potential storage site, including site characterisation and selection;

(b) operation of a storage site;

(c) cessation of injection activities at a storage site;

(d) closure of a storage site; and

(e) transfer of responsibility for a storage site to a relevant government authority.

(iii) The Effectiveness and Affordability of CCS

CCS has the potential to be possibly the most effective mechanism for reducing global GHG gas emissions – provided it can be deployed affordably. The cost of capture is believed to be the largest cost component of CCS (usually greater than 80%) but there is considerable variability according to technology choice, CO_2 purity, site-specific and regulatory factors.

The regulatory regime has a crucial role in providing an efficient investment environment to enable CCS to be deployed affordably.

(iv) Uncertainty over Regulation of GHG Emissions, Including the Price of Carbon

The regulation of GHG emissions across the entire economy, including the imposition of a price on carbon, also has a great deal to do with the affordability of CCS.

As the IPCC has suggested:

> [O]nce the full cost of the complete CCS system has been accounted for, CCS systems are unlikely to deploy on a large scale in the absence of an explicit policy or regulatory regime that substantially limits greenhouse gas emissions to the atmosphere.

According to the International Energy Agency, to be affordable in the long term, CCS may require a global long-term carbon price of around US$52 per tonne. To induce switching in the short-term, the price may need to be considerably higher, perhaps two or three times higher.

With effect from July 2013, the Australian government imposed a price on carbon, commencing with a comparatively high fixed price of $23/tonne in the first year, escalating annually for another two years, before changing to a market-based price. Carbon pricing has been insufficient to induce technology switching on any scale in Australia. More importantly, carbon pricing faces the prospect of repeal in Australia following the change of government in September 2013.

The high cost of CCS and the absence of adequate economic incentives in Australia, as elsewhere, is likely to remain the major barrier to its widespread deployment; hence the need for continuing focus on the efficiency of the regulatory regime.

(v) Main Regulatory Issues Addressed in this Report

Irrespective of cost, investors will not commit to CCS projects unless there is clarity of the regulatory regime, particularly in relation to property and liability issues.

The main property issues are:

(1) the right of access – not only to the surface of land or subsea area for operations but also to the underground aquifer or pore space into which injection and storage could occur (the storage site) – and the need to avoid conflict with present and future petroleum operations;

(2) the right to inject substances into the storage site;

(3) the right to continue to store the injected substances in the storage site and the right to later remove them; and

(4) the main liability issue is the long-term liability for leakage of the injected substances.

(vi) Australia's Experience to Date

By contrast with New Zealand, Australia has a federal system of government. Each Australian State has jurisdiction both onshore and in its coastal waters (up to three nautical miles offshore from the low water baseline) but the Commonwealth has jurisdiction beyond State jurisdiction to the outer edge of Australia's continental shelf. Australia's offshore area provides most of the potential storage sites.

The Commonwealth was an early mover, internationally, in enacting in 2008 a CCS legal and regulatory regime for its offshore area, which it folded into the existing offshore petroleum legislation, retitling it as the *Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Commonwealth)* (whose storage provisions are referred to in this review as the *Offshore Storage Act* or more simply as OSA or the Act).

The Australian legislation to date (for both onshore and offshore areas) comprises:

Offshore Storage Act 2006 (Commonwealth)
(whose storage provisions became operative in 2009)

Barrow Island Act 2003 (Western Australia)

Petroleum Act 2000 (South Australia)

Greenhouse Gas Storage Act 2009 (Queensland)

Greenhouse Gas Geological Sequestration Act 2008 (Victoria)

Offshore Petroleum and Greenhouse Gas Storage Act 2010 (Victoria)

The Commonwealth and the Australian States have, however, taken an inconsistent approach towards the promotion of onshore projects in their respective jurisdictions and towards risk management:

> All of the Australian CCS regimes adopt different thresholds, criteria and definitions including in relation to suitable site selection, serious situations, responses to risk, and whether the stored substance is behaving as predicted. These regimes also have very different approaches to the treatment of the long-term liabilities of project operators with some jurisdictions providing different levels of indemnities and others electing to leave the loss where it falls.[1]

1 N Swayne (nee Durrant), "Carbon Capture and Storage Laws in Australia: Project Facilitation or a Precautionary Approach?", (2010) *Environmental Liability*, Vol 18 Issue 4, at 148–157.

A consequence of the Australian legislative inconsistency is that:

> [D]iffering liability rules … across the jurisdictions [have created] unnecessary legal uncertainty and higher transaction costs, acting as a barrier to the commercial deployment of CCS technology[2]

> [Australia] has some of the most extensive laws on CCS in the world, yet the differing positions currently being taken on long-term liabilities may prove a real hindrance to investment in the technology.[3]

(vii) The Need for Conflict Avoidance and for Legal and Regulatory Clarity and Certainty

In our opinion, it is not so much any jurisdictional differences in liability rules that are a hindrance to CCS investment in Australia but the potential for conflict between operators of petroleum and GHG storage activities, coupled with the daunting cost of CCS as an emissions reduction mechanism in itself, a cost that is made more daunting by any uncertainty over long-term liability. There is a need to focus on conflict avoidance and efficient conflict resolution between petroleum operators and storage operators. There is also a very strong case for legal and regulatory clarity and certainty, including the limitation of common law liability.

(viii) The Formulation of the Australian Offshore Regulatory Regime

In reviewing Australia's experience for the purposes of the NZ research project, we have largely confined ourselves to the Commonwealth's offshore regulatory regime that led the way. The OSA is the main Australian legal instrument to which we will refer. The purpose of the OSA was:

> [T]o establish a system of offshore titles, similar to the offshore petroleum titles that already exist …, that will authorise the transportation by pipeline and injection and storage of greenhouse gas substances in deep geological formations under the seabed … Each form of activity will have the potential to impact on the other, both beneficially and detrimentally. The Bill therefore provides for regulatory decisions made in respect of each form of activity to take into account potential impacts on the other.[4]

(ix) The Approach of this Paper

The OSA was formulated in 2008 after a process of consultation between the federal government and industry in which 12 key issues were considered and canvassed by the government's 2008 discussion paper.

2 N Swayne, and A Phillips, "Legal Liability for Carbon Capture and Storage in Australia: Where Should the Losses Fall?" (2012) 29 *EPLJ* 189 at 190.

3 I Havercroft, et al, Carbon Capture and Storage: Emerging Legal and Regulatory Issues, (Hart Publishing, Oxford, 2011) at 3.

4 Explanatory Memorandum, Offshore Petroleum Amendment (Greenhouse Gas Storage) Bill 2008, Australian Parliament, 2008.

This paper approaches the review of Australia's experience relating to its offshore CCS regime by discussing in turn the implementation of each of the original issues. For convenience of treatment, the paper has divided some of the original issues into discrete components, expanding the list to the 15 issues set out below:

1. What legislation should be used to provide the access and property rights?
2. What management system is needed for the release and award of exploration areas?
3. What regulation is needed to manage environmental issues?
4. What regulation is needed to manage occupational health and safety issues?
5. What regulation is needed for site management?
6. What specific regulation is needed for monitoring and verification of stored substances?
7. What specific regulation is required for remediation and mitigation of leakage?
8. What specific regulation is required for reporting requirements?
9. What regulation is needed in respect of site closure?
10. What regulation is needed to manage transport?
11. What regulation is needed in respect of long-term liability?
12. What regulation is needed in respect of performance bonds and guarantees?
13. What regulation is needed to manage interactions with the petroleum industry?
14. What regulation is needed to manage interactions with other users of the sea?
15. Who should be the regulator?

In discussing many of the issues, we have provided a table headed 'Summary of Advantages and Disadvantages' that in each case is an edited version of a table that appeared in the government's 2008 discussion paper.

Following each issue, we have provided various comments, which are a mixture of comments by others, including officials of the Department of Resources, Energy and Tourism, and ourselves.

Where the text is underlined, this denotes our personal views on specific points that we hope will be of particular interest to the project research team.

We reiterate that the focus of this paper is on Australia's offshore regime.

1 What legislation should be used to provide the access and property rights?

The Commonwealth had a choice of 3 legislative options for its offshore regulatory regime. It ultimately decided that, to minimise complexity, legislation combining both petroleum and GHG storage operations was desirable. The 3 options were:

(i) Project-specific legislation

By the *Barrow Island Act 2003*, the State of Western Australia had made project-specific provision for CCS for the Gorgon LNG Project. The Commonwealth rejected this type of project-specific legislation for a number of reasons:

- project proponents would have no certainty as to their future access until after exploration
- the question would remain of under what framework any initial exploration would be undertaken
- time would be required to develop new legislation for each new project as proposed
- it would become difficult to manage project variations and changes in future practices and
- it would not provide consistency.

(ii) Stand-alone or separate storage legislation

Stand-alone storage legislation (i.e. separate from the petroleum legislation) was seen as increasing the risk that future changes to either the storage industry or the petroleum industry would not take the other industry into account.

Stand-alone legislation could have been developed as a 'satellite act' of the petroleum legislation but this was considered by the Commonwealth to be cumbersome and potentially inefficient.

(iii) Amendment of the Offshore Petroleum Act (OPA) (whose storage provisions are now referred to in this report as the OSA)

Many of the companies wishing to undertake storage activities were expected to be petroleum companies, either wishing to store greenhouse gases that they had produced themselves or acting in collaboration with the power generation industry.

Most of the technologies, equipment and techniques used for injection and storage are identical to those used in the petroleum industry. It was particularly recognized that the petroleum industry had considerable injection experience in respect of:

- natural gas for permanent disposal in remote areas where there is no market for the natural gas
- natural gas reinjected to increase the volume of liquids produced from a well and
- carbon dioxide for enhanced oil recovery.

Combining all requirements within a single piece of legislation was seen as easier for users.

Summary of advantages and disadvantages		
	Potential advantages	**Potential disadvantages**
Project - Specific Legislation		Problems of inconsistency, industry uncertainty
Stand-Alone Legislation	Single purpose legislation will be shorter	Requires a new framework for providing access and property rights Will require extensive cross reference to the OPA to manage interactions with the petroleum industry
Offshore Petroleum Act (OPA)	Draws on well established and understood framework for providing and managing access and property rights Provides an integrated management regime, reducing the need for new regulations, dealing for essentially identical activities	Act becomes very large Could be perceived as making greenhouse matters the province of the petroleum industry

The Commonwealth opted for a single, combined regime. The OPA thus became a huge piece of legislation with 791 sections and 7 schedules.

The OSA now provides a comprehensive statutory system of access and property rights for exploring for and using offshore storage sites, as well as for exploring for and developing petroleum fields.

Unlike the Commonwealth, the State of Queensland opted for stand-alone legislation.

The first step in the process of providing access and property rights to potential storage sites under the OSA is that the government carries out an initial screening of potential storage sites before making a decision to release specified areas for exploration. These areas can then be bid for by applicants, as described in the next section of this report.

Comments by ResourcesLaw

(i) Preference for Stand-Alone Legislation

Contrary to what the Commonwealth of Australia decided, we recommend stand-alone legislation rather than consolidation with existing petroleum legislation. We consider it to be more straightforward and suitable for a new storage regime.

(ii) Regulatory Certainty is Paramount

Despite our own preference for stand-alone legislation, we do not believe the type of legislation to be a critical issue for investors; their paramount concern will always be with regulatory certainty.

(iii) What New Zealand Should Do

We suggest that New Zealand's legislative approach should be based on whatever may be the most expedient for New Zealand, paying respect to its existing mining, petroleum and environmental laws.

2 What management system is needed for the release and award of exploration areas?

There are two basic alternatives for awarding exploration areas (assessment permits) to prospective GHG operators:

- direct allocation to potential users based on some criteria such as perceived need; or
- some form of competitive process, allowing the selection of a winning bid, following an initial screening of potential sites by the government.

Australian petroleum legislation has always provided for a competitive bidding process. There are 2 types:

- cash bidding (which involves bidders tendering a cash amount for the rights to the area, but is rarely used) or
- more typically, work program bidding (in which bids are assessed in terms of the commitments that bidders put forward; a condition of awarding the exploration area is that the commitments must be met).

For GHG assessment permits, both types of bidding were provided for in the OSA,[5] although it is highly unlikely that cash bidding will ever be used in practice.

Advance screening by the government of areas prior to release was considered essential to ensure that areas are appropriate and that the needs of other users of the sea are taken into account.

5 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 288.

The alternative procedure of direct allocation of areas to project proponents would have provided greater certainty to potential operators at an early stage but was rejected by the Commonwealth as it was not open and transparent.

Some stakeholders disagreed at the time, arguing that direct allocation would reduce uncertainty about access to sites and would promote a more rapid uptake.

The government decided that, overall, the market, operating under a bidding system, would provide the best results. It was thought that, to capitalise on an investment in assessing a greenhouse storage site, a storage operator would have a very strong incentive to do business with a greenhouse gas producer (and vice versa).

Summary of advantages and disadvantages		
	Potential advantages	**Potential disadvantages**
Competitive bidding process	Provides a transparent market based process for allocation of areas	Less certainty for greenhouse gas storage proponents
Direct allocation of areas	Provides greenhouse storage proponents with greater certainty as to access	Not a transparent process No certainty that the 'best' potential applicant is awarded the area

Comments by ResourcesLaw

(i) Assessment Permits

The OSA makes it an offence to inject or store a substance in an offshore area unless it is authorised by an injection licence under the OSA or is otherwise authorised by the petroleum regime.[6]

Under the OSA, assessment permits are granted for a term of 6 years, with one possible extension of 3 years.[7]

An assessment permit carries the right to explore for GHG storage formations and, if successful, the exclusive right to convert this to a holding lease or an injection licence.

(ii) Rights of Petroleum Title Holders

It is important to emphasise that the OSA makes special provisions for petroleum title holders:

(1) Petroleum title holders also have the right to explore for GHG storage formations in their title areas without an assessment permit.[8]

(2) They may also apply for injection licences if there is not already an assessment licence or an injection licence in force over the petroleum production area.[9]

6 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 356.

7 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 293.

8 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 98.

9 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 369.

(iii) Criteria for Award of Assessment Permits: Who is the 'Most Deserving'?

Blocks are advertised for application by qualified bidders, that is bidders having appropriate technical qualifications, financial resources and a suitable work program.[10]

The task in granting an assessment permit is to select the work program bid most likely to achieve the fullest assessment of the GHG storage potential within the permit area. Multiple applicants are ranked according to the order in which they are considered to be "most deserving" of the grant.[11] The criteria for determining who is most deserving must be made publicly available by the Minister and may relate to economic, technical and public interest matters. Typically the criteria would be expected to include:

(1) the number and timing of wells to be drilled, assuming there is an adequate supporting program of geological and geophysical work;

(2) the amount, type and timing of seismic surveying to be carried out;

(3) other new surveying, data acquisition, sampling, monitoring and reprocessing to be carried out;

(4) the amount, type and timing of any purchasing or licensing of existing data;

(5) potential migration paths for injected GHG substances;

(6) potential impacts on petroleum operations;

(7) the extent to which the proposed work program takes account of existing or potential petroleum operations; and

(8) whether an applicant has a GHG stream for injection.

(iv) Obligations Attached to Assessment Permits

Assessment permits are subject to a range of statutory obligations.[12] In addition, they will contain a range of permit-specific conditions.[13]

The permit holder must apply to the Minister for further specific approval prior to undertaking 'key greenhouse gas operations' (such as drilling) under the permit.[14] The Minister may attach conditions to any such approval and compliance with those conditions itself becomes a condition of the permit.

The Minister must not approve any key greenhouse gas operations if there is a risk of significant adverse impact on petroleum operations.[15]

10 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 296.

11 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 298.

12 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 290 and s 291.

13 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 298.

14 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 292.

15 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 292.

(v) The Risk of Adverse Impact on Petroleum Operations

In addition, the Minister has power to give directions to a permit holder to eliminate, mitigate or manage a risk of a significant adverse impact on existing or future petroleum operations.[16] Failure to comply is an offence of strict liability.[17]

(vi) Maintaining Assessment Permits in Good Standing

Where a work program condition has not been complied with, the permit would normally be in default and would be cancelled. However, the permittee can maintain 'good standing':

(1) by undertaking to spend an amount equal to the agreed monetary value of the outstanding work commitments on qualifying additional work in permits over alternative acreage. The defaulting permit holder must agree in writing to maintain its good standing and must make a public statement about its undertaking at the time of cancellation or determination of their permit, or at such time as may be agreed with the Minister. A permit holder will be deemed to be in good standing once such an agreement is reached, until such time as it fails to progress with its undertaking; and

(2) by satisfying the Minister that the work undertaken has demonstrated that the area is unlikely to contain a commercial-scale storage formation.

According to Departmental guidelines, a permit holder that is in default of its work program conditions under an assessment permit, but wishes to maintain its good standing, may be able to do so by satisfying the Minister that it has made a significant attempt to assess the GHG storage potential of the permit area. The Minister may take into account whether the defaulting permit holder has completed work in excess of the second highest bid for the permit area.

(vii) Holding Leases and Injection Licences

If a permittee discovers an 'eligible greenhouse gas storage formation',[18] it must apply to the Minister to declare the storage formation as an identified storage formation.[19]

A declaration of a storage formation allows the permittee to apply for a 5 year holding lease[20] or an injection licence for an indefinite term over the declared storage formation.[21]

(viii) Determination of Suitability and Spatial Extent of Holding Leases and Injection Licences

The 'fundamental suitability determinants' (which the permittee must specify in its application) and geological factors together determine the spatial extent of a storage formation and hence the boundaries of a future holding lease or injection licence.

16 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 316.

17 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 317.

18 As defined by Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 21. The formation must be part of a geological formation that is suitable for the permanent storage of at least of at least 100,000 tonnes.

19 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 312.

20 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), Part 3.3. Under s 322, a holding lease remains in force for 5 years. There is also provision under s 336 for the grant of a special holding lease for an indefinite duration where an applicant unsuccessfully applies for an injection licence.

21 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), Part 3.4. Under s 359, an injection licence remains in force indefinitely. Under s 360, it may be terminated if there are no injection operations for 5 years.

A potential storage formation must fulfill simple criteria such as effective sealing mechanisms and possible migration pathways that could be suitable for storage. However, a detailed evaluation of the 'fundamental suitability determinants' (which include such factors as the amount of GHG substance to be stored, injection rates and sites, and the effective sealing mechanism) has to be determined before the formation can be considered an eligible storage formation.

Potential subsurface migration pathways could be extensive and a GHG substance may continue to migrate in subsurface areas for many years after injection has ceased. Work programs proposed in applications may include fieldwork outside the permit area where this is aimed at identifying possible risks of leakage or other adverse impacts that may arise in the long term. This may require expenditure and work to be undertaken outside the assessment permit area, in which case it is the applicant's responsibility to seek the appropriate access permission.

Storage formations will commonly be much larger than petroleum accumulations and may often cover a large proportion of an assessment permit area. This factor is taken into account in the OSA, which does not require the relinquishment of part of a GHG assessment permit area, unlike in the case of petroleum.

These key differences, especially the potentially large spatial extent of storage formations, also highlight the importance of taking 'basin management' into account in GHG storage activities. Basin management includes considerations such as basin-wide reservoir pressure regimes, and possible impacts on petroleum and groundwater resources.

(ix) The Alternative Case of Direct Allocation of Assessment Permits

The relatively slow uptake of potential storage sites in Australia continues to throw doubt on the efficacy of competitive bidding as a method of allocating assessment permits over potential storage sites.

We consider there is a strong argument in principle for direct allocation, at least for early-stage CCS projects. The increased investment certainty that it provides could lead to a more rapid uptake of projects.

The potential for conflict with petroleum operations remains very real. It is discussed further in section 13 of this report.

3 What regulation is needed to manage environmental issues?

Although the storage industry will not usually involve the production of petroleum and the risk of petroleum spills, the environmental risks that apply to the storage industry will be similar to those that apply to petroleum operations. They may include, for example, disturbance of habitat during construction, operation and decommissioning and potential impacts on migratory species.

There are also some specialised risks associated with the impact on any leakage of greenhouse gases to the environment, including, for example, the potential impacts of acidification of water.

Developing new arrangements for the storage industry was thought to duplicate existing arrangements.

Summary of advantages and disadvantages		
	Potential advantages	**Potential disadvantages**
Use of petroleum industry model	Improved efficiency through the use of proven system	
Develop new arrangements		Would require duplication of existing arrangements

Comment by ResourcesLaw

(i) Before storage projects may commence, the existing environmental laws provide that environmental approval be granted by the Minister for the Environment, which requires the proponents to file a detailed environmental impact statement, to make it available for public inspection and to take account of public submissions.

(ii) The importance of community consultation prior to the grant of environmental approval is to be emphasised.[22]

(iii) As a general principle, legal appeal processes in respect of environmental approvals should be confined to points of law and should not put courts in the position where they must review issues that relate to environmental and social merit (cf Resource Management Act 1991 s 299).

As with environmental regulation of the petroleum industry, the OSA gives wide power to the Minister to issue remedial directions to authorise the taking of remedial action and, to recover the costs of doing so from the operator.[23]

(iv) It may be a little early to be sure, but it appears that management of the environmental impacts of assessment and injection activities under the broad framework applied to petroleum activities is an efficient way of proceeding.

(v) There is, however, the obvious additional and ongoing need to specifically regulate the safe and secure storage of CO_2 by effective site management, as to which see section 5 of this report.

22 See in this regard P Ashcroft, and C Cormick, "Enabling the Social Shaping of CCS Technology," Chapter 17 in I Havercroft, et al (eds), *Carbon Capture and Storage; Emerging Legal and Regulatory Issues*, (Hart Publishing, Oxford, 2001) at 251–263.

23 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), ss 591–598.

4 What regulation is needed to manage occupational health and safety issues?

Occupational health and safety risks for the offshore storage industry are similar to those for petroleum operations but compliance is less onerous since CO_2 is not flammable.

The role of the existing environmental authority could be expanded to include greenhouse transport, injection and storage within its scope of activities.

Any other approach would require additional legislation and regulation covering essentially identical activities and the establishment of a body to undertake the regulation. This would require the same skill set as are already available skills that are both expensive and in short supply. This approach would also lead to increased costs.

Summary of advantages and disadvantages		
	Potential advantages	**Potential disadvantages**
Use of petroleum industry model	Improved efficiency through the use of proven system	
Develop new arrangements		Would require duplication of existing petroleum arrangements Issue of access to expertise

Comment by ResourcesLaw

Applying the occupational health and safety framework for the petroleum industry to the storage is considered appropriate.

5 What regulation is needed for site management?

Leakage from storage sites poses possible environmental and health risks. It also has the potential to partially negate the purpose of storage, which is to prevent emission of greenhouse gases to the atmosphere. Even if no leakage occurs, undesirable migration could impact adversely on other resources, such as petroleum or potable water.

There were two basic regulatory approaches open to the government in 2008:

(1) submission of site management plans by proponents, for approval by the regulator; or

(2) prescriptive management plans, overseen by the regulator.

Prescriptive criteria were considered unsuitable where there is a lack of experience and where the circumstances of each individual project are likely to be quite different (for example, different quantities and injection rates, different geology). Each project would need to be considered on a case-by-case basis. What might be an acceptable deviation in the migration path of the injected substance in one case might pose unacceptable risks in another.

An outcome-oriented approach to regulation would allow site-specific factors to be taken into account and provide a basis for the adoption of emerging best practice. Thus, the legislation should require an operator to lodge a comprehensive site plan for approval. A greenhouse gas injection licence should not be granted until a project-specific site management plan is approved by the regulator. The plan should contain detailed modelling of the expected behaviour of the GHG substance after injection, including the expected migration path or paths.

The site management plan would need to demonstrate, to the satisfaction of the regulator, that the site and its management would result in 'safe and secure' storage.

The site management plan would need to identify all risk factors and show that risks had been reduced as low as reasonably practicable. The regulator would then have to decide whether these risks, taking into account potential mitigation and remediation strategies, were acceptable.

Summary of advantages and disadvantages		
	Potential advantages	**Potential disadvantages**
Use of site plan model	Allows for use of objective-based regulation Provides flexibility to deal with site-specific factors Allows for rapid adoption of best practice and new technologies	Lower certainty of regulatory requirements
Use of prescriptive regulation	Better certainty of regulatory requirements Simplifies submission and approvals process, but not necessarily outcomes	Does not provide site-specific flexibility Does not allow for improvements in best practice Creates high levels of duty of care responsibilities for the regulator

Comments by ResourcesLaw

(i) We consider that site management plans are seen as the preferred approach to the regulation of environmental risks.

(ii) Under the OSA, the site management plan is the core regulatory document for each project and provides the basis for the day-to-day regulatory interaction between the operator and the regulator. It must be updated periodically and whenever there is a material change in risks.

(iii) Compliance with the site management plan should be a condition of the storage licence.[24]

(iv) See further the succeeding three sections of this report in relation to each of the specific issues of (1) monitoring, (2) leakage and (3) reporting.

6 What specific regulation is needed for monitoring (including verification) of stored substances?

It was envisaged that monitoring should be carried out:

- pre-injection;
- continuously during injection and
- for an appropriate period thereafter.

Monitoring may involve ambient air monitoring, water monitoring, shallow subsurface monitoring, as well as a range of techniques to monitor the movement of the injected substance in the storage formation. Some monitoring may be continuous, while other might be carried out at intervals, depending on site specific factors.

Any monitoring and verification system requires accurate and relevant information that is readily available to the community and independently verifiable.

Monitoring requirements will be highly dependent on site-specific factors and are closely related to the detection of, and reaction to, any incidents that occur, and hence to mitigation and remediation actions that might be required. For these reasons, it was considered most efficient for monitoring to be integrated with the site plan. Specifically, the proponent should be required to propose a monitoring and verification plan that satisfied the regulator that any serious events in the reservoir would be detected in a timely manner. Timely detection of incidents is essential.

The government decided that integration of monitoring and verification requirements into the site plan would provide the linkage needed between different facets of site management.

Comment by ResourcesLaw

It is considered appropriate for the site management plan to contain a comprehensive monitoring and verification program to be implemented by the licensee throughout the injection phase and post-injection phase of the project, to ensure that the injected greenhouse gas substance is behaving as predicted or, if it is not, to identify any risks to the environment, safety or other resources.

See further section 9 of this report concerning post-injection monitoring, both before site closure and post-site closure.

24 OSA, s 358.

7 What specific regulation is required for remediation and mitigation of leakage? The risk of significant adverse impact

If monitoring were to show that the storage site is leaking or behaving in a way that is likely to lead to leakage to the environment, or impact on other resources, then remediation or mitigation strategies may need to be implemented.

Should a serious situation arise, the site management plan should provide a basis for establishing the need for remediation and mitigation and should set out strategies for management of identified risks.

Remediation and mitigation could involve huge expense for the drilling of wells and injection or extraction of large quantities of fluids. If the injected substance behaves otherwise than predicted, or appears likely to do so, the regulator will need power to direct the licensee to take action to eliminate, mitigate or manage any risk posed by the situation, including the suspension or permanent cessation of operations, as well as the taking of action to prevent or remedy any damage that might arise.

Again, integration of remediation and mitigation strategies into the site management plan would provide the linkage needed between different facets of site management.

The OSA confers wide power on the Minister to issue directions, including remedial directions where there is a significant risk of significant adverse impact (often abbreviated to SROSAI) and where a serious situation arises.[25] This is also important to protect existing petroleum interests.

Comment by ResourcesLaw

It is considered appropriate for the site management plan to specify the safeguard measures that will be implemented to ensure that the injected greenhouse gas substance does not deviate from the expected migration path and does not escape into the atmosphere, supported by regulatory powers to direct outcomes in the event that a serious situation arises.

8 What specific regulation is required for reporting requirements?

Accurate and regular information will be required on the volume and location of greenhouse gas emissions that have been abated and are stored underground to meet current and future inventory reporting and commercial requirements and to engender public confidence.

25 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), ss 376-382.

Detailed regulations on reporting requirements need to be developed, having regard to need of the community to understand fully the fate of the greenhouse gas substance and any requirements through a carbon trading scheme and international reporting obligations.

Reporting should include regular reports of the amount of greenhouse gases stored, together with any losses from the transport and injection processes. Reporting may need to be compatible with the requirements of any emissions trading scheme and any international obligations.

Comments by ResourcesLaw

(i) Because reporting requirements can be onerous, they should be made compatible with any requirements of emissions reporting that apply to the rest of the economy.

(ii) Australia has national greenhouse gas emissions reporting (NGER) legislation. This is compatible with its existing carbon pricing scheme.

(iii) Australia's carbon pricing scheme faces the prospect of repeal if there is a change of government in September 2014.

9 What regulation is needed in respect of site closure?

As part of the site closing process, the licensee should be required to remove or decommission any structures, plant and equipment, to plug any remaining exploration or injection wells and make good any damage to the seabed and subsoil. These requirements are consistent with those placed on the petroleum industry.

Requiring the operator to undertake post-injection monitoring should provide a clear and transparent system for managing risk. Risks would be assumed by industry in a way analogous to any other industrial process. Moreover, the operator should have both the experience and knowledge to undertake activities in the most cost-effective manner.

The licensee will need to conduct extensive monitoring and verification of the behaviour of the injected greenhouse gas substance, in order to make reliable predictions as to its potential migration and interaction with the surrounding geological structures. The licensee may be required to undertake precautionary or remedial work to prevent or mitigate harmful effects on the geotechnical integrity of the storage site. The objective during this phase should be for the licensee to satisfy the regulator that all reasonable possibilities have been provided for.

The regulator should be able to compare predictions of the behaviour of the greenhouse gas substance with actual results, in order to inform future regulatory practice and to ensure that no unforeseen events take place.

A site closing certificate would be issued once a high degree of certainty had been attained by the regulator.

Once the regulator the regulator is satisfied, the licensee may apply for closure, which would result in the surrender of the title and the cessation of the statutory obligations for long-term liability.

Summary of advantages and disadvantages		
	Potential advantages	**Potential disadvantages**
	Post-injection/pre-closure	
Undertaken by operator as part of their obligations under their injection licence	Clear and transparent means of addressing liability Risks managed in a similar way to other industries Makes use of operator experience and expertise	
Undertaken by the regulator using funds provided by the operator	Certainty as to timing for end of statutory obligations Provides an incentive for greenhouse gas operations by reducing uncertainty about future liabilities	Period to closure uncertain
Undertaken by the regulator using public funds	Certainty as to timing for end of statutory obligations Provides an incentive for greenhouse gas operations by reducing uncertainty about future liabilities	Liability issues less clear Potential lack of expertise by the regulator Funds may not be sufficient to cover costs
Undertaken by operator as statutory obligation	Clear and transparent means of addressing liability Makes use of operator experience and expertise	Liability issues clear Potential lack of expertise by the regulator Funds may not be sufficient to cover costs Provides government support for project through an non-transparent mechanism
	Post-closure period	
Undertaken by operator as statutory obligation		Cumbersome additional access tenure would be required Does not provide for changes in company circumstances

Summary of advantages and disadvantages		
	Potential advantages	Potential disadvantages
Undertaken by the regulator using funds provided by the operator	Certainty as to timing for end of statutory obligations Allows monitoring to continue independent of company circumstances Provides an incentive for greenhouse gas operations by reducing uncertainty about future liabilities	Potential lack of expertise by the regulator Funds may not be sufficient to cover costs
Undertaken by the regulator using public funds	Certainty as to timing for end of statutory obligations Allows monitoring to continue independent of company circumstances Provides an incentive for greenhouse gas operations by reducing uncertainty about future liabilities	Liability issues clear Potential lack of expertise by the regulator Funds may not be sufficient to cover costs Provides an effective government subsidy through non-transparent mechanisms

Comments by ResourcesLaw

(i) It is appropriate that post-injection/pre-closure monitoring be undertaken by operators.

(ii) It may also be appropriate for operators to be required to make financial provision for post-closure, long term monitoring after they have vacated the site.

(iii) As for post-closure liability, see section 11 of this report.

10 What regulation is needed to manage transport?

Pipelines to transport greenhouse gases are an integral part of any GHG injection and storage project. The risks associated with these pipelines will be very similar to those for petroleum pipelines.

No need was seen by the Commonwealth for special rules for the storage industry.

Comment by ResourcesLaw

It is appropriate that the rules applicable to the existing petroleum pipeline regime should apply to GHG pipelines.

11 What regulation is needed in respect of long-term liability?

Up until site closure, the proposed regulatory system would establish comprehensive statutory responsibilities of title holders with respect to the protection of the environment, other seabed resources and human health and safety, in exactly as the same way as for petroleum.

After site closing, there are four options for long-term liability:

(1) no new regulation;

(2) new regulation under which government explicitly assumes long term liability;

(3) new regulation where industry is required to assume long term liability;

(4) new regulation to share long term liability between government and industry.

No new regulation would involve relying on common law for long-term liability. Under this option, greenhouse gas title holders would not be immunised from common law liability to persons who suffer injury or loss as a result of their actions. Nor would their liability be limited. This non-intervention would extend to all forms of common law liability, including over the long term. The government would therefore not 'take over' long-term liability from project participants. Nor would the government provide any indemnity to project participants in respect of any liability they might incur.

In the long term, the risk may effectively pass to the community because project participants may cease to exist or because of some other time related factor such as availability of witnesses. For example, if GHG operations were to result in personal injury or loss to individuals, at a time when there were no project participants still available to be sued, or where damages were for some other reason irrecoverable, the cost would in practice be borne by the community. This would, however, be the consequence of the passage of time, not of any assumption of liability on the part of government. Storage industry participants would therefore need to make their own arrangements to deal with potential common law liability, as an ordinary cost of doing business, as must members of any other industry.

Under existing arrangements relating to petroleum, the OPA does not exclude, limit or allocate common law liability of title-holders or others engaged in offshore petroleum operations. Common law liability lies where it falls.

If government were to explicitly assume long-term liability, this would effectively be a subsidy. Any subsidies may better be delivered directly rather than through this indirect mechanism which lacks transparency and puts the government in the position of accepting highly uncertain potential liabilities.

New regulation to require industry to assume liability could only realistically involve the establishment of some sort of fund to meet liabilities. No other options are practicable given the long term nature of potential liabilities (in the order of thousands of years) and the potential life of industrial participants. This would have the effect of posing additional costs on industry compared with existing law. There would also be a major issue in determining the quantum for contributions to any such fund.

A system could be developed through which industry and government shared long-term liability. However, mechanisms for this are unclear and would require significant new law and could set precedents for policy in other areas. In any event, the 'no new regulation' option effectively provides a system where liabilities would be shared between industry and the community, with government effectively assuming a greater share of liability due to the passage of time.

Summary of advantages and disadvantages		
	Potential advantages	**Potential disadvantages**
No new regulation	Makes use of existing frameworks Provides incentive to industry to take practical actions to minimise exposure Provides a mechanism by which liabilities would be shared over time Does not set new precedents for government policy	Lack of precedents in this industry means that the outcome of common law application remains to be tested Perception that long term liability has not been addressed Potential disincentive to investors
New regulation under which Government explicitly assumes long-term liability	Provides an incentive to project investors	Government exposure to future costs unclear Incentive provided in a non-transparent manner Could set precedents for government policy in other areas Incentive for industry to take practical actions to minimise exposure unclear
New regulation where industry is required to assume long-term liability	Could impose higher costs than necessary on industry through the need to contribute to a fund which would be held in perpetuity Issue of determining appropriate level of contribution to a fund	Incentive for industry to take practical actions to minimise exposure
New regulation to share long-term liability between government and industry	Unclear as to how liabilities could be shared	May provide an incentive to industry to take practical actions to minimise exposure

Comments by ResourcesLaw

(i) Site Closing Certificate

The OSA provides for an injection licensee to apply for a site closing certificate.[26] Once issued, it remains in force indefinitely.[27]

(ii) Declaration of Closure Assurance Period

A site closing certificate entitles the licensee to apply to the Minister, after the expiration of 15 years from its issue, to declare a 'closure assurance period'. The Minister must be satisfied that the injected substance is 'behaving as predicted' in the original site plan and there is 'no significant risk' of a 'significant adverse impact' on the geological integrity of the formation, on the environment or on human health or safety.[28]

(iii) Indemnity by Commonwealth Against Certain Liability

After declaration of the closure assurance period, the present and past holders of an injection licence are thereafter, subject to any conditions that may be specified in the regulations, indemnified by the Commonwealth against future liability for damages that may be attributable to an act or omission in the operations that were authorised by the licence.[29] The Commonwealth does not assume the liability itself.

(iv) Assumption of Liability by Commonwealth

If an otherwise liable licensee has ceased to exist, the Commonwealth assumes the liability itself[30]

(v) No Case For Imposition of Additional Liability

It is in our view appropriate that there be no statutory imposition of long-term liability. Either the issue is best left to the common law in the same way as it is for petroleum and other industries, or a statutory limitation should be enacted.

(vi) Remote Likelihood of Commonwealth Liability

The circumstances where the Commonwealth might become liable under the OSA as presently framed are remote in the extreme.

(vii) A Case for More Generous Limitation of Liability?

There may be a strong environmental argument for enacting an earlier and more generous statutory limitation for holders of injection licences in order to nurture CCS.

26 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 386.

27 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 394.

28 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 399.

29 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 400.

30 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 401.

12 What regulation is needed for performance bonds and guarantees?

It is common practice in the Australian on-shore mining and petroleum industries to require financial bonds or guarantees for site rehabilitation. Such bonds and guarantees are also normal practice internationally. These bonds or guarantees are usually required from the commencement of the project and the amount reviewed during the project to take account of any changes that occur.

Bonds and guarantees have not been required of the Australian offshore petroleum industry because of the nature of the industry involved (large companies with the resources to undertake any decommissioning and site rehabilitation required and their need to maintain their social licence to operate).

The storage industry is still very new. There is a relatively high degree of uncertainty about risks and it is likely that an array of potential company ownership, structures and sizes may be involved in new projects. It is considered prudent to provide for the possibility of bonds and guarantees to ensure that funding is available for key activities.

It is appropriate that the need be assessed by the regulator on a case-by-case basis to minimise costs.

For long term monitoring after site closure, it is likely that a bond or guarantee would be required to reflect the long term need for monitoring and the need to maintain certainty as to migration and potential impacts.

Comment by ResourcesLaw

It is considered appropriate that provision be made for bonds and guarantees to be sought by the regulator according to the characteristics and circumstances of each project.

13 What regulation is needed to manage interactions with the petroleum industry?

This issue is to a large extent already addressed in section 2 of this report.

Most of Australia's offshore areas that may be attractive for greenhouse gas injection and storage would already be covered by petroleum titles. Over time, some of these will be relinquished and become vacant.

In most cases, petroleum and storage activities will be able to co-exist but there is considerable risk that storage activities could impact negatively on petroleum operations. This could occur through migration of GHGs into a petroleum pool and displacing the petroleum, making it effectively unrecoverable or leading to incompatibility problems with petroleum production equipment. Similarly, future petroleum operations could impact negatively on an established storage operation.

(i) Pre-commencement petroleum titles

It was considered by the government to be a policy imperative that the rights of pre-commencement petroleum title holders (that is those titles that are in force before the greenhouse gas regulatory framework was put in place) be preserved. Impinging on these rights would increase sovereign risk with the likely result of reducing petroleum activities in Australian waters.

Options to avoid adverse impacts on pre-commencement titles include:

- avoiding areas covered by pre-commencement petroleum titles;
- allowing greenhouse gas operations to proceed only with the agreement of the petroleum title holder;
- requiring greenhouse gas proponents to demonstrate that they will have no significant impact on petroleum operations.

Avoiding areas covered by pre-commencement titles effectively means that no areas would be available for greenhouse operations. A system of overlapping titles is therefore necessary.

In the absence of an agreement between affected parties, storage operations could only proceed if the proponent could demonstrate no significant adverse impact on the pre-commencement petroleum title holder's rights.

In the event that a storage proponent is unable to reach a commercial agreement with a petroleum title holder, they will face significant risks in their ability to operate. Prospective storage title holders should, however, be in a position to evaluate these risks before making any investment decisions.

Comment by ResourcesLaw

As already discussed in section 2 of this report, the OSA provides that the Minister must not approve operations under an assessment permit if there is a risk of a significant adverse impact on petroleum operations.[31]

We consider it appropriate that, in the absence of an agreement between the parties, the rights of pre-commencement petroleum title holders be protected by requiring storage operators to demonstrate that their activities will not have a significant adverse impact on petroleum operations.

(i) Post-commencement titles

It is also important to ensure that the system developed for the storage industry is not an obstacle to later petroleum operations.

Options available include:

- giving one industry (either petroleum or greenhouse gas) precedence over the other;
- giving precedence to whichever industry was first granted a title in the area in question; and
- allowing the government to decide which industry should proceed based on the specific circumstances of the case in situations where both industries cannot co-exist.

31 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), s 292.

Giving precedence to one industry (the 'preferred industry' option) over the other (that is, petroleum always preferred or greenhouse gas always preferred) raises the risk that major opportunities in one industry will be foregone in return for a lesser opportunity in the other. Against this, the other industry would have greater investment certainty.

Allowing the regulator to make decisions on which industry should proceed in cases where they cannot co-exist allows the relative merits of the two competing opportunities to be taken into account (the 'public interest' model). It also allows for flexibility if the relative importance of petroleum and greenhouse gas operations change. It also enables commercial agreements between the parties to be taken into account, which could lead to acceptable compromise solutions. This could be done through a public interest test in which the regulator would consider the relative merits of the two competing proposals. Criteria could include social, economic and environmental factors.

However, to provide confidence to investors it would be necessary to limit this test to titles earlier in the series than production licences or injection licences, after which point title holders could be making large investments. Thus, once an injection licence or production licence has been granted, the other industry would have to demonstrate no significant adverse impact, in the same manner as is done for pre-commencement petroleum titles.

Management of this system would require that certain post-commencement petroleum titles (that is those that overlap a greenhouse gas title) are identified and operators are required to inform the regulator of proposed activities so that the regulator can then inform the greenhouse gas title holder and ensure that activities can co-exist. Storage title holders (except for holders of injection licences) would have to be under a similar obligation.

The difference between these options in terms of administrative requirements was considered by the government to be negligible. In a 'preferred industry' or 'first-in-first-served' option the reduced compliance costs on the first industry may be counterbalanced by increased compliance costs for the second.

Summary of advantages and disadvantages		
	Potential advantages	**Potential disadvantages**
Preferred industry option	Increased certainty for the preferred industry	Reduced certainty for the non-preferred industry No ability to decide which industry represents the most important opportunity Limited basis for commercial agreements between industries
First-in-first-served option	Increased certainty for the second industry to enter the area	Reduced certainty for the second industry to enter the area No ability to decide which industry represents the most important opportunity Limited basis for commercial agreements between industries

Summary of advantages and disadvantages		
	Potential advantages	Potential disadvantages
Public interest model	Increased flexibility to allow the most 'valuable' development opportunity to proceed Provides a basis for commercial negotiations between industries	Reduced certainty for industry

Comment by ResourcesLaw

The need for a conflict avoidance and efficient conflict resolution requires careful consideration. It may be considered appropriate that, in the event that activities cannot co-exist, post-commencement petroleum titles and storage titles will need to be prioritised using a public interest test.

14 What regulation is needed to manage interactions with other users of the sea?

Other users of the sea include fisheries, marine transport, communications and defence. Greenhouse gas activities have the potential to impact on the users through environmental impacts affecting fisheries and through the physical presence of structures (for example impacts on fishing trawling, the hazard to navigation represented by fixed structures, and access to defence practice areas. All these potential impacts are essentially identical to those posed by petroleum operations.

The OPA protects these rights by requiring other users to be taken into account in the process and demonstrating that impacts have been minimised to the extent practical.

Comment by ResourcesLaw

We consider it appropriate that the management of interactions with the rights of other users of the sea be addressed in the same way as for the petroleum industry.

15 Who should be the regulator?

This is an Australia-specific issue arising from Australia's federal system of government.

Given the large number of areas in the Australian offshore regulatory framework which will require decisions or approvals by a regulator, the question of who should be responsible for these tasks was an important one.

There were two basic options:

(1) the existing Joint Authority (JA) model used for petroleum, whereby day-to-day decisions are delegated to the adjacent States or Territories; or

(2) administration by the Commonwealth.

Administration through the JA model offered the advantages:

(a) use of existing administration systems;

(b) close involvement with the day-to-day administration of petroleum could provide synergies for managing GHG activities;

(c) ensuring close involvement with the States/Territories on projects that are likely to be relevant to their interests.

Administration by the Commonwealth is feasible because of the small number of potential projects and also provides a number of advantages:

(a) it would provide greater national consistency, which may be particularly important given that this is a new industry and many regulatory approvals in the early stages of the scheme will set precedents;

(b) not all jurisdictions have the expertise or desire responsibility for managing GHG operations;

(c) given that projects will be in offshore waters under Commonwealth legislation, delegation of decision-making powers to the States/Territories could lead to additional complexity if issues arise relating to long term liability.

An element of greenhouse gas activities more suited to the JA regulation model related to pipelines. This approach was well suited because all known potential greenhouse gas pipelines associated with offshore storage projects will traverse areas of State/Territory jurisdiction as well as Commonwealth waters. Leaving pipeline administration under current arrangements would provide for better coordination of decision making than applying the Commonwealth model.

Comment by ResourcesLaw

This paper has focused, as we said at the beginning, on the offshore CCS regime in Australia, which is now quite settled. Some Australian States nonetheless have yet to establish onshore CCS regimes.

So far as offshore is concerned, we consider it appropriate that the regulation of greenhouse gas injection and storage activities in Australia be the responsibility of the Minister responsible for petroleum operations.

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APPENDIX B

The Developing Regime for the Regulation of Carbon Capture and Storage Projects in Canada

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Two developments since the time of writing should be noted:

(i) Alberta Energy Regulator came into existence 17 June 2013, with proclamation in force of most of Responsible Energy Development Act. It immediately took on all functions of the Energy Resources Conservation Board (ERCB). See Responsible Energy Development Act SA 2012 c R-17.3 ss 38 & 45. The Alberta Energy Regulator replaces the ERCB.

(ii) The Alberta Regulatory Framework Assessment was released in August 2013, available at <www.energy.alberta.ca/Initiatives/3544.asp>.

Contents

1 Outline of the report

This report examines the legal and regulatory regime for carbon capture and storage projects as it has developed in Canada. The report focuses on the experience of one province, Alberta. While recognizing that there are three links in the CCS chain (capture and compression, transportation, and injection and long term sequestration) this report focuses on the legal and regulatory issues associated with injection and long term sequestration.

Part two of the report offers some brief introductory comments on the role of carbon capture and storage (CCS) in meeting Canada's greenhouse gas emission reduction commitments. It also refers to some of the key policy reports and initiatives of the federal and provincial governments and mentions important CCS and CCS-EOR (Enhanced Oil Recovery) projects that are being developed in Canada.

Part three of the report introduces the developing legal framework in Canada. Canada is a federal state but most of the responsibilities for regulating CCS projects lie with provincial governments. This report focuses on the legal regime as it has developed in the Province of Alberta. There are three reasons for this emphasis. First, Alberta has a large oil and gas industry and the most experience in dealing with one of the principal analogous activities to CCS, acid gas disposal (AGD). Second, Alberta is the province that is most committed to CCS as part of its mitigation efforts. Alberta has invested heavily in CCS both through financial contributions to projects but also by developing a legal and regulatory regime for CCS activities. Third, and related to the last point, Alberta is the province that has made the most progress in developing that legal and regulatory regime. In developing a legal framework this report suggests that it is useful think about four groups of issues: (1) property or ownership issues, (2) regulatory (project review and approval or permitting) issues, (3) liability issues, and (4) carbon accounting and crediting issues.

Part four of the report deals with the property law issues associated with the development of a CCS regime. It focuses on two issues, the ownership of pore space for sequestration purposes and the development of a pore space leasing regime for pore space that is the subject of public ownership. Alberta resolved to clarify ownership of pore space by enacting declaratory legislation vesting pore space in public ownership. Following that, Alberta introduced a disposition scheme consisting of a short term evaluation permit and a longer term sequestration lease.

Part five of the report examines the regulatory regime that Alberta has put in place for the review and approval of CCS projects in the province. The government has chosen to build upon the expertise of the province's main oil and gas regulator the Energy Resources Conservation Board (ERCB), and, in particular, the ERCB's experience in regulating acid gas disposal projects. It is characteristic of Alberta's regulatory approach in this area that most of the detailed directions to project proponents take the form of Directives and project approvals (with terms and conditions) rather than primary legislation and regulations. The statutory "hook" on which all of this hangs is quite slender. The report discusses one important CCS project, Shell Canada's Quest project which has progressed through the ERCB's regulatory process.

While Alberta's regulatory response is largely based on adapting the approach used for AGD projects to the different scales (volume, geography and time) involved in CCS projects, Alberta also initiated a comprehensive multi-stakeholder review of its regulatory framework. This process, known as the Regulatory Framework Assessment, completed its work at the end of 2012 but the Minister has yet to release the report. Part five concludes with a discussion of some of the changes to the existing regulatory scheme that the RFA has suggested.

Part six of the report examines the way in which Alberta has chosen to deal with issues of liability associated with CCS projects. The report identifies four different type of liability: (1) potential tort liability in the event that the project causes harm to some person or persons, (2) statutory liability with respect to abandonment and re-abandonment obligations, (3) liability for ongoing monitoring of the site and the injected carbon dioxide (CO_2), and (4) potential accounting liability for any emissions of CO_2 from the project site. In sum, the Alberta scheme contemplates that liability during the operating phase of the project should remain with the operator and its working interest partners. Once a closure certificate is issued most liabilities are assumed by the Crown (but not any potential greenhouse gas accounting liability). Some of the costs associated with the transfer of liability will be funded by the CCS industry through the creation of the Fund but other liabilities (and in particular any tort liability that the Crown assumes) remain unfunded.

Part seven of the report deals with the regulatory treatment of CCS projects for carbon crediting purposes. Alberta uses a baseline and credit system to regulate the emissions intensity of large final emitters in the province (facilities that emit more than 100,000 tonnes of GHGs per year). An emitter can meet its target in a number of ways including by reducing emissions or by purchasing offsets. An offset is an activity undertaken by a non-regulated entity that reduces GHG emissions over a business as usual baseline. At a conceptual level, CO_2 that is captured and sequestered can be treated as either an avoided emission at the regulated facility or as an offset (in which case the regulated entity declares the captured CO_2 as an emission and then acquires offset credits from the operator of the injection facility). Alberta has elected to qualify CCS projects as giving rise to offset credits rather than as an avoided emission.

There are two appendices. Appendix I provides the text of the scheme approval issued to Shell Canada for the Quest Project. Appendix II is an example of a sequestration lease.

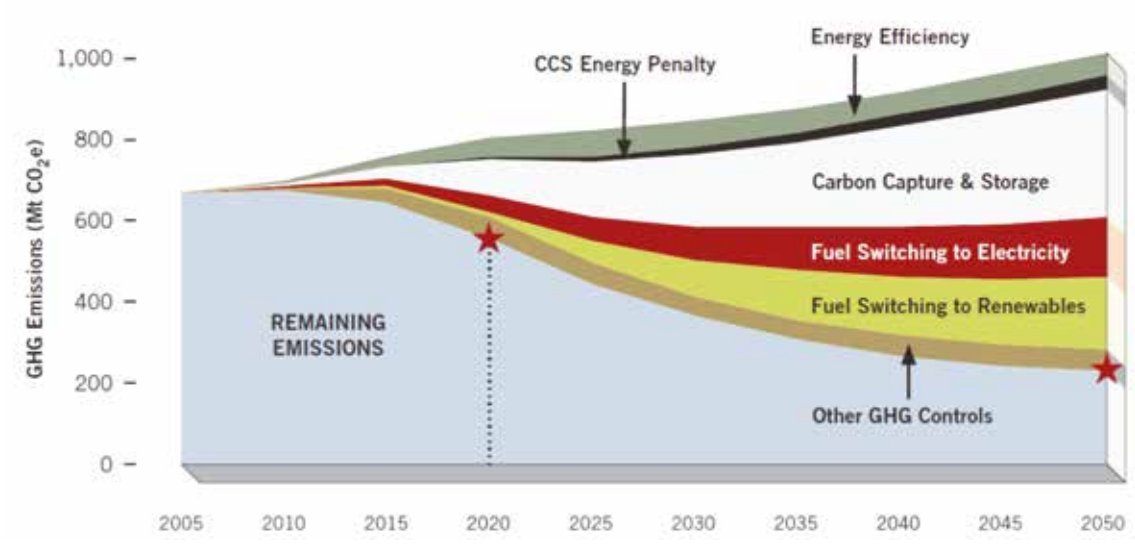
2 The role of CCS in meeting greenhouse gas emission reduction targets in Canada

Federal and provincial governments in Canada have made significant investments in the development of carbon capture and storage (CCS). These governments, and in particular, the federal government, and the governments of Alberta, and Saskatchewan anticipate that CCS will make a significant contribution in meeting emission reduction targets to which each has committed.

2.1 Canada's targets

Canada did ratify the Kyoto Protocol and in doing so committed to achieving a reduction in emissions of minus six per cent of 1990 emissions by the end of the first commitment period, 2012. Canada failed to achieve that target and gave notice in December 2011 that it would withdraw from the Protocol effective December 2012. Consequently, Canada is no longer a party to the Protocol although it remains a party to the United Nations Framework Convention on Climate Change (UNFCCC). Canada did sign on to the Copenhagen Accord and as such followed the United States in making a commitment to reduce emissions by 17% by 2020 over a 2005 baseline.

A wedge diagram prepared by the National Round Table on the Economy and the Environment shows CCS as making a significant contribution to reduced GHG emissions in Canada.[1]



2.2 Provincial targets

Alberta's *Climate Change Strategy* (2008)[2] committed Alberta to "a 50% reduction in emissions by 2050, compared to business as usual, or a 14% reduction below 2005 levels by 2050". According to the province's calculations this represents a reduction in annual emissions of 200 Mt by 2050. Provincial policy contemplates that 24 Mt of this reduction will come from energy efficiency measures, 37 Mt from renewable energy sources and fully 139 Mt from CCS projects.

Saskatchewan is committed to reducing greenhouse gas emissions by 20% over 2006 levels by 2020 and sees CCS as making a contribution to reduced emissions. Other provinces have more aggressive targets. For example, Nova Scotia remains committed to reducing GHG emissions by 10% below

1 National Round Table on Environment and Economy's "Achieving 2050: A Carbon Pricing Policy for Canada", 2009. The NRTEE (since abolished) does not establish government policy but federal government officials still refer to this wedge diagram when discussing Canada's commitment to CCS. See, for example Kathryn Gagnon, "Canada Update, CCS Legal and Regulatory Developments", IEA *4th CCS Regulator Network Meeting*, (Paris, France, May 9, 2012) <www.iea.org/media/workshops/2012/ccs4thregulatory/new/KathrynGagnon.pdf>.

2 <www.environment.alberta.ca/01757.html>.

1990 levels by 2020 while Ontario is committed to a 15% reduction over the same (Kyoto) base year. British Columbia is committed to a 33% reduction by 2020 over 2007 levels stated to be equivalent to 12% below 1990 levels by 2020).[3] British Columbia is exploring CCS opportunities within the province (especially in the upstream oil and gas sector) and, as with Alberta, also has experience with regulating acid gas disposal projects.

2.3 Government support for CCS projects and technology

The federal and (some) provincial governments have offered significant support for the development of carbon capture and storage technology. While the most important form of support is no doubt the direct financial support that has been made available to commercial scale demonstration projects governments have also invested in the development of public policy and public awareness by striking high level task forces and regulatory reviews to assess the implications of CCS projects and technology from a broad variety of perspectives. The most important initiatives in this context include:

The ecoEnergy Carbon Capture and Storage Task Force (2008)
This joint federal/provincial task force produced a report entitled, *Canada's Fossil Future: The Way Forward on Carbon Capture and Storage*.[4]

Carbon Capture and Storage Development Council (2009)
This Council, the members of which were appointed by the Government of Alberta prepared a report entitled, *Accelerating Carbon Capture and Storage Implementation in Alberta*.[5]

Alberta's Regulatory Framework Assessment (2013)
The Government of Alberta initiated the Regulatory Framework Assessment (RFA) in March 2011. The RFA was a multi-stakeholder process that was designed to review the technical, environmental, safety and monitoring requirements for CCS and to recommend regulatory changes to enable the deployment of CCS in a safe, responsible and efficient manner. The project steering committee submitted the final report to the Minister of Energy at the end of 2012 but the report has yet to be released.[6]

The Carbon Capture and Storage Research Consortium of Nova Scotia (CCS Nova Scotia)
CCS Nova Scotia is a not-for-profit corporation whose members are the Province of Nova Scotia, Nova Scotia Power Inc. and Dalhousie University.[7] The consortium is conducting multidisciplinary research into the issues involved in the capture, transport, storage and monitoring of stationary sourced carbon dioxide emissions in a safe and environmentally acceptable manner. Work to date has included reports on the regulatory and legal requirements for both onshore and offshore CCS projects as well as more technical reports assessing capture options and storage options.[8]

3 All of the targets in this paragraph are drawn from David Suzuki Foundation, *All Over the Map: a comparison of provincial climate change plans* (2012) <www.davidsuzuki.org/publications/reports/2012/all-over-the-map-2012/>.

4 ecoEnergy Carbon Capture and Storage Task, Canada's Fossil Future: The way forward on Carbon Capture and Storage, (2008). <www.energy.alberta.ca/Org/pdfs/Fossil_energy_e.pdf>.

5 Carbon Capture and Storage Development Council, Accelerating Carbon Capture and Storage Implementation in Alberta, Final Report, (2009). <www.energy.alberta.ca/Org/pdfs/CCS_Implementation.pdf> The Council also produced an interim report.

6 The author served as a member of the steering committee.

7 <www.ccsnovascotia.ca/index.php>.

8 All of the reports are confidential. The author was engaged as a reviewer for both the onshore and offshore legal and regulatory reports.

Both the Alberta and federal governments have provided direct financial support to a number of commercial scale CCS projects in Canada. The most important of these are:

2.3.1 Shell Canada Energy Quest Project

Shell Canada Energy, on behalf of the Athabasca Oil Sands Project, a joint venture among Shell Canada, Chevron Canada Limited and Marathon Oil Sands L.P., is advancing Quest, a fully integrated CCS project (i.e. capture, transport, inject and store CO_2) capturing over one million tonnes of CO_2 per year from the Scotford upgrader to be transported by pipeline to an injection location northeast of the Scotford Complex for injection into the Basal Cambrian Sandstone reservoir (saline). The CO_2 could also be made available for use in enhanced oil recovery projects. The project has been approved by provincial regulatory authorities. Part 5 of the paper reviews the approval process for the Quest Project. The Government of Canada will be providing funding of $120 million for this project. The Government of Alberta is contributing $745 million through its CCS Fund.

2.3.2 Enhance Energy – Alberta Carbon Trunk Line Carbon Capture and Storage Project

The Alberta Carbon Trunk Line project will include a fully integrated carbon capture and storage (CCS) system incorporating gasification, capture of CO_2 emissions, transportation, storage and enhanced oil recovery (EOR). Enhance Energy will provide CO_2 gathering and distribution infrastructure for CO_2 emissions from facilities in Alberta's Industrial Heartland (including the North West Upgrader). The captured CO_2 from these sites will be transported via a 240-km pipeline to mature oil reservoirs in central and southern Alberta, where it will be injected for enhanced oil recovery purposes. The Government of Canada will be funding about $30 million for the project through the Clean Energy Fund, in addition to $33 million from the ecoENERGY Technology Initiative. The province of Alberta will contribute $495 million over 15 years.[9]

2.3.3 The Aquistore Project

The Aquistore project will involve commercial scale CO_2 capture at SaskPower's Boundary Dam coal fired power plant (Estevan, Saskatchewan) followed by injection at a co-located site in the Williston Basin which is a large sedimentary basin extending though southeastern Saskatchewan, southwestern Manitoba, North and South Dakota, and Montana. First deliveries for injection are expected in 2014. The federal government has contributed $9 million through ecoENERGY Technology Initiative and $5 million through Sustainable Development Technology Canada (SDTC).

2.3.4 Other projects

Alberta was committed to supporting two other projects. One project, TransAlta's Pioneer project would have involved capture at a coal fired power plant, and a second, Swan Hills Synfuels would have involved an in-situ coal gasification project with the captured gas being used for enhanced oil recovery projects. Both proponents have withdrawn their projects for economic reasons including, in the case of Swan Hills, chronically low natural gas prices in North America.

9 <www.solutionsstarthere.ca/70.asp>.

2.3.5 The Weyburn/Midale Project

One of the most studied geological sequestration projects in the world is the CO_2-EOR project at Weyburn and the neighbouring Midale field. CO_2 for the project is produced in the Great Plains synfuels plant in Beulah North Dakota and shipped by a 325 km pipeline to the Weburn field in Saskatchewan. The Weyburn field first began producing oil in 1954. CO_2 injection began in 2000 and currently about 6500 tonnes/day new CO_2 is injected at the Weyburn site and about 1250 tonnes/day at the adjacent Midale field. Current estimates (2011) are that about 18 million tonnes have been stored to date. The project has been intensively studied by an international group of experts initially convened by the Greenhouse Gas Program of the International Energy Agency in collaboration with the Petroleum Technology Research Centre and the University of Regina. One of the outputs of the project is a paper by Zukowsky on *The Regulatory Framework Governing Injection and Storage of Carbon Dioxide at the Cenovus Weyburn and Apache Midale Enhanced Oil Recovery Operations in Saskatchewan*.[10]

2.3.6 Standard setting initiatives

In addition to the initiatives of governments it is also important to refer to the work that has been undertaken collaboratively by industry, government and others to develop standards and protocols for both project approval purposes and most importantly for carbon accounting purposes and for crediting offsets.

The most important examples here include the work of the Canadian Standards Association (CSA) in developing CSA Standard Z741-12 on the Geological Storage of Carbon Dioxide (October 2012) and the work of Alberta Environment and Sustainable Development in conjunction with a number of industry players and consultants in the development of a number of Offset Quantification Protocols. These Protocols are designed to provide a common methodology for quantifying the carbon credits (offsets) that may be generated by CCS projects and by CO_2/EOR projects. The most relevant of these protocols are two Protocols for Enhanced Recovery Projects and a Draft Protocol for the Capture of CO_2 and Storage in Deep Saline Aquifers.[11]

2.3.7 Civil society organizations in Canada and CCS

No civil society organization in Canada has championed the case for CCS in quite the way that the Bellona Foundation has in Norway. The most prominent NGO engaged in active discussion of CCS in Canada is the Pembina Foundation in Alberta.[12] While emphasising that CCS is not a "silver bullet" response to the problem of climate change, Pembina does accept that CCS can and should make a contribution as part of a suite of mitigation measures including commitments to renewable energy. Pembina representatives have also been engaged in some if not all of the regulatory review initiatives launched by governments referred to above. In addition, Pembina, in conjunction with the University community, convened a public discussion of CCS issues focused around a number

10 (2010) IEA GHG Weyburn-Midale CO_2 Monitoring and Storage Project <www.ccs101.ca/ccs_pro/publications/canadian_publications>.

11 The Protocols as well as guidance documents and background documents on the preparation of the protocols are all available on the website of Alberta Offsets Registry <www.carbonoffsetsolutions.climatechangecentral.com/offset-protocols/approved-alberta-protocols>.

12 <www.pembina.org/climate/carbon-capture-and-storage>.

of discussion papers[13] dealing with such subjects as the environmental and economic opportunities and challenges and a paper on the legal associated with implementing large scale CCS projects.

2.3.8 The North American Sequestration Atlas

It is important that regulators have an understanding of the availability of suitable sequestration geology. To that end, agencies in Canada and the United States have collaborated to develop and publish successive editions of a North American Sequestration Atlas which identifies (and quantifies at a high level) the sequestration potential (categorized in terms of saline aquifers, depleted oil and gas reservoirs and unminable coal seams) of the individual provincial and state jurisdictions. The Atlas, now available in its 4th edition (2012), also maps major emitters within these jurisdictions.[14]

3 A framework for analyzing the developing regime for the regulation of carbon capture and storage in Canada

Canada is a decentralized federation in which the ten provinces wield significant authority in relation to the natural resources within each province - both by virtue of the ownership of public lands and resources within the province, and by virtue of important heads of legislative authority. The dominant position of the provinces in relation to natural resources was confirmed in 1982 with the so-called resources amendment to the Constitution. Thus, the provinces are responsible for regulating both the upstream oil and natural gas industry as well as the electricity sector including most generating facilities (the federal government has an important role in relation to nuclear facilities).

The federal government has indicated that it will develop sector specific regulations for greenhouse gas emission reduction regulations under the *Canadian Environmental Protection Act, 1999*.[15] One set of regulations has already been adopted: the Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations.[16] These regulations contemplate that CO_2 that is captured and stored in accordance with provincial regulatory standards will be treated as an avoided emission for the purpose of the regulations.[17]

It is broadly acknowledged that the responsibility for the detailed regulation of capture, transportation and storage facilities within the CCS chain will be assumed by the provinces.[18] The situation is therefore quite different from that in the United States where the federal government has an important role to

13 The papers are all available on the above web site under the heading "Thought Leader Forum", November 10, 2008.

14 The Sequestration Atlas is available here: <www.netl.doe.gov/technologies/carbon_seq/refshelf/atlasIV/>.

15 SC 1999, c.33.

16 SOR/2012-167, August 30, 2012, <www.canlii.org/en/ca/laws/regu/sor-2012-167/latest/sor-2012-167.html> and with the Regulatory Impact Assessment Statement (RIAS) here <www.gazette.gc.ca/rp-pr/p2/2012/2012-09-12/pdf/g2-14619.pdf#page=21>.

17 Id., section 3(5).

18 There is one important exception: an interprovincial or international CO_2 pipeline will be subject to federal regulation under the *National Energy Board Act*, RSC 1985, c. N-7. Thus the NEB regulates the CO_2 pipeline that provides service to the Weyburn/Midale project: Reasons for Decision, Souris Valley Pipeline Limited MH-1-98, October 1998.

play through EPA's (Environment Protection Agency's) Underground Injection Control (UIC) Program which is developed under the terms of the federal Safe Drinking Water Act (SDWA).[19]

In earlier writings I have suggested that, at least from a legal perspective, it is useful to distinguish four types of issues when considering the development of an appropriate legal and regulatory regime for CCS activities and I shall use that framework in this analysis: (1) the property issues, (2) the regulatory issues, (3) liability issues, and (4) carbon crediting and accounting issues. These categories provide the headings for the next four parts of the paper.

4 The property issues

CCS projects may give rise to at least two types of property questions. The first relates to the ownership of pore space. This question is often framed in terms of a competition between the surface owner and the mineral owner but it can also be framed in terms of a competition between public ownership and private ownership, i.e. no matter whether pore space for sequestration purposes is vested in the surface owner or the mineral owner, is there a case for the state to take preemptive action in the public interest and simply vest the pore space resource in the state (i.e. in public ownership)? The second type of question arises in those situations in which the government is the owner of pore space. In such a case the government needs to decide how it will make decisions about how to allow third parties to acquire pore rights for sequestration projects. In particular, there might be a question about whether the government should proceed in an ad hoc manner or should design a new form of tenure to accommodate CCS projects.

4.1 Ownership of pore space in Alberta

When CCS issues were first raised in Alberta in the 2005 – 2010 period there was considerable discussion about the ownership of pore space for sequestration purposes. The discussion was principally framed in terms of whether or not Alberta would follow the American approach with respect to natural gas storage and assign ownership of pore space rights to the owner of the surface, or whether it would follow a so-called English model and assign ownership of pore space to the mineral owner.[20]

In retrospect, and especially in light of the UK Supreme Court decision in *Star Weald Basin Limited v. Bocardo SA*,[21] that distinction was likely misconceived. In the *Star Weald* decision the Court confirmed the principle that under English law (and therefore presumably throughout the common law world), the starting premise is that the surface owner owns all subsurface resources that can reasonably be exploited. That premise might be rebutted such as where the legislature elects to vest a particular resource in the state (for example, the UK *Petroleum (Production) Act*, 1934 under consideration in *Star Weald*) but such exceptions will not be given an expansive interpretation. The specific holding

19 For EPA's UIC program and the Class VI permit regulations for geological sequestration wells see <www.water.epa.gov/type/groundwater/uic/index.cfm>. States can attain "primacy" under this program if they develop their own regulations which meet or exceed the federal standards but unless they do the federal regulations apply.

20 See, for example, N Bankes, J Poschwatta and M Shier, "The Legal Framework for Carbon Capture and Storage in Alberta" (2008) 44 Alberta Law Review 585.

21 2010 UKSC 35.

in *Star Weald* was to the effect that a party, Z, who has acquired the petroleum rights in block B underneath B's land from the Crown, still commits a trespass against B when it acquires surface rights from B's neighbour and then drills directionally under B's land to tap into the reservoir without acquiring any working rights from B. The Court effectively concludes that while the declaratory provision of the UK's legislation was effective to vest petroleum rights in the Crown, that is all that it did; all other rights in relation to the subsurface remained with the owner of the surface (subject to additional statutory provisions that provided for the compulsory acquisition of the necessary right to work the petroleum). *Star Weald* then favours the surface owner in any competition between the mineral owner and the surface owner in relation to pore space ownership, although much might depend upon the language of reservation or severance that establishes the existence of separate mineral estates.[22]

An additional element in the discussion in Alberta was the appreciation that the scale of CCS projects[23] might require an operator to deal with multiple owners (whether surface owners or mineral owners) when attempting to put together the necessary package. There was the concern that this might give rise to large transaction costs, delays and the possibility of holdouts.[24]

Thus, and perhaps for a combination of reasons, the province in the end elected to introduce declaratory legislation vesting title to pore space in the Crown.[25] The provision now appears as section 15.1 of the *Mines and Minerals Act*.[26]

> It is hereby declared that
>
> (a) no grant from the Crown of any land in Alberta, or mines or minerals in any land in Alberta, has operated or will operate as a conveyance of the title to the pore space contained in, occupied by or formerly occupied by minerals or water below the surface of that land,
>
> (b) the pore space below the surface of all land in Alberta is vested in and is the property of the Crown in right of Alberta and remains the property of the Crown in right of Alberta whether or not
>
> (i) this Act, or an agreement issued under this Act, grants rights in respect of the subsurface reservoir or in respect of minerals occupying the subsurface reservoir, or
>
> (ii) minerals or water is produced, recovered or extracted from the subsurface reservoir, and
>
> (c) the exception of pore space under this section is deemed to be an exception contained in the original grant from the Crown for the purposes of section 61(1) of the *Land Titles Act*.

The Act did not define the term "pore space" although the term was subsequently defined in the Carbon Tenure Sequestration Regulation[27] to mean "the pore contained in, or occupied by or formerly occupied by minerals or water below the surface of land."

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22 In Alberta the severance typically occurred in the original grant from the Crown in which the Crown reserved out all mines and minerals. Thus the Crown owns about 80% of the mineral estate in the province. Early grants and grants to the railway companies did not contain such a reservation and thus some landowners acquired mineral rights. These owners might in turn created severed estates by their own reservation practices: *Borys v CPR* [1953] AC 217.

23 The physical plume of CO_2 associated with a commercial scale injection project may extend over several square kilometers (and migrate updip over time) while the pressure plume might extend across a much larger area.

24 Discussed in Bankes, Legal Issues Associated with the Adoption of Commercial Scale CCS Projects, (2008), <www.pubs.pembina.org/reports/ccs-discuss-legal.pdf>.

25 SA 2010, c. 14.

26 RSA 2000, c. M-15.

27 Alta. Reg.68/2011, s.1(i).

The legislation goes on to shield the Crown from any possible claims to compensation that might be made by a party that claims that the legislation has worked an expropriation:

> (4) It is deemed for all purposes, including for the purposes of the *Expropriation Act*, that no expropriation occurs as a result of the enactment of this section.
>
> (5) No person has a right of action and no person shall commence or maintain proceedings
>
> (a) to claim damages or compensation of any kind, including, without limitation, damages or compensation for injurious affection, from the Crown, or
>
> (b) to obtain a declaration that the damages or compensation referred to in clause (a) is payable by the Crown, as a result of the enactment of this section.

Section 15.1 therefore serves as the principal proprietary basis for geological sequestration operations in Alberta but only where the project is a pure storage or disposal project, likely a saline aquifer project. If the project is conceived of as an enhanced oil recovery project using CO_2 as a miscible or immiscible flooding agent then the operation will be based upon the operator's (and its partners') existing petroleum and natural gas tenures (which may be Crown leases or leases granted by the private owner of the mineral estate).

Given the scope of New Zealand's review exercise and the reference in the terms of reference to Māori interests, it is perhaps worth highlighting one of the other subsections in this amendment, section 15.1(2).[28] This section makes it plain that the declaratory effect of the legislation does not apply to Crown lands the title to which is vested in the Crown in right of Canada rather than the Crown in right of Alberta. In doing so the legislation is making a necessary constitutional concession since any attempt by the province to define the scope of the federal government's estate would necessarily be unconstitutional. The federal property affected by this exclusion comprises not only the large national parks within Alberta but also Indian reserves, title to which is understood to vest in the federal Crown in trust for the particular bands or First Nations. Since such reserves generally include mineral title as well as surface title, it seems fairly clear than any geological storage space beneath the reserve will accrue, one way or another, to the benefit of the particular band or First Nation. While Canada has adopted a disposition regime for oil and gas rights on reserve[29] there is, as yet, no parallel regime for geosequestration rights.

4.2 The tenure regime: Alberta

Having made the decision to vest pore space for sequestration purposes in the Crown it became necessary for the province to also address the means by which it would allow potential CCS operators to acquire derivative rights to pore space. The province accomplished this by amending its *Mines and Mineral Act* to add a new Part 9 titled "Sequestration of Captured Carbon Dioxide". In addition, the province promulgated the Carbon Sequestration Tenure Regulations[30] to further implement the Act and has developed standard form sequestration leases and licences. The first such leases have been granted to Shell Canada Limited for the Quest Project.[31]

28 The text is as follows: "Subsection (1) does not operate to affect the title to land that, on the date on which this section comes into force, belongs to the Crown in right of Canada."

29 See Indian Oil and Gas Act, RSC 1985, c.I-7.

30 Alta. Reg. 68/2011.

31 One of Shell's six leases is reproduced as Appendix II to this report.

Before examining the regime that Alberta has put in place it is perhaps worth referring to two other options that might have been considered. The first was the licensing scheme that the province has used for over two decades to accommodate acid gas disposal projects. The second was the ad hoc special agreement scheme that Alberta used to accommodate some of the early oil sands developments.

4.2.1 Licences for injection wells

Acid gas disposal projects (dealt with in further detail below) involve the capture of waste gas streams with a high acid content at natural gas processing plants. The acid gases typically comprise some combination of hydrogen sulphide (H_2S) and CO_2. In an AGD project the operator, instead of incinerating the waste stream and recovering the sulphur through further processing (eg the Klaus process), captures the entire stream and injects the captured gas into a hydrocarbon formation or a saline aquifer. Such projects have operated in the province essentially without any form of tenure from the Crown with the operator relying instead on a licence issued under section 56 of the *Mines and Minerals Act*.[32] Section 56 provides as follows:

> Injection wells
>
> 56(1) Subject to section 57, a person has, as against the Crown in right of Alberta,
>
> (a) the right to use a well or drill a well for the injection of any substance into an underground formation, if the person is required by or has the approval of the Energy Resources Conservation Board to do so, and
>
> (b) the right to remove and withdraw any machinery, tool, plant, building, erection and fixture used in or in connection with the operation of that well, if the removal or withdrawal is approved by the Board.
>
> (2) A person who exercises a right referred to in subsection (1)(a) (a) shall indemnify the Crown in right of Alberta for loss or damage suffered by the Crown in respect of any claims or demands made by reason of anything done by that person or any other person on that person's behalf in the exercise or purported exercise of that right, and
>
> (b) shall abandon the well when so directed or authorized by the Energy Resources Conservation Board, in accordance with the directions of the Board.

The licence took the form the form of standard form letter issued by the Department of Energy. It was generally considered that this provided an inadequate basis for a commercial scale CCS project. However, it is still possible that section 56 licences in conjunction with amended version of section 54 will be used to authorize small scale experimental projects as well as shallower projects which do not meet the depth requirements for permits and leases issued under Part 9 of the *Mines and Minerals Act* and the Regulations.[33]

32 Some suggest that section 54 was also relevant. While the new section 54 discussed below is clearly relevant, the old section 54 used only to refer to operations for the recovery of minerals.

33 Under the Carbon Sequestration Tenure Regulation, Alta. Reg. 68/2011 permits and leases may only be issued in respect of "deep subsurface reservoirs". The regulation defines a deep subsurface reservoir as "the pore space within an underground formation that is deeper than 1000 metres …".

The new section 54 read as follows:

(1) No person shall…

(b) inject any substance into a subsurface reservoir that is the property of the Crown in right of Alberta unless the person is authorized to do so under this Act or by an agreement.

(5) The Minister may authorize in writing the conducting of operations in respect of a mineral or subsurface reservoir that is the property of the Crown in right of Alberta and that is not the subject of an agreement issued under this Act where the Minister is of the opinion that the operations are desirable in respect of the exploration for or the development, processing or recovery of minerals or the sequestration of captured carbon dioxide.

4.2.2 Special agreements

Oil and gas rights in the province of Alberta are typically issued as standard form licences or leases following a bonus bidding procedure (a Crown sale). However, the Minister also has the exceptional power under section 9 of the *Mines and Minerals Act*, with the approval of the Lieutenant Governor in Council, to issue an agreement that departs from the standard form. The terms of such an agreement may vary the application of the *Act*. The Province used this form of agreement in the early development of oil sands projects and there was some suggestion that this would also be an appropriate vehicle for authorizing early CCS projects in ways that might facilitate adaptive management and learning by doing. This option clearly had its attractions and while the province did proceed to authorize two new forms of tenure for sequestration purposes it also, at the same time, amended section 9 to add a paragraph expressly addressing the "storage or sequestration of substances in subsurface reservoirs". The section now reads as follows:

9. Notwithstanding anything in this Act or any regulation or agreement, the Minister, on behalf of the Crown in right of Alberta and with the authorization of the Lieutenant Governor in Council, may

(a) enter into a contract with any person or the government of Canada or of a province or territory respecting ….

(iii) the storage or sequestration of substances in subsurface reservoirs;

….

(vi) any matter that the Minister considers to be necessarily incidental to, in relation to or in connection with any of the matters referred to in subclauses (i) to (v);

(b) issue an agreement

(i) containing a provision that is a variation of a provision of this Act or the regulations that would otherwise apply to the agreement, or

(ii) making inapplicable a provision of this Act or the regulations that would otherwise apply to the agreement; …. (emphasis supplied)

It is perhaps telling that the province elected to use the new standard form sequestration lease for Shell's Quest Project rather than a section 9 special agreement.

4.2.3 The tenure provisions

Alberta's sequestration tenure regime is created by Part 9 of the *Mines and Minerals Act* and the Carbon Sequestration Tenure Regulation. The scheme offers two forms of tenure an evaluation permit and a carbon sequestration lease.

Evaluation permit

An evaluation permit may be granted on application. In addition to fees and rentals, an applicant for a permit (section 3) must propose a monitoring, measurement and verification (MMV) program that meets certain requirements. In particular, the plan must contain (section 7(1)) "an analysis of the likelihood that the operations or activities that may be conducted under the permit will interfere with mineral recovery". This analysis is required because of a new provision in the *Oil and Gas Conservation Act (OGCA)* which provides that "The Board shall not grant a CO_2 injection scheme approval unless the lessee of that agreement satisfies the Board that the injection of the captured carbon dioxide will not interfere with (a) the recovery or conservation of oil or gas, or (b) an existing use of the underground formation for the storage of oil or gas."[34]

A permittee must comply with an approved MMV plan (section 7(2)). Once granted the permit:

> [G]rants, in accordance with the terms and conditions of the permit, the right to conduct evaluations and testing, including the drilling of wells and injection of substances as approved by the Board, into deep subsurface reservoirs within the location of the permit to evaluate the geological or geophysical properties of the deep subsurface reservoirs for the purposes of determining their suitability for use for the sequestration of captured carbon dioxide.

Deep subsurface reservoirs are defined as pore space in an underground formation that is deeper than 1,000 metres below the surface. A permit does not grant any right to win, work, or recover minerals. A permit can be granted for an area of up to 73,728 hectares (which is about 284 square miles). A permit may be grouped (section 8) with other contiguous permits for the purposes of meeting the MMV filing requirements. An evaluation permit is valid for a five year term.

Sequestration Lease

The process for acquiring a sequestration lease follows that outlined above for permits with some additional requirements. A party may proceed directly to a lease.[35] The additional requirements are: (1) evidence that the location is suitable for CO_2 sequestration, and (2) a closure plan in addition to the MMV plan. The closure plan must set out (section 18) "a description of the activities satisfactory to the Minister that the lessee will undertake to close down sequestration operations and facilities". The MMV program must also address (in somewhat more detail than in the permit application) the effect of the proposed operations on mineral recovery. In particular, it must contain (section 15(b)):

> [A]n analysis of the likelihood that the operations or activities that may be conducted under the carbon sequestration lease will interfere with mineral recovery, based on the geological interpretations and calculations the lessee is required to submit to the Board pursuant to Directive 65 in its application for approval of the injection scheme under the *Oil and Gas Conservation Act*…

The lease grants the same rights as the permit plus the right to inject captured CO_2 (section 9(3)). The size limits for the lease are the same as for a permit as are the grouping rules (section 14).

34 RSA 2000, c. O-6 (s.39(1.1))

35 Shell Canada proceeded directly to lease for the Quest Project i.e. it did not acquire a permit and then a lease.

A lease is granted for an initial term of 15 years. There is no right of renewal (see section 11(1)), "but the Minister may renew for successive 15 year terms subject to any terms and conditions prescribed by the Minister at that time" – and perhaps only with respect to a portion of the lease area or with respect to certain zones (section 11(2)).

The Regulations suggest that the Government is committed to learning by doing and to procedures of adaptive management. Thus, MMV programs for leases and closure plans are only valid for three years and must be successively renewed during the term of the lease and upon lease renewal (section 16 for MMV and section 19 for the closure plan). The closure plan provision also contains the important requirement that the lessee must provide (section 19(3)(c))"an evaluation of whether the injected captured carbon dioxide has behaved in a manner consistent with the geological interpretations and calculations the lessee submitted to the Board pursuant to Directive 65 in its application for approval of the injection scheme under the *Oil and Gas Conservation Act*". This is crucial for understanding how the CO_2 plume is performing as against the modeling that was undertaken before injection commenced.

This last point suggests that there is some overlap in content between the leasing regime created by Part 9 of the *Act* and the regulations, and the regulatory regime under the jurisdiction of the Energy Resources Conservation Board (ERCB). I will elaborate on this in the next section.

4.3 Conclusions on the property issues

(1) Alberta concluded that ownership of pore space might be contentious and might therefore create considerable legal uncertainty which might delay commercial scale implementation of CCS projects. In light of that, Alberta chose to deal proactively with the problem of pore space ownership by enacting declaratory legislation vesting pore space in the Crown. The legislation also made it quite clear that no person would have a cause of action against the Crown for damages or compensation as a result of the statutory vesting of pore space in the Crown.

(2) Having vested title to the pore space in the Crown the government, in the same legislation, also created a tenure regime for pore space. There are two forms of tenure, evaluation permits and sequestration leases. It is not necessary for an operator to proceed from a permit to a lease; an operator may go straight to a lease if it has an adequate information basis on which to make the application. The first such leases have been granted to Shell Canada for the Quest Project.

(3) The tenure amendments to the Mines and Minerals Act also provide for MMV Plans, closure plans and closer certificates. These issues are all dealt with in more detail in Part 5.

5 The regulatory regime in Alberta

In developing a regulatory regime to govern the review and approval of carbon capture and storage projects, Alberta has drawn heavily on existing approaches to the regulation of acid gas disposal projects (AGD). Indeed, from the perspective of the main energy regulator in the province, the Energy Resources Conservation Board (ERCB), carbon capture and storage projects are a subset of acid gas disposal projects, albeit presenting problems of scale that are not present in AGD projects.

Given the ERCB's reliance on the AGD analogy this section of the report begins with an account of how the Board regulates the approval of AGD projects.

5.1 The regulation of acid gas disposal projects

Acid gas disposal or injection refers to the injection and geological disposal of mixed streams of CO_2 and hydrogen sulphide (H_2S). AGD began in Alberta in 1989 as a response to the dual challenge posed by the need to reduce sulphur dioxide emissions from natural gas processing plants and by falling prices for elemental sulphur produced as part of conventional processing. In essence, the idea is to take the sulphur emissions stream and inject it back into the ground. While the principal emissions target has always been H_2S, the waste stream from the typical processing plant also contains CO_2 as an impurity. The injection ratios for approved injection projects vary between 83% H_2S and 14% CO_2 to 2% H_2S and 95% CO_2. Since 1989 the Board has approved over 50 AGD schemes for a variety of target formations including saline formations, depleted oil and gas reservoirs and in a few cases into the water leg of a producing oil reservoir.[36]

AGD is regulated in Alberta by the ERCB under the terms of the *Oil and Gas Conservation Act*[37] (*OGCA*) and regulations. The purposes of the statute include conservation of the resource, prevention of pollution and the economic development of the resource.[38] Prior to the 2010 amendments (discussed below) the *Act* itself had very little to say about geological disposal beyond a number of generic sections that require ERCB approval before a person may engage in a particular activity. Thus a person requires ERCB approval before: (1) drilling a well (including evaluation and injection wells) (section 11), (2) operating or constructing a facility (including a facility for the disposal of hydrocarbon wastes) (section 12), (3) proceeding with a scheme for (a) an EOR operation, (b) the processing or underground storage of gas, (c) *the storage or disposal of any fluid or substance to an underground formation through a well,* or (d) the storage treatment or disposal of oilfield waste (section 39). The italicized language is particularly pertinent to AGD and CCS projects.

The regulations offer some limited additional guidance as to the content of applications but the ERCB provides much more detailed instructions through a series of "Directives" including Directive 51 dealing with "Injection and Disposal Wells" and the more general Directive 65, "Resources Applications".[39] This latter includes a series of units dealing respectively with general disposal schemes, acid gas disposal schemes and gas storage schemes. Directive 65 requires an applicant for AGD approval to provide information on containment of injected substances, reservoir characteristics, hydraulic isolation, equity and safety.[40]

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36 S Bachu and K Haug, "In Situ Characteristics of Acid-Gas Injection Operations in the Alberta Basin, Western Canada: Demonstration of CO_2 Geological Storage" in S Benson (ed), *Carbon Dioxide Capture for Storage in Deep Geologic Formations – Results from the CO_2 Capture Project, Volume 2, Geologic Storage of Carbon Dioxide with Monitoring and Verification*, Elsevier, 2005 at 867–876.

37 RSA 2000, c.O-6.

38 OGCA, s.4.

39 The Directives are all available on the Board's website <www.ercb.ca/regulations-and-directives/directives>.

40 In addition to the text of the Guides there has been some discussion of the Board's regulatory requirements in the technical literature. See in particular H.L. Longworth, G.C. Dunn and M. Semchuk, "Underground Disposal of Acid Gas in Alberta, Canada: Regulatory Concerns and Case Histories" in *Proceedings of the Gas Technology Symposium*, (28 April – 1 May, 1996, Calgary Alberta, paper # SPE 35584) at 181–192.

Under the heading of *containment* the ERCB expects the applicant to be able to show that the injected fluids will be contained within a defined area and geologic horizon and ensure that there will be no migration to a hydrocarbon-bearing zone or groundwater. Hence the applicant will be expected to provide a complete and accurate drilling history of offsetting wells within several kilometres as well as information on the permeability of the cap rock and any fracturing. The applicant will also be expected to identify folding and faulting and comment on how this relates to seismic risk – both the effect of seismic activity on the integrity of the project and the effect of disposal schemes on (increased) seismic activity. Under the heading of *reservoir characteristics* the applicant will need to describe and analyse the native reservoir, the composition of the waste stream and phase behaviour as well as migration calculations and proposed bottom hole injection pressures. Board approvals will be limited to 90% of formation fracture pressures. The Board will expect an assessment of the effect of the acid gas on the target zones. Under the heading of *hydraulic isolation* the Board expects the applicant to demonstrate that all potable water bearing zones as well as hydrocarbon bearing zones are hydraulically isolated from the proposed injection wells by cement and/or casing with all injection occurring through tubing appropriately isolated from the casing by packer with casing integrity confirmed by an inspection log.

Many of the *safety* concerns that apply to AGD projects are the same as those that apply to all sour gas wells and facilities including pipelines. These include a requirement for the development of an emergency response plan (ERP) including an emergency planning zone that is the area of land that may be impacted by an H_2S release and may include the processing plant, the injection well and the connecting pipeline. The Board expects to see evidence of broad public consultation on both the ERP and all other matters related to the proposed project. Finally, under *equity* issues the Board expects the applicant to provide evidence that all offsetting mineral rights owners have been contacted as well as details of outstanding objections or concerns.

Perhaps surprisingly, very few AGD applications have triggered a public hearing and formal reasons for decision from the Board approving a project.[41]

In sum, AGD schemes present a range of regulatory challenges that will be similar to those which will have to be faced in the design of a CCS regulatory scheme. In some cases the risks associated with CCS will be lower than those associated with AGD. For example, length of pipeline will be far less of a concern with a CO_2 pipeline than it is with respect to an H_2S pipeline given the significantly more hazardous properties of H_2S. On the other hand, the sheer scale of CCS projects suggests that lateral migration issues will be far more significant than the migration issues associated with the disposal of relatively small volumes of acid gas into well defined physical/structural traps.

5.2 The Board's Mutatis Mutandis Bulletin

In July 2010 the Board issued a Bulletin, ERCB Processes Related to Carbon Capture and Storage Projects,[42] in which it confirmed its intention to treat CCS projects as a form of acid gas disposal. In doing so it drew attention to the relevant Directives particularly Directive 65 and Directive 51 dealing with Injection and Disposal Wells.

41 EUB Decision 2001-43, Re Duke Energy Midstream Services Canada Ltd, proposed modifications to the Puce Coupe plant; EUB Decision 99-31, Re Northrock Resources, application for a proposed sour gas processing plant in the Pembina field; EUB Decision 2000-42, Re Burlington Resources Canada Energy Ltd application to modify an existing sweet gas processing plant.

42 ERCB Bulletin 2010-22.

5.3 Amendments to the Oil and Gas Conservation Act and the Regulatory Add-ons to the Mines and Minerals Act

At the same time as the legislature amended the *Mines and Minerals Act* to address the two main property issues outlined above (ownership of pore space and the creation of a tenure regime) it also amended the *Oil and Gas Conservation Act* to give the Board some additional direction with respect to the approval process for CCS projects. It also added some *regulatory* elements to Part 9 of the *Mines and Minerals Act*. This latter was an unusual step for the Government of Alberta. Historically there has been a fairly clear demarcation between the content of the *Mines and Minerals Act* and the *Oil and Gas Conservation Act*. Under this demarcation the *Mines and Minerals Act* addresses the property and financial (royalty) issues associated with Crown owned minerals (eg the forms of tenure, issuance of tenure and continuation of tenure) while the *Oil and Gas Conservation Act* deals with the regulation of energy projects. However, with the creation of the new forms of sequestration tenure, the Department of Energy will be critically involved in some aspects of project regulation. These are highlighted below (section 5.3.3).

5.3.1 The Amendments to the *Oil and Gas Conservation Act* to accommodate CCS Projects

The province clearly accepted the premise of the Board's Bulletin 2010-22 to the effect that the Board was already well equipped to deal with the review and approval of CCS projects but the legislation did make two important changes to the *Oil and Gas Conservation Act* as well as a number of minor changes. The first significant change was to harmonize one of the key liability provisions of the *Act* with the amendments to the *Mines and Minerals Act* which proposed a transfer of liability. This is dealt with in Part 6 of this report which focuses on liability. The second significant change was to amend the "scheme approval" section of the *Act* (already referred to above in the context of AGD projects) to explicitly refer to CCS projects. As amended, this provision now reads as follows:

> 39(1) No scheme for
>
> .....
>
> (d) the storage or disposal of any fluid or other substance to an underground formation through a well,
>
> may be proceeded with unless the Board, by order, has approved the scheme on any terms and conditions that the Board prescribes.
>
> (1.1) The Board may not approve a scheme for the disposal of captured carbon dioxide to an underground formation under subsection (1)(d) that is pursuant to an agreement under Part 9 of the *Mines and Minerals Act* unless the lessee of that agreement satisfies the Board that the injection of the captured carbon dioxide will not interfere with
>
> (a) the recovery or conservation of oil or gas, or
>
> (b) an existing use of the underground formation for the storage of oil or gas.
>
> (2) Prior to the Board approving a scheme under subsection (1)(d), it shall refer the application to the Minister of Environment for that Minister's approval with respect to the application as it affects matters of the environment.
>
> (3) The Minister of Environment may give approval with or without conditions, but when conditions are imposed, the Board shall, if it approves the scheme, make its order subject to the same conditions imposed by the Minister of Environment when that Minister gave approval.
>
> .....

The amendment created a sub-category of storage and disposal projects namely CO_2 disposal projects that are proceeding under Part 9 of the *Mines and Minerals Act*[43] and it provides a clear instruction to the Board that it may not approve a CCS project unless the applicant has convinced the Board that the project will not interfere with hydrocarbon recovery operations or an existing storage operation. The fact that the word "existing" only qualifies the use of a formation for storage operations suggests that the applicant and the Board must have in mind not only current hydrocarbon recovery operations but also possible future operations.

5.3.2 The Board's review of Shell's Quest Project

Since the amendment was passed the Board has considered one application for approval of a CCS project. This was Shell Canada's application for approval of the Quest Project.[44] The project is associated with the long standing Athabasca Oil Sands Project (AOSP) and the Scotford Upgrader where new facilities are designed to capture up to 1.2 megatonnes of CO_2 per year for ongoing injection. The cumulative stored volume is expected to be greater than 27 Mt of CO_2 over the expected 25 year life of the Scotford Upgrader. The application was actually a composite application involving not only an application under section 39 of the *Oil and Gas Conservation Act* but also an application for approval of a CO_2 pipeline and for the necessary capture facilities at the Scotford Upgrader.

The Board identified the following list of issues with respect to the applications (at 4):

- the corporate structure of the applicant and other legal issues;
- the need for the project;
- amendment to the Scotford Upgrader;
- pipeline transmission of CO_2 to the injection sites;
- sequestration of CO_2 —containment in the subsurface;
- public safety and emergency response;
- environment and socio-economics;
- monitoring, measurement, and verification;
- public consultation, communications, and access to information;
- the public interest; and
- ongoing approval processes.

43 It should be noted then that the provision does not apply to CO_2-EOR projects (such projects would be dealt with under section 39(1)(a) which does not trigger the need for the approval of the Minister of the Environment) and would not apply to a CCS project that was proceeding on a Crown tenure or licence that was not issued under Part 9 of the MMA (eg a section 11 special agreement or a section 54 & section 56 licence).

44 Shell Canada Limited, Application for the Quest Carbon Capture and Storage Project, Radway Field, July 10, 2012, 2012 AERCB 008.

The Board decision covers close to sixty pages of text with additional figures and appendices. I cannot review all of these issues here but I will briefly review how the Board addressed six issues: (1) proof of containment, (2) the protection of hydrocarbon production and storage interests, (3) the protection of potable groundwater, (4) the treatment of legacy wells, (5) monitoring, measurement and verification (MMV), and (6) how Shell, as the applicant, made use of third party evaluations in order to support its application.

Containment

Proof of geological containment is perhaps the most important issue that a CCS proponent must address. In this case there was considerable evidence that the target storage complex the Basal Cambrian Sand (BCS) would provide appropriate containment. The base of the storage formation is sealed by the Precambrian granite basement (at para. 136) while the seals above included shales (between 90m and 22m in thickness), salt formations between 35m and 85m in thickness and an evaporite formation. The water chemistry of these shallower formations indicated that they were isolated as did evidence of pressure differences in relation to other formations. Additionally, Shell noted that a number of porous zones would act as baffles (ie they would restrict any vertical fluid flow since they would allow CO_2 to migrate into these zones). There was no evidence of faulting (at para. 196) while there was evidence that the area has been one of relative tectonic stability over a long period of geologic time. Thus, the BCS is clearly a very favorable geological storage site.

Hydrocarbon production interests

As noted above, the Board may not approve a CCS scheme unless the proponent "satisfies the Board that the project will not interfere with hydrocarbon production and storage interests." The evidence showed that there was no organic material below the base of the BCS and therefore no hydrocarbon source rock; while the BCS itself (at para 130) "exhibits no structural or stratigraphic closure as a trapping mechanism for oil or gas, and for that reason was not suitable for natural gas storage either, even though the BCS storage complex has excellent sealing capacity." Furthermore, the nearest producing hydrocarbon formation lies more than 1,000 metres above the BCS and 10 km from the storage wells. This allowed the Board to conclude (at para. 180) (and notwithstanding the fact that there were existing Crown leases granting rights down to the basement as well as non-Crown oil and gas rights) that there was little prospect that anybody would apply to drill an oil or gas well into the formations in the "Location" (at para 180 and see also at paras 187 – 188). Furthermore, the evidence suggested that, on a prospective basis, the Crown would not lease oil and gas rights within the zone of interest (at para. 180).

All of this allowed the Board to conclude (at paras. 187 – 188) that Shell had satisfied the statutory test – although the Board does state a few paragraphs later (at para. 195), "that producing fields might see a slight increase in salinity or acidity of produced fluids, but finds that their lateral and vertical distances from the injection area—the nearest field is 1000 m vertically and 10 km laterally from the injection area—render this outcome unlikely." Implicitly, the Board must be concluding that this risk is not inconsistent with the non-interference test prescribed by the statute.

Protection of potable groundwater

While the *Oil and Gas Conservation Act* requires that the applicant establish that its proposed operation will cause no harm to (or more precisely "will not interfere with") oil and gas interests, there is no similar requirement in relation to potable groundwater. However, the ERCB is clearly of the view that it has the responsibility to ensure that CCS operations will not affect potable groundwater. In this case the target formation is highly saline (311,000 milligrams/litre TDS). The Board addressed concerns as to the potential for groundwater contamination at several points in its decision emphasising, *inter alia*, the completion requirements for injection wells, the fact that there would be three layers of casing cemented to surface (at para. 198), and the importance of the proposed MMV program (combined with development of baseline data including well testing within a 3.2 km radius of any injection well (at 356 – 360.)) See further discussion of the MMV program below.

The treatment of legacy wells

The CCS literature confirms that one of the principal possible pathways for leakage is posed by the existence of legacy wells within the storage complex. A working definition of a legacy well (see para 181) is an old well (long since abandoned) which penetrates the proposed storage complex (in this case the BCS). It is clear that Shell carefully selected its injection target with a view to minimizing the number of legacy wells it would need to deal with. In this case there are only four legacy wells within the area of interest and the nearest was located more than 18km from any of the proposed injection wells. Three of the wells were abandoned between 1949 and 1955 and the other in 1978. In one case the evidence was to the effect that the abandonment left about 900m of open hole below the first cement plug (at paras and 126 & 183). However, the Board was satisfied that there was little risk of the injected substances migrating and reaching the legacy wells and even it did there was little risk that the induced pressure increases at these locations would lift the brine to reach protected groundwater aquifers (at paras 181 – 186). The Board did however indicate (at para. 340) that it would require Shell to address in its annual reporting the need for additional monitoring wells adjacent to the legacy wells if a risk emerged that the plume pressure might be sufficient to raise BCS brine to the base of groundwater protection (BGWP).

It seems safe to assume that the licensees of these legacy wells did not object to Shell's proposal. If they had objected that would likely have been noted in Board's decision. We do not, however, know from the decision whether these licensees never objected from the outset, or whether Shell was able to satisfy any concerns that they might have had. Given that an operation to pressure up formations penetrated by a legacy well increases the risk for the licensee and working interest participants in that legacy well, one might have expected that a licensee of such a well would seek to have Shell take an assignment of the licence or to have Shell provide an indemnity to cover any costs associated with possible future re-abandonment operations. But perhaps these licensees simply thought the risk of a problem was too small given the distance between the injector and legacy wells. The decision is silent on the point.

Monitoring, Measurement and Verification (MMV)

Shell submitted a comprehensive MMV program for the project emphasising, as did the Board, the importance of conducting appropriate baselines studies over the next two years before injection begins. The MMV measures include three (shallow) non-saline groundwater monitoring wells for each injection well, at least three deep injection wells in the Winnipegosis formation in the upper part of the storage complex, repeated 3-D seismic to monitor the plume, and the use of InSAR a radar based technology to measure any ground deformation (ground heave) associated with the injection activities. The Board also emphasised that the MMV program needed to be adaptive (at para 333) and, in recognizing that the proposed MMV program had yet to be finalized, took the opportunity to add a number of conditions to the scheme approval and also to warn Shell that additional requirements might be imposed as the project evolved, depending upon how the injection plume performed. Some of these requirements such as the possible need for additional evaluation wells could be quite onerous. Indeed of the 23 conditions included in the Board's decision, 21 relate to the MMV portion of the report.[45] This should not, I think, be read to mean that the Board was dissatisfied with the quality of Shell's proposal but instead reflects the importance of the issue. In the end the MMV conditions are best read as the outcome of a dialogue between the proponent and the Board in which both parties seem to be using best efforts to design an MMV program that permitted both Shell and the Board (at para. 273) "to verify that actual storage performance conforms to model-based forecasts, and to trigger additional control measures to prevent or correct any loss of containment before significant impacts occurred."

Third party assessments

Shell took the unusual step of having several aspects of its application materials vetted by external assessors and filing those assessments with the Board in support of its application. On the technical side, Shell retained Det Norsk Veritas (DNV) (at paras. 143 and 278) to review Shell's proposed MMV program. DNV issued a "certificate of fit for purpose". Shell also retained Oxand (at para. 148) to assess the long term (200 years) integrity of injection wells. And finally, Shell retained the Pembina Institute (at para 369), Alberta's highest profile ENGO, to evaluate and provide advice to it on its public consultation and communication program. These assessments (and Shell's responses to the assessments) were presented as part of the evidence supporting its application and in Shell's words, to encourage transparency in relation to the technical aspects of the proposal (at para. 143).

5.3.3 Regulatory issues included in the amendments to the *Mines and Minerals Act*

As noted above, the province decided to include in the CCS tenure rules certain matters that are concerned more with the regulation of CCS projects than they are with the proprietary issues on which a disposition statute such as the *Mines and Mineral Act* typically focuses. Specifically, the *Act* and the regulations deal with three matters that might ordinarily have fallen within the jurisdiction of the ERCB: (1) MMV plans, (2) closure plans, and (3) the issuance of closure certificates. I am given to understand that the government decided to deal with these issues in the *MMA* (and thus to have

45 I have included the scheme approval for the Quest Project as Appendix I.

them dealt with in-house in the Department of Energy rather than through the ERCB) because of the transfer of liability that the legislation provides for. The government wanted to be in control of the circumstances in which liability would be transferred.

MMV plans

The regulations require an applicant for a permit (section 3(2)(d)) and for a lease (section 9(2)(e)) to file an MMV plan but do not offer much guidance as to the content of the plan except with respect to the possible effects of the project on hydrocarbon recovery. Thus, in the case of a permit the applicant must provide (section 7(1)(b) "an analysis of the likelihood that the operations or activities that may be conducted under the permit will interfere with mineral recovery", and similarly, in the case of a lease the applicant must provide (section 15(b)) "an analysis of the likelihood that the operations or activities that may be conducted under the carbon sequestration lease will interfere with mineral recovery, based on the geological interpretations and calculations the lessee is required to submit to the Board pursuant to Directive 65 in its application for approval of the injection scheme under the *Oil and Gas Conservation Act*". A lessee must renew its MMV plan at least every three years (section 16) and must file an annual report (section 17) with the Minister "that sets out the findings and observations" from the MMV operations that the lessee has conducted.

Closure plans

An applicant for a lease must include in its application a closure plan (section 9(2)(f). At this time the regulations offer little guidance as to the content of the closure plan other than to state that the Minister may approve a plan submitted in support of an application for a lease "if the plan sets out a description of the activities satisfactory to the Minister that the lessee will undertake to close down sequestration operations and facilities."[46] However, as with the MMV plans, the closure plan must be renewed every three years and on any renewal of the lease. The *revised* closure plan must address the following:

(a) a summary of the activities that have been conducted by the lessee on the location of the carbon sequestration lease since it was issued;

(b) the quantity of captured CO_2 that has been injected;

(c) an evaluation of whether the injected captured CO_2 has behaved in a manner consistent with the geological interpretations and calculations the lessee submitted to the Board pursuant to Directive 65 in its application for approval of the injection scheme under the *Oil and Gas Conservation Act*;

(d) the most recent geological interpretations and calculations that may have been made by the lessee with respect to the injected CO_2 and any associated pressure front;

(e) a description of the location, condition, plugging procedures and integrity testing results for every well that has been used for the injection of captured CO_2 under the lease;

46 CSTR, section 18 and titled "Initial closure plan".

(f) a description of any decommissioning, abandonment or reclamation activities undertaken by the lessee in the location of the lease;

(g) an inventory of the reports and documents that the lessee has submitted to the Board or a department or agency of the Crown in right of Alberta or the Crown in right of Canada since the approval of the first closure plan related to the carbon sequestration lease, whether or not those reports and documents were required to be submitted;

(h) advice and recommendations about the monitoring, measurement and verification activities that should be conducted after the issuance of a closure certificate is issued for the carbon sequestration lease under section 120 of the Act.

The closure certificate

The closure certificate is addressed in the *Act*. The regulations do not yet further elaborate on the procedure to be followed when a party is applying for a closure certificate.[47] The issuance of a closure certificate is a precondition to the Crown's assumption of liability. The *Act* provides that Minister may issue a closure certificate on the application of a lessee if the Minister is satisfied that:

> (a) the lessee has complied with section 119, [i.e. it has monitored all wells and facilities and performed all the closure activities as prescribed by the regulations – the regulations have yet to be developed]
> (b) the lessee has abandoned all wells and facilities in accordance with the requirements under the *Oil and Gas Conservation Act* and the regulations under this Part,
> (c) the lessee has complied with the reclamation requirements under the *Environmental Protection and Enhancement Act*,
> (d) the closure period specified in the regulations has passed, [no time yet prescribed]
> (e) the conditions specified in the regulations have been met [no regulations to this point], and
> (f) the captured carbon dioxide is behaving in a stable and predictable manner, with no significant risk of future leakage.

While this provides a framework and identifies one substantive condition for issuing a closure certificate (the idea that the CO_2 plume is behaving in a stable and predictable manner with no significant risk of leakage) it is apparent (from the bracketed references in the above quotation) that much still remains to be elaborated by way of regulations.

5.4 The Regulatory Framework Assessment

The RFA identified 21 different issues that needed to be examined. These were as follows: (1) approvals, permits and regulatory process, (2) closure and transfer of liability, (3) CO_2 classification, (4) CO_2 enhanced oil recovery and acid gas disposal, (5) CO_2 transportation and composition, (6) competition with other resources, (7) environmental assessments, (8) environmental impacts, mitigation and remediation, (9) MMV, (10) pipeline open access, (11) pore space open access, (12) post-closure stewardship fund and financial security, (13) public engagement and stakeholder consultation,

47 *MMA*, s. 124(h) empowers the Lieutenant Governor in Council to make regulations respecting applications for closure certificates, including regulations respecting the form and contents of applications and the closure period that must have passed before a lessee is eligible to apply.

(14) public safety, (15) risk assessment, (16) site closure, (17) site selection, (18) surface access, (19) surface reclamation, (20) tenure process, and (21) well construction.

In what follows I shall focus on those issues that seem to have a bearing on the legal and regulatory framework rather than some of the more technical issues that were discussed.

Third party access

The RFA expressed some concern that regulated emitters might not be able to negotiate access on market terms to CO_2 pipeline infrastructure or an appropriate storage site.[48] Accordingly it recommended that Alberta should create a mechanism whereby in exceptional circumstances a party might apply for regulated access. The report also recommends that pipeline operators should be encouraged to conduct some form of "open season" as part of commissioning new pipeline capacity. The RFA also encouraged efforts to cooperate in the shared use of infrastructure and suggested that the Government should consider taking an active role in the regional planning of CO_2 pipeline infrastructure.

Site selection issues

The RFA recommended that the ERCB should review its requirements relating to CO_2 sequestration to ensure that they adequately reflect issues related to sequestration volume capacity, injectivity and containment. An inventory of pore space should be established and updated and consideration should be given to identifying high priority areas where there is good quality pore space and little risk of conflict between CCS activities and other subsurface resource users.

The roles of the ERCB and the Department of Energy

The RFA suggested that government should clarify the respective roles and responsibilities of Energy and the ERCB in relation to the issuance of closure certificates and MMV issues. The RFA was of the view that MMV issues should be dealt with by the ERCB rather than the Department of Energy.

Transparency issues

The RFA made a number of recommendations relating to transparency including development of a guide for CCS proponents to guide them through the regulatory system; broad notification of stakeholders as part of project applications; development of a wide range of public information documents.

Tenure issues

Recommendations in relation to tenure include the following: the continued use of section 54 licences for CCS research activities; an enhanced list of matters to be addressed in a closure plan; and the revocation of unused sequestration leases.

48 These issues are also discussed in N Bankes and R Nilson, "Economic Regulation and the Design of a Carbon Infrastructure for Alberta" in Roggenkamp et al (eds), Energy Networks and the Law, (Oxford University Press, 2012) at 231 – 251.

Environmental impact assessments

In addition to the review conducted by the ERCB under the *Oil and Gas Conservation Act* Alberta Environment and Sustainable Resource Development may also require an environmental impact assessment under the terms of the *Environmental Protection and Enhancement Act*.[49] The regulations under that Act create three categories of projects: (1) those for which an EIA is mandatory, (2) those activities that are exempt from an EIA, and, (3) (the default position) activities for which a Director may order an EIA. At the current time CCS projects fall in to this default category. The RFA recommends that CCS projects should be placed on the mandatory list – at least until further experience is gained with CCS projects.

Liability issues

The RFA recommended that the government needs to establish a contribution rate for the Post-closure Stewardship Fund. The rate should be based on a risk assessment. Lessees should be required to post security for anticipated suspension, abandonment and remediation costs so as to reduce the risk of drawing on the fund to cover "orphan" facilities. Government should assume liability for any emissions accounting liability that might occur after the closure certificate issues. Disbursements from the Fund for this purpose should be permitted. Liability issues are discussed in greater detail in part six of this report.

CCS and CO_2-EOR Operations

The RFA recommended that government needed to identify and justify the different treatment of CO_2-EOR projects, CCS projects and acid gas disposal projects.

5.5 Conclusions on the regulatory issues

(1) The principal legislative authority for reviewing, assessment and approving CCS projects in Alberta is the scheme approval provision of the *Oil and Gas Conservation Act*.

(2) The detailed regulatory framework for CCS projects in Alberta is found in the key Directives of the ERCB and the terms and conditions of scheme approvals. In particular, the ERCB will treat CCS projects as a sub-set of acid gas injection projects.

(3) Shell's Quest project provides an example of how the regulatory review process work and the types of issues that the Board will address in its detailed review of an application.

(4) In addition to the provisions of the *Oil and Gas Conservation Act*, the *Mines and Minerals Act* prescribes additional obligations for CCS operators. In particular, the *Mines and Minerals Act* and regulations address the need for MMV Plans and Closure Plans and also discuss the circumstances in which a closure certificate may be issued. However, there are many issues here that still need to be elaborated in the regulations.

(5) The Regulatory Framework Assessment in Alberta has identified a number of improvements that might be made to the regulatory scheme for CCS projects in Alberta.

49 RSA 2000, c. E-12.

6 Liability issues

The liability issues associated with CCS activities include: (1) potential tort liability in the event that the project causes harm to some person or persons, (2) statutory liability with respect to abandonment and re-abandonment obligations and any necessary remedial operations, (3) liability for ongoing monitoring of the site and the injected CO_2, and (4) potential accounting liability for any emissions of CO_2 from the project site.

In discussing CCS liability issues it is conventional to distinguish between: (1) the liability for CCS activities during the operational phase and for at least some period after active injection has ceased, and (2) liability for the post-closure period. It is commonly accepted both in the literature and in practice that during the operational phase liability should always rest, and for all purposes, with the project operator or licensee. The principal issue discussed in the literature is whether, and if so under what circumstances, there should be a transfer of liability to the government. And if there is to be a transfer it will be important to identify: (1) the trigger for any transfer, (2) the liabilities that are being transferred, and (3) the legal means for effecting any transfer.

The Government of Alberta introduced a special liability regime for CCS operations in the 2010 amendments that added Part 9 to the *Mines and Minerals Act*. In particular, the amendments provided for a transfer of liability to the Crown upon issuance of a closure certificate, and also provided for the creation of the Post-Closure Stewardship Fund.

6.1 Liability prior to the issuance of a closure certificate

Prior to the issuance of a closure certificate, the project licensee will be responsible for the first three categories of liability identified above. That liability extends to those parties who hold a working interest in the project.[50] I will deal with accounting liability under the heading of crediting (Part 7) below. In the event that the project licensee and its working interest participants default on their statutory duties to pay for any abandonment and reclamation costs that accrue *prior* to issuance of the closure certificate,[51] these costs may (notwithstanding the name of the Fund), be covered by the Post-closure Stewardship Fund.[52]

6.2 The Crown's assumption of liability

Section 121 of the *Mines and Minerals Act* provides that the Crown assumes certain liabilities for the CCS project upon the issuance of closure certificate. More specifically, the Crown

(a) becomes the owner of the captured carbon dioxide injected pursuant to the agreement,

(b) assumes all obligations of the lessee

  (i) as owner and licensee under the *Oil and Gas Conservation Act* of the wells and facilities covered by that agreement,

50 *OGCA*, s. 29.

51 Such wells and facilities are then treated as "orphans".

52 *MMA*, s.122(2)(c) and s.123. This is the only form of liability for which the Fund has any responsibility prior to the issuance of a closure certificate.

(ii) as the person responsible for the injected captured carbon dioxide under the *Environmental Protection and Enhancement Act*,

(iii) as the operator under Part 6 of the *Environmental Protection and Enhancement Act* in respect of the land within the location of the agreement used by the lessee in relation to the injection of captured carbon dioxide, and

(iv) under the *Surface Rights Act*,

and

(c) releases the lessee from any obligations under section 56(2)(a) with respect to the wells within the location of the agreement used by the lessee in relation to the injection of captured carbon dioxide.

I will discuss each of these paragraphs in turn. Paragraph (a) deals with ownership of the CO_2. It is not itself concerned with liability but to the extent that liability turns on ownership (tort liability, the subject of the indemnity discussed below, ordinarily turns on control rather than ownership) any such liability will pass to the Crown. This provision appears to have been included out of an abundance of caution.

Item (i) of paragraph (b) deals with all of the obligations of a licensee under the *Oil and Gas Conservation Act*. These include obligations for re-abandoning a well or for taking any other necessary remedial activities in relation to any wells or facilities. The 2010 amendments also amended the *OGCA* in order to give effect to this assumption of liability. The new section 23.1 of the *OGCA* effectively novates the Crown into the position of licensee in the Board's records and relieves the lessee of any responsibility that it might have had. It seems reasonable to think that the obligations of the licensee that the Crown assumes would include any ongoing MMV obligations imposed on the licensee.[53]

Item (ii) and (iii) of paragraph (b) achieves the same result in relation to the statutory obligations that the lessee might have as "a person responsible" or as an "operator" under the *Environmental Protection and Enhancement Act*.[54] The liabilities associated with item (ii) are any potential liabilities associated with a "release", whereas the liabilities associated with item (iii) and Part 6 of *EPEA* are surface reclamation activities associated with wells and facilities.

Items (iii) of paragraph (b) deals with any liabilities that the lessee may have under the *Surface Rights Act*.[55] Thus, to the extent that a right of entry order is still in place in order to accommodate ongoing MMV operations, then any obligations of the lessee under the right of entry order will be assumed by the Crown.

Paragraph (c) also seems to be included out of an abundance of caution since it deals with a situation in which a party is relying on section 56 of the *Mines and Minerals Act* rather than its lease.[56] In any event, the new paragraph effectively reverses the licensee's indemnification obligation under section 56(2).

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53 Note in this context that section 122(2)(a) of the MMA provides that the Post-closure Stewardship Fund may be used inter alia "for the purposes of monitoring the behaviour of captured carbon dioxide that has been injected pursuant to an agreement under this Part".

54 RSA 2000, c.E-12.

55 RSA 2000, c.S-24. The 2010 amendments also amended the SRA to make it clear that the Surface Rights Board could issue a right of entry order to accommodate a CO_2 injection well and any MMV activities required by Part 9 of the *MMA*. See now section 13.2 of the *SRA*.

56 It is possible that the Crown takes the view that section 56 applies even if there is no sequestration lease or permit. Certainly, the section is capable of that interpretation although the section was first included in the *MMA* before the *MMA* was amended to include the sequestration tenures provided by Part 9.

In addition to the assumption of liability, the Crown also undertakes (section 121(2)) to indemnify the lessee against any liability for damages in an action in tort brought by a party if:

> (a) the liability is attributable to an act done or omitted to be done by the lessee in the lessee's exercise of rights under the agreement in relation to the injection of captured carbon dioxide, and
>
> (b) any other conditions specified in the regulations are met [no relevant conditions prescribed as yet]

It will be observed that the assumption of liability and the indemnity arrangement effectively cover off the first three of the categories of liability identified in the introduction to this section. These sections do not provide that the Crown will assume any liability for project emissions that may trigger an accounting liability under federal or provincial greenhouse gas emissions reduction legislation.

6.3 The Post-closure Stewardship Fund

The Crown's assumption of liability upon the issuance of a closure certificate and its liability for orphan facilities is not entirely unfunded since the 2010 amendments also provided for the creation of the Post-closure Stewardship Fund. The Fund may be used for the following purposes:

> (a) for the purposes of monitoring the behaviour of captured carbon dioxide that has been injected pursuant to an agreement under this Part;
>
> (b) for the purposes of fulfilling any obligations that are assumed by the Crown pursuant to section 121(1)(b);
>
> (c) for the purposes of paying for suspension costs, abandonment costs and related reclamation or remediation costs in respect of orphan facilities ….
>
> (e) for any other purpose prescribed in the regulations.

It is important emphasise what the Fund may *not* be used for. Note in particular that the scope of responsibilities of the Fund does *not* cover all of the matters for which the Crown has assumed responsibility. Specifically, the Fund may not be used to cover any liability that the Crown may have as a result of becoming the owner of any injected CO_2 (section 121(1)), or any liability that the Crown may have under section 121(2) with respect to its statutory undertaking to indemnify the lessee. Furthermore, since the Crown's assumption of liability under section 121 does not extend to any greenhouse gas accounting liability the Fund may not be used for that purpose either. As noted above however the Fund may be used, even pre-closure, to cover off any responsibilities for orphan wells and facilities (i.e. facilities for which the licensee and its working interest partners are in default).

Lessees are obliged to contribute to the Fund (section 122(3)) "in accordance with the regulations". At present the regulations have simply deferred the matter since section 20 provides only that:

> A lessee shall pay into the Postclosure Stewardship Fund a fee per tonne of captured carbon dioxide injected into the location of a carbon sequestration lease at the rate established by the Minister.

So far as I am aware the Minister has yet to establish the fee.

6.4 Conclusions on the liability issues

(1) Prior to the issuance of a closure certificate all liabilities (with the possible exception of emissions accounting liabilities) will rest with the lessee/operator/licensee and its working interest partners. In default of that liability the facilities may be declared to be orphaned and any abandonment and reclamation costs may be covered by the Fund.

(2) Upon the issuance of closure certificate the Crown assumes the statutory liabilities of the lessee/operator/licensee and also agrees to indemnify the lessee from relevant tort liabilities. In part this assumption of liability is effected by the Crown becoming the licensee of any wells and facilities under the terms of the *Oil and Gas Conservation Act*.

(3) Continuing MMV obligations will be assumed by the Crown either by the assumption of responsibilities under the OGCA licences or by the provision in section 122(2)(a) which allows disbursements from the Fund to cover ongoing MMV activities.

(4) The Fund is financed by lessees. The Fund may be used for MMV purposes and for reclamation, re-abandonment and any necessary remedial activities. It may not be used to cover any liability that the Crown may have under its general indemnity of the lessee and it may be not be used to pay for any emissions accounting liability.

7 Carbon crediting issues

CCS projects are designed to provide net carbon emission reductions over a business as usual operation. As such, the operator of a CCS project will expect to obtain credits in some way, shape or form which it can use either to meet its own emissions obligations (in the case of an integrated capture/transport/storage project) or to sell to others to allow them to meet their obligations whether in the form of emissions performance credits (i.e. an avoided emission) or in the form of offset credits.

7.1 The Specified Gas Emitters Regulation

Alberta's carbon crediting regime is based on the *Climate Change and Emissions Management Act (CCEMA)*[57] first enacted in 2003 and amended in 2007.[58] Key elements of that regime are the Specified Gas Reporting Regulation (SGRR),[59] the Specified Gas Emitters Regulation (SGER)[60] and the Specified Gas Reporting Standard.[61] The SGERs were amended in 2011 to specifically address crediting issues associated with geological sequestration.[62]

57 SA 2003, c. C-16.7.

58 SA 2007, c. 4.

59 Alta. Reg. 251/2004.

60 Alta. Reg. 139/2007.

61 Alberta Environment, Specified Gas Reporting Standard, March 2007 <www3.gov.ab.ca/env/air/pubs/ghg_specified_gas_reporting_standard.pdf>.

62 Alta. Reg. 127/2011.

The SGERs require that covered facilities (or more specifically the "person(s) responsible" for a covered facility) must achieve (section 6) the emissions intensity targets specified by the regulations. A covered facility is a facility (section 2) that has "direct emissions" of 100,000 tonnes or more of specified gases (i.e. greenhouse gases or GHGs) in 2003 or any subsequent year. The SGERs contemplate that a person responsible may meet its obligations in a number of different ways. It may do so by actually achieving the reduction at the specific facility; it may do so by acquiring allowable emissions offsets; it may do so by payments into the Climate Change and Emissions Management Fund (the Fund) (currently set at $15 per tonne); or it may do so by applying to the facility any emissions performance credits that it has acquired or accumulated (section 4(3)).[63]

An allowable emissions offset is a project-based reduction in GHG emissions (over a business as usual baseline) that is obtained in relation to an activity that does not have its own emission reduction commitment under the regulations (i.e it is not a covered facility). Emissions offsets are dealt with in detail in section 7 of the regulations. This section of the regulations was amended in 2011 to specifically address geological sequestration offsets. The amendment also changed the definition of offsets. The definition of "emissions offsets" now reads as follows:

> (i) a reduction in the release of specified gases, expressed in tonnes on a CO_2e basis, that meets the requirements of section 7(1), but does not include an emission performance credit,
>
> (ii) a geological sequestration of specified gases, expressed in tonnes on a CO_2e basis, that meets the requirements of section 7(1.1), and
>
> (iii) a capture of specified gases that are geologically sequestered that meets the requirements of section 7(1.2); (emphasis added)

There are thus three categories of offsets: (1) reduction offsets, (2) geological sequestration offsets, and (3) upgrader capture + geological sequestration offsets.

Section 7(1) lays out the general requirements that must be met before a reduction in GHGs may count as an offset:

> (a) the specified gas emissions reduction must occur in Alberta;
>
> (b) the specified gas emissions reduction must be from an action taken that is not otherwise required by law at the time the action is initiated;
>
> (c) the specified gas emissions reduction must
>
> (i) result from actions taken on or after January 1, 2002, and
>
> (ii) occur on or after January 1, 2002;
>
> (d) the specified gas emissions reduction must be real and demonstrable;
>
> (e) the specified gas emissions reduction must be quantifiable and measurable, directly or by accurate estimation using replicable techniques.

Section 7(2) imposes some fairly straightforward restrictions on the use of all three forms of emission offsets. Thus an offset can only be used once and its use must accord with any Ministerial Guidelines issued under the *Act* and the emissions offset must be "held" by the person responsible using it and where such an offset is jointly held each holder may only use "a portion of the offset on a pro rata basis".

63 An emissions performance credit (EPC) arises when a covered emitter beats its target.

More detailed additional guidance is provided for offset projects. This takes the form of two general guidance documents the *Technical Guidance for Offset Protocol Developers*[64] and the *Technical Guidance for Offset Credit Project Developers*,[65] as well as detailed Quantification Protocols (QPs). Alberta Environment and Sustainable Resource Development (AESRD, formerly Alberta Environment) has sanctioned more than 30 Quantification Protocols[66] including two Quantification Protocols for Enhanced Oil Recovery (EOR),[67] and a Quantification Protocol for Acid Gas Injection (AGI).[68] Both of the EOR QPs are "asterisked" indicating that they are under review to address "known risks". Projects may still be accepted for offset purposes on a case-by-case basis with the approval of AESRD. The QP for AGI has now been withdrawn on the basis that acid gas injection is now the business as usual approach for dealing with acid gases recovered as part of natural gas processing. Accordingly AGI for these purposes fails the additionality test for generating offset credits. A QP for the Capture of CO_2 and Storage in Deep Saline Aquifers is still under development.[69] Offset credits cannot be generated for an activity that does not have a government approved quantification protocol.[70]

Projects under the Alberta system have a credit duration period of 8 years with a possible extension for five years.[71] Biosequestration activities may have a longer credit duration period.[72] The offset scheme is said to be based on eleven key principles: (1) reduce provincial emissions, (real, quantifiable and verifiable) (2) produce net benefits that would not otherwise have occurred, (3) support incremental change technologies, (4) balance conservativeness and accuracy, (5) develop protocols to credit actions that can be implemented in Alberta, (6) verifiable, (7) transparent and accountable, (8) no leakage from any shift in emissions, (9) maximum scope, (10) "building and linking" (i.e. linking to existing programs and trading systems), and (11) reasonable program administration.[73]

The principal aim of the Technical Guidance documents and the Protocols is to ensure that credit is only claimed for reductions that would not otherwise occur (i.e. that go beyond business as usual or establish additionality) and that credit is only claimed for net emission reductions.[74] Protocols may be reviewed from time to time and withdrawn if it is concluded that an activity that previously qualified for offset credits now represents business as usual for the sector.[75] An activity

64 Version 1.0, January 2011.

65 Technical Guidance for Offset Project Developers, v.4.0 (February 2013). Both guidance documents are available here: <www.carbonoffsetsolutions.climatechangecentral.com/offset-protocols/approved-alberta-protocols>.

66 The Protocols are posted on AESRD's website at http://environment.alberta.ca/02275.html and on the Alberta Offsets Registry website at <www.carbonoffsetsolutions.climatechangecentral.com/offset-protocols/approved-alberta-protocols>.

67 There is both a long version: <www.environment.alberta.ca/documents/EOR_Protocol_V1_Oct_07.pdf> (October 2007, version 1) and a "streamlined" version: <www.environment.alberta.ca/documents/EOR_Protocol_-_Streamlined_V1_Oct_07.pdf>.

68 Quantification Protocol for Acid Gas Injection, May 2008, <www.environment.gov.ab.ca/info/library/7961.pdf>.

69 See DRAFT, Quantification Protocol for the Capture of CO2 and Storage in Deep Saline Aquifers, December 2011, available at: <www.carbonoffsetsolutions.climatechangecentral.com/files/microsites/OffsetProtocols/DraftProtocolsDocs/col_Draft_PUBLIC_COMMENT_Version__Dec9_2011__0.pdf>.

70 Technical Guidance for Offset Protocol Developers, at 12, note 1.

71 Technical Guidance for Offset Protocol Developers, at 17. An emissions performance credit can be earned at a regulated facility for so long as emissions are reduced and the facility beats its own emissions intensity target.

72 Id., at 17.

73 Technical Guidance for Offset Protocol Developers, at 10.

74 On the additionality tests for Alberta see Technical Guidance for Offset Protocol Developers at 22 – 23.

75 Technical Guidance for Offset Project Developers at 33. An example is the AGI Protocol.

that is required by law (federal, provincial, municipal) is not additional.[76] Once a Protocol has been approved then "all projects implemented under that protocol … will be considered additional until such time as the protocol is reviewed and/or the credit duration lapses."[77]

The Alberta system is an "ex post" verification system.[78] The project proponent creates the offsets by developing a project using an approved protocol which produces reduced net emissions over some business as usual baseline. This results in a Greenhouse Gas Assertion i.e. a statement of the total tonnes of GHG emission reductions or removals that are being claimed as offset credits.[79] The assertion is then verified by an independent third party according (effective 2012) to a reasonable level assurance standard.[80] The Technical Guidance for Offset Project Developers provides further details as to the third party verification measures including the required qualifications for third party verifiers and the verification standards and materiality requirements (errors over 5% are considered material).[81] The resulting Verification Report should follow a standard template.[82]

Offsets once created must be registered with the Alberta Offsets Registry before they may be used for compliance purposes. Once registered, the Offset Credits will be serialized and a person responsible for a covered facility may use the Credit to meet its obligation by notifying the Register and requesting that the purchased offsets be retired.[83]

The person responsible for a facility must file an annual compliance report which must be verified by a third party auditor (SGER, section 11). Compliance reports are subject to further government audit which will extend to the project developers and regulated facilities that submitted the offset credits for compliance.[84]

In order to qualify for geological sequestration offset credits (section 7(1.1) the following rules apply:

(a) the specified gas that is geologically sequestered must be captured through a dedicated process from sources located at a facility in Alberta;
(b) the specified gas must be stored in a geological formation that is located wholly or partly in Alberta;
(c) the geological sequestration of the specified gas must not be required by law at the time geological sequestration of specified gas is initiated;
(d) the construction of the infrastructure used to geologically sequester the specified gas must have been initiated on or after January 1, 2002;
(e) the geological sequestration of the specified gas must occur after January 1, 2002;
(f) the quantity of specified gas that is geologically sequestered must be quantifiable and measurable, directly or by accurate estimation using replicable techniques.

A geological sequestration of one tonne of specified gas constitutes one emission offset (section 7(1.5)).

76 See Technical Guidance for Offset Protocol Developers at 16.
77 Id at 24. As the document acknowledges "Alberta assesses additionality during protocol development."
78 Technical Guidance for Offset Project Developers, at 45.
79 Id., at 37.
80 Id.
81 Id., at 46 – 52.
82 Id., at 55.
83 Id., at 66.
84 Id., at 60.

In order to qualify for the upgrader capture + sequestration offset credits (ie section 7(1.2) the captured gas must be sequestered as provided for in section 7(1.1) above but must also meet some additional terms and conditions. In particular, the specified gas must be captured through a dedicated process from sources located at a facility upgrading or refining bitumen in Alberta; capture before December 31, 2017; the project must be capable of capturing and storing at least 1 000 000 tonnes of specified gas per year, and at least 51% of the captured gas must be stored under the terms of a pore space tenure agreement under the *MMA*. This latter condition means that these particular volumes could not be used for CO_2-EOR purposes.

The formula for determining the quantity of emissions offsets constituted by upgrader capture + sequestration activities is prescribed by section 7(1.6) of the Regulations. This provision contemplates that for so long as the Fund Credit amount is set at less than $40 per tonne (currently $15 per tonne) at the time that the gas is captured then the credits generated shall equal the emission offsets constituted by the geological sequestration of the specified gas under section 7(1.1). However, where the Fund Credit exceeds $40, the capture activity generates a declining portion of an emissions offset until the Fund Credit reaches $80 at which point the offset credit generated by the capture activity declines to zero. The sequestration activity will however continue to generate a full emissions offset.

The goal of these two new subsections 7.1 and 7.2 is therefore to credit both the capture activity and the sequestration activity (provided that capture does lead to sequestration) but only where the capture activity occurs at an upgrader. The amount of credit (offsets) accorded to the capture activity will decline as the Fund Credit prices rises. Where the capture activity occurs at another facility such as a coal-fired generating plant, then the overall activity (capture plus sequestration) will only earn geological sequestration offsets.

As noted in the previous section, offset credits can now only be generated using an approved Protocol. There is no approved Protocol for CCS activities although there is DRAFT Quantification Protocol for the Capture of CO_2 and Storage in Deep Saline Aquifers which was circulated for public comment in December 2011. The next section discusses some elements of that Draft Protocol.

7.2 The DRAFT Quantification Protocol for the Capture of CO_2 and Storage in Deep Saline Aquifers

Alberta Environment (now Alberta Environment and Sustainable Resource Development (AESRD)) has published a Draft Quantification Protocol for the Capture of CO_2 and Storage in Deep Saline Aquifers.[85] This draft is current as of December 2011. AESRD expects the protocol to undergo a final public comment period in 2013, and to be released as a government-approved protocol shortly thereafter. This section of the report discusses some of the key elements of the Protocol under the following headings: (1) determination of project boundaries, (2) the concept of additionality, (3) description of calculation methods, (4) the energy penalty, (5) fugitive emissions, monitoring verification and accounting, and (6) duration of crediting.

85 Available here: <www.carbonoffsetsolutions.climatechangecentral.com/offset-protocols/draft-alberta-protocols-currently-under-public-review> The material in this section was largely drafted by Elizabeth Brennan.

Determination of project boundaries

The purpose of the Draft Quantification Protocol for the Capture of CO_2 and Storage in Deep Saline Aquifers (hereafter referred to as "the Saline CCS Protocol") is to quantify emissions associated with the "direct disposal of CO_2 from a previous source of emissions into deep saline aquifers" (page 1). The protocol covers carbon capture activities, compression, transportation, injection, and storage. It distinguishes between the carbon capture facility or infrastructure, and the industrial facility that operates a primary process, to which the capture technology is attached. This distinction has an impact on the way in which the energy penalty is handled (see *Energy Penalty* section below).

The methodology is not limited to particular technologies but it clearly has specific technologies in mind, in particular steam methane reforming for hydrogen production. The capture technology is comprised of a chemical solvent, typically an amine solvent and may include solvent regeneration units, including the stripping column, solvent filtration, solvent storage, and a CO_2 vent stack; CO_2 compression, possibly including a multi-stage compressor; and CO_2 dehydration, possibly including a triethylene glycol absorber and regeneration unit. The explicit description of the technology in section 1.0, and in more detail in section 3.0, provides a very clear explanation of the intent of the protocol without being entirely prescriptive.

Determination of project baselines

The Saline CCS Protocol "uses a projection-based baseline condition" (page 7), indicating that emissions reduced are relative to the emissions that the primary industrial process would have produced without the carbon capture activities. "The baseline emissions are quantified from the metered quantity of CO_2 that is injected and stored into the deep saline aquifer for the permanent storage in the project condition" (page 7). This means that emissions from the primary industrial process that are not sequestered permanently are considered to have been part of the baseline. This includes all venting events, fugitive emissions, or losses upstream of where the CO_2 is metered and injected into the ground.

The Saline CCS Protocol identifies sources and sinks of emissions, based on guidance from ISO 14064-2, Alberta Environment, and Environment Canada. The Protocol deems sources and sinks to be controlled (under the influence of the project developer), related (when material or energy flows are within the project boundaries but "not under the reasonable control of the developer"), or affected (influenced by the project activity). Sources and sinks are described in tabular form, and also categorized into upstream, on-site, and downstream, occurring before, during and after each the baseline and the project. As in the EOR protocol, the Saline CCS Protocol uses the terms "upstream" and "downstream" in a narrower sense than does the LCA literature; in the literature, upstream project emissions begin with materials used in CO_2 Capture Process. The supporting tables explaining the sources and sinks justify the exclusions of particular emissions sources from the quantification methodology (Table 5, page 18).

The Saline CCS Protocol describes all of the "baseline" and "project" sources and sinks within section 3.1 (Identification of Project Sources and Sinks), and provides a process flow diagram for the project conditions. Section 4.0 (Quantification) provides a table of identified sources and sinks and a justification for including or excluding them. Sources are excluded if they are a "one-time only source of greenhouse gas emission that is negligible compared to the expected size

and lifetime of the project", or if the source is upstream of the point of metering. For example, fugitive emissions at the capture site are upstream of the meter recording the amount of injected CO_2, therefore, those fugitive emissions are deemed "equivalent to emissions that would have occurred in the baseline and can be excluded from quantification" (page 22). This approach has been chosen over the indirect calculation of some small (fugitive and vented) sources of emissions, and does not compromise accuracy.

The concept of additionality

The concept of additionality is not explicitly addressed within the CCS Protocol, but, as discussed above, is dealt with under project eligibility requirements for the Alberta Offset System. As a protocol is being developed, additionality requirements must be met. Therefore, once a government approved protocol is in place, the project is considered to be additional until the project seeks renewal.

Description of calculation methods

The quantification methodology presented in the Saline CCS Protocol takes the same general approach as the McCormick (2012) protocol. Emissions reductions are the difference between the Project Emissions and the Baseline Emissions, where the Project emissions are the sum of the emissions under the project condition, and the Baseline emissions are the sum of the emissions under the baseline condition (pp. 25). The un-captured emissions from the industrial facility are considered to be the emissions under the baseline condition; this is consistent with the projection-based baseline approach as described above. The sum of the emissions under the project condition considers multiple sources or sinks: the production and delivery of material inputs (for the carbon capture and storage facility); fuel extraction and processing of fuels used for heat or power generation; electricity consumption; off-site heat and power generation; on-site heat and power generation; carbon capture and storage facility operation; venting CO_2 at injection well sites; fugitive emissions from injection at well sites; emissions from the subsurface to the atmosphere; and emissions from the loss, disposal, or recycling of material inputs. For each of the sources or sinks, the Saline CCS Protocol provides, in tabular form, relevant parameters related to that source/sink, the units the parameter is expressed in, whether the parameter is measured or estimated, the frequency of measurement, methods, and explanatory notes (Table 7; pp. 27–45).

The project sources of emissions include emissions resulting from the combustion of fuels. Such emissions are considered to be comprised of CO_2,t methane, and nitrous oxide and converted to CO_2 equivalents (CO_2e) by multiplying the quantity of that emission by its global warming potential (21 and 310, respectively). This is consistent with the methodology presented by McCormick (2012).

Energy penalty incurred by CO_2 capture

The saline CCS Protocol accounts for the energy penalty incurred by the primary process by including the additional materials and energy needed for the capture of waste gases from the primary process in the list of project condition sources and sinks. The project condition sources and sinks include "Construction of Carbon Capture and Storage Facilities, Production and Delivery of Material Inputs used in CO_2 Capture Process, Generation of Electricity for use by Carbon Capture and Storage Facilities, and Carbon capture and Storage Facility Operation" (Table 5, pp. 18–19). This approach is consistent with the use of a projection-based baseline methodology.

Fugitive emissions from storage reservoir

The Saline CCS Protocol addresses the permanence of geologic storage in Section 3.0 (Project Condition) noting that "with appropriate site selection, good operating practices and various monitoring activities, it is anticipated that there will be no CO_2 emissions from the subsurface to the atmosphere" (pp. 13). In doing so the protocol assumes that site selection has been comprehensively examined by the provincial regulator, the Energy Resources Conservation Board. The Saline CCS protocol deals extensively with project monitoring, and monitoring, measurement and verification activities, which are addressed below.

Monitoring, verification, and accounting activities

The Saline CCS Protocol addresses all manner of monitoring activities in Section 5.0 (Data Management). Section 5 distinguishes between "project monitoring" activities that occur during the project to quantify greenhouse gas reductions, and "monitoring, measurement and verification" (MMV) plans that are intended to ensure the safe and permanent geologic storage of CO_2 in accordance with operating license conditions. MMV plans are equivalent to the MVA plans discussed in the literature, or in other protocols, except that the Saline CCS Protocol includes "accounting" activities as "project monitoring" activities.

The Saline CCS Protocol covers "Project Monitoring" Requirements in section 5.1.1. This section indicates that project monitoring activities should be consistent with "the ISO 14064-2 principles of transparency and accuracy such that the data capture is sufficient to ensure that the quantification and documentation of greenhouse gas reductions is verifiable and replicable" (pp. 46). This section describes the minimum monitoring requirements for the Saline CCS Protocol quantification methodology. These include four specific locations in the project flow diagram at which mass balance calculations must be undertaken. A further table provides additional guidance. The guidance contained within this section is sufficiently explicit to enable the development of robust MMV protocols for saline CCS projects.

Section 5.1.2 addresses "Measurement, Monitoring and Verification of Containment" plans and methodologies (pp. 50). A Saline CCS Project must obtain a Carbon Sequestration Lease pursuant to the Carbon Sequestration Tenure Regulation, under the *Mines and Minerals Act*, and those regulations require a Carbon Sequestration Lessee to prepare a MMV plan. "Each carbon capture and storage project would undertake various monitoring activities to ensure the safe and permanent storage of CO_2 in accordance with its operating license requirements based on the characteristics of the deep saline aquifer" (pp. 50). This section of the Saline CCS Protocol explains requirements for MMV plans by reference to other regulations and ERCB directives;[86] the project proponent must adhere to the most recent version of all regulations. The proponent must also show that the MMV plan demonstrates the permanence of geologic storage, and that the plan has been updated to comply with any regulatory changes that have been established since project commissioning.

86 Including ERCB Directive 007, Directive 017, Directive 020, Directive 051, and Directive 065.

MMV activities are described over four life cycle phases of the CCS project, including Pre-Injection, Injection, Closure, and Post-Closure. The MMV activities will result in the collection of some baseline monitoring data, as well as data collected through the injection and closure phases of the project. The MMV plan should be updated to reflect information gained in the Pre-Injection and Injection phases of the project and the site-specific experience gained during those phases. "The overall goal of the [MMV] program is to demonstrate the permanent containment of the CO_2 in the subsurface, and that there is no release of CO_2 to the atmosphere" (pp. 52).

Duration of crediting

The Saline CCS Protocol does not specify the duration of the credits for CCS activities. The current rules allow offset projects to earn credits for up to eight years, with five-year extensions. AESRD may approve a longer crediting period on a project-by project basis. It is our understanding that the Government of Alberta has agreed to provide Shell's Quest project with an initial crediting period of 25 years.

7.3 Conclusions with respect to crediting issues

(1) An operator of a CCS project may earn credits for carbon that is captured and sequestered. Captured CO_2 is not treated as an avoided emission. Instead a CCS project creates credits to the extent that project qualifies under the applicable Protocol. A Quantification Protocol is available in draft and the government expects to finalize it in 2013.

(2) A small subset of CCS projects (those involving upgraders) are eligible to earn double offset credits.

(3) Most offset projects can only earn credits for an eight year period after which they must be re-qualified. The principal reason for such a requirement is to ensure that the projects continue to meet the relevant additionality tests (i.e. to ensure that the application of the technology has not become "business as usual" in the sector.

Appendix I Carbon Dioxide Disposal, Approval No. 11837 [Quest Project]

The Energy Resources Conservation Board (ERCB), pursuant to the Oil and Gas Conservation Act, chapter O-6 of the Revised Statutes of Alberta, 2000, orders as follows:

1) The Class III scheme of Shell Canada Limited (Approval Holder) in the Radway Field and surrounding areas (approval area) shown in Appendix A, for the disposal and sequestration of carbon dioxide (CO_2) into the Basal Cambrian Sand Formation (BCS) as described in

   a) Application No. 1670112, is approved, subject to the terms and conditions herein contained.

2) For the purposes of this approval, the injection fluid will contain a minimum of 95 per cent CO_2 by volume, at any time.

3) (1) The Approval Holder may commence or continue injection and disposal of CO_2 for the wells listed in this clause 3)(1) a) when the commitments of the current Measurement, Monitoring, and Verification (MMV) Plan for these wells are met, substantially in accordance with the scheme.

   a) 00/08-19-059-20W4/0

   (2) The undrilled well(s), referred to in clause 3)(2) a), may be eligible for approval to commence injection once an application that includes at a minimum the *Directive 065* requirements described in clause 4), and once the *Directive 051* requirements have been submitted and approved.

   a) 07-11-059-20W4

      15-01-059-21W4

      05-35-059-21W4

      10-06-060-20W4

      12-14-060-21W4

      15-16-060-21W4

      15-29-060-21W4

4) The minimum *Directive 065* application requirements for undrilled wells listed in clause 3)(2) a) must include:

   a) geological interpretation of the BCS CO_2 disposal formation in the well(s), including:

      i) updated BCS gross sand thickness isopach map over the approval area

      ii) updated BCS storage capacity map over the approval area

iii) updated interpreted and annotated log cross-section showing:

a. stratigraphic interpretation of the zone(s) of interest,

b. completions/treatments to the wellbore(s), with dates,

c. finished drilling date and Kelly bushing (KB) elevation and the scale of the log readings, and

d. tabulation of the interpreted net reservoir thickness, permeability and porosity for the well(s),

b) geological interpretation of the bounding formations, extending from the Precambrian to top of the Upper Lotsberg Salt, based on all information from the new well(s) including:

i) continuity and thickness of base and caprock (include all seals and baffles in the bounding formations),

ii) updated thickness and extent map of the Middle Cambrian Shale (MCS) over the approval area,

iii) updated thickness and extent maps of the Upper and Lower Lotsberg Salts in the approval area,

iv) lithology,

v) integrity of the base and caprock, and

vi) if fracturing is evident, explanation of how containment can be assured

c) bottomhole injection pressure, maximum sandface pressure, fracture propagation pressure, and formation fracture pressure for each of the well(s) in clause 3)(2) a).

d) BCS stabilized shut-in reservoir pressures in accordance with *Directive 040* requirements at the injection well(s) referred to in clause 3)(2) a), accompanied by pressure transient analyses (PTA), which may provide indication of fracture flow,

e) address the need to rerun the CO_2 plume and pressure front models after each well is drilled, and

f) evidence that the current MMV Plan commitments have been met.

5) The Approval Holder must conduct the CO_2 injection only through the well(s) referred to in clause 3)(1) a) in accordance with the following requirements and those of Table 1:

a) the BCS Formation stabilized shut-in reservoir pressure in each injection well listed in clause 3)(1) a) must not exceed 26 000 kilopascals (gauge),

b) the Approval Holder must obtain stabilized shut-in reservoir pressures in accordance with *Directive 040* requirements after 2 years of injection at the well(s) referred to in clause 3)(1) a). Based on the results, additional tests may be required in order to better understand the plume movement,

c) a hydraulic isolation log must be run on the injection well(s) and deep monitoring wells in accordance with *Directive 051* after two years of injection. The need for further hydraulic isolation logging over the life of the injection well(s) will be determined through the annual reporting and presentation process,

d) the cumulative injection volume for all approved scheme wells must not exceed 14 500 million cubic metres of CO_2 at standard conditions (15°C, 101.325 kPa), which is an equivalent mass of 27 million tonnes.

e) no waste or other materials may be added to the injectant. The injectant must contain no less than 95 per cent of CO_2 by volume. The composition of the injection stream must be monitored by taking a representative sample of the injectant on a monthly basis,

f) continuously monitor the pressures of the tubing/casing annulus for the injection well(s), conduct annual packer isolation tests, which must be submitted electronically to the ERCB in accordance with the current MMV Plan, implement appropriate corrosion protection, and install and test the wellhead emergency shutdown valves prior to commencement of the CO_2 injection to ensure their proper operation. If a leak, or potential leak, is detected in the tubing/casing annulus or packer in the injection well(s), the Operator must immediately inform WellOperations@ercb.ca,

g) immediately suspend injection operations if the injection facilitates the movement of fluids into any zone above the base of groundwater protection or any zone other than the BCS, and immediately inform WellOperations@ercb.ca,

h) immediately suspend injection operations if any injection equipment, monitoring equipment, or safety devices fail that could compromise the safe operation of the scheme,

i) immediately report any loss of containment, anomalies that indicate fracturing out of zone, or anomalous pressure changes occurring anywhere within the CO_2 disposal approval area to ResourceCompliance@ercb.ca and WellOperations@ercb.ca,

j) apply to remove the injection well from the list in clause 3)(1) a), before abandoning any well in the disposal project,

k) apply for and receive approval of its abandonment plan from the Well Operations Section, before abandoning any well in the disposal project, and

l) continue to monitor the injection and observation wells in accordance with the current MMV Plan, until the CO_2 disposal scheme is transferred to the Government of Alberta or when the subject approval is rescinded.

6) The Approval Holder must provide a written incident report within 90 days to ResourceCompliance@ercb.ca and WellOperations@ercb.ca for an event that raises any immediate risk to public safety or environment including

a) any anomalies that indicate fracturing out of zone,

b) any indications of loss of containment,

c) unexpected surface heave, and

d) appropriate mitigative measures taken.

If monitoring shows loss of containment or unexpected surface heave the approval holder is required to conduct and submit results of more comprehensive project modeling using site specific parameters to re-evaluate the issue of deformations caused by pressure changes.

7) The Approval Holder is required to submit MMV plan updates as required by the ERCB; at a minimum updates are required at the critical milestones for commencement of injection, closure and post closure.

8) The Approval Holder must provide a complete pre baseline MMV plan by September 30, 2012, which includes a full set of baseline measurements to be taken during the pre-injection period and submitted to ResourceCompliance@ercb.ca.

9) The Approval Holder must provide a special report by September 30, 2012, which includes the following;

a) a phased assessment of natural variability of the geochemistry of the water in the domestic water wells included in its baseline study, including the need for more frequent sampling during both the baseline data collection and early operational monitoring periods,

b) explanation of method for determining statistical significance of number of landowner water wells included in baseline data collection and analysis,

c) potential need for downhole microseismic arrays in other deep monitoring wells,

d) geomechanical testing of primary seal (MCS),

e) InSAR results to date and need for corner reflectors. If corner reflectors are deemed necessary the Approval Holder will be required to install the reflectors near each injection site at least 15 months prior to injection,

f) update on technologies to be used for monitoring changes in vegetation health due to surface leaks, and

g) evaluation and analysis of the need to add another deep monitoring well completed in the Winnipegosis formation at either the 15-16-060-21W4M or 15-29-060-21W4M locations.

The report must be submitted to ResourceCompliance@ercb.ca.

10) The Approval Holder must provide annual status reports and presentations. The reports must be aligned to the most current MMV plan and submitted to ResourceCompliance@ercb.ca.

The report must be in metric units and include:

a) a summary of scheme operations including, but not limited to,

i) any new project wells drilled in the reporting period,

ii) any workovers/treatments done on the injection and monitoring wells including the reasons for and results of the workovers/treatments,

iii) changes in injection equipment and operations,

iv) identification of problems, remedial action taken, and impacts on scheme performance.

b) complete pressure analysis including but not limited to stabilized shut-in formation pressures and a discussion on how the pressure compares with the formation pressure expected for the cumulative volume of CO_2 injection, along with an updated estimate of what the actual cumulative injection volume will be at the maximum shut-in formation pressure specified in clause 5) a),

c) discussion of the overall performance of the scheme, including: how the formation pressure is changing over time; updated geological maps; and updated CO_2 plume extent and pressure distribution models, if needed. The updated models should be based on all new data obtained since the last model run including the cumulative CO_2 injected to the end of the reporting period.

d) a summary of MMV Plan activities, performance and results in the reporting period, including, but not limited to:

i) a report on any event that exceeded the approved operating requirements or triggered MMV activities,

ii) comparison of measured performance to predictions,

iii) summary of operations and maintenance activities conducted,

iv) details of any performance or MMV Plan issues that require attention,

v) pressure surveys, corrosion protection, fluid analyses, logs and any other data collected that would help in determining the success of the scheme, and

vi) discussion of the need for changes to the MMV plan.

e) a table for all wells listed in clause 3)(1) a), showing the following injection data for each month of the reporting period:

i) mole fraction of the CO_2 and impurities in the injection stream,

ii) volume of the CO_2 injected at standard conditions,

iii) formation volume factor of the injected CO_2 stream,

iv) cumulative volume of the injected CO_2 at standard conditions following the commencement of the scheme,

v) volume of the CO_2 injected at reservoir conditions,

vi) hours on injection,

vii) maximum daily injection rate at standard conditions,

viii) average daily injection rate at standard conditions,

ix) maximum wellhead injection pressure (MWHIP) and corresponding wellhead injection temperature,

x) average wellhead injection pressure, corresponding average wellhead injection temperature,

xi) maximum bottom hole injection pressure (MBHIP) at the top of injection interval and the corresponding bottom hole injection temperature, and

xii) average bottom hole injection pressure at the top of injection interval and the corresponding average bottom hole injection temperature.

f) a table showing the volumes of injected CO_2 on a monthly and cumulative basis,

g) Hall Plots of constant average reservoir pressure where unexplained anomalous injection rate and pressure data could indicate fracturing.

h) a plot showing the following daily average data at standard conditions versus time since the commencement of CO_2 injection:

i) daily CO_2 injection rate,

ii) wellhead and bottom hole injection pressure, and

iii) estimated or measured average reservoir pressure in the target formation.

i) the potential need for installing additional monitoring wells in the Winnipegosis and BCS towards the periphery of the pressure build up zone in the BCS later in the project life,

j) evaluate the need for additional deep monitoring wells adjacent to the four legacy wells in the approval area. Based on the information provided the ERCB may require the Approval Holder to drill one or more such deep monitoring wells, and

k) discussion of stakeholder engagement activities in the reporting period.

11) The Approval Holder must provide its first annual status report by January 31, 2013. The report must include all the relevant requirements listed in clause 10). This report must also provide a summary of construction and implementation activities, as well as updates, conclusions, and reviews of

a) the feasibility of using 07-11-059-20W4M and 05-35-059-21W4M injection wells as BCS monitoring wells prior to commencement of injection,

b) detailed feasibility of technical, operational, cost and public safety considerations of adding mercaptans,

c) the initial baseline fall-off test analyses of 00/08-19-059-20W4/0 and any other drilled injection wells, and

d) any testing results in relation to construction and implementation activities.

12) The Approval Holder must provide a special report by January 31, 2013, on the suitability of the InSAR baseline data for pressure front and geomechanical modeling and analysis.

13) The Approval Holder must provide a special report by January 31, 2014, on the feasibility of using an artificial tracer for CO_2 injection, including conclusions and action plan, and provide a discussion of alternatives.

14) The Approval Holder must provide its second annual status report by January 31, 2014. The report must include all the relevant requirements listed in clause 10). As well, this report must include updates, conclusions, and reviews of:

a) geology update from new injection wells,

b) initial injection well drilling and testing, and need for additional injection wells, and

c) any testing results in relation to construction and implementation activities.

15) The Approval Holder must provide its third annual status report by January 31, 2015. The report must include all the requirements listed in clause 10). Furthermore, this report must also include update, conclusions, and review of:

a) baseline data and analysis of biogenic flux of CO_2 in different soil types throughout the approval area,

b) geology update from new injection wells,

c) initial injection well drilling and testing, and need for additional injection wells,

d) any testing results in relation to construction and implementation activities, and

e) the MMV Plan.

16) The Approval Holder must provide a special report by July 31, 2015. This report must include the efficacy of the InSAR program. Installation of GPS instruments may be required if the quality of InSAR data is too low for effective monitoring.

17) The Approval Holder must provide ongoing annual reports beginning March 31, 2016 through to March 31, 2040. The report must include all the requirements listed in clause 10). The Approval Holder must provide a report and presentation of general performance of prior calendar year, identification of operations problems, and discussion of the need for MMV changes. Include updates, conclusions and review of:

a) need for additional deep monitoring wells adjacent to the four legacy wells in the approval area,

b) results from well testing including data from annual hydraulic isolation logging,

c) need for further hydraulic isolation logging beyond the first five years of injection,

d) projected timing for additional 3D surface seismic surveys,

e) required frequency of time-lapse seismic surveys,

f) update of CO_2 plume and pressure front models including the results of the prescribed reservoir pressure fall-off test two years after the start-up of each injection well,

g) need for ongoing fall-off shut-in reservoir pressure tests in all injection wells,

h) updated geology, and

i) potential need for additional monitoring wells in the Winnipegosis and BCS towards the periphery of the pressure build up zone.

18) The Approval Holder must submit a closure report in 2040, which summarizes project total performance, updated surface and subsurface information, and detailed review of containment. It must also include a MMV plan update, with specific attention to any performance problems evident in the 25 years of operations.

19) The Approval Holder must submit a post closure report, which includes an update of its MMV plan. (Further details will be provided upon review of the closure report as specified in clause 18).

20) The Approval Holder must allow additional water well owners to participate in the landowner water well portion of its MMV program at any time. The Approval Holder is required to include such wells in the MMV plan and associated reports.

21) The Approval Holder must immediately advise the ERCB of any changes to its pore space rights within the approval area.

22) The Approval Holder must comply with all ERCB Acts and Regulations, including all applicable directives and approvals issued by the ERCB.

23) The ERCB may at any time vary these terms and conditions or may suspend or revoke this approval if, in its opinion, circumstances so warrant.

24) This approval, insofar as it pertains to matters of the environment, is subject to the approval of the Minister of Environment and Sustainable Resource Development, Ministerial Order No. 18/2012, hereto attached as Appendix B.

25) The Approval Holder must submit the MMV plans and project reports referenced in conditions 6, 7, 8, 15, 18, and 19 to Alberta Environment and Sustainable Resource Development for review, who will provide comments and recommendations to the ERCB pertaining to matters of the environment, at:

    Water Policy Branch
    Environment and Sustainable Resource Development
    Oxbridge Place, 7 Floor
    9820 – 106 Street
    Edmonton, AB T5K 2J6
    Steve.Wallace@gov.ab.ca

26) The Approval Holder must immediately notify the Ministry of Environment and Sustainable Resource Development at 1-800-222-6514, regarding any loss of CO_2 to the atmosphere, oils or shallow (non-saline) aquifers and must provide a copy of any incident report required pursuant to condition 6 of this approval to Alberta Environment and Sustainable Resource Development at:

    Water Policy Branch
    Environment and Sustainable Resource Development
    Oxbridge Place, 7 Floor
    9820 – 106 Street
    Edmonton, AB T5K 2J6
    Steve.Wallace@gov.ab.ca

    Appendix A (map), Table 1 and Appendix B are all omitted.

Appendix II Carbon Sequestration Lease to Shell Canada Ltd for the Quest Project

Government of Alberta
Energy

CARBON SEQUESTRATION LEASE
NO. 5911050001

Term Commencement Date: May 27, 2011

Lessee:

SHELL CANADA LIMITED 100.0000000%

WHEREAS Her Majesty is the owner of the pore space in respect of which rights are granted under this Lease;

THEREFORE, subject to the terms and conditions of this Lease, Her Majesty grants to the Lessee, insofar as Her Majesty has the right to grant the same, the right to drill wells, conduct evaluation and testing and inject captured carbon dioxide into deep subsurface reservoirs within the Location for the term of fifteen (15) years computed from the Term Commencement Date and renewable under and in accordance with the *Mines and Minerals Act* and *Carbon Sequestration Tenure Regulation* (AR 68/2011), and subject to the terms and conditions prescribed by the Minister in relation to each renewal;

RESERVING AND PAYING to Her Majesty, in respect of each year during which this Lease remains in effect, a clear yearly rental computed at the rate prescribed by and payable in accordance with the *Mines and Minerals Act*;

1.(1) In this Lease, a reference to the *Mines and Minerals Act* or to any other Act of the Legislature of Alberta referred to in section 2(2)(b) of this Lease shall be construed as a reference to

(a) that Act, as amended from time to time,

(b) any replacement of all or part of that Act from time to time enacted by the Legislature, as amended from time to time, and

(c) any regulations, orders, directives or other subordinate legislation from time to time made under any enactment referred to in clause (a) or (b), as amended from time to time.

(2) In this Lease,

(a) "Her Majesty" means Her Majesty in right of Alberta, as represented by the Minister of Energy of the Province of Alberta;

(b) "Location" means the subsurface area or areas underlying the surface area of the tract or tracts of land described under the heading "Description of Location" in the Appendix to this Lease;

(c) "Term Commencement Date" means the date shown on the first page of this Lease as the Term Commencement Date;

2. This Lease is granted upon the following conditions:

(1) The Lessee shall pay to Her Majesty the rental reserved under this Lease.

(2) The Lessee shall comply with the provisions of

(a) the *Mines and Minerals Act*, and

(b) the *Oil and Gas Conservation Act* or any other Acts of the Legislature of Alberta that prescribe, apply to or affect the rights and obligations of a Lessee to inject captured carbon dioxide into a deep subsurface reservoir for sequestration, or that relate to, apply to or affect the Lessee in the conduct of its operations or activities under this Lease.

(3) The provisions of the Acts referred to in subsection (2) are deemed to be incorporated in this Lease.

(4) In the event of conflict between a provision of this Lease and a provision referred to in subsection (2), the latter provision prevails.

(5) The Lessee shall not claim or purport to exercise any rights, prerogatives, privileges or immunities that would otherwise exempt the Lessee from compliance with any of the provisions of the *Mines and Minerals Act* or of any other Act of the Legislature of Alberta referred to in subsection (2)(b).

(6) The Lessee does not have the right to win, work or recover any minerals found within the Location.

(7) The Lessee shall keep Her Majesty indemnified against

(a) all actions, claims and demands brought or made against Her Majesty by reason of anything done or omitted to be done, whether negligently or otherwise, by the Lessee or any other person in the exercise or purported exercise of the rights granted and duties imposed under this Lease, and

(b) all losses, damages, costs, charges and expenses that Her Majesty sustains or incurs in connection with any action, claim or demand referred to in clause (a).

(8) The use in this Lease of the word "Lessee", "Lease", or "rental," or of any other word or expression,

(a) does not create any implied covenant or implied liability on the part of Her Majesty, and

(b) does not create the relationship of landlord and tenant between Her Majesty and the Lessee for any purpose.

(9) This Lease is also subject to the special provisions, if any, contained in the Appendix to this Lease.

EXECUTED on behalf of the Minister of Energy of the Province of Alberta at Edmonton, Alberta.

For Minister of Energy
on behalf of Her Majesty

APPENDIX

TO

CARBON SEQUESTRATION LEASE NO. 5911050001

TERM COMMENCEMENT DATE:

MAY 27, 2011

AGGREGATE AREA:

73 728 HECTARES

DESCRIPTION OF LOCATION:

4-18-059: 1-36
4-18-060: 1-36
4-18-061: 1-36
4-19-059: 1-36
4-19-060: 1-36
4-19-061: 1-36
4-19-062: 1-36
4-20-060: 1-36

PORE SPACE BELOW THE TOP OF THE ELK POINT GRP
AS DESIGNATED IN D00284
INTERVAL: 783.00 - 1370.00 METERS
KEY WELL: 02/06-13-063-06W4/00
LOG TYPE: COMPENSATED NEUTRON-LITHO DENSITY

SPECIAL PROVISIONS:

NIL

APPENDIX C

An Overview of CCS Law and Regulation in Norway

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University of Oslo

Contents

1 Overview. The status of CCS and CCS regulation in Norway

Norway is widely supportive of Carbon Capture and Storage (CCS) technologies as a climate change mitigation measure, both at the national and international level. The country benefits from a large offshore CO_2 storage capacity in its North Sea continental shelf, both in saline aquifers and in depleted oil and gas fields, which could exceed by far its own storage needs and provide storage opportunities to neighbouring countries.

Since mid-1990s, Norway has developed CCS technologies linked to off shore petroleum production. Norway has been pioneer in developing the first 'full' CCS projects for storing CO_2 offshore at the Sleipner (1996)[1] and Snøhvit (2008) offshore natural gas fields.[2] Currently, several technological development projects are undertaken linked to gas fired power plants on shore, with the participation of industry and the Norwegian government.

As of today, there is no comprehensive, specialized legislation regarding CCS in Norway. Apart from some minor amendments to existing laws, no dedicated legislative work has been undertaken to regulate this technology. This may be partly due to the fact that the most relevant existing acts applicable to CCS seem to provide a sufficiently broad legal basis for more specific regulations, if necessary. The most important are: the *1963 Act on Research, Exploration and Exploitation of other Natural Resources than Petroleum on the Ocean Floor*[3] (hereafter the Continental Shelf Act); the *1981 Pollution and Waste Act,*[4] and the *1996 Petroleum Activities Act*.[5]

The EU Directive 2009/31 on the geological storage of CO_2 ("CCS Directive") made evident the need for more precise rules on CCS in Norwegian law. Norway is not a member of the European Union, but is a member of the European Economic Area (EEA). The CCS Directive qualifies as being 'EEA relevant', which means that, if it is incorporated within the EEA agreement, it must be implemented also by all EEA members, including Norway. As of March 2013, such incorporation has not yet been agreed and it seems unlikely that it will be formally incorporated in the EEA agreement. This has to do with the geographical scope of the agreement, which – according to the Norwegian view – does not cover Norway's exclusive economic zone and continental shelf outside the territorial waters, where the relevant geological formations and reservoirs are found.

Despite the fact that Norway may choose not to implement the CCS Directive for such formal reasons, the Directive will most certainly serve as a model for Norwegian legislation on CCS. This intention was confirmed by the Norwegian government in the Royal decree of 13 March 2009 on delegation of authority in CCS matters under the 1963 Continental Shelf Act. The reason for this is that if Norway wants to offer CO_2 storage opportunities to other European countries, it is likely that Norway must

1 Sleipner was the first commercial-scale project in the world dedicated to the geological storage of CO_2 in a saline formation.

2 In both cases, the gas in the field has a too high content of CO_2, which consequently has to be removed on the platform. The high tax on CO_2 emissions from off shore activities introduced by law in 1990 (Act of 1 December 1990 no. 72) works as a decisive incentive to store the CO_2 instead of emitting it. Annually, 1 million tons and 700,000 tons of CO_2, respectively, are stored in underground saline aquifers below the gas fields.

3 Act of 21 June 1963 no. 12.

4 Act of 13 March 1981 no. 6.

5 Act of 29 November 1996 no. 72.

itself follow the provisions of the CCS Directive in order for it to be legal for any European country to use the Norwegian storage sites.

It is foreseen that most of the new rules required will be in the form of regulations pursuant to existing legislation, in particular the Continental Shelf Act, the Pollution and Waste Act, and the Petroleum Activities Act. But it is not excluded that some amendments of and additions to the acts themselves will be necessary as well.

At the time of writing, June 2013, this work has not yet been finalized. Apparently, the aim was to present a draft regulation by the end of 2012, but this has been postponed at least until the late autumn 2013.

The reasons for this may be both the complexity of some issues, such as the transfer of liability to the state (see below point 7.3), and possible controversies between the respective ministries about the sharing of responsibilities (see below point 2), mainly the ministries of Petroleum and Energy and of the Environment. However, as a matter of fact, there does not seem to be any particular sense of urgency in this matter anyway. This is probably due to the fact that the technological development and progress is taking more time and has become much more expensive than was foreseen at an earlier stage. It is now unlikely that any carbon capture and storage of CO_2 from Norwegian on-shore sources will take place before 2016 at the earliest. At the same time, the EU seems to have lost interest in CCS and apparently has put further progress in this area on hold for the time being.[6]

Until today, the only "pure" CCS project for installations that emit CO_2 on shore in Norway is a research/development project with the purpose of developing CCS technology: Test Center Mongstad TCM. Apparently, TCM is the world's largest facility for testing and improving CO_2 capture and the only test center in the world to test two different types of technology applicable to emissions from both coal- and gas-fired power plants. The technologies to be tested during the first phase are based on chilled ammonia and amines. TCM has been constructed with a capture capacity of up to 100,000 tonnes of CO_2 per year. The center is owned by Gassnova (which manages the Norwegian state's interests) (75.12%), Statoil (20%), Shell (2.44%) and the South African company Sasol (2.44%). It is thus mainly funded from the state budget, and the costs are huge.[7]

Part of the background is the political decision of principle, made several years ago, that CCS should be required for all new gas fired power plants in Norway, with storage of CO_2 off shore, in geological formation or emptied oil/gas fields on the continental shelf. Today, we have only one such plant running (Kaarstø), and it is not yet equipped for CCS. A second is under construction at Mongstad. As of today, however, it is most unclear when – or whether at all – these will be equipped for CCS, since the technology seems to be more complicated and the costs much higher than originally foreseen.

It should be underlined that the decision to start the huge technological development project TCM was a political decision. It was an important element in shifting governments' climate policy agenda, with broad political support in Parliament. There is no short term economic incentive at present to develop or apply CCS. The EU ETS CO_2 price seems to stay much too low (see below point 8).

6 Originally, the EU decided to use 60 % of the income from the EU Emissions Trading Scheme (EU ETS) for CCS pilot projects, in order to develop CCS technology, and 40 % on renewable energy. However, on 30 November 2012 the EU Commission proposed to spend only 18% on CCS projects, and 82 % for renewable energy. Only one (French) project has so far been approved for financial support.

7 For more information see <www.tcmda.com/en/>.

Nevertheless, Norway has still ambitious goals with regard to CCS. CCS remains as one of the most important climate change mitigation strategies for Norway in the long term. Both the Norwegian state and private companies have been willing to invest in the development of necessary technology for a full-scale CCS solution in the future. However, as mentioned, the parties involved have been forced to extend their timeframe for completion, due to the uncertainties related to predicting when the technology will be available. In addition to this, the lack of commercial viability of CCS technologies under the present conditions has contributed to such postponement.[8]

The focus of CCS research in Norway today is still on the capture of CO_2 from gas-fired power plants and offshore storage of CO_2 mainly from such plants There are two reasons for this. First, gas-fired power plants are expected to be the biggest single point emitters of CO_2 in Norway and it is likely that the emissions from this industry will continue to rise, due to the possibility of construction of additional gas-fired power plants in Norway. Second, research indicates that there is a huge international potential for natural gas as a source for power production, not least in European countries, in the coming 50 to 100 years. If the international objectives related to climate change are to be reached, a significant expansion of gas power will require CCS on a large scale. However, quite recently, interest has also turned toward the possibility of CO_2 capture in the cement industry. A Norwegian research project in this area is being prepared.

2 Main legal areas and division of authority

In the Royal decree of March 2009 the responsibility for the implementation was divided between three different ministries, based on three different main legal areas.

The first legal area regards transport and storage of CO_2, including exploration of possible sites, which the Government found as having many similarities with petroleum activities – i.e. requirements for permission to survey and use underground formations, requirements relating to environmental impact assessments on the continental shelf, etc. The power to design such regulations and to issue required licenses for transport and storage was therefore delegated to the Ministry of Petroleum and Energy.[9] This ministry is responsible for the implementation of both the Continental Shelf Act and the Petroleum Activities Act.

In 2009 this ministry proposed an amendment to section 4-8 of the Petroleum Activities Act, which enabled the regulations regarding third party access to petroleum installations to apply also to CCS facilities, and this was approved by Parliament.[10]

The second legal area regards environmental safety. The Ministry of the Environment was given the power to develop regulations to ensure that the storage of CO_2 occurs in an environmentally safe way. This includes regulations which determine the composition of the CO_2 stream, surveillance, the monitoring and reporting regime, and financial security. It is clear that CCS storage also will require a permit by the environmental authorities pursuant to the Pollution and Waste Act.

8 One factor here is the extremely low price on carbon in the EU ETS at present which is not an incentive to develop new technology and use CCS.

9 The delegation was made in accordance with the Continental Shelf Act art 2 (2) and art 3. See Regulation FOR-2009-03-13-321.

10 Act of 19 June 2009 no. 104.

The third legal area regards human safety in relation to CCS. The Ministry of Labour was made responsible for developing regulations on safety in connection with CO_2 transport and storage; especially with regards to security measures for the construction and operation of facilities. This has to do with this ministry's general responsibility for safety in the petroleum sector.

The division of responsibility between the Ministry of Petroleum and Energy (MPE) and the Ministry of the Environment (ME) clearly raise some problems. Both ministries may claim that CCS falls within their general responsibility.

MPE is, as mentioned, responsible for the general management of the continental shelf pursuant to the 1963 Continental Shelf Act. This implies to regulate all activities on the shelf (and the underground) – not only the petroleum activity. The ministry and its subordinate directorates and agencies have relevant knowledge of the geology, of ongoing activities and potential for future petroleum activities etc. It is essential to see CCS in relation to the petroleum industry, both as a possible *combination* – in particular through the reinjection of CO_2 into the oil reservoir to obtain enhanced recovery **of** the hydrocarbons (EHR) – and as a possible *conflict* in the exploitation of the seabed and underground.

ME and its subordinate directorate – the Climate and Pollution Agency – are generally responsible for pollution permits pursuant to the Pollution and Waste Act. This applies to decisions on CO_2 capture from gas fired power plants on shore as well as to regular emissions from the petroleum activity on the continental shelf – and thus for saying yes (or no) to CO_2 capture at the installations. It also applies to the risk of leakage from CO_2 storage and thus also the storage part. In addition, ME is also the ministry responsible for the 2004 Carbon Trading Act[11] which apply to the petroleum activity and presumably will apply to leakage from CCS storage.

Therefore, it is at the outset very difficult to see how the regulation of CCS can be left to one of these ministries only. So it is likely that both systems will apply and several authorities will be responsible.

There may be various solutions to this. The situation corresponds to several other cases in Norwegian law, where a permit is required pursuant to several different laws, and where environmental concerns have to be taken into account, and may be in conflict with the sector development interests in question. In some cases, the sector ministry has the final say in balancing the environmental concern against the development needs. There may be a "one stop" system, whereby only the sector ministry receives the application and is sole responsible for coordinating the process. In that case the environmental authorities only give an advice or opinion, and it is the sector ministry that decides to what extent it shall be taken into account. In other cases several separate permits are required. This usually means that the environmental authorities treat the case independently on the basis of its legislation, and in reality can veto a development project which already has got a permit from a sector authority. There may be efforts to coordinate the procedures, but these do not necessarily succeed.

There is thus no single model for this in the Norwegian legal and administrative system. The different solutions are more or less the result of political strengths and priorities at the time the legislation in question was issued. It also varies with the type of environmental interests that are threatened. As a matter of fact, both our pollution legislation and cultural heritage legislation are stronger in this regard vis-à-vis sector legislation than the legislation on biodiversity, ecosystem and landscape protection.

11 Act of 17 December 2004 no. 99. This act is the basis for Norway's participation in the EU ETS, see point 8 below.

The issue of delegation

The State has of course full decision-making power with regards to CO_2 capture, and the construction, operation and closure of transport and storage facilities. The power may be delegated from the ministries to subordinate state bodies, to state-owned companies or other institutions. For example, with regards to transport of natural gas from the Norwegian continental shelf, the transport network is operated by a state-owned non-profit company; Gassco. And the government has established an important special agency, *Gassnova SF*, to manage the state's interests in CCS-affairs.

Gassnova SF is a somewhat particular institution.[12] It is formally a state enterprise under the Ministry of Petroleum and Energy. It is both a business actor with the power to enter into commercial agreements with regards to CCS development, and the source of CCS information to the public. Gassnova provides advice to the government in matters relating to CCS. In addition, Gassnova contributes to the implementation of the CCS technology development programme, "CLIMIT", in cooperation with the Research Council of Norway. One of the aims of Gassnova's work is to develop ways to reduce the costs associated with CCS deployment. It participates in the three most important projects of CCS development in Norway: the CO_2 Technology Centre Mongstad (TCM); the full-scale CO_2 capture project at the (future) gas- fired power plant at Mongstad and a (future) large-scale CO_2 transport and storage project from Mongstad to a presumed storage site in the North Sea.

3 Property issues

As already mentioned, offshore storage of CO_2 is the only relevant option for Norway in the foreseeable future. The Petroleum Activities Act applies to any offshore storage of CO_2 that stems from petroleum activities on the continental shelf. Any storage of CO_2 that does not stem from such activities falls outside the scope of the act. Non-petroleum related storage of CO_2 falls within the 1963 Continental Shelf Act. Both Acts must be interpreted to the effect that the Norwegian state is the owner/holder of rights of any pore space on the continental shelf.

Despite the fact that onshore storage at present is not viewed as an option in Norway, the question of onshore sub-surface ownership may still be of at least theoretical interest. The possibility of future onshore storage can probably not be completely excluded in the long term. As of today, there are no acts of law regulating the ownership of onshore pore space, which would mean that the ownership must be determined in accordance with general Norwegian private property law. It has been established by case law that the owner of the property overground is the owner of the land, including property underground. The property right is however not infinite and it is established by the Supreme Court that the underground property right does not follow the overground property right beyond approximately 100 meters below the surface.[13] Beyond this level the rule of occupation applies, meaning that the first one to possess underground resources claims the property right.

However, these general rules with regards to property rights do not apply to onshore exploration or recovery of petroleum underground. Onshore petroleum resources are state property by law, regardless

12 See St.prp. Nr. 49 (2006-2007) and Innst. S. nr. 205 (2006–2007).

13 See: Norsk Retstidende 1998 s. 251 (The Tellnes-case).

of ownership overground or potential first-possession, according to a special Act on exploration and exploitation of onshore petroleum resources.[14] This Act solely includes petroleum resources and thus not empty pore spaces suitable for storage of CO_2. As of today, the rules of ownership overground and first-possession apply to such pore spaces. However, based on the fact that offshore storage spaces are state property, it is likely that it will be decided by law that onshore pore spaces are to be owned by the state as well, once the issue may become relevant.

4 Permits for CCS

4.1 Introduction

It is clear that any CO_2 transport and storage activity will require permits pursuant to Norwegian law. So far, the two main examples of storage – at the Sleipner and Snøhvit fields – have been seen exclusively as part of the petroleum activity and regulated within the general system of permit for exploitation of petroleum resources pursuant to the Petroleum Activities Act. This will probably be the case also in the future for storage for the purpose of enhanced hydrocarbon recovery (EHR) or other purposes linked directly to the production of petroleum.

For "ordinary" CCS a broader spectrum of legislation comes into play. As mentioned, most likely a permit will be required pursuant to at least the Continental Shelf Act and the Pollution and Waste Act.

The EU CCS Directive foresees separate and subsequent permits for exploration and actual storage. This corresponds roughly to the system in our petroleum sector. But even before an exploration application can be treated, our system for petroleum activity requires an environmental impact assessment to be carried out for the whole sea and shelf area in question. The first issue is always whether an area shall be "opened" for exploitation and subsequent production in the first place. This requires an initial EIA. This is meant to bring forward the necessary information about the area, its general suitability for activity on the one hand, and on he other hand about what natural values and resources, and other interests, that may be affected by the exploration and possible exploitation/production. This will decide whether an area is suitable at all for this type of activity. If the conclusion is that storage in the area in question seems to be acceptable, it will formally be "opened" for exploration and the application for exploration permit is the next step, and subsequently for exploitation in case of a finding of petroleum.

It is likely that there will be a similar system of a "preliminary EIA" to decide in what parts of the Norwegian sea and shelf area CO_2 storage is technically feasible and acceptable.

4.2 Exploration permit

As mentioned, Norway will most probably introduce a system of permits which fulfill the requirements of EU CCS Directive. The Directive holds in Article 4 that the state has the right to determine the storage areas. In order to identify where storage is possible, the state may demand that exploration is

14 Act of 4 May 1973 nr. 21 (Lov om undersøkelser etter og utvinning av petroleum i grunnen under norsk landområde) art 1.

carried out. Such exploration relies on a permit (Article 5 of the Directive). An exploration phase will probably always be necessary because of the complexities in geological conditions, uncertainties and the risk of leakage.

The CCS Directive lists specific requirements that the state must impose on anyone applying for an exploration permit. The concept of an exploration permit is well known in Norwegian natural resources and environmental law in general, and in the Norwegian petroleum industry in particular. The existing petroleum regulations are not in conflict with the requirements in the CCS Directive.[15] However, the requirements following the directive appear at some points ambiguous and at other points they grant discretion on the implementation. Thus it remains to be seen how the exact requirements for obtaining an exploration permit for CO_2-storage purposes will be designed in Norwegian law.

According to the CCS Directive, the state decides whether exploration activities are needed. The permit must be limited in duration/time and location/area – where the duration may be extended. Furthermore there must not occur "conflicting uses of the complex" (see below) and the applicant must possess the "necessary capacities".

Details on the duration of the permit and location of the area subject to exploration are also included in the Norwegian regulations governing petroleum exploration permits. Both the duration of the permit and the extension of the area can be extended. The extension of the permitted area is not mentioned in the storage-directive. However, there is no difference in reality between the permit-holder applying for a new permit for an extended area and the permit-holder applying for an extended area under the current permit. Therefore, the possibility of extension of a permit in both duration and area can be adopted when implementing the CCS Directive. This is the preferred solution for petroleum activities and is – based on the similarities between offshore petroleum activities and offshore CO_2-storage – likely to become the preferred solution in regard to CCS.

The CCS Directive does not provide any definition of "conflicting uses of the complex". We shall get back to this issue under point 6.

The CCS Directive does not give a definition of the term "necessary capacities" either. The most likely interpretation of this term would be that the applicant meets the requirements and obligations following the CCS Directive which can be considered relevant in the exploration phase. Such capacities will probably include the technical competence and financial capacity required for an environmentally sound fulfillment of the precise objective of the exploration.

Since exploration activity of course does not include storage of CO_2, this means that the requirements with regards to financial security and financial contribution required for storage, in general do not apply directly at this stage. However, it may well be that the authorities will consider such factors as well, to avoid that an exploration permit is given to an actor who has not the necessary economic basis for the subsequent storage.

Norwegian petroleum law contains some of these requirements concerning exploration permits. Petroleum regulations also require certain personal information and that the applicant pays a fee for the exploration activities. However, the storage-directive is more comprehensive than Norway's petroleum legislation on other issues. The Norwegian legislative authorities can therefore not just

15 See: Petroleum Activities Act Article 2-1 and the Regulations relating to the act chapter 2.

copy the existing system for petroleum exploration, but will to some extent have to establish an individual and more thorough system for CCS exploration permits in order to fulfill the requirements of the EU CCS Directive.

4.3 Storage permit

The EU CCS Directive decides in Article 6 that a storage permit shall be required for the storage of CO_2. The requirements for a storage permit are very similar to the requirements for exploration. However, the requirement for the operator to possess the "necessary capacities" when storing CO_2 is, of course, more comprehensive than for the exploration phase, since proper storing requires more extensive and long term measures and obligations on the part of the operator than exploration.

During the application for a storage permit "conflicting uses" of the complex will not be allowed. As stated, we shall get back to this issue below, under point 6.

Article 6 further prescribes that the holder of an exploration permit shall be given priority for the granting of a storage permit. In the strict formal sense, this is not the case in Norwegian petroleum law with regard to the relationship between exploration permit and production permit of petroleum. However, in reality a successful exploration most often leads into a production permit for the company, although it often has to accept several partners in the production phase.

Article 6 of the Directive states that only one "operator" shall operate the storage site. The Directive defines an operator as the natural or legal, private or public person who operates, controls or has decisive economic power over the technological functions of the storage site (Article 3 para 10). The same definition of operator is also used under Norwegian petroleum law, which as the main rule also accepts only one operator per oil or gas field. But of course, there may be several companies as economic partners in the production of a field.

4.4 Application requirements for storage permits

Article 7 of the EU CCS Directive contains a list of the information required in the application for a storage permit. The list is a minimum requirement and the Norwegian legislative authorities may impose stricter requirements. The information that the applicant for storage permit is required to provide is more extensive than those required by Norwegian petroleum regulations. The application of the rule of the directive will however not raise any problem and will most probably be included in the Norwegian regulation. Whether the authorities want to impose even stricter requirements is an open question.

4.5 Public participation requirements

Future CCS regulations in Norway will certainly reflect and apply the general rules and principles for public participation in the procedure for storage permits. According to the applicable Norwegian environmental law (mainly the 1981 Pollution and Waste Act) applications for discharge and emission permits are subject to a transparent procedure; the application is public, and the public has the right to information and participation.

Furthermore, it is most likely that both the plants and installations where CO_2 is captured, and the storage, will be subject to EIA-regulation in line with what we have today for other projects as well as for land use plans. This will also define the various steps in the procedure where the public are entitled to information and have the opportunity to have a say. It is also likely that both the environmental organisation and fishery people will be quite alert and active on these issues.

In the EU CCS Directive, article 31 explicitly states that the EIA directive 85/337/EC is amended in order that the EIA requirement shall apply to installations for capture of CO_2, pipelines "for the transport of carbon dioxide (CO_2)streams for the purposes of geological storage, including associated booster stations" and to storage sites for geological storage of CO_2.

Directive 85/337/EC, article 6, has detailed rules on the public's right to information and participation, and these will thus apply to decisions on capture, pipelines and storage. In practice, this also means that the requirements of the Aarhus convention will apply.

4.6 Conditions for storage permits

The conditions for a storage permit are found in Article 8 of the CCS Directive. There are three categories of conditions.

The first category determines that all relevant requirements in the CCS Directive must be fulfilled. This is a rather vague condition, but is more extensive than the conditions in the current Norwegian legislation.

The second category of conditions relates to financial soundness and technical competence. Such provisions are also found in current Norwegian petroleum legislation. However, given the required financial contribution in relation to the transfer of responsibility (see below), the CCS Directive has a wider set of conditions than existing petroleum legislation.

The last category concerns pressure interactions where more than one storage site is in the same hydraulic unit. This is also a new condition.

Seeing that each of the conditions for a storage permit are more comprehensive than current petroleum legislation, the impression is that the new Norwegian regulations have to be developed more or less from scratch on these issues in order to fulfill the directive.

4.7 Contents of storage permits

Article 9 of the CCS Directive provides that the storage permit itself shall contain a minimum set of information. This information is derived from the conditions set forth in the permit. In practice, this refers to specified information in relation to the operator and how the operator shall run the storage site in question. Norway, and the EU Member States, would have the discretionary power to require additional content of a storage permit. The rules with regards to the content of the permit are similar to the practice under Norwegian petroleum law.

4.8 Changes, review, update and withdrawal of storage permits

In its Article 11, the CCS Directive states that the authorities must be informed of any change in the operation and that substantial changes require a new or updated storage permit. In cases where the operator does not meet the permit conditions, the authorities have the discretion to withdraw the storage permit. An equivalent provision can be found in Norwegian law, where both the Pollution and Waste Act and the petroleum legislation require the operator to inform the competent authority of any change, and the competent authority has the power to change, review, update or withdraw the petroleum recovery permit.

The CCS Directive prescribes that in the event of a withdrawal, the authorities shall temporarily take over all legal obligations, whereas any costs shall be recovered by the former operator. Such a scenario is not reflected into Norwegian petroleum law. However, it is clear that – following environmental law and legal principles of recourse – the mentioned regulation would be consistent with Norwegian legislation in general.

5 Regulation of operations, monitoring, reporting, etc.

5.1 CO_2 stream acceptance criteria and procedure

An important issue in the area of CO_2 storage is the quality requirements – the "purity" as it were – as regards the gas being stored. The CCS Directive sets forth concrete and discretionary requirements with regards to the quality of the CO_2-stream (Article 12). This is also an important element in the international acceptance of CCS within the London Dumping Convention/Protocol and OSPAR. Such requirements are important in Norwegian Petroleum law as well. Pipeline for the transport of natural gas can be used as an example, where the operator is subject to a detailed set of quality requirements in relation to the natural gas, by virtue of both the petroleum regulations and the standard agreement.[16]

The specific standard of quality will depend on the state of the capture technology. The quality standards now included in the European Commission Guidance document 2[17] will of course be closely studied by the Norwegian authorities.

5.2 Monitoring

Article 13 of the CCS Directive imposes on the state an obligation to ensure that the operator carries out the monitoring of the injection facilities, the storage complex and the surrounding environment. Monitoring requirements are well known in Norwegian law. The petroleum regulations sets forth stringent requirements in relation to safety zones and operators must at all times maintain effective emergency arrangements in order to face hazardous situations or accidents. Regulations and permits

16 See: Terms & Conditions for transportation of Gas in Gassled, chapter 4.

17 <www.ec.europa.eu/clima/policies/lowcarbon/ccs/implementation/docs/gd2_en.pdf>.

pursuant to the Pollution and Waste Act regularly require the permit holder to have proper monitoring systems in place. The Directive contains a comprehensive list of requirements in this respect (Article 13 and Annex II). These will most likely be considered as sufficient monitoring requirements by Norwegian legislative authorities.

5.3 Reporting by the operator

Article 14 of the CCS Directive states that the operator – at least once a year – shall submit to the competent authority a report containing information on the results of monitoring, the quantity of CO_2 stored, the properties of the CO_2 streams, proof of financial security and other information that the competent authority might find relevant. In Norway, the current petroleum law also imposes on the operator an obligation to submit a report on an annual basis. This provision is therefore not new. According to the petroleum regulations, the report shall describe activities and measures performed which will give the authorities grounds to consider production strategy, environmental issues and so forth. The authorities can furthermore request additional information in the report. Regular reporting is also a normal condition in all pollution permits pursuant to the Pollution and Waste Act.

The requirement in the Directive regarding proof in relation to financial security is seemingly new to Norway, since it is not explicitly mentioned in the correlating petroleum regulations. However, it is clear that any petroleum operator's financial soundness is an important aspect of the production strategy and is therefore likely to be a part of the report. The reporting process following Article 14 is thus not new in Norway and this requirement does not bring anything new to Norwegian legislation.

5.4 Inspections

The CCS Directive prescribes in Article 15 a duty and a right for the member states to organize a system of routine and non-routine inspections, which should include visits, assessments and checking of records. The inspections shall be carried out at least once a year, and shall be publicly available at least within two months after the inspection. Inspections are a part of the Norwegian pollution prevention and petroleum legislation as well. In the petroleum sector a yearly inspection is the minimum. The inspectors shall have access to all data and material necessary and have the right to stay at installations as long as needed and also conduct relevant research. Costs shall be covered by the operator or licensee.

There are two minor material differences between the directive and Norwegian legislation. On the one hand, Norwegian legislation is more comprehensive when it explicitly states that the financial burden of inspections is to be borne by the operator, whereas the directive is silent on this issue. On the other hand, the directive seems more comprehensive when it sets a maximum period for the inspection report to be made publicly available, which is not explicitly stated in the Norwegian legislation.

Apart from the mentioned differences, the Norwegian legislation and the CCS Directive are very similar.

5.5 Measures in case of leakage or significant irregularities

In case of leakages or significant irregularities, Article 16 of the Directive requires the member state to ensure that the operator notifies the competent authority and takes necessary corrective measures. The competent authority may also take corrective measures itself and recover the costs from the operator, but it has a duty to do so if the operator fails to fulfill its obligations. Both the Norwegian petroleum legislation and pollution control legislation impose a duty of action on the operator in case of leakages or irregularities, whereas the authorities are provided with discretion to take such measures. If the authorities launch any measures, this may be a decision to delegate a third-party to take the necessary measures and thereafter recovering the costs from the operator.

The existing petroleum regulations mirrors the CCS Directive, and does also contain some specifications with regards to the right to appeal and cost recovery in practice.

6 Relationship of CCS with other subsurface activities

6.1 The issue of "conflicting uses"

The EU Directive decides in Article 6 that a storage permit shall be required for the storage of CO_2. During the application for a storage permit "conflicting uses" of the complex will not be allowed. What constitutes a conflict is not defined.

The directive applies to CCS, but also to Enhanced Hydrocarbon Recovery (EHR) activities, provided that they are combined with permanent storage of CO_2. Other activities – such as EHR without permanent storage – are not under the scope of the Directive and will thus probably qualify for a type of conflicting use. A question is however if CCS combined with EHR with permanent storage will fall under the definition of "conflicting use". This is a relevant issue for Norway, since the combination of EHR and "pure" CO_2 storage in an oil reservoir apparently is not excluded. If EHR with CO_2-storage does not utilize the capacity of a storage site and there is room for additional storage of CO_2 (in the form of CCS), this will contribute to a larger volume of CO_2 being stored which is in line with the purpose of the CCS Directive. Therefore, storage of CO_2 with the purpose of EHR, and CCS without this purpose should not be regarded as conflicting use. (See more on this issue below in point 6.3).

In general it is foreseen that petroleum activities and CCS can be combined on the Norwegian continental shelf. The Norwegian oil company Statoil is itself heavily engaged in the technological development of CCS at Mongstad, and apparently sees this as a future business opportunity.

The decision whether a particular storage area will be opened or not will of course be taken with due account of actual or potential petroleum activity in the area. What is striking, is that new oil and gas fields are still – to some surprise – discovered in the North Sea. There seem to be quite a lot of uncertainties and lack of precise knowledge with regard to geological conditions etc. There are also considerable uncertainties of the risk of leakage from CO_2 storage in the relevant geological formations. Norwegian experts tend to warn against the thinking that finding safe storage sites will not be a problem on our continental shelf.

6.2 Third party access

The CCS Directive requires the state to ensure that potential users are able to obtain access to transport networks and storage sites (article 21). This means, for example, that a certain company can not, as the main rule, have exclusive right to use a certain storage site. The article imposes some criteria and objectives on the state in relation to third party access. In essence the state must take necessary measures in order to achieve a system where access to transport and storage facilities is granted in a transparent and non-discriminatory manner, as long as the operator of such facilities does not refuse access on the basis of duly substantiated reasons. These criteria and objectives are somewhat ambiguous. The Directive states that Member States are granted discretionary power in relation to the exact design of the third party access regulations – article 21 is thus only a framework.

Norwegian law has a well developed system for third party access in several of the energy sectors. As already mentioned, in 2009 it was decided that the system in the Petroleum Activities Act was to be applied also in relation to CCS-installations.[18] The Norwegian regulations in relation to third party access are similar to the regulations in the CCS Directive – but more detailed – and are derived from in the provisions of the recent EU electricity market directive[19] and the natural gas market directive[20]. This fact should mean that the existing third party regulations will remain unchanged. However, the existing regulations in the Petroleum Activities Act do not apply to non-petroleum related activities such as CCS from gas-fired power plants. Given that the main focus for CCS in Norway today is in relation to such plants, the applicability of existing third-party access provisions must be considered.

One of the most interesting issues in relation to the implementation of a complete third party access regime for CCS activities is how access will be granted. On one side access can be negotiated and on the other side regulated. As of today a combination between the two applies to petroleum-related CCS. Because there are no immediately striking arguments against a similar system for a complete access regime, the same system is likely to be continued.[21]

6.3 Issues regarding the relationship between CCS and Enhanced Hydrocarbon Recovery (EHR)

The relationship between CCS and storage for the purpose of Enhanced Hydrocarbon Recovery or other purpose for the benefit of petroleum exploitation[22] raises some special questions for the legislator. For Norway, this is partly a question of choice of/relationships between various national legislations and authorities, and partly formal issues in relation to the EU CCS Directive.

CCS is technically very similar to EHR, but the CO_2 is not intended for any purposeful means other than storage. An interesting question is whether or not different regulations will apply to the two activities after the implementation of the storage-directive, and if so which differences there will be.

18 See main rule in: Petroleum Activities Act art 4-8.

19 See Directive 2009/72/EC.

20 See Directive 2009/73/EC.

21 These issues are discussed in a master thesis from the Faculty of Law in Oslo: Tonje Eilertsen: "Tredjepartsadgang til transportnett og lagringsområder for CO_2" (Third party access to transport networks and storage sites for CO_2), published in Marius no. 392, Oslo 2010.

22 See footnote 3 above.

The CCS Directive only mentions Enhanced Hydrocarbon Recovery in its Preamble section 20, which states that EHR is "not in itself included in the scope of this Directive". However, if EHR is combined with (permanent) geological storage of CO_2, "the provisions of this Directive for the environmentally safe storage of CO_2 should apply". The question is which of the rules in the storage-directive can be said to fall under the wording "for the environmentally safe storage of CO_2".

On the one hand it is clear that provisions with regards to safe monitoring and commitments that shall assure permanent storage must be included. On the other hand it is not as obvious that the regulations in relation to the financial mechanism and transfer of liability are needed for the "environmentally safe storage of CO_2". However, the CCS Directive's expressed purpose is "environmentally safe geological storage of carbon dioxide" (article 1 (1)), which – from the directive's own point of view – spawns the need for all the listed requirements and obligations (including the financial mechanism and transfer of liability). Thus, the two wordings are almost identical and a system oriented interpretation leads to the conclusion that EHR-processes with permanent storage of CO_2 must follow the same regulations as "pure" storage-projects.

Because EHR combined with permanent storage of CO_2 "should" be governed by the same provisions as CCS, it is most likely that such EHR-processes will follow the upcoming CCS regulations in Norway. However, this is not clear at the present time.

The fact that the Directive does not cover EHR processes where CO_2 is not permanently stored, does not prevent the Member States adopting their own national regulations for this type of activity. This means that there is room for two forms of regulations in regard to EHR: one for "pure EHR projects", and one for EHR projects in combination with permanent geological storage of CO_2. In the case of Norway, EHR projects which are not combined with permanent storage of CO_2 (as at Sleipner and Snøhvit) are regulated by the Petroleum Activities Act. The question is then whether the Petroleum Activities Act will be amended, as a result of the new CCS-legislation, to also cover EHR combined with permanent storage. Such amendments are not unlikely given the fact that Norway has proved to be an ardent advocate of CO_2-storage where it is technologically possible. The required technology for EHR combined with permanent CO_2 storage exists. However, there might be cases where permanent storage of CO_2 in combination with EHR is not possible. This calls for separate regulations for this type of EHR.

The provisions of the Petroleum Activities Act are to a large extent designed to leave discretion to the administrative organs with regards to the exact requirements for any activity. As such, it is likely that the existing provisions for EHR are maintained. At the same time it is possible that the authorities will impose the use of CCS-technology where it can. This means not only demanding EHR operators to actually store CO_2 where it is possible, but also demanding that such operators try to implement other requirements and obligations derived from the CCS Directive. An example of this would be to require that the EHR-operator – whether or not combined with permanent CO_2 storage – seeks to achieve the same level of quality in the captured CO_2-stream as the operators who actually store the CO_2.

7 Liability, transfer of liability, and financial security

7.1 The general liability picture in Norwegian environmental and petroleum law

The Pollution and Waste Act imposes a duty, irrespective of fault or negligence, to take reasonable measures to prevent, abate and repair pollution, including accidental emissions and discharges. It also lays down strict liability for the owner or operator of a property, installation or activity for damage and loss caused by pollution from such source, including costs of restoration measures.[23] This Act will most probably apply if leakage from the storage site should occur.

In addition, the Petroleum Activities Act imposes strict liability on operators for environmental damage caused by emission or discharge of petroleum from a petroleum installation. This also covers reasonable measures to prevent and limit such damage. Furthermore, this Act imposes strict liability for any type of damage to actors in the fishing industry, i.e. third parties.[24] It is likely to assume that a similar scope of duty to take preventive and remedial actions, as well as strict liability for any damage caused by leakage, will be adopted for CCS transport and storage in Norwegian law.

Both the Pollution and Waste Act and the Petroleum Activities Act contain forms of limitation of liability. On one hand there is a discretionary upper limit – expressed by the word "reasonable" – as to the operators duty of action in case of a leakage accident.[25] Furthermore, the liability may be restricted in case of *force majeure* pursuant to the Petroleum Act,[26] but not explicitly pursuant to the Pollution Control Act. The CCS Directive does not explicitly mention such limitations, and one can therefore ask if it would be in compliance with the Directive to introduce the limitations when implementing the CCS Directive. However, the Directive refers to Articles 5 and 8 of the EU Environmental Liability Directive.[27] This Directive has now been included in the EEA agreement and applies to Norway. Article 5 requires the "operator" to take "necessary" preventive measures when there is an imminent threat of environmental damage. Article 8 lays down as the main rule that the operator shall bear the costs for the preventive and remedial actions pursuant to the Directive. The same article spells out some exceptions to this obligation and defines some (limited) possibilities for member States to allow other exceptions.

Since Norway has implemented the Environment Liability Directive there will be no problems in this area.

7.2 Long-term liability

The operational phase and the post-closure phase connected to the storage of CO_2 pose different risks of damage. In relation to post-closure, Article 17 (2) of the CCS Directive, in conjunction with

23 Pollution and Waste Ac, chapter 8.

24 See the Petroleum Activities Act chapter 8.

25 See the Petroleum Activities Act art 7-1.

26 Article 7-3 para 3 of the Petroleum Act.

27 Directive 2004/35/EC.

article 18 (1) a, prescribes that the operator of a storage site is liable for the site until responsibility has been transferred to "the competent authority". As the main rule, this can happen after a minimum period of 20 years, but also before if the authority "is convinced" that the stored CO_2 "will be completely and permanently contained".

The transfer of responsibility from the operator to the "competent authority" is a key point in the CCS Directive. Given the fact that the Norwegian state owns the offshore pore space this means in reality that the state shall take over the responsibility.

According to the directive the post-closure long-term liability consists of the duty to carry out monitoring, reporting, potential corrective measures, the surrender of GHG allowances if leakage occurs and preventive and remedial actions pursuant to articles 5 and 7 of the EU Environmental Liability Directive. Thus, both a comprehensive duty of action and an economic liability is imposed on the operator. The economic liability does not explicitly impose on the operator to cover potential economic losses of third parties, but this follows in general from Norwegian law.

The implementation of the provisions concerning long-term liability will not entail any radically new to current Norwegian tort and environmental law. Post-closure long-term liability may be seen as an expression of the polluter pays principle, which is an important principle in Norwegian environmental law.[28] With regards to the duties of action prescribed in the CCS Directive, these are quite extensive and will probably be regarded as sufficient by Norwegian legislative authorities. However, it appears that the economic liability set out in the Directive only imposes on the operator an obligation to give up ETS allowances in case of leakages (see below). The scope of such a liability is below the current legal standard of economic liability vis-à-vis third parties in Norway.

7.3 Transfer of liability

The CCS Directive article 18 first para. states that:

> Where a storage site has been closed pursuant to points (a)or (b) of Article 17(1), all legal obligations relating to monitoring and corrective measures pursuant to the requirements laid down in this Directive, the surrender of allowances in the event of leakages pursuant to Directive 2003/87/EC and preventive and remedial action pursuant to Articles 5(1) and 6(1) of Directive 2004/35/EC, shall be transferred to the competent authority on its own initiative or upon request from the operator, if the following conditions are met[.]

This is a very important point: the operator's post-closure liability shall be transferred to the competent authority – in reality the state – after a minimum period of 20 years, subject to the fulfillment of a number of important conditions laid down in article 18.

Norwegian law does not contain any provision where the authorities are obliged to accept the transfer of environmental liability from private commercial actors.[29]

28 See the Pollution and Waste Act art 2 (5).

29 Pursuant to the Petroleum Activity Act the state has the right – but no obligation – to take over petroleum installations when an exploitation permit expires and/or an activity comes to a close.

Whether – and eventually how – the principle of liability transfer to the state will be implemented in Norwegian law remains to be seen, and this is probably one of the more difficult issues presently under discussion within the government. One might expect that such a new provision on the transfer of environmental liability will be met by skepticism by legislative authorities and the public in general, since it of course entails a risk for future costs for the state – costs that may be considerable in "a worst case scenario". As of today there has however been no open debate on the subject. This silence may stem from a general acceptance of CCS or simply ignorance of the implications of such transfer. On the one hand, it is possible that the transfer of liability is regarded as a necessary condition for making CCS commercially attractive and that the process is viewed as safeguarded by the stringent transfer-requirements. On the other hand, it is also possible that the implication of a provision that allows the transfer of liability is still quite unknown among relevant interested parties. If the latter is the case, it cannot be excluded that the transfer of liability finally will be regulated even in a stricter way than what the CCS Directive proposes in order to have it accepted.

One way of making the transfer of liability stricter is by using the discretion given to the competent authority to extend the minimum period of 20 years. As of today, there are no statements from the authorities as to whether or not Norway wishes to do so. On the one hand Norway might want to extend the 20-year period in order to stress its strong commitment to environmentally safe storage of CO_2. However, in this matter the government will also be under pressure from the industry that wants to engage in CCS and need acceptable conditions with regard to long term risk and obligations. A longer responsibility period will have the potential to inhibit commercial incentives and may have a distortive effect in favour of other EU countries which do not expand the minimum period. Those countries that keep the minimum period shorter would have a competitive advantage over those that make this condition stricter, in terms of investment and investor's confidence. Seeing that CCS in general and the storage-directive in particular is new, my "best guess" is that Norway will start out with implementing the prescribed 20 year period. The state will not make it too difficult for operators when the petroleum industry sees the possibility of developing CO_2 storage for other countries as a new industry.

In addition to the 20 year period, there are several other conditions that the operator has to fulfill in order for the authorities to accept transfer of liability: Permanent and complete containment of the injected CO_2, sealing of the storage site, removal of the storage facilities and a provision of financial contribution (see below). There is no reason to believe that Norway will deviate from these proposed conditions. Furthermore, it is natural that the liability that is transferred to the state is of the same character as the liability that the operator has been responsible for before the transfer. This means that the state will be subject to a comprehensive duty of action, and an economic liability encompassing both the obligation to surrender ETS allowances and third party liability.

7.4 Financial security and financial contribution

Article 19 of the CCS Directive imposes a requirement of financial security on potential operators in order to ensure that all obligations – following the Directive – during the operation phase can be met. This includes closure and post-closure requirements as well as potential requirements arising from the EU ETS.

The Directive does not define "financial security" and neither does it provide any criteria in regards to what constitutes such security.

The Norwegian Petroleum Activities Act also contains a provision which gives the Ministry of Petroleum and Energy the authority to impose on the operator a form of "security".[30] However, the Act does not give any definition of what is meant by such security.

Norway adopted a Financial Security Act in 2004.[31] The act defines financial security as an agreement where the ownership of an asset is transferred for the purpose of securing the fulfillment of financial obligations. It applies to agreements between public authority, central banks, other financial institutions and legal persons. The act was introduced as a result of the EEA implementation of Directive 2002/47/EC on financial collateral arrangements. Therefore it is likely that Norwegian authorities will regard the act as applicable in relation to the financial security provisions in the CCS Directive.

The Financial Security Act leaves wide autonomy to the parties involved, with regards to the conditions relating to the financial security. The parties can make their own arrangements when it comes to what kind of financial security should be set up and their right to use the security. Autonomy is also granted with regards to how and on what terms the security provider can provoke the final settlement. The rules are clearly written with a high degree of flexibility, which is quite typical in Norway for legislation concerning commercial relationships between strong business actors. The parties involved in CO_2 storage activities will be the Norwegian government on one side and, most likely, a strong commercial company on the other. As such, the legislative authorities are likely to grant the parties flexibility with regard to the financial security.

The Norwegian government, as a party in the financial security agreement for CCS, is likely to impose stringent requirements vis-à-vis the operator. With regards to the amount of financial security, this issue will also most likely depend on the parties' autonomy and, thus, rely on what the government can consider acceptable. A natural starting point in relation to calculating the amount of financial security would be to determine how much it would cost to the government to fulfill the duties and obligations it is likely to incur, in a worst case scenario. This question is in itself rather subjective and will have to be decided on a case-by-case basis for each operator.

The duration of the financial security is specified in the CCS Directive, which decides that it is to be valid and effective until the responsibility of the storage site is transferred to the competent authority. Furthermore, the Directive also adds that the financial security is to be periodically adjusted. These two elements will most likely be implemented by Norway without any problems.

In addition to the financial security imposed on the operator during the operation of the storage site, the CCS Directive in Article 20 requires the operator to make a financial contribution available to the authorities as a condition for the transfer of responsibility. Norwegian law has at least one rule along the same lines, in the case of the closing down of a polluting activity; in that case the authorities may require a financial guarantee as a contribution for possible future costs and liability.[32] Since the financial contribution is a way of balancing out the fact that the operator is relieved of his environmental liability, the Norwegian legislative authorities will probably not have a problem with the implementation of this rule. The fact that the transfer of responsibility will entail a financial commitment for the operator can make the transfer easier for the legislator to accept.

30 Petroleum Activities Act Article 10-7.

31 Lov 26 mars 2004 nr. 17 om finansiell sikkerhetsstillelse.

32 Pollution and Waste Act, section 20.

The CCS Directive states that the amount of financial contribution is supposed to cover the cost of the fulfillment of the anticipated post-transfer obligations and at least the costs of monitoring for a period of 30 years. Norway, as well as the other EU Member states, has the discretion to impose a longer period than 30 years. Whether this discretion will be used or not remains to be seen. However, the same kind of argument as the one in relation to minimum-period relating to the transfer of liability points towards implementing the 30 year period for the financial contribution and not a longer period. The actual post-transfer obligations will be dependent on the specific conditions for each individual storage facility and on how much CO_2 is stored, which will determine the magnitude and cost of a potential leakage. It would thus be natural for Norway to give the competent authority, under the meaning of the Directive, the discretion to set the financial contribution on a case-by-case basis, based on the two aforementioned elements.

Other than the indication of the amount of the financial contribution, the CCS Directive does not give any further details with regards to the payment. An important question is how the payment is to be done (i.e. in cash or in another form; all at once or several installments, etc.). However, given the new character of the rule of financial contribution, there are at the moment no indications regarding how the remaining questions will be solved in Norwegian law.

8 Relationship with the Emission Trading Scheme

At some later stage it may be necessary to consider CCS in relation to the international climate regime. This is an issue which is under discussion for the time being. The Kyoto protocol establishes GHG emission reductions and sinks as the two groups of measures to combat global warming. Whether CCS should be regarded as emissions reduction or a sink was discussed during the negotiations of the Kyoto protocol as part of a more general debate on the role of sinks within the regime. These discussions were complex, and many issues, including this one, were left unsolved.[33] The concepts of 'emissions' and 'sinks' are defined in UNFCCC article 1(4) and (8), and these definitions apply equally to Kyoto. Only certain types of sink measures may provide a basis for addition to a state's 'assigned amount' pursuant to the protocol: land use, land use change and forestation (LULUF-activities). Since CCS is not a sink, it must be treated as reduced emissions or non-emissions, and it follows that leakage from the CCS chain will be an 'emission' under the system.

CCS thus serves to fulfill the emissions reduction obligation of a state party, in that it eliminates or reduces an emission that would otherwise have counted in the state's emissions quota. However, in order to have such an effect, the CO_2 must come from a source that is covered by the emissions reduction obligation. In Kyoto these are listed in annex A[34] as 'sectors/source categories'. The main categories are 'energy', 'industrial processes', 'solvent and other product use', 'agriculture' and 'waste'. In order to count towards a state's commitment, the CCS chain must capture CO_2 from a producer that is included in this list. These categories cover most of the producers where CCS is feasible and relevant, such as installations for petroleum exploitation, power production from fossil fuel burning power plants, and industrial processes.

33 Intergovernmental Panel on Climate Change (IPCC), *Special Report on Carbon Dioxide Capture and Storage* (Cambridge, Cambridge University Press, 2005) and *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, vol 2 Energy, p 55.

34 See Kyoto Protocol, art 3(1)

At present, the role of CCS in a future climate regime is unclear. So far, it has been formally discussed mainly in connection with the further development of the Clean Development Mechanism (CDM). The UN Climate Change Conference in Cancún (2010) decided that CCS in geological formations is 'eligible as project activities' under the CDM, on strict conditions laid down in the decision. Further work is to be carried out by technical and legal experts to clarify the more detailed modalities, including 'the appropriateness of the development of transboundary carbon capture and storage project activities ...'.[35] This was further followed up at COP 17/CMP.7 in Durban in 2011 by a special decision[36] and further discussions have been going on during 2012.

CCS projects are included in the EU ETS.[37] This means, on the one hand, that GHG emission sources do not need allowances to the extent that the CO_2 is captured and stored. On the other hand, it means that emission from leakage from CO_2 transport and storage must be covered by allowances. As mentioned, it even appears that the economic liability for the storage operator set out in the EU Directive only imposes on the operator an obligation to give up ETS allowances in case of leakages.

9 Regulation of Transportation of Carbon Dioxide

CO_2 may be transported for storage both by ship and pipeline. There is not yet any special regulation on CO_2 transport by pipeline. The regulation we have for transport of natural gas from Norway to the UK and the Continent will probably be applicable to a great extent and will most likely be the basis for the regulation of CO_2 transport for storage. This raises both public and private law questions. In the public law area legislation is generally rather technical (safety rules on gas transport with ships and with pipe-lines, etc.). In the area of private law, there are complex but well developed systems of contracts for both gas transport with ships and with pipelines.

Norwegian law is well developed in both fields, through standard contracts, etc. In particular, there is a well developed law with regard to gas transport by pipe-line, which is the main transport medium for natural gas from gas fields on the Norwegian continental shelf to UK and the European continent. In CCS many of the same questions arise, although the gas stream in fact goes in the opposite direction, from emission on land to the storage deep into the continental shelf. In both situations the key issues are of course the respective rights and obligations of the owner of the gas and the owner of the transport facility. Here is the question of third party access to the transport facility also essential (see above point 6.2).

An important question is also when the "property right" to the gas – and the accompanying responsibility for leakage etc. – is transferred from the source (emitter) to the owner of the storage site. This may be decided by public law regulation, but may also be left to the parties to decide by contract.[38]

35 Decision 7/CMP.6.

36 Decision 10/CMP.7 Modalities and procedures for carbon dioxide capture and storage in geological formations as clean development mechanism project activities.

37 Directive 2003/87/EC as amended by directive 2009/29/EC for the period 2013-2020.

38 Some aspects of this are treated in Hans Christian Bugge "Transboundary Chains for Carbon Capture and Storage: Allocation under the Climate Regime between the States Parties of Emissions due to Leakage", in I Havercroft, R Macrory and R Stewart (eds.): *Carbon Capture and Storage. Emerging Legal and Regulatory Issues* (Hart Publishing, 2011). There is a master thesis on the private law issues of CO_2 transport by pipe-line from the Faculty of Law in Oslo: André Lamark Ueland: "Offshore rørtransport av CO_2 fra kontinentet til lagringssted på norsk sokkel" (Offshore pipe-line transport of CO_2 from the continent to storage on the Norwegian continental shelf), published in Marius no 404, Oslo 2011.

APPENDIX D

Resource Management Act 1991 Issues

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This report considers issues arising under the Resource Management Act 1991 (RMA) regarding the design of a legal and regulatory framework for Carbon Capture and Storage (CCS) in New Zealand. It includes a review of the present law, some comparative analysis of overseas regulatory experience, and puts forward some tentative reform options.[1]

1 Resource Management Act 1991

The RMA was designed to reform and restate the law regarding the use of air, land and water; it repealed and replaced 59 statutes; and is the principal statute governing the New Zealand environment. But despite arguments about whether the RMA should become a "one stop shop",[2] New Zealand environmental law is currently contained in a suite of 36 statutes.[3]

The statutory purpose of the RMA is to promote the sustainable management of natural and physical resources,[4] which is the ultimate issue that determines the legality of policy statement and plan provisions or whether proposed activities are granted or refused resource consent.[5] Key features of the RMA include the vertical integration of policy statements and plans into a hierarchy of statutory planning instruments,[6] and the horizontal integration of resource consent decision-making to ensure that proposed activities are assessed in a holistic way.[7]

The RMA is permissive in relation to land use activities, which only require resource consent when a proposed activity will be carried out in a way that would be contrary to a rule in a plan.[8] In contrast, the RMA prohibits all other activities (e.g. the discharge of contaminants into the environment) from being carried out, unless prior authorisation for the activity is obtained.[9]

The RMA is a framework statute that primarily provides procedural guidance by defining the functions, powers and duties of decision-makers; and sets out the procedure for preparing policy statements and plans,[10] deciding resource consent applications,[11] and civil and criminal enforcement.[12] Administration of the RMA is devolved at first instance to local authorities (regional councils and territorial authorities),[13] and on appeal to the Environment Court.[14]

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1 The brief was to provide a report (3,500-5,000 words) covering: the effect of the RMA on CCS operations; prohibition of discharge a contaminant, discharge permits, and the term of discharge permits in relation to the likely duration of injection operations, stabilization periods, and liability periods; the possibility that the RMA can form the core of legal framework for CCS; measures to manage boundary issues such as overlapping statutes; the present law; comparative analysis; and reform options.

2 K Tremaine, *RMA – Is it still a one-stop shop?* RMLA 4th Annual Conference (3–5 October 1996).

3 Environment Act 1986, Sch.

4 Resource Management Act 1991, s 5.

5 *Shirley Primary School v Telecom Mobile Communications Ltd* [1999] NZRMA 66 at 99.

6 Resource Management Act 1991, Part 5.

7 Resource Management Act 1991, s 102, and s 103.

8 Section 9.

9 Sections 11–15.

10 Part 5.

11 Part 6.

12 Part 12.

13 Sections 30, 31.

14 Section 120; Part 12; and Sch 1, cl 14.

At national level, the preparation of statutory planning instruments is permissive, apart from the requirement to prepare the New Zealand Coastal Policy Statement.[15] National Policy Statements (NPS) and National Environmental Standards (NES) have been slow to emerge,[16] and the delay in preparing a complete suite of NPS and NES has been the subject of continued criticism about policy failure under the RMA.[17] NPS have also been prepared in a way that requires implementation by further delegated regulation via the plan change process under Schedule 1 of the RMA, and therefore do not have direct applicability or effect on all persons exercising functions, powers or duties under the RMA.[18]

The preparation of policy statements and plans by local authorities is generally permissive, apart from the requirement to prepare regional policy statements,[19] regional coastal plans,[20] and district plans.[21] As a result, there is no requirement for regional councils to prepare regional plans regarding a range of matters, including the discharge of contaminants into the environment.

2 The effect of the RMA on CCS operations

This section of report considers the effect of the RMA on CCS operations.

CCS involves the capture of carbon dioxide gas from large point sources (e.g. fossil fuel power stations), its transportation, and permanent storage under ground. The permanent storage of carbon dioxide (CO_2) underground is accomplished by injecting it in supercritical form into porous rock (e.g. a depleted oil or gas reservoir or a saline aquifer) at depths of 800 m or more.[22] CCS will include:

- The storage site: "A storage complex, overburden, the surface projection of the storage complex, and injection facilities."[23]
- The storage complex: "A primary containment system and any secondary containment system."[24]

It will also include any pipeline network required to transport CO_2 from large point sources to the storage site for injection into the storage complex.

15 Section 57.

16 Sections 45–55; and sections 43AA-44A.

17 AP Randerson, *Environmental Law and Justice: A perspective on three decades of practice and some possibilities for the future*, NZCEL National Forum: Environmental Law for Sustainability, Entering a New Millennium (17 April 1999); AP Randerson, *RMLA Seminar to celebrate the 10th anniversary of the enactment of the Resource Management Act* (28 August 2001); S Westerlund, "Theory for Sustainable Development: Towards or Against", in HC Bugge and C Voigt *Sustainable Development in International and National Law* (2003) Europa Law Publishing, at 49; S Dovers and R Connor, "Institutions and Policy Change for Sustainability", in B Richardson and S Wood, *Environmental Law for Sustainability* (2006) at 21.

18 For example, the NPS on Freshwater Management 2011 contains 14 policies but only two policies are directed to be included in regional plans under section 55 of the RMA without using the Schedule 1 plan change process. The compliance period specified for implementation of the NPS by regional councils is 31 December 2030. See: Milne & Severinsen, "The NPS on Freshwater Management: What will it mean in practice?" April 2012 RMJ 13, for a critique of the NPS.

19 Resource Management Act 1991, s 60.

20 Section 64.

21 Section 73.

22 Transfield Worley NZCCS Partnership, CCS in New Zealand: Can carbon capture and storage deliver value to New Zealand as we head towards a low carbon future? (September 2011) at 3.

23 International Energy Agency, Carbon Capture and Storage Model Regulatory Framework (2010) at 127.

24 At 127.

The activity will comprise distinct stages including site selection and establishment, operation, and aftercare. It will also include a range of component activities similar to the activities encountered in relation to geothermal and oil and gas wells, and landfills.

As a result, CCS activities will likely require a suite of land use consents, water permits and discharge permits from the relevant consent authorities.[25] Depending on the location of both the storage site and the storage complex, resource consent could be required from a number of local authorities (regional councils and territorial authorities) as consent authority jurisdiction is confined by the boundaries of local authority administrative areas,[26] and there may be no correlation between the physical extent of subterranean geological or hydrogeological structures or formations and administrative boundaries.

While horizontal integration is a key feature of the RMA, it is limited to joint hearings in the context of a particular region.[27] For joint decision-making to occur in an inter-regional context, the resource consent applications would need to be called-in for decision by the Minister, and referred to a board of inquiry or directly to the Environment Court under the RMA streamlining and simplifying procedures.[28]

Where multiple resource consent applications are nominally required, both the RMA and relevant regulations are drafted in a way that would allow a single resource consent application and assessment of environmental effects to be prepared in relation to the whole project and filed with the relevant consent authorities.[29] However, in practice some consent authorities insist on "global" applications being unbundled and require a suite of separate applications to be filed.[30]

3 The prohibition on the discharge of contaminants, discharge permits, and the term of discharge permits

This section of report considers the prohibition on the discharge of contaminants into the environment under the RMA; discharge permits; and the term of discharge permits in relation to the likely duration of injection operations, stabilisation periods, and liability periods.

25 Scottish experience is that more than 50 separate consents may be required for a CCS project: The Scottish Government, *Carbon Capture, Transport and Storage Regulatory Test Exercise* (11 & 12 August 2010), at 3.

26 Currently, there are 11 regional councils, 61 territorial authorities, and 6 unitary councils in New Zealand: source, Local Government New Zealand, <www.lgnz.co.nz>.

27 Resource Management Act 1991, s 102.

28 Part 6AA.

29 Section 88 and Sch 4, and Resource Management (Forms, Fees and Procedure) Regulations 2003.

30 For example, 5 separate resource consent applications (including 3 discharge permit applications) were required to establish the composting activity carried on by Living Earth Ltd on Puketutu Island, Manukau: *Living Earth Ltd v Auckland Regional Council*, A126/06 (unreported).

Prohibition on the discharge of contaminants

As noted above, the discharge of contaminants into the environment requires prior approval under section 15 of the RMA, which prohibits the discharge unless expressly allowed by an NES, or by a rule in the relevant regional plan, or by resource consent. Section 15(1) of the RMA regulates (inter alia) the discharge of contaminants into land in circumstances which may result in that contaminant entering water, and the discharge of contaminants from any industrial or trade premises into land. Relevant statutory definitions include:

- "Contaminants" are defined as any substance or energy or heat, or any combination of them that when discharged into water or onto land "changes or is likely to change the physical, chemical, or biological condition" of the water or land. Contaminative substances include "gases, odorous compounds, liquids, solids, and micro-organisms".[31]
- Water is defined as including "surface water and groundwater"; and "fresh water, coastal water, and geothermal water".[32]
- Industrial or trade premises are defined to include "any premises used for the storage, transfer, treatment, or disposal of waste materials or for other waste-management purposes, or used for composting organic materials".[33]

Significantly, there is no comprehensive statutory definition of "discharge" in the RMA.[34] The meaning of "discharge" was considered by the Court of Appeal in *McKnight v NZ Biogas Industries Ltd*.[35] The case involved the discharge of potato and vegetable waste into a tributary of the Otara Stream in Manukau, when a storage bladder at a waste treatment plant burst and the contents were disgorged over land and into the creek. The plant operator was charged with criminal offences under s 338 of the RMA, and the issue for the Court was whether the discharge was "due to an event beyond the control of the defendant that could not reasonably have been foreseen or provided against".[36] If so, a statutory defence was available under s 341(1) of the RMA. The Court noted that:[37]

> In the ordinary and natural use of language, a person discharges something when he causes it to be discharged. In the context of an environmental protection statute there is everything to be said for adopting that meaning … the extension of the meaning in the definition to include emit points in the same direction. Similarly the extension of the defined meaning to allow to escape appears to encompass passive lack of interference.

The Court also had regard to comparative authorities from other jurisdictions and concluded that the situation in *McKnight* was "indistinguishable" from *Alphacell Ltd v Woodward*,[38] where the House of Lords held:

31 Resource Management Act 1991, s 2(1).

32 Section 2(1).

33 Section 2(1).

34 Section 2(1) simply provides that "discharge" includes "emit, deposit, and allow to escape".

35 *McKnight v NZ Biogas Industries Ltd* [1994] NZRMA 258.

36 *McKnight v NZ Biogas Industries Ltd* [1994] NZRMA 258 at 264.

37 At 265.

38 *Alphacell Ltd v Woodward* [1972] 2 All ER 475 at 479 per Lord Wilberforce.

> In my opinion, "causing" here must be given a common sense meaning and I deprecate the introduction of refinements, such as causa causans, effective cause or novus actus. There may be difficulties where acts of third persons or natural forces are concerned but I find the present case comparatively simple. The appellants extract water, pass it through their works where it becomes polluted, conduct it to a settling tank communicating directly with the stream, into which the polluted water will inevitably overflow if the level rises over the overflow point. They plan, however, to recycle the water by pumping it back from the settling tank into their works; if the pumps work properly this will happen and the level in the tank will remain below the overflow point. It did not happen on the relevant occasion due to some failure in the pumps.
>
> In my opinion, this is a clear case of causing the polluted water to enter the stream. The whole complex operation which might lead to this result was an operation deliberately conducted by the appellants and I fail to see how a defect in one stage of it, even if we must assume that this happened without their negligence, can enable them to say they did not cause the pollution. In my opinion, complication of this case by infusion of mens rea, and its exceptions, is unnecessary and undesirable.

As a result the Court found no difficulty in holding that the defendant had caused the discharge due to the manner in which the pit that contained the bladder had been constructed. Failure to take reasonable precautions, such as obtaining engineering advice, had made the discharge "inevitable".

When these definitions are applied to CCS, it is reasonably clear that injecting CO_2 in supercritical form into depleted oil or gas reservoirs or saline aquifers deep below the land surface will be deemed to include the discharge of contaminants into the environment, that the precautionary approach to landfills that requires discharge permits due to the potential that contaminants may enter ground water will also be applied to CCS,[39] and that storage sites for CCS will be deemed to be industrial or trade premises. As a result, resource consent will be required unless the activity is permitted by an NES, or by a rule in the relevant plan. It is also reasonably clear that enforcement under the RMA could result in the event of any CO_2 leakage from a pipeline or storage complex.

Discharge permits

As noted above, unless CCS is expressly allowed by an NES or by a permitted activity rule in the relevant regional plan, resource consent will be required.[40] Section 87A of the RMA provides for plan rules to classify activities as permitted activities, controlled activities, restricted discretionary activities, discretionary activities, non-complying activities, and prohibited activities.[41] Absent a rule in a plan classifying the consent status of the activity, all activities are deemed to be discretionary activities.[42]

The RMA imposes few substantive requirements on regional councils. For example, when preparing regional plans they must ensure that the plan will promote sustainable management as required

39 See: Centre for Advanced Engineering (CAE), *Landfill Guidelines* (2000); Ministry for the Environment, *Guide to Landfill Consent Conditions* (May 2001); Ministry for the Environment, *A Guide to the Management of Closing and Closed Landfills in New Zealand* (May 2001); Ministry for the Environment, *A Guide to the Management of Cleanfills* (January 2002).

40 Various types of resource consents are defined by section 87 of the RMA, including "discharge permits", which are defined as "a consent to do something (other than in a coastal marine area) that otherwise would contravene section 15": Resource Management Act 1991, s 87(e).

41 Resource Management Act 1991, s 87A(6) provides that no resource consent application can be made for a prohibited activity, and that consent authorities must not grant resource consent for prohibited activities.

42 Resource Management Act 1991, s 87B(1)(a).

under Part 2 of the RMA,[43] when including permitted activity rules about discharges in regional plans they must ensure (inter alia) that the discharge does not give rise to adverse effects in relation to drinking water for farm animals or aquatic life,[44] and they are precluded from having regard to the effects of greenhouse gas discharges on climate change.[45] Similar substantive requirements apply to regional councils when deciding discharge permit applications.[46]

Absent any substantive guidance in the RMA, or NPS, or NES, regional councils will be left in a policy vacuum, and will be free to determine what requirements or conditions should apply to CCS activities.[47] It is clear that a range of matters will be relevant when deciding whether to allow CCS activities to be carrier out, either generally or in relation to specific proposals. They will include: definitions, site exploration, site selection, activity classification, inspections, monitoring, remediation measures, site closure, and financial contributions for aftercare.[48] An examination of regional plan rules regarding landfill activities indicates that although similar matters will also be relevant in the context of waste-management activities, plans typically do not provide detailed guidance on these matters.[49] Instead, regional councils rely on non-statutory guidelines from the Centre for Advanced Engineering (CAE) and from the Ministry for the Environment (MfE),[50] and their power to include consent conditions when granting discharge permits.[51] In particular, site selection does not appear to be expressly considered, apart from those cases where the question of alternative sites is relevant under Part 2 of the RMA.[52] Reliance on non-statutory guidelines, however, appears to be endemic under the RMA. For example, Williams noted that "New Zealand appears to have become seduced into thinking that much of the needed action can be initiated and sustained by voluntary programmes".[53]

Duration of discharge permits

Discharge permits may be granted for a period not exceeding 35 years from the date of grant, or where no period is specified the duration of the consent is 5 years from the date of commencement of the consent.[54] Regardless of the maximum 35 year consent period available under the RMA, some consent authorities have adopted policies (either formally or informally) designed to keep consent holders on a "short leash" by normally granting permits for periods of 10–15 years.[55] The duration of discharge

43 Section 63(1).

44 Section 70(1)(f) and (g).

45 Section 70A.

46 Sections 107(1)(f) and (g); and 104E.

47 Section 30(1)(f): The functions of regional councils are defined as including "the control of discharges of contaminants into or onto land, air, or water and discharges of water into water".

48 International Energy Agency, Carbon Capture and Storage Model Regulatory Framework (2010) at 55-104.

49 See, for example: Waikato Regional Plan, 5 Land and Soil Module, 5.2 Discharges onto or into land, 5.2.3 Policies, Policy 2 Other discharges onto land, and 5.2.7.1 Discretionary activity rule – New and currently operating landfills.

50 See: Centre for Advanced Engineering, *Landfill Guidelines* (2000); Ministry for the Environment, *Guide to Landfill Consent Conditions* (May 2001); Ministry for the Environment, *A Guide to the Management of Closing and Closed Landfills in New Zealand* (May 2001); Ministry for the Environment, *A Guide to the Management of Cleanfills* (January 2002).

51 Resource Management Act 1991, s 108 regarding conditions of resource consents; and s 108A regarding bonds.

52 *TV3 Network Services Ltd v Waikato District Council* [1997] NZRMA 557.

53 JM Williams, "Sustainability: the "language" for the 21st century" in T Daya-Winterbottom (ed) *The Salmon Lectures – Justice and the Environment* (2nd ed) (2012) at19.

54 Resource Management Act 1991, ss 123(d), and 116.

55 *PVL Proteins v Auckland Regional Council*, A61/2001 (unreported).

permits is therefore problematic for infrastructure and capital intensive activities,[56] and is also likely to be problematic for CCS projects where the injection phase could be some years or decades long, but where measuring, monitoring and verification would need to go on for decades longer afterwards,[57] unless resource consents are renewed. The relatively short consent period available under the RMA will also create specific issues in relation to injection operations and stabilization periods.[58] Overall, the need to renew consents will have an effect on compliance costs and investment certainty.

Under the RMA liability during the consent period, and liability post closure, will rest with consent holders, site owners, and occupiers.[59] The RMA imposes strict liability,[60] with limited statutory defences,[61] and provides a "deep pockets" regime with no express preference regarding who should be primarily responsible for any statutory breach: i.e. the consent authority could choose to commence enforcement action against all persons that have been involved in the CCS activity, including any passive land owner, or it could focus on the person with the greatest financial resources at their disposal to pay mitigation costs and criminal fines.[62] However, there are practical difficulties that may limit retrospective RMA liability (e.g. availability of legal site access for former owners).[63]

4 Can the RMA form the core of a legal framework for CCS?

This section of report considers the possibility that the RMA could form the core of a legal framework for CCS. However, the legal framework provided by the RMA would require careful analysis before any policy decisions are taken about RMA reform to retrofit the statute and make it fit for purpose as the core legal framework for CCS in New Zealand, including the following matters:

- While the RMA could form the core legal framework for CCS, a critical issue would be preparing or changing plans to regulate these activities via the Schedule 1 process. This could take time,[64] and absent any relevant NPS or NES there would be no guarantee that a nationally consistent

56 For example, current policy questions in the RMA reform process include "whether permits for large-scale long-term infrastructure should be given for more than 35 years and whether there should be a minimum term for water permits – for example, 20 years". Source: Ministry for the Environment, *Freshwater reform 2013 and beyond* (March 2013) at 43.

57 B Barton, "Carbon Capture and Storage Law for New Zealand: A Comparative Study" (2009) 13 NZJEL 1, at 2.

58 For example, stabilisation periods of 15-20 years after site closure are typically required under Australian and European Union legislation: Offshore Petroleum and Greenhouse Gas Storage Act 2006, s 399; and EU CCS Directive 2009/31, Article 18. See: N Durrant, *Legal Responses to Climate Change* (2010), at 190-193.

59 Resource Management Act 1991, s 314.

60 Section 341.

61 Section 341.

62 See: T Daya-Winterbottom, "Contaminants in Paradise" (1998) 2 NZJEL 93.

63 *Voullaire v Jones* (1998) 4 ELRNZ 75.

64 There has been lobbying from local government for RMA reform of the Schedule 1 plan preparation process by substituting merits appeals with appeals on questions of law only, but these proposals have not (to date) been supported by informed analysis and commentary. See: T Daya-Winterbottom, "Blue horizons" August 2011 RMJ, at 21; D Nolan et al "A better approach to improving the RMA plan process" [2012] RM Theory & Practice, at 63; L Newhook "Current and recent past practice of the Environment Court concerning appeals on proposed plans and policy statements" [2013] RM Theory & Practice, at 241; and D Nolan et al "Faster, higher, stronger – or just wrong? Flaws in the framework recommended by the Land and Water Forum's Second Report" [2013] RM Theory & Practice, at 252.

and horizontally integrated rule framework would emerge. Additionally, based on experience with existing plans (e.g. landfills) it is unlikely that detailed guidance would be provided regarding CCS activities of the kind envisaged by the IEA Model Regulatory Framework.[65]

- The permissive approach to land use activities under section 9 of the RMA is not replicated in other jurisdictions where CCS activities require prior authorisation in order to be lawfully carried on.[66]
- Procedurally, the RMA does not impose any obligations for applicants to consult with affected persons.[67] In contrast, legislation in other jurisdictions places considerable emphasis on public consultation both as part of the application process and on a continuing "stakeholder" basis throughout the lifetime of the CCS project.[68] This could present a real tension between current RMA practice and international best practice by raising "public sensitivities" similar to those encountered in the GMO debate,[69] and the simplifying and streamlining objectives of current RMA reforms.[70]
- Absent any express rules about priority to resources in the context of competing applications, the first in first served rule applies as a default mechanism under the RMA;[71] whereas in other jurisdictions other methods of allocation are used (e.g. tenders) and express provision is made for comparative consideration of competing applications.[72]
- Apart from the general monitoring duties in section 35 of the RMA, there are no specific ongoing obligations imposed on the consent authority. This contrasts markedly with the situation in the European Union where annual inspection is required in relation to CCS activities, reducing to inspection every 5 years post closure until responsibility for the site is transferred to a competent authority.[73] Likewise in Australia detailed monitoring requirements are specified in legislation, including requirements for injection and monitoring plans;[74] and specific provision is made in the European Union for CCS operators to notify the competent authority of any leakages or significant irregularities and carry out any required remediation action.[75]

65 International Energy Agency, Carbon Capture and Storage Model Regulatory Framework (2010) at 55-104.

66 Energy Act 2008 (UK), s 17.

67 Resource Management Act 1991, Sch 4, cl 1AA.

68 Greenhouse Gas Geological Sequestration Act 2008 (Vic), ss 152-156.

69 See: M Grant, "Letting the Genie out of the Bottle?", in T Daya-Winterbottom (ed) *The Salmon Lectures – Justice and the Environment* (1st ed) (2007) at 30; and Havercroft, Macrory & Stewart (eds), *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (2011) at 3, 251-264.

70 See: S Nolan, "Facilitating infrastructure development", [2012] RM Theory & Practice, at 97; and Havercroft, Macrory & Stewart (eds), *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (2011), at 3, 277-296.

71 *Fleetwing Farms Ltd v Marlborough District Council* [1997] 3 NZLR 257.

72 Greenhouse Gas Geological Sequestration Act 2008 (Vic), ss 22 and 24.

73 EU Directive 2009/31 on the geological storage of carbon dioxide, art 15.

74 Greenhouse Gas Geological Sequestration Act 2008 (Vic), s 94.

75 EU Directive 2009/31 on the geological storage of carbon dioxide, art 16.

- Express provisions are also made in overseas legislation for site closure and liability, e.g. for the terms on which the surrender and cancellation of licenses will be accepted by the relevant competent authority,[76] for indemnities and the assumption of long-term post closure liability by the relevant competent authority,[77] and for the payment of financial contributions to meet long-term monitoring and verification costs.[78] These approaches contrast starkly with the "deep pockets" approach under the RMA noted above, and long-term liability has been identified as an issue that "may prove a real hindrance to investment in the technology".[79]

Internationally, a range of approaches have been adopted to provide for CCS including amendments to existing legislation pertaining to "resource extraction" or the assessment of environmental effects, and "dedicated" CCS legislation.[80] When considering the alternative approaches of revising existing legislation or enacting "dedicated" legislation to provide the legal framework for CCS, "gap and barrier analysis" will be an important component of the deliberation process.[81] Comparison with some of the detailed provisions noted above indicates that the RMA may not be suitable to "handle the specific risks involved in CCS operations".[82]

5 Measures to manage boundary issues such as overlapping statutes

This section of report considers measures to manage boundary issues such as overlapping statutes.

Boundary issues will arise where proposed CCS activities require approval under multiple statutory or administrative jurisdictions. Currently, New Zealand environmental law adopts a "silo" approach where approval is required under more than one statute, and applicants are left to navigate their way through the statutory thicket and prioritise the order in which consents are applied for. Where boundary issues are dealt with by the RMA, this is addressed by excluding jurisdiction so that matters are dealt with entirely under another statute.[83] While this approach may simplify matters by clarifying the statutory jurisdiction under which particular matters will be processed and decided, it does not streamline process in the way envisaged by Tremaine when he questioned whether the RMA should become a "one stop shop".[84]

76 Greenhouse Gas Geological Sequestration Act 2008 (Vic), ss 168 and 170.

77 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth), ss 399-401.

78 Greenhouse Gas Geological Sequestration Act 2008 (Vic), ss 112 and 174.

79 Havercroft, Macrory & Stewart (eds), Carbon Capture and Storage: Emerging Legal and Regulatory Issues (2011) at 3, 159-178.

80 International Energy Agency, Carbon Capture and Storage Model Regulatory Framework (2010) at 14.

81 At 22.

82 At 23.

83 See, for example: Resource Management Act 1991, s 5(2)(a) regarding minerals: *Winter and Clark v Taranaki Regional Council and Fletcher Challenge Energy Taranaki Ltd* (1998) 4 ELRNZ 506, [1999] NZRMA 1; RMA, s 30(3) regarding fisheries; and RMA, s 70A and 104E regarding the discharge of greenhouse gases: *Genesis Power Ltd v Greenpeace New Zealand Inc* [2007] NZCA 469 and [2008] NZSC 112, and *Royal Forest and Bird Protection Society of New Zealand Inc v Buller Coal Ltd* [2012] NZHC 2156.

84 K Tremaine, *RMA – Is it still a one-stop shop?* RMLA 4th Annual Conference (3–5 October 1996).

In contrast, under the Integrated Development Act 1997 and the Sustainable Planning Act 2009 in Queensland, local authorities have been required to follow the integrated development assessment system (IDAS), designed (inter alia) to address cases where approvals are required under multiple statutory jurisdictions administered by different state or local authority functionaries, where the responsibility for processing and deciding applications is "referred" or allocated to a specific functionary. From June 2013, this system will be further streamlined by introducing a single state assessment and referral agency (SARA) that will be responsible for receiving all applications and coordinating the processing and determination of them via a single process. Put simply, SARA will establish a "one stop shop" for processing and deciding applications. This will avoid the need for the "mediation" process under IDAS that allocates the processing and determination of applications after they have been filed with a local authority or state department.[85]

In other jurisdictions there has been greater use of national statutory planning instruments (e.g. NPS) to coordinate, streamline and simplify decision-making by local authorities under particular statutes, for example, in the United Kingdom under the Town and Country Planning Acts where a full suite of 25 planning policy guidance notes (PPG's) was used to ensure uniformity in decision-making by local authorities regarding plan preparation and deciding planning applications. Most recently, the suite of PPG's has been streamlined and replaced by a single, 59 page, national planning policy framework (NPPF). Where local authority plans are not up to date, the policies in the NPPF prevail.[86] Additionally, statutory regulations (similar to NES) are used in the United Kingdom to classify activities as permitted and controlled activities, and the requirements and conditions that apply to these activities.[87]

6 Reform options

This section of report provides concluding comments on the present law, comparative analysis, and possible reform options.

The present law under the RMA is fractured. Decision-making is devolved to 78 local authorities, and horizontal integration between local authority policy statements and plans is not coordinated as a result of the slow progress made with preparing a full suite of directly applicable NPS and NES. Environmental decision-making, generally, also remains split across 36 separate statutory jurisdictions.

Comparative analysis illustrates that greater use of NPS and NES is urgently required to coordinate decision-making by local authorities regarding particular activities, such as CCS. Analysis also demonstrates that a more direct approach is required when NPS are drafted and gazetted, and that NPS should have direct effect without the need to prepare plan changes via the RMA Schedule 1 process.

85 Queensland planning reform: <www.dsdip.qld.gov.au>.

86 National Planning Policy Framework (2012), para 4, at 4.

87 Town and Country Planning (General Permitted Development) Order 1995 (amended 2008).

While NPS and NES could be used to coordinate uniform decision-making in relation to proposed CCS activities, this would not resolve issues regarding consent duration or post-closure and aftercare liability. Specific RMA amendments would be required to address these issues. Likewise, boundary issues between different statutory jurisdictions that may apply to proposed CCS activities (e.g. Crown Minerals Act 1991 or Gas Act 1992) could not be fully addressed by preparing NPS or NES or by further RMA amendments, and a more sophisticated approach to environmental decision-making (e.g. IDAS or SARA) may be required.

The complexity of providing for proposed CCS activities across multiple local authority and statutory jurisdictions, however, indicates that specific legislation may be required to govern these activities. Notwithstanding the more sophisticated approach to horizontal and vertical integration of environmental decision-making in Queensland, the Greenhouse Gas Storage Act 2009 was enacted to provide expressly for CCS activities. The Australian experience provides a basis for legislative reform in New Zealand,[88] while the complexity of regulating proposed CCS activities across multiple jurisdictional silos is amply illustrated by the United Kingdom experience.[89]

Finally, stepping back from specific RMA issues to consider the purpose of CCS as a mechanism to reduce greenhouse gas emissions, it is for note that the Environment Court held in the *Environmental Defence Society* cases that a national approach was required to address climate change,[90] and the RMA was subsequently amended to reflect the preferred policy choice of the New Zealand government for addressing climate change via the Emissions Trading Scheme by precluding consideration of the climate change effects of greenhouse gas emissions under the RMA.[91] Notwithstanding the result of any "gaps and barriers analysis" of the RMA, these authorities may indicate that dedicated CCS legislation is likely to be the preferred New Zealand policy choice for regulating CCS activities.[92]

88 Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth); Barrow Island Act 2003 (WA); Greenhouse Gas Geological Sequestration Act 2008 (Vic); and Greenhouse Gas Storage Act 2009 (Qld).

89 Department of Energy and Climate Change, UK Carbon Capture and Storage (CCS) Commercial Scale Demonstration Programme, Delivering Projects 2-4 (Further Information) (December 2010), at 23-26.

90 *Environmental Defence Society v Taranaki Regional Council* (A184/2002) unreported, and *Environmental Defence Society v Auckland Regional Council* [2002] NZRMA 492.

91 Resource Management (Energy and Climate Change) Amendment Act 2004.

92 However, legal analysis of CCS in New Zealand environmental legal writing is rudimentary. There is no discussion of the topic in the leading text, A Cameron (ed) *Climate Change Law and Policy in New Zealand* (2011), outside the context of carbon sequestration in relation to biofuels and forestry activities; and the only in-depth legal study to date appears to be: B Barton, "Carbon Capture and Storage Law for New Zealand: A Comparative Study" (2009) 13 NZJEL 1. In contrast, Australian environmental legal writing on CSS is prolific, including: Bonyhady & Christoff, *Climate Law in Australia* (2007) at 142-160, W Gumley and T Daya-Winterbottom, *Climate Change Law: Comparative, Contractual & Regulatory Considerations* (2009) at 111-122, and N Durrant, *Legal Responses to Climate Change* (2010) at 175-200.

APPENDIX E

Treaty of Waitangi Issues in Respect of Carbon Capture and Storage

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1 Introduction

The capture and underground storage of carbon dioxide (CO_2) is an approach employed to reduce emissions and alleviate concerns associated with global climate change. In light of the effect this operation may have on Māori, the purpose of this Appendix is to consider the possibility of a claim to the Waitangi Tribunal for a breach of the rights contained in the Treaty of Waitangi/te Tiriti o Waitangi (the Treaty). In ascertaining this possibility this Appendix will first provide a general background of the rights articulated in the Treaty and any legal effect, second the claim process and the jurisdiction of the Waitangi Tribunal, and third identify some issues with some concluding comments. In light of the concluding comments the final part will hypothesise on the likely areas where a Treaty claim may result. It should be noted that the limitations, or potential effect, of additional legislation e.g. Resource Management Act 1991 (RMA) and the Crown Minerals Act 1991, upon such a claim will not be considered.

2 The Treaty of Waitangi

In 1840, the Crown and Māori signed the Treaty. This action subsumed the existing social, political, legal and economic rights for Māori into a non-Māori paradigm.

2.1 Text

There were several different texts of the Treaty both in English and in Māori, te Tiriti o Waitangi. Signed in 1840, Article 1 of the English text, commonly referred to, stated:[1]

> The Chiefs of the Confederation of the United Tribes of New Zealand … cede to Her Majesty the Queen of England absolutely and without reservation all the rights and powers of Sovereignty which the said Confederation … respectively exercise or possess[.]

In Article 2 the Crown, in exchange, confirmed and guaranteed:

> Her Majesty the Queen of England confirms and guarantees to the Chiefs and Tribes of New Zealand … the full exclusive and undisturbed possession of their Lands and Estates Forests Fisheries and other properties which they may collectively or individually possess[.]

In Article 3, the Crown also extended:

> Her Majesty the Queen of England extends to the Natives of New Zealand Her royal protection and imparts to them all the Rights and Privileges of British Subjects.

1 I H Kawharu, "The Treaty of Waitangi (the text in English) by I H Kawharu" in M Belgrave, M Kawharu and D Williams (eds) *Waitangi Revisited: Perspectives on the Treaty of Waitangi* (Oxford University Press, Australia, 2005) at 389–390.

The Māori text of Te Tiriti stated:[2]

> Ko Wikitoria te Kuini o Ingarani i tana mahara atawai ki nga Rangatira me nga Hapu o Nu Tirani i tana hiahia hoki kia tohungia ki a ratou o ratou rangatiratanga me to ratou wenua, a kia mau tonu hoki te Rongo ki a ratou me te Atanoho hoki kua wakaro ia he mea tika kia tukua mai tetahi Rangatira - hei kai wakarite ki nga Tangata maori o NuTirani - kia wakaaetia e nga Rangatira maori te Kawanatanga o te Kuini ki nga wahikatoa o te Wenua nei me nga Motu - na te mea hoki he tokomaha ke nga tangata o tona Iwi Kua noho ki tenei wenua, a e haere mai nei.
>
> Na ko te Kuini e hiahia ana kia wakaritea te Kawanatanga kia kaua ai nga kino e puta mai ki te tangata maori ki te Pakeha e noho ture kore ana. Na kua pai te Kuini kia tukua a hau a Wiremu Hopihona he Kapitana i te Roiara Nawi hei Kawana mo nga wahi katoa o Nu Tirani e tukua aianei, amua atu ki te Kuini, e mea atu ana ia ki nga Rangatira o te wakaminenga o nga hapu o Nu Tirani me era Rangatira atua enei ture ka korerotia nei.
>
> Ko te tuatahi
>
> Ko nga Rangatira o te wakaminenga me nga Rangatira katoa hoke ki hai i uru ki taua wakaminenga ka tuku rawa atu ki te Kuini o Ingarani ake tonu atu - te Kawanatanga katoa o o ratou wenua.
>
> Ko te tuarua
>
> Ko te Kuini o Ingarani ka wakarite ka wakaae ki nga Rangatira ki nga hapu - ki nga tangata katoa o Nu Tirani te tino rangatiratanga o o ratou wenua o ratou kainga me o ratou taonga katoa. Otiia ko nga Rangatira o te wakaminenga me nga Rangatira katoa atu ka tuku ki te Kuini te hokonga o era wahi wenua e pai ai te tangata nona te wenua - ki te ritenga o te utu e wakaritea ai e ratou ko te kai hoko e meatia nei e te Kuini hei kai hoko mona.
>
> Ko te tuatoru
>
> Hei wakaritenga mai hoki tenei mo te wakaeetanga ki te Kawanatanga o te Kuini - Ka tiakina e te Kuini o Ingarani nga tangata maori katoa o Nu Tirani ka tukua ki a ratou nga tikanga katoa rite tahi ki ana mea ki nga tangata o Ingarani.
>
> [signed] W. Hobson Consul & Lieutenant Governor
>
> Na ko matou ko nga Rangatira o te Wakaminenga o nga hapu o Nu Tirani ka huihui nei ki Waitangi ko matou hoki ko nga Rangatira o Nu Tirani ka kite nei i te ritenga o enei kupu, ka tangohia ka wakaaetia katoatia e matou, koia ka tohungia ai o matou ingoa o matou tohu.
>
> Ka meatia tenei ki Waitangi i te ono o nga ra o Pepueri i te tau kotahi mano, e waru raue wa te kau o to tatou Ariki.

There are several different translations of the Māori text into English. The reconstruction of the Māori text by I.H. Kawharu is widely recognised and accepted. The reconstruction states:[3]

In Article 1:

> The Chiefs of the Confederation … give absolutely to the Queen of England for ever the complete government over their land.

In Article 2:

> The Queen of England agrees to protect the chiefs … in the unqualified exercise of their chieftainship over their lands, villages and all their treasures [taonga] [.]

2 Distinguished Professor Dame Anne Salmond's Brief of Evidence for the Waitangi Tribunal Wai 1040 dated 17 April 2010, at 4.

3 I H Kawharu "A reconstruction of Maori text" in M Belgrave, M Kawharu and D Williams (eds) *Waitangi Revisited: Perspectives on the Treaty of Waitangi* (Oxford University Press, Australia, 2005) at 389-390.

In Article 3:

> [T]he Queen of England will protect all the ordinary people of New Zealand and will give them the same rights and duties of citizenship as the people of England.

It is clear that the Māori text enables continuing rangatiratanga of Māori tribes over their possessions and taonga and that the Crown would protect that rangatiratanga. This includes the right of self-determination and the right of development. The Crown receiving the right to govern, a delegated power, subject to continuing Māori authority.[4] However, in the English text Māori cede sovereignty to the Crown.

The meaning of the Treaty is often debated.[5] The discrepancies between the English and Māori texts and translations of the Treaty/te Tiriti have caused much debate and misunderstanding and are to be noted.[6] According to Professor Anne Salmond, this due to the fact that the Treaty of Waitangi and Te Tiriti are:[7]

> [T]wo very different documents, with divergent textual histories and political implications; and for that reason, it is a mistake to bracket them together. I have observed that this error has led to a confused and confusing historiography of the Treaty, which should not be perpetuated.

From a legal perspective, the most important discrepancy lies within the translation of "kawanatanga" to mean, governorship, and not, sovereignty. Kawharu noted that Māori signatories had no understanding of 'government' in the sense of 'sovereignty' when signing the Treaty. There was no equivalent translation of "kawanatanga".

According to Professor Anne Salmond "I do not believe, however, that in signing Te Tiriti, the rangatira ceded sovereignty to the British Crown".[8]

The issue of whether or not Māori ceded their sovereignty to the Crown is the subject of a current Treaty claim that, although it has no direct impact on Carbon Capture and Storage (CCS), should be noted.[9] If Māori did not in fact cede sovereignty then the Crown's subsequent sovereign actions can be perceived as illegitimate.

Notwithstanding these discrepancies, the Treaty is the main vehicle through which Māori continue to express their desire to survive as a distinct people. The Treaty stands on its own[10] as a source of rights and obligations between Māori and the Crown.[11]

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4 See Brief of Evidence given by Distinguished Professor Dame Anne Salmond to the Waitangi Tribunal Wai 1040 17 April 2010, at 25.

5 See, for example, discussion in Maui Solomon "The Wai 262 Claim" in in M Belgrave, M Kawharu and D Williams (eds) *Waitangi Revisited: Perspectives on the Treaty of Waitangi* (Oxford University Press, Australia, 2005) at 216-217.

6 For discussion, see C Orange *The Treaty of Waitangi* (Allen & Unwin, Wellington, 1997) at 32–59 and also *He Tirohanga o Kawa ki te Tiriti o Waitangi* (Te Puni Kokiri, Wellington, 2001) at 37 <www.tpk.govt.nz>.

7 To fully understand the extent of misunderstanding see Distinguished Professor Dame Anne Salmond's Brief of Evidence for the Waitangi Tribunal Wai 1040 dated 17 April 2010, at 84.

8 Salmond, ibid, at 26.

9 Wai 1040 Te Paparahi o te Raki claim.

10 But see further discussion in point "Legal Status of the Treaty" and *Te Heu Heu Tu Kino v Aotea District Māori Land Board* [1941] NZLR 590.

11 Alison Quentin-Baxter "The International and Constitutional Law Contexts" in Alison Quentin-Baxter (ed) *Recognising the Rights of Indigenous Peoples* (Institute of Policy Studies, Victoria University of Wellington, New Zealand 1998) at 32.

Further, it is commonly accepted that Article 2 confirms and guarantees to Māori the full, exclusive, and undisturbed possession of their lands, estates, forests, fisheries, and other treasures. The use of *taonga,* or treasures, implies a connection between the Treaty and Māori social and economic development. Although Article 2 may seem to be restricted to forests and fisheries, the 1988 Royal Commission on Social Policy broadened the application of Article 2 to include social and economic policies.[12] In stating that the "Queen of England will protect all Māori of New Zealand and will give them the same rights as those of the people of England" article 3 includes protection and equality.

There is change in the understanding of what taonga captures, and there is complexity in the status of carbon dioxide. In climate change terms, CO_2 is usually thought of as greenhouse gas, a waste with harmful effects; but that is not the whole story. The substance has long been useful and valued in firefighting, in the food industry, and in greenhouse horticulture. It is important in enhanced oil recovery (EOR, or enhanced hydrocarbon recovery). More generally CO_2 is part of the web of life in photosynthesis and respiration. It is necessary for plant life. There is some reason therefore to consider that the CO_2 aspect of a CCS operation could be classified as a taonga under Article 2, and be subject to a potential Treaty claim by Māori.

It would be reasonable to assume that a CCS operation may impact on Māori economic and social development and thus be subject to a potential Treaty claim by Māori.

It would also be reasonable to assume that if the storage, separation and capture operation was on, or near, traditional land, or waahi tapu, this activity could be subject to a potential Treaty claim by Māori. Although the title of the land may have passed from Māori the obligation, as kaitiaki with manawhenua, on Māori, continues.[13] This becomes manifest in the ongoing role, for Māori, to caretake the land to ensure it is available for future generations. The feasibility of such claims will be further considered in the final part of this Appendix.

2.2 Legal Effect

Initially viewed as a simple nullity,[14] the orthodox view, on the legal effect of the Treaty, is that unless it has been adopted or implemented by statute, it is not part of our domestic law and creates no rights enforceable in Court. In *Te Heu Heu Tukino v Aotea District Maori Land Board* (1941) Viscount Simon LC, Privy Council ruled that:[15]

> [I]t is well settled that any rights purported to be conferred by such a Treaty of cession cannot be enforced by the Courts, except so far as they have been incorporated in municipal law.

Viscount Simon LC also noted that:[16]

> [T]he Treaty is a valid treaty of cession and the Treaty was unenforceable of itself in New Zealand Courts except to the extent that it had been given by statute.

12 Royal Commission on Social Policy, *The April Report* (1988) Vol 11: Future Directions 27, 80.

13 See for example *The Chief Executive of the Ministry of Agriculture and Forestry v Waikato Regional Council* Environment Court, Hamilton, Decision No A 133/2006, 17 October 2006, Judge Sheppard.

14 *Wi Parata v Bishop of Wellington* (1877) 3 NZJur (NS) 72 at 78 per Prendergast CJ.

15 *Te Heu Heu Tukino v Aotea District Maori Land Board* [1941] 2 All E.R. 93 at p 98; also [1941] NZLR 590.

16 *Te Heu Heu Tu Kino* ibid.

The noble Viscount then quoted the passage from Lord Dunedin's judgment[17] and continued with:

> So far as the appellant invokes the assistance of the court, it is clear that he cannot rest his claim on the Treaty of Waitangi, and that he must refer the court to some statutory recognition of the right claimed by him.

This is consistent with the constitutional principle in New Zealand that in general treaties are not part of the law in New Zealand, and if rights and duties, under that law, are to be altered legislation is required.[18] This is also the view in *Ashby v Minister of Immigration* and Cooke comments "a treaty that Parliament had not incorporated into New Zealand law could not possibly override the broad discretion conferred by Parliament on the Minister".[19]

Irrespectively, it is generally accepted that the Treaty has constitutional importance and is part of New Zealand's constitutional arrangements,[20] there is, however, major disagreement on its precise role and the nature and extent of its importance.[21] To address this, the Government is currently conducting a wide-ranging review of our Constitutional arrangements. Included in these terms of reference is the role of the Treaty. This review has no immediate bearing on this Report, however it is important to note.

Although the Treaty is seen as "the founding document of New Zealand",[22] "a constitutional document",[23] "simply the most important document in New Zealand's history",[24] "essential to the foundation of New Zealand" and "part of the fabric of New Zealand society",[25] and "of the greatest constitutional importance to New Zealand"[26] the text of the Treaty is not referred to in domestic legislation rather it is the "principles of the Treaty".

2.3 Principles of the Treaty

The term the "principles of the Treaty" first appeared in the Treaty of Waitangi Act 1975. This Act also provided the Waitangi Tribunal with the jurisdiction to determine whether an ordinance or Act, or regulation, order, proclamation, notice, or other statutory instrument, or the policy or practice, or the act or omission, was inconsistent with the principles of the Treaty and to also determine the meaning and effect of these principles.

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17 See *Vajesingji Joravarsingji v. Secretary of State for India* (1924), L.R. 51, Ind. App. 357, Lord Dunedin's comments at pp. 360 - 361 on treaties of cession.

18 M McDowell and D Webb, *The New Zealand Legal System,* (4th ed, Lexis Nexis, Wellington, 2006) at 181.

19 *Ashby v Minister of Immigration* [1981] 1 NZLR 222, 224. The other Judges agreed with Cooke's comments. However see comments by Taggart M, "Rugby, the Anti-apartheid Movement and Administrative Law in R Bigwood (ed) *Public Interest Litigation* (Lexis Nexis New Zealand, 2006) at 81 where the conferral of a broad discretionary power does not of itself exclude or displace the interpretive principle.

20 See comments by G W R Palmer *Constitutional and Administrative Law in New Zealand Wellington*, (Victoria University Press, 2002) at 22 and comments by Lord Woolfe in *New Zealand Māori Council v Attorney General* [1994] 1 NZLR 513, 516 (Lord Woolf) (PC).

21 Sir Geoffrey Palmer Presentation to the Te Papa Treaty of Waitangi Debate Series 2 February 2006 "The Treaty of Waitangi – Where to from here? Looking back to move forward" point 25, available <http://www.lawcom.govt.nz/SpeechPaper.aspx> (21 November 2007).

22 McDowell and Webb, above n 18, at 194.

23 G W R Palmer, *Constitutional Conversations* (Victoria University Press, Wellington, 2002) at 22.

24 Sir Robin Cooke "Introduction" (1990) 14 NZULR 1, at 1-8.

25 See *Huakina Development Trust v Waikato Valley Authority* [1987] 2 NZLR 188 especially at 206, 210. But see also the obiter reservations of Casey and Hardie Boys JJ in *Attorney General v New Zealand Māori Council (No 2)* [1991] 2 NZLR 147 at 149.

26 *New Zealand Māori Council v Attorney General* [1994] 1 NZLR 513, 516 (Lord Woolf) (PC).

It is generally accepted that the principles of the Treaty include the acquisition of sovereignty in exchange for the protection of rangatiratanga; partnership and the imposition on the partners of the duty to act reasonably and in good faith; the freedom of the Crown to govern; the Crown's duty of active protection; the duty of the Crown to remedy past breaches; Māori to retain rangatiratanga over their resources and taonga and to have all the privileges of citizenship; and the duty to consult.[27] Since the 1987 Court of Appeal judgement[28], the Treaty principles have been developed and reconsidered in a raft of cases.[29] If any legislation or policy, of the Crown, is inconsistent with the principles of the Treaty a claim can be brought before the Waitangi Tribunal.[30]

It is reasonable to assume if a CCS operation breaches or impinges on the ability of Māori to use their lands and waters to the fullest extent practicable[31] this could be subject to a claim by Māori.

It is reasonable to assume if adequate consultation is not undertaken, in terms of a CCS operation, this could be subject to a claim by Māori.

It is also reasonable to assume that if any impending legislative framework, for this CCS operation, was not consistent with the principles of the Treaty this would be subject to a claim by Māori.

It is acknowledged that the term "principles of the Treaty" occur in many other pieces of legislation including section 8 of the RMA and section 9 of the State Owned Enterprises Act 1986.[32] The effect of this term however is subject to the context of the statute. For instance section 8 of the RMA requests the decision maker to take into account the principles of the Treaty. This is only one consideration for the decision maker when determining whether the activity satisfies the purpose of the Act. Whereas the Treaty of Waitangi Act 1975 bestows upon the Waitangi Tribunal the jurisdiction to consider whether a CCS operation would be inconsistent or a breach of the principles.

3 Process

Treaty Settlement Process

The Waitangi Tribunal ("the Tribunal") was established in 1975 to receive claims on, report on, and make recommendations on alleged Crown breaches of the principles of the Treaty of Waitangi. These powers were extended to include retrospective claims back to 1840 and more recently limited to hearing historical claims that were submitted prior to 1 September 2008.[33]

All clams must satisfy the provision that the claimants have been prejudicially affected by legislation, Crown policy or practice, or Crown action, or omission, on or after the 6 February 1840 and that

27 *NZMC & Ors v Attorney General & Ors* [1987] 1 NZLR 641.

28 Ibid.

29 For example *Ngai Tahu Maori Trust Board v Director-General of Conservation* [1995] 3 NZLR 534, 535, where the right to development although not unlimited was confirmed, together with the principle of active protection and consultation.

30 See Treaty of Waitangi Act 1975, s 6.

31 See *NZMC* above n 27 at 664, per Cooke.

32 There are, at least, an additional 40 statutes that refer to the principles of the Treaty.

33 Treaty of Waitangi Act 1975, s 6AA (1).

that policy or legislation was inconsistent with the principles of the Treaty.[34] The Tribunal must then consider this claim unless it is deemed frivolous or vexatious not made in good faith or there is another avenue of appeal.[35]

The Tribunal has the power to examine and report on any legislation to ensure its consistency with the principles of the Treaty.[36] The Tribunal also has exclusive authority to determine the meaning of the Treaty and to decide issues relating to the two texts.

The Crown in settling Treaty claims will generally acknowledge historical injustices and that any Treaty settlements should not create further injustices. The Crown also has a duty to act in the best interests of all New Zealanders. As settlements are to be durable they must be fair, achievable and remove the sense of grievance. The Crown must deal fairly and equitably with all claimant groups. Settlements do not affect ongoing rights arising out of the Treaty.

The Tribunal has been described as a "cultural safety valve" which allows Māori to be heard. The Tribunal is a not a court but a permanent Commission of Inquiry. It provides recommendations to the Crown that for instance 'action be taken to compensate for, or remove, the prejudice or to prevent other persons from being similarly affected in the future'[37]. This could include, for instance, the return of Crown and State Owned Enterprise land.

However, the recommendations by the Tribunal are, generally, not binding on the Crown[38] and there has been a tendency not to accept the recommendations.[39] Notwithstanding the lack of certainty that recommendations hold[40] this avenue of redress is available to Māori.[41] The Treaty of Waitangi Act provides a legislative avenue of redress for Māori.

Again, it is reasonable to assume that if any impending legislative framework for CCS was not consistent with the principles of the Treaty this would be subject to a claim by Māori.

4 Additional Concerns

In April, 2010, the Government offered support for the United Nations Declaration on the Rights of indigenous People ("the Declaration"). The orthodox view is that the Declaration is soft law and will not be legally binding upon the state unless it is incorporated into domestic legislation. The doctrine

34 Section 6 (1).

35 Section 7 (1).

36 Section 8 (1).

37 Treaty of Waitangi Act 1975, s 6 (3).

38 Although often requested by iwi (e.g. Ngati Kahu) the Tribunal has only exercised its binding powers once. See the preamble to the Treaty of Waitangi (State Enterprises) Act 1988; Turangi Township Remedial Report Wai 84; Turangi Township Remedies Report 1995.

39 See Report of the Minister of Māori Affairs on the Progress made in the implementation of recommendations made to the Crown by the Waitangi Tribunal for the period January 1995 – June 2007. Tabled in the House July 2007.

40 See *Everton v Attorney General* (High Court, Wellington, CP 121/00, CP 68/99 5 July 2000 Doogue J) where the Crown had rejected a Tribunal recommendation regarding the radio frequency spectrum. The claimants unsuccessfully argued that a failure to recognise the recommendations was a breach of fiduciary duty.

41 It is acknowledged that a Remedies Hearing is required prior to any redress and even then there is no guarantee a suitable redress is attained by the Claimants.

of state sovereignty provides a restriction on international instruments, such as the Declaration, to regulate matters within the realm of the state. Notwithstanding this perspective there is developing case law in common law jurisdictions[42], offering a persuasive application, that rely on the articles of the Declaration. Further the doctrine of customary international law and administrative law principles[43] can assist the realisation of the rights articulated in the Declaration.

Although the use of the Declaration may not be the substantive submission it can provide additional support for a potential claim. For instance the use of Article 26 e.g. article right to resources.

Article 26

(1) Indigenous peoples have the right to the lands, territories and resources which they have traditionally owned, occupied or otherwise used or acquired.

(2) Indigenous peoples have the right to own, use, develop and control the lands, territories and resources that they possess by reason of traditional ownership or other traditional occupation or use, as well as those which they have otherwise acquired.

(3) States shall give legal recognition and protection to these lands, territories and resources. Such recognition shall be conducted with due respect to the customs, traditions and land tenure systems of the indigenous peoples concerned.

5 Issues

The following issues below identify potential areas for a claim by Māori to the Waitangi Tribunal:

(1) **The subject:** If CO_2 can be classified as a taonga under Article 2 this could result in a pan tribal claim.

(2) **The place:** If the areas identified for a CCS operation, e.g. the capture, the separation and the storage, are near, or on, traditionally owned land or coincide with waahi tapu sites this could also result in a claim by Māori.

(3) **The effect:** If CCS activities impact on Māori economic and social development this could result in a pan tribal claim.

(4) **The legislation:** If the resulting legislation is inconsistent with the principles of the Treaty then a potential claim is possible.

It is noted that the activity is inconsistent with tikanga Māori in that it, for instance, seeks to alter the tapu nature of the whenua. This inconsistency becomes heightened when that area of whenua is a scared site or a waahi tapu.

42 *Cal v Attorney-General* SC Belize Claim 171/2007, 18 October 2007.

43 For instance mandatory relevant consideration and the presumption of consistency.

For Māori, the natural environment is a taonga to be administered in accordance with tikanga Māori, a Māori worldview. The aim of tikanga Māori is balance. The infusing of Papatuanuku with CO_2 is an unnatural alteration of the land and will result in an imbalance requiring rectification.

6 Conclusion

It is acknowledged that the success, or not, of the possible claims identified above will turn on the situation and also any prior engagement with iwi.

To this end, in view of a potential Treaty claim, it is recommended that full and meaningful consultation occur between Māori and the Crown prior to any CCS operation, particularly in areas where the capture, separation and storage component is likely to take place.

7 Hypothetical Claim

This final section will consider each of the three parts to a CCS operation and highlight, within these three parts, any issues that may trigger a potential Treaty claim.

Capture

Carbon dioxide can be collected at various stages during the capture process. Absent any issue with the physical nature of the building or structure that captures the CO_2 nor any associated consent process to establish the building or structure, the major concern, from the perspective of a potential Treaty claim, would, in my opinion, be a claim to the subject i.e. whether the CO_2 could be classified as a taonga under Article 2.

Broadly a taonga is an object, tangible or intangible, that is treasured. The interpretation of taonga has varied over time. Initially viewed as relating only to forests, fisheries and resources this definition now encompasses te reo (language) flora and fauna, radio frequencies and water.

The orthodox view of CO_2 is that of waste and contributing to climate change thus attracting no value. It would be difficult under this view to perceive CO_2 as a taonga.

However, in light of the changing interpretation of taonga it is not unreasonable that such a claim may be brought. The success of such of claim would ultimately be determined by its context. Such a claim may indeed be viewed now as fanciful however similar "fanciful" claims, having no monetary value, to items classified as a taonga have been successful.[44]

Although the recent claim by Māori to water was unsuccessful the Supreme Court found that the courts do have jurisdiction to consider similar cases.[45] It is not unreasonable then that if the context was favourable a claim could be considered.

44 See for example Wai 11 Te Reo claim, also the Broadcasting Claim Wai 150.

45 *NZMC v The Attorney General* [2013] NZSC 6.

Carbon Transport

The transport component is more contentious. If the transport vehicle e.g. pipeline traverses waahi tapu or Māori owned land this would impinge on the ability for Māori to use their lands to the fullest extent practicable[46] resulting in grounds for a Treaty claim.

For Māori, even if title of land has passed, the obligation on Māori still remains.[47] However, if a pipeline traversed Māori owned land would, in my opinion, provide stronger grounds for a Treaty claim.

It is noted that similar issues arise when expressways are proposed that traverse waahi tapu or Māori land. Currently Ngati Te Roro o Te Rangi and Ngati Hurunga Te Rangi are objecting to the eastern arterial to proceed partly because it will cut access to traditional land in Ngapuna, an area used to harvest sulphur for medicine. One solution proposed by the Transport Agency Bay of Plenty State Highway Department is to redirect the eastern arterial route. This is a positive example of meaningful consultation resulting in potential solutions and possible co-management solutions.

Carbon Storage

During this component, when the CO_2 is injected or stored, the activity provides grounds for not only a possible Treaty claim but is incompatible with tikanga Māori. For Māori, just as there is no distinction between land above the water and land below so too is there no "cut off" in terms of obligation, responsibility or ownership of the area below the surface. The area is known as Papatuanuku, Earth Mother.

The accessing or penetration of the land is inconsistent with tikanga Māori as the action metaphorically destroys the whenua (land) or Earth Mother. The current mining issue on ancestral Māori land highlights similar concerns.

The activity of storing any CO_2 on or below ancestral lands would be inconsistent with the principles of the Treaty in particular that of active protection.

In light of a potential claim by Māori, as a result of the effect a CCS operation, it is recommended that full and meaningful consultation occur between Māori and the Crown prior to the activity. This may not only circumvent future claims but ensures transparency in the process.

46 See *NZMC* above n 27 at 664, per Cooke.

47 See for example *The Chief Executive of the Ministry of Agriculture and Forestry v Waikato Regional Council* Environment Court, Hamilton, Decision No A 133/2006, 17 October 2006, Judge Sheppard.

APPENDIX F

Supplementary Material on CCS Offshore for Chapter 9

Greg Severinsen

This Appendix provides additional detail and argument to support the discussion in Chapter 9, in relation to the regulation of CCS offshore. Each Part of this Appendix is self-contained, and should be read in the context of the point in Chapter 9 where reference is made to that Part. The Appendix as a whole is not designed to be read as a standalone document.

As in other parts of the Report, the law is stated as at 13 September 2013. Since then, as already noted, the Marine Legislation Bill was split into two bills via supplementary order paper and enacted, on 22 October 2013, as the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Amendment Act 2013 and the Maritime Transport Amendment Act 2013. Different provisions will come into force on different dates. The text of the legislation remains, in substance, largely the same as in the version of the Bill reported from Select Committee (on which this Report relies).

1 New Zealand's Jurisdiction to Regulate CCS in its Exclusive Economic Zone

Article 56 of UNCLOS sets out the rights, jurisdiction and duties of a coastal state in its exclusive economic zone (EEZ). Such jurisdiction is more limited than in the territorial sea, and does not amount to full sovereignty. The Article provides (with emphases added):

> Article 56
>
> Rights, jurisdiction and duties of the coastal State in the exclusive economic zone
>
> 1. In the exclusive economic zone, the coastal State has
>
> (a) sovereign rights **for the purpose of exploring and exploiting, conserving and managing the natural resources**, whether living or non-living, of the waters superjacent to the sea-bed **and of the sea-bed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone**, such as the production of energy from the water, currents and winds
>
> (b) jurisdiction as provided for in the relevant provisions of this Convention with regard to:
>
> (i) **the establishment and use of artificial islands, installations and structures**;
>
> (ii) marine scientific research;
>
> (iii) **the protection and preservation of the marine environment**;
>
> (c) other rights and duties provided for in this Convention.

Materially co-extensive sovereign rights to explore and exploit natural resources exist in relation to the continental shelf under Article 77.[1] The stipulation that sovereign rights relate only to natural resources means that domestic CCS regulation in the EEZ cannot be based on rights to manage injected CO_2, which is unlikely to be a natural resource (in much the same way that no exclusive jurisdiction exists to regulate shipwrecks).[2] However, for now it is sufficient to conclude that pore space in the continental shelf underlying the EEZ appears to amount to a "natural resource", and injection could probably be managed on this jurisdictional basis.[3] Furthermore, exclusive jurisdiction

1 In Article 81, the right to regulate drilling on the continental shelf is wider, as it is for any purpose.

2 This is reflected in the jurisdiction provided for in the EEZ Act, where the purpose of sustainable management relates only to the natural and not "physical" resources of the zone.

3 R Purdy and R Macrory *Geological Carbon Sequestration: Critical Legal Issues* (Tyndall Centre, London, 2004), at 12.

exists in the EEZ[4] in relation to installations used for the exploitation of natural resources or other economic purposes, which clearly encompass installations that will be used for the injection of gas. Jurisdiction also exists in relation to the protection of the marine environment from any effects of CCS.[5] The same jurisdiction exists over the extended continental shelf by virtue of the fact that CCS installations and any marine pollution from CCS would be connected to the exploitation of subsurface formations.[6] This extends to full civil and criminal jurisdiction over such installations in the EEZ.[7]

A coastal state also has the right under UNCLOS to establish reasonable safety zones around installations, which cannot exceed a distance of 500 metres from the installation (measured from each point of its outer edges).[8] Within such zones a coastal state can take measures to ensure the safety of navigation and the safety of the installation. Such zones are only able to be imposed around "artificial islands, installations and structures", and do not seem to be able to be imposed over a storage complex to the extent it is further than 500 metres from an injection installation. Finally, Article 60(7) prohibits installations or safety zones to be established where they could interfere with the use of recognised sea lanes essential to international navigation. Domestic regulation would need to be careful to import this consideration as mandatory in the decision making process for permits to inject CO_2 streams.

Although no jurisdictional issues are presented by Article 56 for CCS regulation in the EEZ in a broad sense, such sovereign rights and jurisdiction are subject to the rights of other states in the EEZ, as specified in Article 58. Domestic regulation would need to be in accordance with such rights, which include the freedoms of navigation (wider than innocent passage), overflight, and the laying of submarine cables and pipelines. In particular, Article 79 elaborates on the freedom to lay pipelines and cables, and stipulates that a coastal state cannot impede the laying of pipelines or cables (subject to reasonable measures for exploiting natural resources and control of pollution from pipelines), but can control their specific delineation. However, this would not prevent full coastal jurisdiction over pipelines for the purposes of CCS injection in its EEZ. This is because Article 79(4) affirms such jurisdiction where pipelines are used in connection with the exploitation of the continental shelf. However, in allowing CCS pipelines to be constructed and used, a coastal state has to have regard to cables or pipelines already in position. As discussed in Chapter 9, there is a protection mechanism under existing domestic legislation for this purpose.[9]

One further obligation to which the rights of exploitation are subject warrants further attention. Article 82 provides that the exploitation of the natural resources of the extended continental shelf is subject to payment to the International Seabed Authority (ISBA) set up under UNCLOS. This payment is based on the value or volume of production, which appears to be a problematic concept in a CCS context. Article 82 applies to all exploitation of the extended continental shelf. However, the calculation of contribution based on "production" envisages only activities that are

4 Under the United Nations Convention on the Law of the Sea, Articles 58 and 60.

5 United Nations Convention on the Law of the Sea, art 56.

6 This relies on the jurisdiction over the continental shelf rather than over the EEZ, as the EEZ only includes the seabed below the water column within 200 nautical miles of the baseline.

7 United Nations Convention on the Law of the Sea, arts 80 and 60(2).

8 Under arts 60(4)-(5). This is reflected in New Zealand's Continental Shelf Act as discussed in Chapter 9.

9 Submarine Cables and Pipelines Protection Act 1966.

extractive. CCS is regarded as "dumping" under international law, as well as the "exploitation" of the natural resources of the subsurface. Other forms of dumping on the extended continental shelf do not appear to require any payment. Whether payments are payable for CCS activities (and if so, how these are to be calculated) would require clarification at an international level. Like other forms of dumping, CCS has no "production" as such (unless this amounts to profit made through the acquisition of emission units) but it also clearly amounts to a use of natural resources. This may be significant in the future if CCS were to occur on the extended continental shelf. No literature has been able to be located on this issue,[10] and at present it remains theoretical because globally CCS is not occurring on any extended continental shelf.[11] In particular, it is not likely to be a significant issue in New Zealand given the cost and technical difficulties of engaging in CCS on the extended continental shelf. Other than the issue of payment to the ISBA, the regime for the extended continental shelf under UNCLOS is the same as that for the continental shelf proper.[12]

Problems also exist regarding the ability of states to engage in CCS in the international seabed area. Under UNCLOS, states are not permitted to appropriate areas of the international seabed area, and thus CCS injection here is currently prohibited under international law.[13] Proposals for CCS would require the approval of the ISBA, yet it is doubtful whether this organisation has jurisdiction to consider or permit such applications. However, to conduct CCS in the international seabed area would require substantial economic incentives, resources and improvements in technology and there appears to be no global appetite to make the necessary amendments to the UNCLOS regime at present.

2 The Impact of Part 12 of the United Nations Convention on the Law of the Sea

The United Nations Convention on the Law of the Sea addresses not only the jurisdiction of coastal states in their maritime zones, but also (in Part 12 of the Convention) the protection of the marine environment. Although CCS was not envisaged when the Convention was done in 1982, and as such it is not referred to specifically in Part 12, the provisions of UNCLOS are broad and impose obligations that are of general relevance to CCS.

Under Article 192, states have a general obligation to protect and preserve the marine environment. This is an absolute, or bottom line, requirement. Under Article 193, states have the sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment. This statement holds true for both the territorial sea and the EEZ, where sovereign rights for these purposes are provided by the jurisdictional provisions of UNCLOS.

10 Although passing reference has been made to the fact that it might be an issue, as in Mark de Figueiredo "The Liability of Carbon Dioxide Storage" (PhD Thesis, Massachusetts Institute of Technology, 2007).

11 Global CCS Institute, *The Global Status of CCS 2012* (Global CCS Institute, 2012).

12 Although the regime governing the overlying water column (being high seas) is different.

13 Baker and McKenzie Strategic Analysis of the Global Status of Carbon Capture and Storage Report 3: Policies and Legislation Framing Carbon Capture and Storage Globally (Global CCS Institute, 2009) at 85.

Potentially relevant to CCS is Article 195, which provides that in taking measures to prevent, reduce and control pollution of the marine environment, states shall act so as not to transfer, directly or indirectly, damage or hazards from one area to another or transform one type of pollution into another. If CO_2 amounts to "pollution" under the Convention, then injecting it into the seabed arguably infringes the obligation not to transfer one type of pollution (emissions to the air) into another (injection to the ground). However, this obligation has not been treated in this way by states in practice. The Convention has not been seen internationally as a barrier to CCS deployment, because injection arguably does not meet the definition of pollution in Article 1.4:

> [T]he introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.

Although this appears to be a wide definition, it is constrained in a number of ways. First, the definition is anthropocentric, and does not recognise any effects that CO_2 might have on the deep subsurface or the formation itself.[14] Thus it is unlikely in most cases that injection could be treated as pollution. The injection of CO_2 may also not be "likely" to result in the kinds of effects contemplated, as this presents a high threshold. Although CCS has been treated as "dumping", it has not in practice been treated as being "pollution from dumping" under Article 210. This general assumption by the international community may not be beyond legal challenge, particularly if gas were both likely to escape from the formation and be likely to cause the kinds of effects contemplated in the definition of pollution. Carbon dioxide discharged into the water column could dissolve completely or escape to the surface, and potentially could cause environmental effects.[15] In most cases any effects would likely be minor. There may be questions over whether effects on sub-surface benthic life would come within the scope of pollution to the "marine environment" if this relates only to the water column.[16] However, whether injection were likely to result in an escape of gas, and whether an escape would be likely to cause harm, would need to be assessed on a proposal specific basis. Thus there can be no definitive conclusion in the abstract on whether escapes of gas from a formation would amount to pollution under international law.

Article 197 provides that states shall cooperate on a global and regional basis. In the context of marine CCS, which internationally has been treated as a form of dumping,[17] global cooperation has been achieved through the London Dumping Convention and Protocol (to which New Zealand is a contracting party). On a regional basis, the provisions of the LDP are largely (although not completely) reproduced in a Dumping Protocol to the Noumea Convention.[18] For the reasons above, Article 207 of the Convention (which provides that states shall adopt laws to prevent, reduce and control pollution of the marine environment from land based sources), has not been considered to be the applicable regime for most CCS activities, even where gas streams produced on land are transported by pipeline to an offshore installation.

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14 For example, effects that the injected CO_2 could have on petroleum, minerals, or future uses of the formation.

15 Intergovernmental Panel on Climate Change *Special Report on Carbon Capture and Storage* (Cambridge, 2005), at 243.

16 Intergovernmental Panel on Climate Change, above n 15, at 249.

17 Rather than pollution from seabed activities or (where pipelines are used) as pollution from land based sources.

18 Protocol for the Prevention of Pollution of the South Pacific Region by Dumping [1986] PITSE 16 (signed 24 November 1986, entered into force 22 August 2005).

One issue remains in relation to CCS where injection occurs from remotely controlled devices on the seafloor. Most academic opinion is of the view that this does not amount to "dumping" under UNCLOS or the London Protocol, and is therefore not subject to the dumping provisions of the Protocol.[19] The reason given for this view is that the Protocol applies only to dumping "at sea", and the definition of "sea" expressly excludes subsea repositories accessed only by land. It would at least seem arguable that this interpretation has the potential to undermine the strict CCS requirements of the London Protocol, and encourage the use of seafloor devices to avoid internationally accepted standards on CCS. Given the absence of a global binding regime on land based sources of pollution, such CCS would not be subject to any international standards. Furthermore, injection is unlikely to amount to pollution and therefore unlikely to trigger even the general obligations of states in relation to the control of pollution. An alternative argument could be that the use of a remote injection device on the seabed performs a similar role to an offshore installation, and arguably means that access is not "only" via a land-based pipeline. On this reading, this form of CCS would remain subject to the dumping provisions of UNCLOS and the London Protocol. However, the significant point to note is that there is uncertainty over which international regime applies to CCS via pipeline and seabed injection devices.

Similarly, CCS injection from offshore installations or ships has been treated as dumping rather than pollution from "seabed activities" or "offshore installations" envisaged in Article 208.[20] In any event, Article 8 simply provides a very general obligation that states shall adopt laws to "prevent, reduce and control" pollution of the marine environment arising from or in connection with sea bed activities subject to their jurisdiction and from artificial islands, installations and structures under their jurisdiction. There is no obligation in this Article to prohibit specific forms of pollution.

A broad obligation also applies to states, under Article 209, to control pollution of the marine environment in the international seabed area (the area beyond the continental shelf or extended continental shelf). It provides that international rules shall be established in accordance with Part XI to prevent, reduce and control pollution of the marine environment from activities in the Area, and states must impose laws on their own ships that are no less effective than these rules for activities in the Area. New Zealand has implemented this requirement by referring directly to UNCLOS in the United Nations Convention on the Law of the Sea Act 1996. It is unlikely, however, that CCS in the Area is lawful under international law for jurisdictional reasons (as discussed in Appendix F, Part 1), and it is recommended that this not be authorised in domestic law.

A general monitoring provision in Article 204(2) requires that New Zealand keep under surveillance the effects of any activities that it allows, in order to determine whether these are likely to pollute the marine environment. Even if CCS injection were viewed as a form of "pollution" by dumping (which is unlikely), this Article does not itself prohibit pollution. It would apply more to the potential discharge of CCS from a storage formation into the water column, and require that permits for CCS be subject to monitoring to identify and respond to any leakage that is likely to cause harm. This is potentially

19 J Friedrich "Carbon Capture and Storage: A New Challenge for International Environmental Law" [2007] 67 Zeitschrift fur auslandisches offentliches Recht und Volkerrecht 211 at 219; Mark de Figueiredo "The Liability of Carbon Dioxide Storage" (PhD Thesis, Massachusetts Institute of Technology, 2007) at 137; R Purdy and R Macrory *Geological Carbon Sequestration: Critical Legal Issues* (Tyndall Centre, London, 2004) at 20; International Energy Agency *Legal Aspects of Storing CO_2: Update and Recommendations* (2007) at 64.

20 Which is targeted at operational pollution from activities and installations (such as garbage) as opposed to situations where the primary purpose of an operation is to dispose of matter.

significant in the domestic context, given that there are questions as to what extent limited duration consents under the EEZ Act and RMA are capable of imposing such monitoring in the long term.[21]

Most relevant to CCS, given international treatment of CCS as a form of dumping, is Article 210. This relates primarily to "pollution" by dumping, but contains provisions relevant to dumping in general. This provides that:

1. States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment by dumping.
2. States shall take other measures as may be necessary to prevent, reduce and control such pollution.
3. Such laws, regulations and measures shall ensure that dumping is not carried out without the permission of the competent authorities of States.
4. States, acting especially through competent international organisations or diplomatic conference, shall endeavour to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control such pollution. Such rules, standards and recommended practices and procedures shall be re-examined from time to time as necessary.
5. Dumping within the territorial sea and the exclusive economic zone or onto the continental shelf shall not be carried out without the express prior approval of the coastal State, which has the right to permit, regulate and control such dumping after due consideration of the matter with other States which by reason of their geographical situation may be adversely affected thereby.
6. National laws, regulations and measures shall be no less effective in preventing, reducing and controlling such pollution than the global rules and standards.

Article 210(5) imposes an obligation on states not to treat dumping, including CCS, as a permitted activity, given that express approval is required. Given the wider context of the Article, the right to "permit" dumping more likely amounts to the right to grant a "permit" for a specific application, rather than the right to treat dumping as a "permitted activity" in the RMA sense. This interpretation is in line with the presumption against dumping contained in the LDP.

Finally, Article 210(6) imposes an obligation on New Zealand to regulate dumping in a manner no less effective than the relevant "global rules and standards". It is arguable that this could refer to the London Dumping Convention rather than its Protocol.[22] However, this question is academic because New Zealand will be bound by the higher standards in the Protocol, by virtue of being party to the Protocol directly. This would include implementing, in New Zealand legislation, an approach presuming that dumping of any matter is prohibited unless expressly listed, and such listed substances could not fall outside of those in Annex 1 of the Protocol. UNCLOS, in addition to requiring legislative recognition of the LDP, requires in Article 216 that such international rules and standards be enforced by the coastal State in relation to dumping not only in its EEZ and continental shelf, but also in its territorial sea. Also, Article 235 requires that States provide legal recourse for relief in respect of damage caused by pollution of the marine environment within their jurisdiction. Liability for pollution damage is provided for in Part 25 (and the proposed Part 26A) of the Maritime Transport Act 1994, although in the context of CCS this has potential issues.[23]

21 For more on this, refer to the discussion in Chapter 2.

22 Ratification levels for the LDC remain significantly higher than for the LDP.

23 Discussed in Chapter 9.

3 The Impact of the Substantive Provisions of the London Dumping Protocol

The London Dumping Convention (LDC) addresses the problem of marine pollution specifically by dumping. The London Dumping Protocol (LDP) effectively replaces its parent convention for New Zealand.[24] The LDP implements a precautionary approach to dumping, by requiring parties to prohibit the dumping of wastes or other matter into the sea or seabed, unless it is contained within an exhaustive list of substances in Annex 1 (described as a "reverse list"). Parties are obliged to require a permit for the dumping of Annex 1 substances.[25]

Under Article 2, contracting Parties are required to "individually and collectively protect and preserve the marine environment from all sources of pollution and take effective measures, according to their scientific, technical and economic capabilities, to prevent, reduce and where practicable eliminate pollution caused by dumping or incineration at sea of wastes or other matter." As under UNCLOS, the primary focus of the objective of the Protocol is therefore on dumping that causes pollution, rather than dumping itself. "Pollution" is defined in a similar way as in UNCLOS:[26]

> [T]he introduction, directly or indirectly, by human activity, of wastes or other matter into the sea which results or is likely to result in such deleterious effects as harm to living resources and marine ecosystems, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.

As discussed earlier, CCS injection is unlikely to amount to pollution, although it is arguable whether any given escape of gas would meet the definition. The general obligation to "prevent, reduce and where practicable eliminate" pollution has therefore not been treated by the international community as requiring that efforts be made to prevent, reduce or eliminate CCS.

However, the Protocol's restriction on dumping in Article 4(4) does not require that dumping amount to "pollution", nor does the definition of dumping require an activity to cause pollution. Article 4 provides simply that "contracting Parties shall prohibit the dumping of any wastes or other matter with the exception of those listed in Annex 1" and that "the dumping of wastes or other matter listed in Annex 1 shall require a permit". Furthermore, "contracting Parties shall adopt administrative or legislative measures to ensure that issuance of permits and permit conditions comply with provisions of Annex 2. Particular attention shall be paid to opportunities to avoid dumping in favour of environmentally preferable alternatives."

The requirements of the LDP apply to all dumping at "sea", which includes all marine waters (and underlying seabed and subsoil) other than internal waters.[27] In other words, the LDP applies to the territorial sea, EEZ, the extended continental shelf and high seas,[28] but not to waters on the landward side of the baseline. The LDP also applies to ships where they are loaded in the territory of a state party and the matter loaded is intended for dumping at "sea".[29]

24 London Dumping Protocol, Article 23.

25 Article 4.

26 Article 1.

27 Article 1.

28 Although a coastal state only has international legal jurisdiction on the high seas in relation to its own ships and installations.

29 Article 9(2).

Dumping is defined in Article 1 as including:

1. any deliberate disposal into the sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea; and
2. any storage of wastes or other matter in the seabed and the subsoil thereof from vessels, aircraft, platforms or other man-made structures at sea; but excluding
3. the "placement of matter for a purpose other than the mere disposal thereof, provided that such placement is not contrary to the aims of this Protocol".

Furthermore, the disposal or storage of wastes or other matter directly arising from, or related to the exploration, exploitation and associated off-shore processing of seabed mineral resources is not covered by the provisions of the Protocol. Carbon dioxide itself is not a mineral. However, CCS that doubles as EOR or EGR would not be subject to the Protocol, nor arguably would a situation where injection is of CO_2 that has been stripped from offshore natural gas, such as at the Sleipner CCS project off the Norwegian coast.[30]

Despite the Protocol's exclusion of the placement of matter for a purpose other than mere disposal,[31] the international community has interpreted CCS injection as falling within the definition of "dumping" under the Protocol. In 2006, in response, the contracting parties adopted amendments to Annex 1 of the Protocol to include (and therefore no longer prohibit) the dumping of CO_2 streams, subject to the following restrictions:

4 Carbon dioxide streams referred to in paragraph 1.8 may only be considered for dumping, if:
   1. disposal is into a sub-seabed geological formation; and
   2. they consist overwhelmingly of carbon dioxide. They may contain incidental associated substances derived from the source material and the capture and sequestration processes used; and
   3. no wastes or other matter are added for the purpose of disposing of those wastes or other matter.

This amendment came into force on 10 February 2007. The LDP therefore no longer prohibits CCS, but it does now place restrictions on it, in light of its inclusion within Annex 1. In particular, Annex 2 to the Protocol covers a list of obligations now applicable to CCS injection, including dump-site selection, assessment of effects, monitoring, and permitting issues and conditions that are to be met. Annex 2 is reproduced in full in Part 4 of this Appendix.

Under Annex 2(9) and (10), parties must set up a national action list and upper and lower levels for dumping, and categorise waste into one of three categories according to such levels.

30 Mark de Figueiredo "The Liability of Carbon Dioxide Storage" (PhD Thesis, Massachusetts Institute of Technology, 2007) at 130.

31 Although unlikely, it is theoretically arguable that the purpose of CO_2 injection is not "mere disposal", but rather the sequestration of CO_2 only until the issue of climate change has been resolved: see J Friedrich "Carbon Capture and Storage: A New Challenge for International Environmental Law" [2007] 67 Zeitschrift fur auslandisches offentliches Recht und Volkerrecht 211 at 219; R Purdy and R Macrory *Geological Carbon Sequestration: Critical Legal Issues* (Tyndall Centre, London, 2004) at 23.

Annex 2(11) provides also that:

> Information required to select a dump-site shall include:
>
> 1. physical, chemical and biological characteristics of the water-column and the seabed;
> 2. location of amenities, values and other uses of the sea in the area under consideration;
> 3. assessment of the constituent fluxes associated with dumping in relation to existing fluxes of substances in the marine environment; and
> 4. economic and operational feasibility.

Such criteria concerning site selection for marine CCS would be required in domestic legislation or regulation. More detailed domestic regulation on site selection will be needed, given that the primary risks of leakage are likely to arise from a poorly characterised storage formation.[32]

Clauses 12 to 15 of Annex 2 address the requirements for assessments of environmental effects for dumping, which could usefully be replicated in domestic regulation on marine CCS. Similarly, Annex 2(16) concerns monitoring requirements that must be met or exceeded in domestic regulation. The requirements should not be difficult to meet in the approval process.

Marine CCS under the LDP is also subject to the permitting and reporting requirements in Article 9. In short, contracting parties are obliged to:

(1) issue permits in accordance with the LDP (including permits for dumping and for the loading, in its territory or on its ships, of matter to be dumped);

(2) keep records of the nature and quantities of all matter for which dumping permits have been issued and where practicable the quantities actually dumped and the location, time and method of dumping;

(3) monitor individually, or in collaboration with other Contracting Parties and competent international organizations, the condition of the sea for the purposes of the LDP; and

(4) report certain information annually, and other information regularly, to the IMO (and to other Parties where appropriate).

Even if CCS is not characterised as "dumping" under domestic law, the requirements of the LDP must still be met, because international law characterises CCS as dumping.

Article 3 of the LDP provides that "in implementing the provisions of this Protocol, Contracting Parties shall act so as not to transfer, directly or indirectly, damage or likelihood of damage from one part of the environment to another or transform one type of pollution into another". This mirrors the provision in UNCLOS discussed earlier, and is also mirrored in Article 3 of the Protocol on Dumping under the Noumea Convention.[33] As discussed earlier, it is most likely that the injection of CO_2 into the subsurface does not amount to "pollution" under the LDP, unless an escape of gas is likely and the escape is likely to cause harm.

32 A Ingleson, A Kleffner, and N Nielson "Long-Term Liability for Carbon Capture and Storage in Depleted North American Oil and Gas Reservoirs – A Comparative Analysis" 31 Energy Law Journal 431, at 437; S Benson, *Carbon Dioxide Capture and Storage in Underground Storage Formations* (2004) Centre for Climate and Energy Solutions 10-50 Workshop Proceedings <www.c2es.org> at 9.

33 The Noumea Convention and Protocols are discussed in a moment.

It is also questionable whether CCS injection amounts to "damage". If it did, injecting CO_2 into the seabed arguably infringes the obligation not to transfer one type of damage (effects on climate change from emissions to the air) into another (disturbance to the seabed by injection to a storage formation). As with the term "pollution", this obligation not to transfer damage is likely not, and has not been treated internationally as, a barrier to CCS deployment. However, CCS that is likely to result in leakages of CO_2 to the water column may infringe the obligation in Article 3.

Article 4(2) of the LDP provides that:

> [N]o provision of this Protocol shall be interpreted as preventing a Contracting Party from prohibiting, insofar as that Contracting Party is concerned, the dumping of wastes or other matter mentioned in Annex 1. That Contracting Party shall notify the Organization of such measures.

As discussed in Chapter 9, if the definition of an offshore installation in the Maritime Transport Act were extended to include CCS injection installations, CCS in New Zealand's territorial sea would be prohibited under regulations made under the RMA, and New Zealand would be obliged to notify the IMO of this fact.[34] However, at present, the Regulations under the RMA (and therefore their prohibition) do not apply to CCS installations, and we do not recommend that CCS be prohibited, except those forms required to be prohibited under the LDP.

The extent to which the EEZ Act aligns with the requirements of the LDP is presently uncertain. Clause 96 of the Marine Legislation Bill (as reported from Select Committee) proposes the introduction of a new Part 2, including a new section 24F, into the EEZ Act. The new Part 2 prohibits the dumping of toxic or hazardous waste. The definition of toxic and hazardous waste is left for regulations to define. Section 24F provides, effectively, that no person can dump other matter in the EEZ or continental shelf unless regulations allow a marine dumping consent to authorise the dumping, and a marine dumping consent duly does so. In accordance with Article 4 of the LDP, section 24F requires a permit to be granted for any dumping to occur, and does not allow dumping of any kind to be a permitted activity.

However, dumping regulations have not yet been made. To fulfil New Zealand's obligations under the LDP, regulations would have to refer to or mirror the LDP by prohibiting the dumping of all matter apart from that listed in Annex 1.[35] The stringent requirements in Annex 1 relating to CCS would also have to be mirrored in regulations, given that CCS is still a prohibited dumping under the LDP unless the requirements of Annex 1 are met. For the specific purposes of CCS, this uncertainty would be removed if injection were removed from the scope of the EEZ Act (as recommended in Chapter 9) and the requirements of the LDP were introduced into a new CCS Act. However, before a CCS Act were enacted, it would be important for regulations under the EEZ Act to be consistent with the LDP.

A significant provision in the LDP for CCS deployment in New Zealand is contained in Annex 2, where it is stated that "the acceptance of dumping under certain circumstances shall not remove the obligations under this Annex to make further attempts to reduce the necessity for dumping."[36] Because CCS is not excluded from the LDP's definition of dumping, New Zealand remains under

34 Resource Management (Marine Pollution) Regulations 1998.

35 Although dumping of those substances in Annex 1 would also be able to be prohibited.

36 London Dumping Protocol, Annex 2(1). The preamble to Resolution LP.1(1) explicitly provides that the enabling of the technology does not remove the need to address the root cause of CO_2 production (*Resolution on the Amendment to Include CO_2 Sequestration in Sub-Seabed Geological Formations in Annex 1 to the London Protocol* Res LP.1(1) (2006)).

an obligation to reduce the need for CCS by focusing on factors such as emissions reductions, the promotion of renewable energy, demand side management and energy efficiency. This may have implications for New Zealand's policy direction in balancing CCS and renewable energy in particular.

For completeness, Annex 2(5) of the LDP provides that:

> [A]pplications to dump wastes or other matter shall demonstrate that appropriate consideration has been given to the following hierarchy of waste management options, which implies an order of increasing environmental impact:
>
> 1. re-use;
> 2. off-site recycling;
> 3. destruction of hazardous constituents;
> 4. treatment to reduce or remove the hazardous constituents; and
> 5. disposal on land, into air and in water.

There is clearly a hierarchy within the numbers listed, but it is uncertain whether an internal hierarchy is intended within the phrase "on land, into air and into water". This may not in practice be an issue, as marine CCS is arguably on "land" (the seabed) as opposed to "in water" (the water column). This has not in practice been treated internationally as a constraint on marine CCS, or a direction that land based CCS injection is to be preferred over marine injection.

There are also issues in the LDP concerning the cross border transportation of CO_2, which currently appears to be prohibited. The Parties are working on a solution to this issue, although it is not likely to be significant in the New Zealand context, due to this country' geography. It is therefore not discussed further here.

4 Extracts from the London Dumping Protocol

4.1 Article 9, Issuance of Permits and Reporting

1. Each Contracting Party shall designate an appropriate authority or authorities to:
    1. issue permits in accordance with this Protocol;
    2. keep records of the nature and quantities of all wastes or other matter for which dumping permits have been issued and where practicable the quantities actually dumped and the location, time and method of dumping; and
    3. monitor individually, or in collaboration with other Contracting Parties and competent international organizations, the condition of the sea for the purposes of this Protocol.
2. The appropriate authority or authorities of a Contracting Party shall issue permits in accordance with this Protocol in respect of wastes or other matter intended for dumping or, as provided for in Article 8.2, incineration at sea:
    1. loaded in its territory; and

2. loaded onto a vessel or aircraft registered in its territory or flying its flag, when the loading occurs in the territory of a State not a Contracting Party to this Protocol.

3. In issuing permits, the appropriate authority or authorities shall comply with the requirements of Article 4, together with such additional criteria, measures and requirements as they may consider relevant.

4. Each Contracting Party, directly or through a secretariat established under a regional agreement, shall report to the Organization and where appropriate to other Contracting Parties:

    1. the information specified in paragraphs 1.2 and 1.3;

    2. the administrative and legislative measures taken to implement the provisions of this Protocol, including a summary of enforcement measures; and

    3. the effectiveness of the measures referred to in paragraph 4.2 and any problems encountered in their application.

    The information referred to in paragraphs 1.2 and 1.3 shall be submitted on an annual basis. The information referred to in paragraphs 4.2 and 4.3 shall be submitted on a regular basis.

5. Reports submitted under paragraphs 4.2 and 4.3 shall be evaluated by an appropriate subsidiary body as determined by the Meeting of Contracting Parties. This body will report its conclusions to an appropriate Meeting or Special Meeting of Contracting Parties.

4.2 Annex 1, Wastes or Other Matter That May Be Considered For Dumping

1. The following wastes or other matter are those that may be considered for dumping being mindful of the Objectives and General Obligations of this Protocol set out in articles 2 and 3:

    1. dredged material;

    2. sewage sludge;

    3. fish waste, or material resulting from industrial fish processing operations;

    4. vessels and platforms or other man-made structures at sea;

    5. inert, inorganic geological material;

    6. organic material of natural origin;

    7. bulky items primarily comprising iron, steel, concrete and similarly unharmful materials for which the concern is physical impact, and limited to those circumstances where such wastes are generated at locations, such as small islands with isolated communities, having no practicable access to disposal options other than dumping; and

    8. Carbon dioxide streams from carbon dioxide capture processes for sequestration.

2. The wastes or other matter listed in paragraphs 1.4 and 1.7 may be considered for dumping, provided that material capable of creating floating debris or otherwise contributing to pollution of the marine environment has been removed to the maximum extent and provided that the material dumped poses no serious obstacle to fishing or navigation.

3. Notwithstanding the above, materials listed in paragraphs 1.1 to 1.8 containing levels of radioactivity greater than *de minimis* (exempt) concentrations as defined by the IAEA and adopted by Contracting Parties, shall not be considered eligible for dumping; provided further that within 25 years of 20 February 1994, and at each 25 year interval thereafter, Contracting Parties shall complete a scientific study relating to all radioactive wastes and other radioactive matter other than high level wastes or matter, taking into account such other factors as Contracting Parties consider appropriate and shall review the prohibition on dumping of such substances in accordance with the procedures set forth in article 22.

4. Carbon dioxide streams referred to in paragraph 1.8 may only be considered for dumping, if:

    1. disposal is into a sub-seabed geological formation; and

    2. they consist overwhelmingly of carbon dioxide. They may contain incidental associated substances derived from the source material and the capture and sequestration processes used; and

    3. no wastes or other matter are added for the purpose of disposing of those wastes or other matter.

4.3 Annex 2, Assessment of Wastes or Other Matter That May Be Considered For Dumping

GENERAL

1. The acceptance of dumping under certain circumstances shall not remove the obligations under this Annex to make further attempts to reduce the necessity for dumping.

WASTE PREVENTION AUDIT

2. The initial stages in assessing alternatives to dumping should, as appropriate, include an evaluation of:

    1. types, amounts and relative hazard of wastes generated;

    2. details of the production process and the sources of wastes within that process; and

    3. feasibility of the following waste reduction/prevention techniques:

        1. product reformulation;

        2. clean production technologies;

        3. process modification;

        4. input substitution; and

        5. on-site, closed-loop recycling.

3. In general terms, if the required audit reveals that opportunities exist for waste prevention at source, an applicant is expected to formulate and implement a waste prevention strategy, in collaboration with relevant local and national agencies, which includes specific waste reduction targets and provision for further waste prevention audits to ensure that these targets are being met. Permit issuance or renewal decisions shall assure compliance with any resulting waste reduction and prevention requirements.

4. For dredged material and sewage sludge, the goal of waste management should be to identify and control the sources of contamination. This should be achieved through implementation of waste prevention strategies and requires collaboration between the relevant local and national agencies involved with the control of point and non-point sources of pollution. Until this objective is met, the problems of contaminated dredged material may be addressed by using disposal management techniques at sea or on land.

CONSIDERATION OF WASTE MANAGEMENT OPTIONS

5. Applications to dump wastes or other matter shall demonstrate that appropriate consideration has been given to the following hierarchy of waste management options, which implies an order of increasing environmental impact:

    1. re-use;

    2. off-site recycling;

    3. destruction of hazardous constituents;

    4. treatment to reduce or remove the hazardous constituents; and

    5. disposal on land, into air and in water.

6. A permit to dump wastes or other matter shall be refused if the permitting authority determines that appropriate opportunities exist to re-use, recycle or treat the waste without undue risks to human health or the environment or disproportionate costs. The practical availability of other means of disposal should be considered in the light of a comparative risk assessment involving both dumping and the alternatives.

CHEMICAL, PHYSICAL AND BIOLOGICAL PROPERTIES

7. A detailed description and characterization of the waste is an essential precondition for the consideration of alternatives and the basis for a decision as to whether a waste may be dumped. If a waste is so poorly characterized that proper assessment cannot be made of its potential impacts on human health and the environment, that waste shall not be dumped.

8. Characterization of the wastes and their constituents shall take into account:

    1. origin, total amount, form and average composition;

    2. properties: physical, chemical, biochemical and biological;

    3. toxicity;

    4. persistence: physical, chemical and biological; and

    5. accumulation and biotransformation in biological materials or sediments.

ACTION LIST

9. Each Contracting Party shall develop a national Action List to provide a mechanism for screening candidate wastes and their constituents on the basis of their potential effects on human health and the marine environment. In selecting substances for consideration in an Action List, priority shall be given to toxic, persistent and bioaccumulative substances from anthropogenic sources (e.g., cadmium, mercury, organohalogens, petroleum hydrocarbons, and, whenever relevant, arsenic, lead, copper, zinc, beryllium, chromium, nickel and vanadium, organosilicon compounds, cyanides, fluorides and pesticides or their by-products other than organohalogens). An Action List can also be used as a trigger mechanism for further waste prevention considerations.

10. An Action List shall specify an upper level and may also specify a lower level. The upper level should be set so as to avoid acute or chronic effects on human health or on sensitive marine organisms representative of the marine ecosystem. Application of an Action List will result in three possible categories of waste:

    1. wastes which contain specified substances, or which cause biological responses, exceeding the relevant upper level shall not be dumped, unless made acceptable for dumping through the use of management techniques or processes;

    2. wastes which contain specified substances, or which cause biological responses, below the relevant lower levels should be considered to be of little environmental concern in relation to dumping; and

    3. wastes which contain specified substances, or which cause biological responses, below the upper level but above the lower level require more detailed assessment before their suitability for dumping can be determined.

DUMP-SITE SELECTION

11. Information required to select a dump-site shall include:

    1. physical, chemical and biological characteristics of the water-column and the seabed;

    2. location of amenities, values and other uses of the sea in the area under consideration;

    3. assessment of the constituent fluxes associated with dumping in relation to existing fluxes of substances in the marine environment; and

    4. economic and operational feasibility.

ASSESSMENT OF POTENTIAL EFFECTS

12. Assessment of potential effects should lead to a concise statement of the expected consequences of the sea or land disposal options, i.e., the "Impact Hypothesis". It provides a basis for deciding whether to approve or reject the proposed disposal option and for defining environmental monitoring requirements.

13. The assessment for dumping should integrate information on waste characteristics, conditions at the proposed dump-site(s), fluxes, and proposed disposal techniques and specify the potential effects on human health, living resources, amenities and other legitimate uses of the sea. It should define the nature, temporal and spatial scales and duration of expected impacts based on reasonably conservative assumptions.

14. An analysis of each disposal option should be considered in the light of a comparative assessment of the following concerns: human health risks, environmental costs, hazards, (including accidents), economics and exclusion of future uses. If this assessment reveals that adequate information is not available to determine the likely effects of the proposed disposal option then this option should not be considered further. In addition, if the interpretation of the comparative assessment shows the dumping option to be less preferable, a permit for dumping should not be given.

15. Each assessment should conclude with a statement supporting a decision to issue or refuse a permit for dumping.

MONITORING

16. Monitoring is used to verify that permit conditions are met – compliance monitoring – and that the assumptions made during the permit review and site selection process were correct and sufficient to protect the environment and human health – field monitoring. It is essential that such monitoring programmes have clearly defined objectives.

PERMIT AND PERMIT CONDITIONS

17. A decision to issue a permit should only be made if all impact evaluations are completed and the monitoring requirements are determined. The provisions of the permit shall ensure, as far as practicable, that environmental disturbance and detriment are minimized and the benefits maximized. Any permit issued shall contain data and information specifying:

    1. the types and sources of materials to be dumped;

    2. the location of the dump-site(s);

    3. the method of dumping; and

    4. monitoring and reporting requirements.

18. Permits should be reviewed at regular intervals, taking into account the results of monitoring and the objectives of monitoring programmes. Review of monitoring results will indicate whether field programmes need to be continued, revised or terminated and will contribute to informed decisions regarding the continuance, modification or revocation of permits. This provides an important feedback mechanism for the protection of human health and the marine environment.

5 The Impact of the Noumea Convention and Protocols

New Zealand ratified the original Noumea Dumping Protocol in 1990, and signed an amended Protocol on 10 September 2006. As at July 2012 the amended protocol has not entered into force.

The original Protocol, which entered into force on 22 August 1990 and remains in force in that form, does not prohibit CCS, because it takes the London Dumping Convention's approach that all dumping may be permitted by a Party State as long as it does not fall within those substances listed in Annex 1. Annex 1 does not include CO_2.

The amended version of the Protocol as at 2006 takes the opposite approach, and reflects the "reverse list" approach of the LDP. Under Article 4 it prohibits the dumping at sea[37] of all matter[38] *other* than those substances in Annex 1. Annex 1 of this version of the Protocol does not include CO_2 for CCS injection.

Further amendments to Annex 1 of the amended Noumea Protocol on Dumping, adopted at the 11th ordinary meeting of the Parties to the Noumea Convention in 2012,[39] also do not appear to have entered into force. Such further amendments would reflect the 2006 changes to Annex 1 of the LDP, thereby enabling CCS to the same extent as the LDP currently in force.

At present, therefore, it appears that CCS injection into the continental shelves of parties to the Noumea Convention is not prohibited. Not all parties to the Noumea Protocol are parties to the LDP, therefore at present there are potentially a variety of approaches in the region that could be taken to marine CCS. Parties to the Noumea Protocol that are not parties to the LDP may lawfully engage in forms of CCS not allowed under the LDP, although the likelihood of these states engaging in CCS appears low.

Under Article 3(1) of both the in force and amended Protocols, Parties are also required to take all appropriate measures to effectively prevent, reduce and where practicable eliminate pollution by the dumping matter at sea. Article 10 of the Noumea Convention imposes an equivalent obligation. "Pollution" is defined in the Noumea Convention in an identical manner to the LDP. As discussed earlier, injection would not likely amount to pollution. However, pollution would more likely include the escape of sequestered gas from the seabed into the water column, and thus States may be obliged to take appropriate measures to prevent such escapes (including, for example, through effective monitoring and maintenance requirements).

Another potentially relevant Protocol to the Noumea Convention is the Protocol on Hazardous and Noxious Substances Pollution, Preparedness, Response and Cooperation in the Pacific Region. This Protocol is not yet in force in any form. Under the Protocol, "hazardous and noxious substance" is defined widely as including any substance other than oil which, if introduced to the marine environment, "is likely to …. harm living resources and marine life, to damage amenities or to interfere

37 Sea is defined to include seabed and subsoil.

38 Defined widely in the Convention to include material and substances or any kind, form or description.

39 Agenda Item 8.4, 11th Ordinary Meeting of Noumea Convention, 30 August 2012, at 1.

with other legitimate uses of the sea".[40] Broadly, Parties are required to set up national systems for responding to pollution incidents. Pollution incident is defined as an occurrence which "may result in a discharge, release or emission of hazardous and noxious substances and which poses or may pose a threat to the marine environment… and which requires emergency action or immediate response".[41] As with the comments above regarding the definition of "pollution", it is likely that neither of the above definitions would apply to CCS injection, but may more likely apply to escape of CO_2 from storage formation – depending on the particular threat posed in any given case. If CO_2 amounted to a hazardous and noxious substance under the Protocol, it would impose an obligation to prepare for an escape of CO_2, and to engage in measures to respond to such an escape.[42] It would be good practice for such measures to feature in new CCS legislation regardless of the requirements of the Protocol.

6 The Impact of the Maritime Transport Act and the EEZ Act as Currently in Force

6.1 The Current Impact of the EEZ Act 2012

The impact and relevance of the EEZ Act as it will exist after amendment from the MLB has been discussed in Chapter 9. This Part of this Appendix outlines the impact of the EEZ Act and MTA as they apply to CCS prior to amendments under the MLB. This is because the amendments in the MLB do not represent the current law. However, given that an application for CCS is not likely to be made in the near future, the law as it currently stands may not be of particular significance.

Currently, section 20 of the EEZ Act does not restrict discharges other than those that amount to the deposit of any "thing" in under or on the seabed or subsoil. Therefore the Act in its present form would not restrict the escape of gas from a CCS storage formation after injection. Section 20, and therefore the main restrictions in the Act, also do not apply to certain activities currently regulated under the MTA.[43] These include the "storing of toxic or hazardous waste" and the "dumping of waste or other matter". Both of these are potentially applicable to CCS injection. Therefore to determine the extent to which the EEZ Act currently applies to injection, it is useful here to provide an analysis of these relevant provisions in the MTA. Discussion will then return to the impact of the EEZ Act.

6.2 The Current Impact of the Maritime Transport Act 1994

The purpose of the MTA is not expressed in a dedicated purpose section. However, section 5 lists the objectives of the Minister under the Act, which are relatively diverse: to undertake his or her functions in a way that contributes to an integrated, safe, responsive, and sustainable transport system, and to ensure that New Zealand's obligations under the relevant international conventions

40 Protocol on Hazardous and Noxious Substances Pollution, Preparedness, Response and Cooperation in the Pacific Region, Article 1.

41 Article 1.

42 Article 6.

43 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, s 20(5).

are implemented. The Act reflects a number of New Zealand's international obligations.[44] As such, it addresses a diverse range of subjects, from salvage and the carriage of goods, to safety requirements. Parts of the Act are concerned with environmental protection, but have limited scope. As suggested by the exclusions in section 20 of the EEZ Act, the focus of the environmental provisions of the MTA is the regulation of dumping and hazardous or harmful substances. A general purpose of protecting the marine environment, as evidenced by Parts 19 to 27 of the Act, can clearly be read into the MTA. However, in contrast to the EEZ Act, the MTA is not designed as a comprehensive, effects-based statute regulating all aspects of environmental harm from a wide variety of activities.

For CCS to be regulated by the MTA, it must be triggered by the machinery of the Act, or by the Marine Protection Rules made under it. The parts of the MTA that are prima facie triggered by CCS injection are:[45]

(1) Part 19, relating to the protection of the marine environment from harmful substances;

(2) Part 20, relating to the protection of the marine environment from (among other things) hazardous offshore operations; and

(3) Part 21, relating to the protection of the marine environment from dumping, incineration and the storing of wastes.

Part 25, concerning civil liability for pollution, may also have an impact on the post-injection phase. Parts 19 and 21 generally apply only to activities in the EEZ and underlying and extended continental shelf. In the territorial sea, these matters are regulated under the RMA and HSNOA. Section 20 of the EEZ Act states that the restrictions in the section do not apply to "the dumping or storing of radioactive waste or other radioactive matter," "the storing of toxic or hazardous waste" or "the dumping of waste or other matter" regulated under the MTA.

Dumping under Part 21 of the Maritime Transport Act 1994

First, it needs to be considered whether CCS injection amounts to dumping under the MTA. "Dumping" is not defined in the EEZ Act, but it is reasonable to assume that it has the same meaning as that given in the MTA. Section 257 of the MTA defines dumping in line with the wording used in the LDP, which includes not only the deliberate "disposal" of matter into the sea, but also any "storage" of matter in the seabed (even though storage of *hazardous* waste is dealt with separately). As such, "storing" is effectively treated as the specific subset of "dumping" applicable to the seabed, with a separate prohibition on storing hazardous/toxic matter.

A potential uncertainty in the definition of dumping in the MTA is that it expressly includes "any storage of wastes or other matter in the seabed and the subsoil" and yet goes on expressly to exclude from dumping the "placement of matter for a purpose other than the mere disposal of them, provided that such placement is not contrary to the aims of the 1996 protocol to the London Convention". This reflects the wording in the LDP itself, and the international approach to this issue has been discussed earlier. CCS injection arguably amounts to the placement of matter for a purpose other than

44 For example, the MARPOL and SOLAS Conventions, and the LDP.

45 Part 18 also has a bearing on Parts 19 to 21, but not in a substantive sense. Other parts may also apply to the transportation phase of CCS if done by ship.

mere disposal, since the gas is not being abandoned but rather "stored". Since the 2006 amendments to the LDP, it is also not contrary to the aims of the LDP. However, the international community has interpreted this phrase in the LDP as classifying CCS injection as "dumping", and given a purpose of the MTA is to implement the LDP, the same interpretation would likely be made by the New Zealand Courts. The placement of matter for purposes "other than mere disposal" is more likely intended to refer to objects that remain useful in the short term, such as measuring instruments, navigational aids or artificial reefs. The term CO_2 "storage" is a misnomer, given that the purpose of CCS is disposal.

Section 257 of the MTA also excludes from the definition of dumping "the disposal or storage of wastes or other matter directly arising from, or related to, the exploration, exploitation, and associated offshore processing of seabed mineral resources". This provision probably allows oil and gas mining activities to reinject natural gas (for temporary storage) or production water, use CO_2 EOR and EGR techniques, or to inject CO_2 that has been stripped (in an offshore location) from offshore natural gas and injected back into the seabed.[46]

The applicability of this exception is less clear in the case of "pure" marine CCS, where the injection of CO_2 is not necessarily related to or arising from the offshore processing of minerals. Carbon dioxide itself is not a mineral. The gas being injected may originally have been produced as a result of the processing of mineral resources (such as petroleum or natural gas), but it would not necessarily be the case. Similarly, any mineral resources that produced the CO_2 would not necessarily have come from an offshore source. It is even less likely that the CO_2 would be produced by the *offshore* processing of seabed mineral resources, as processing (and capture) is more likely to occur onshore at industrial sites. Injection streams may also be mixed from more than one capture source; which may be only partly produced in connection with the offshore processing of seabed mineral resources. The exception to dumping in section 257 therefore provides an arbitrary distinction between different kinds of CCS streams, which would not have been intended by the Act. Most CCS is likely to be excluded from this exception and therefore amount to dumping under the MTA. As a consequence, currently CCS injection in the EEZ would not be governed under the EEZ Act.[47]

The Prohibition on Dumping under Section 260 of the Maritime Transport Act

If CCS amounts to the storing of "toxic" or "hazardous" waste (and does not come within the exception to the definition of "dumping" discussed above) it will fall under the specific subcategory of dumping in section 260 of the MTA, and be prohibited. However, CO_2 (if it conforms to the purity requirements of the LDP) is unlikely to amount to a "toxic" or "hazardous" substance. The MTA defines toxic or hazardous waste with reference to the definition contained in the Marine Protection Rules.

Curiously, the Marine Protection Rules do not appear to define a toxic or hazardous substance in Part 180 (relating to dumping), or in any other part of these Rules. "Harmful substance" is defined in Part 200 of the Rules for the purposes of Part 19 of the MTA (protection of the marine environment

46 As occurs at the Sleipner Field off the Norwegian coast.

47 To the extent that CCS injection involves dumping. Injection may involve other activities that are not excluded from section 20 of the Exclusive Economic and Continental Shelf (Environmental Effects) Act 2012, in which case marine consent would be required for these in addition to a dumping permit under the Maritime Transport Act. An example would be the disturbance of the seabed.

from harmful substances) with reference to hazardous substances under HSNOA regulations.[48] It may be reasonable to conclude that the definition of "hazardous" for the purposes of Part 21 is the same as that provided under the same HSNOA regulations. Carbon dioxide does not amount to a hazardous substance under these regulations.

Given the above conclusions, CCS would not be prohibited by section 260 of the MTA. Instead, it would fall within the more general dumping regime of section 261. Curiously, for the limited purpose of transport by ship under international law (and, by incorporation, some Parts of the Maritime Rules), CO_2 is treated as a dangerous substance.[49] However, this classification is a result of the safety requirements of the SOLAS Convention, and not for the purposes of protecting the marine environment. Therefore the classification as a "hazardous substance" for the purposes of transport by ship can be distinguished from the classification as a "hazardous substance" for the purposes of dumping under section 260 of the MTA.

Dumping Permits under section 261 of the Maritime Transport Act

Although CCS likely amounts to dumping under the MTA, it would have to trigger section 261 for the Act to have practical effect. To trigger this section, injected gas would have to be a "waste or other matter". Although questions could arise over whether CO_2 is a "waste" (which is not defined) CO_2 is clearly at least "other matter".

However, section 261 only requires permits for the dumping of matter "from a ship, aircraft, or controlled offshore installation". A "controlled offshore installation" is defined with reference to an "offshore installation", which in turn requires an artificial structure to have a purpose of exploring for, exploiting or processing any "mineral". Installations used for CCS (and not concurrently used for EOR/EGR or extraction) do not have this purpose, because CO_2 is not a mineral. Due to this unintended oversight, CCS injection in the EEZ is not technically restricted.

Assuming for the sake of argument that CCS installations were treated as "offshore installations" under the MTA, the matters that the Director would have to consider in deciding whether to grant a dumping permit under section 262 are contained in Rule 180.8 of the Marine Protection Rules. The decision must be in accordance with:

(1) section 270 of the MTA (a general requirement that the Director must be satisfied the application meets all prescribed requirements);

(2) the criteria, measures and requirements for the granting of dumping permits set out in the LDP[50] (this amounts to a direct incorporation of international law into domestic law); and

(3) the Guidelines for the implementation and uniform interpretation of the LDP adopted from time to time by resolution of the contracting parties and published by the IMO.

48 Maritime Transport Act 1994, s 225; Marine Protection Rules, rule 200.2; Hazardous Substances (Minimum Degrees of Hazard) Regulations 2001.

49 Under the International Gas Carrier Code, which is incorporated into Chapter VII of the SOLAS Convention.

50 The section technically refers to the LDC, but the LDC is defined in section 257 as including amendments and Protocols. For practical purposes in New Zealand, the LDP is the relevant instrument.

Rule 180.3 clarifies that the Director cannot grant an application that permits the dumping of matter in breach of the LDP. The Director is also required to have regard to the *New Zealand Guidelines for Sea Disposal of Waste*. However, these Guidelines are silent on CCS activities. Although the Director may have regard to other international, domestic or foreign guidelines on dumping, this would not allow the consideration of guidelines that were more lenient than the LDP, such as the Noumea Protocol on Dumping (as currently in force). As recommended in Chapter 9, domestic law on marine CCS should reflect the standards in the LDP.

Part 19 of the Maritime Transport Act

Part 19 of the MTA concerns the protection of the marine environment from harmful substances, and was largely introduced to ensure New Zealand's compliance with the MARPOL Convention.[51] For the purposes of CCS, the relevant provisions of Part 19 concern the discharge or escape of harmful substances into the sea. The significance here is that it may apply to unintended escapes of CO_2 from a formation. Such escapes would not amount to dumping, and therefore the regime governing discharges would not be prevented from applying.

The key question is whether an escape would trigger section 226 of the MTA, the relevant parts of which provide:

> [H]armful substances shall not be discharged or escape, otherwise than in accordance with the marine protection rules,-
>
> (a) from any ship, offshore installation,[52] or pipeline-
>
> (i) into the sea within the EEZ of New Zealand; or
>
> (ii) onto or into the seabed below that sea".

A "harmful substance" is defined in section 225 of the MTA as "any substance specified as a harmful substance for the purposes of this definition by the marine protection rules". The Marine Protection Rules Part 200.2 (definitions) refers to regulations made under the HSNOA.[53] This requires that substances other than oil be ecotoxic to aquatic organisms and considered hazardous for the purposes of the *Hazardous Substances (Minimum Degrees of Hazard) Regulations 2001*. These regulations define different kinds of substances differently, via schedules. A sensible way of reading Part 200.2 of the Marine Protection Rules is that the requirement that a substance is both "ecotoxic" and "hazardous" for the purposes of the Regulations in fact refers to the requirement that the substance amount to a hazardous substance under Schedule 6 of the Regulations (which addresses the definition of a hazardous substance that has ecotoxic properties).

It is reasonably clear that CO_2 is not ecotoxic to aquatic organisms under any of the criteria in Clause 2(1)(a) of Schedule 6. The criteria focus only on the characteristics of the substance, rather than the potentially (albeit unlikely) harmful way in which it could escape (in high concentrations or at high pressure).

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51 International Convention for the Prevention of Pollution from Ships 1340 *UNTS* 184 (adopted 2 November 1973, entered into force 2 October 1983) (MARPOL). Part 19 of the Maritime Transport Act 1994 is wider than MARPOL, because it applies both to ships and offshore installations.

52 For the purposes of the present discussion, it is assumed that a CCS installation is included within the definition of an "offshore installation" although, as discussed earlier, it currently is not.

53 Part 24A of the Marine Protection Rules also provides a (different) definition of harmful substance, but it is fairly clear that the Maritime Transport Act in this context is referring to Part 200 (offshore installations – discharges) rather than Part 24A (carriage of cargoes – dangerous goods).

Furthermore, it is unlikely that a discharge from a storage formation would be "from any ship, offshore installation, or pipeline" as required by the MTA. Although originally the CO_2 would have been injected from an offshore installation (assuming again that a CO_2 injection installation is treated as falling within this definition), the seabed itself does not amount to an "installation". The escape of CO_2 from a formation is therefore not currently regulated under the MTA (or, for that matter under the EEZ Act).

In relation to injection, one curious feature of the Marine Protection Rules is that Part 200.2 provides a wider definition of "discharge" than the MTA, adding that "reinjection into geological formations" does not amount to a discharge even if the substance in question is harmful. Section 226 clearly provides that harmful substances can be discharged "in accordance with" the Marine Protection Rules, but it is by no means clear that the Rules can do so by redefining a term already defined in the MTA.

The altered definition of "discharge" only excludes "reinjection", a term that was most likely envisaged to apply in cases of re-injection of production water, or potentially also temporary natural gas storage. It is unclear the extent to which CO_2, which is produced elsewhere and would be injected in large amounts for permanent or long-term storage, could amount to re-injection. It may require a substance to have been extracted from a geological formation and then returned to it. Furthermore, the schema of the Act as a whole is clearly that an activity amounting to dumping will not amount to a discharge, even if that discharge is characterised under the Marine Protection Rules as "injection".

The provisions in the MTA and Part 200 of the Marine Protection Rules regarding the preparation and approval of detailed discharge management plans, however, apply to offshore installations generally[54] and (if an offshore installation were treated as applying to injection installations) would include a CCS platform. The plan would not have to address the actual injection of CO_2, because this would not be a "discharge", but would have to address incidental discharges of harmful substances. In particular, the following rules would apply:

(1) Rule 200.4, under which a discharge management plan is required to be approved for the installation (every 3 years);

(2) Rule 200.6, which requires consultation with persons whose interests in the vicinity of the installation are likely to be affected by a spill of the harmful substance;

(3) Rule 200.20, which requires notification of any modification to discharge management plan; and

(4) Rules 200.11 and 200.12, which require emergency spill response procedures to be set up.

The matters required to be included in a discharge management plan, under Schedule 1 to Part 200 of the Rules, are more comprehensive for installations beyond the coastal marine area than for those inside it.[55] In short, all operators of offshore installations are required to provide general risk assessment information in an application for approval of a discharge management plan, but operators outside the coastal marine area have to provide information on harmful substances as well.

54 Marine Protection Rules, rule 200.3.

55 Presumably because the RMA plays a role in relation to installations within the coastal marine area.

Part 25 of the Maritime Transport Act

Part 25 of the MTA imposes civil liability on persons in charge of offshore structures for pollution damage caused by the discharge of harmful substances or dumping. This Part is to be partially replaced by a new Part 26A under the MLB, although the bulk of the Part will not be subject to change. For this reason, both the existing Part 25 and the proposed Part 26A are discussed in Chapter 9 and Appendix F, Part 9.

6.3 Summary of the Current Legislative Regime Applicable to CCS beyond the Coastal Marine Area

Currently, the regimes for dumping and discharges under the MTA and EEZ Act are in flux. As these Acts currently stand CCS injection is most likely classed as dumping and thus excluded from consideration under the EEZ Act.[56] However, given the definition of "offshore installation" under the MTA, no permit is technically required for CCS injection under that Act. For completeness, the applicability of Part 19 of the MTA has also been discussed above, although currently it is unlikely to apply to CCS injection because a "discharge" expressly excludes "dumping".

The escape of gas from an injection platform or a storage formation is also unlikely to infringe the MTA as it stands. Such an escape most likely amounts neither to "dumping" nor the discharge of a "harmful substance" as currently defined in the MTA. Section 20(5) of the EEZ Act therefore does not exclude these escapes from the scope of the EEZ Act. However, section 20 of the EEZ Act also does not restrict or regulate the discharge of CO_2 to the water column. The only restriction appears to be section 25 of the Act, imposing a general duty to avoid, remedy and mitigate adverse effects of activities on the environment. It is by no means clear that all (or potentially any) escapes of CO_2 to the water column would cause "adverse effects" in an environmental sense and be caught by the section. In any case, the reactive nature of section 25 is clearly not an adequate basis for the active regulation of CCS storage formation integrity.

However, the Marine Legislation Bill is set to make sweeping changes to this regime. The effect of the Bill is discussed in Chapter 9. Given the likelihood of the Bill passing into law, we have based our recommendations in Chapter 9 on the legal regime in the EEZ as it would stand after the coming into force of the Bill.

56 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, s 20(5). CCS is excluded from the EEZ Act regime only to the extent that an activity amounts to dumping or the discharge of harmful substances. The requirement to obtain consent for the disturbance or drilling of the seabed, the laying of pipelines or the construction of an injection installation would still currently require marine consent under the EEZ Act.

7 Consents Required for CCS Operations Straddling the Boundary between EEZ and Coastal Marine Area

The EEZ Act expressly provides for the consenting of cross boundary activities,[57] where (generally) applications are processed together, but are required to address both regional and EEZ matters. These matters are decided by the body with competent jurisdiction.[58] A cross boundary activity is defined as "an activity that is carried out partly in the exclusive economic zone or in or on the continental shelf and partly in New Zealand".[59] The reference to New Zealand refers to the coastal marine area. It is unclear whether CCS would amount to a "cross boundary activity" if injection occurred in one jurisdiction but injected CO_2 migrated to the other. An "activity" is defined as any activity restricted by section 20.[60] Although it is clear that the injection of CO_2 into the seabed will be an activity restricted by the Act, it is arguable that the natural migration of gas does not amount to a separate activity, and therefore would be considered only in accordance with the policy guidance applicable to the injection site. However, given that the EEZ Act is a broadly effects-based statute like the RMA, it is more likely that CCS involving straddling pore space will require consent as a cross boundary activity, or at least that regulations or regional plans could provide for this as a cross boundary activity.[61]

The EEZ Act provides for an efficient administrative process for deciding cross boundary activities (including information sharing, non-duplication of administrative functions, and referral to a board of inquiry for decision on matters of national significance). However, the Act makes no provision for how policy discrepancies are to be resolved. The approach taken in the EEZ under regulations could foreseeably be different to the policy direction adopted at a regional level in the coastal marine area, with the potentially frustrating result that a single activity with consistent effects in each zone could receive consent in one zone but be declined in another. If decided by a board of inquiry as an activity of national significance, there is a risk that an application could be declined in its totality due to the existence of strong regional policies against the activity. No provision is currently made for national regulations in the EEZ to override regional policies in the territorial sea, or for how a board of inquiry is expected to reconcile potentially opposed policy guidance for a single activity.

Some mitigation of this issue is already provided for in section 176 of the EEZ Act, where the RMA has been consequentially amended to require regional councils, when preparing or changing any regional policy statements and regional plans, to have regard to the extent to which the document needs to be consistent with regulations made under the EEZ Act. This reflects a similar provision already in sections 61(2) and 66(2) of the RMA whereby regard must be had to the extent to which a plan needs to be consistent with the RPSs and plans of adjacent regional councils. The risk with this approach

57 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, ss 88 to 100.

58 Except if referred to a board of inquiry in the case of a nationally significant activity under section 99 of the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012.

59 Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012, s 88.

60 Which will also, under clause 90 of the Marine Legislation Bill, include dumping and discharges of harmful substances.

61 The Resource Management Act 1991 deals with this issue in section 67(2)(f), where regional plans are empowered to state how issues that cross jurisdictional boundaries will be dealt with.

for regulations under the EEZ Act is that it may not be sufficiently directive in the absence of an NPS or NES. First, regional councils only need to consider *the extent to which* their documents need to be consistent with regulations, which leaves open the possibility that councils may consider there is no such need. Secondly, it is possible that regional councils could *consider* the need for consistency, but for other reasons decline to take action based on it. Third, the requirement only applies when preparing or changing regional policy statements or plans. If a cross boundary activity application were lodged between the point at which regulations were promulgated and the time that a council reviewed its RPS or plan, the outcome of an application could still be uncertain.

An option could be for NESs and NPSs under the RMA to ensure that regional level policy is consistent with regulations developed under the EEZ Act. The NPS and NES process is a transparent, established and reasonably well accepted process by which national level resource management policy can guide (or, if necessary, direct) regional approaches, while providing engagement with concerned parties to explain the nature of likely effects in advance of any specific consent application. Alternatively, injection could simply be removed from the scope of the RMA and EEZ Act regimes and provided for in a new CCS Act. As recommended in Chapters 2 and 9, we consider that this option is preferable. It would resolve not only the issue in relation to CCS where formations straddled the EEZ-territorial sea boundary, and would also avoid a number of other problematic aspects of these Acts.

8 The Continuing Relevance of the MTA for Marine Dumping Activities

The Marine Legislation Bill[62] provides that the MTA will continue to regulate the dumping of matter in emergencies. The definition of "emergency" requires that there be an unacceptable risk to the marine environment or human health or safety. It is unlikely that CO_2 would need to be intentionally injected into the seabed or dumped into the water column in an emergency, given that it could simply be emitted to the air with no regulatory restrictions. An unintended leak into the water column would not constitute dumping or be subject to a requirement for an emergency dumping permit, because it would not be deliberate.

The Marine Legislation Bill also provides that the MTA will continue to regulate the dumping of matter beyond the extended continental shelf by New Zealand structures or ships.[63] Section 261 of the MTA is amended accordingly. Although section 257A(2)(a) only refers to the dumping of matter into the water column, section 261(1) in fact requires a permit for any dumping from a New Zealand ship or structure into or onto the seabed. Section 262 of the MTA[64] provides that the Director may issue permits authorising the dumping of matter (including ships, aircraft or offshore installations) from a New Zealand ship or aircraft beyond New Zealand's continental waters. The Marine Protection Rules (Part 180 on dumping) are expressly imported into this section, and applications must be determined in accordance with these Rules.

62 Maritime Transport Act, s 262A, as in the Marine Legislation Bill, Sched 3.

63 Maritime Transport Act, 257A(2)(a), as in the Marine Legislation Bill, Sched 3.

64 Marine Legislation Bill, Sched 3.

The injection of CO_2 amounts to dumping into the seabed. In the international seabed area, it is likely that CCS injection is currently prohibited under international law. This is because the International Seabed Authority may lack the practical jurisdiction to process such applications, and because the ongoing presence of injected CO_2 may amount to a state's appropriation of an area of the deep seabed for its own benefit (as discussed in Part 1 of this Appendix). Therefore we recommend that CCS injection be removed from the MTA regime on dumping beyond the extended continental shelf, and that a prohibition be included in a new CCS Act on any injection by New Zealand ships or structures in the international seabed area.

9 Liability for Marine Pollution under the MTA for CCS Injectors

Currently, Part 25 of the MTA imposes civil liability on the owner of a marine structure or person in charge of any marine operation for all pollution damage in continental waters caused by the escape or discharge of a harmful substance, or caused by matter that is dumped.[65] This is potentially relevant to any escape of CO_2 into the water column from an injection installation or a storage formation.

"Pollution damage" is defined widely as including "damage or loss of any kind", and includes loss of profit from the impairment of the environment.[66] A marine "operation" requires that an operation be connected with the exploitation of mineral resources.[67] Therefore liability for CCS operators under Part 25 would be limited to where pollution damage is caused by the release of a harmful substance from a structure, or where pollution damage is caused as a result of matter that has been dumped from a structure. However, as discussed earlier, CO_2 is unlikely to amount to a "harmful substance" as defined in the Marine Protection Rules. A "structure" is defined in section 247 of the MTA as "an offshore installation or a pipeline". An "offshore installation" includes only those installations connected with minerals exploitation and would not include a CCS injection installation.

The proposed Part 26A of the MTA, introduced by clause 62 of the MLB, makes changes to the regime for civil liability in relation to pollution damage from marine structures and operations. Sections 355 to 360 of the existing Part 25, relating to marine structures and operations, are to be repealed. Instead, a new Part 26A will provide for civil liability for these discharges.

Under proposed s385C of the MTA, the owner of a marine structure is to remain liable for all pollution damage in New Zealand or its continental waters or the seabed below them caused by any matter that is dumped from that structure. Liability also extends to any clean-up costs by the Crown, or preventative measures taken by the Crown where there is a grave and imminent threat of such a discharge.[68] The definition of pollution damage remains the same as under the existing Part 25.[69] However, the Marine Legislation Bill does not propose any amendment to the definition of "offshore

65 Maritime Transport Act 1994, s 356.

66 Section 342.

67 Thus where CCS amounts to EOR or EGR, this will be caught by the definition of a marine operation.

68 Maritime Transport Act 1994, ss 385B and 385C(b).

69 Maritime Transport Act, s 385A in the Marine Legislation Bill, cl 62.

installation" or "structure", and an escape of CO_2 from an injection installation would not be caught by the section.

Equally significant is whether a leak from a storage formation, which caused damage, would be subject to the liability regime under Part 26A. A natural geological formation would not fit within the definition of an "offshore installation", which requires there to be an "artificial structure".[70] However, liability extends to all pollution damage caused by "any waste or other matter that is dumped from that… structure".[71] Thus the pollution damage need not be from the structure itself, and it is sufficient that it is caused by the matter that has, at some point, been dumped from a structure. Damage from a discharge from a storage formation would have been caused by the CO_2 that had been dumped from an injection installation. However, this installation would not be a marine "structure" under the Act,[72] Furthermore, such an escape could not amount to pollution damage if injection were removed from the dumping regime of the EEZ Act or RMA (as recommended in Chapters 2 and 9), because the source of the damage would not be matter that had been "dumped".

It would involve relatively simple amendments to the MTA to bring escapes of CO_2 within the regime for liability for pollution damage. If this were done, there would be no cap on the quantum of damages payable for an escape of gas from an installation or formation. The provision of some form of legal recourse for pollution damage is required under Article 235 of UNCLOS. However, escapes of CO_2 that are not likely to cause harm (which is the most likely scenario) would not amount to "pollution" under UNCLOS or require redress. Recourse for escapes that did cause harm could equally be provided under a new CCS Act, or perhaps through existing common law actions. The most significant point, however, is that liability under the MTA is not well suited to the detailed regulation of CCS operations that is required, and should not be used in isolation as a way to regulate the integrity of marine storage formations. Preventing leakage is essential irrespective of whether it causes private damage. Detailed and proactive regulation for leakage needs to be provided for in a new CCS Act.

For completeness, section 356 of the MTA provides that civil liability for pollution damage from matter dumped from a structure is attributed to the owner of that structure. Escapes of CO_2 from an underground formation could foreseeably occur long after the structure that injected it was removed, and it may be possible to transfer ownership of the structure after injection. In the case of CCS, liability might be better imposed on the holder of an injection permit rather than an owner of a structure.

We consider that amendments should still be made to the definition of "structure" in the MTA to include CCS injection installations. This would ensure that any discharges of harmful substances from the installation (such as incidental discharges of oil) are properly subject to Parts 25 or 26A.

70 Maritime Transport Act 1994, s 222.

71 Maritime Transport Act, s 385C, in the Marine Legislation Bill, cl 62.

72 Marine Legislation Bill, cl 62.

10 The Impact of the Continental Shelf Act 1964 on Marine CCS Injection

Section 4 of the CSA imports the permitting regime of section 25 of the CMA[73] for petroleum mining. Recent amendments[74] have also brought the CMA regime into force for the mining of other minerals under the CSA.[75] The impact of the CMA regime on CCS is discussed in Chapter 2, and the conclusions reached there will apply equally under the CSA.

The EEZ Act also consequentially amends the CSA. These changes are relatively minor, and leave the core elements of the CSA regime intact. Section 171 of the EEZ Act repealed six subsections of section 8 of the CSA, concerning the matters for which regulations can be made under the CSA. This is a result of these matters now being governed by regulations under the EEZ Act. The matters include:

(1) the regulation of installations related to the exploitation of resources;[76]

(2) measures that can be taken in safety zones for the protection of the natural environment from harmful agents;[77] and

(3) restricting exploration where it could cause unjustifiable interference with other uses.[78]

Although prima facie the CSA may appear relevant to CCS,[79] the Act does not provide an adequate basis for regulatory jurisdiction over the activity. The broad limitations of the Act are the same as under the CMA: it relates almost exclusively to minerals and to extractive activities, and has a limited purpose.

However, the CSA does provide a basis for the extraterritorial application of general New Zealand civil and criminal law to CCS installation in/on the EEZ/continental shelf. Under section 7 an installation must be constructed in connection with the exploitation of the natural resources of the continental shelf for jurisdiction to apply. This seems to be adequate to include the exploitation of geological storage capacity/pore space as "natural resources".

Aspects of the CSA are also wider than its restrictive provisions. Section 3 of the Act vests all rights of exploration and exploitation of the natural resources of the continental shelf in the Crown.[80] Furthermore, regulations can still be made under section 8 of the CSA for the establishment of safety zones around installations and devices associated with the exploitation of any natural resources of the continental shelf (including under the territorial sea), and for restricting the entry of ships into these zones. An injection platform for CCS likely falls within the terms "installation" or "device" under

73 Except for references to section 10 of the Crown Minerals Act 1991, because the Crown does not "own" minerals in the continental shelf.

74 Continental Shelf Amendment Act 2013.

75 Continental Shelf Act 1964, s 5AA. This is subject to certain transitional arrangements.

76 Continental Shelf Act 1964, ss 8(a), (b), (g) and (i) (repealed).

77 Section 8(f) (repealed).

78 Section 8(j) (repealed).

79 Since the petroleum industry uses similar infrastructure, and similar exploration activities are needed.

80 The Crown does not "own" resources in the continental shelf beyond territorial waters (in contrast to the CMA), because it only has sovereign rights to them under UNCLOS.

the Act, although a storage formation would not. Thus safety zones could not be created to exclude ships from navigating above formations.[81] For completeness, regulations made under section 8(h) of the CSA, concerning the placement of warning markers to show the location of installations and devices, could also apply to CCS operations.

Section 5A of the CSA provides for payments to be made for the exploitation of the extended continental shelf, which implements New Zealand's obligations under Article 82 UNCLOS to make payments to the ISBA. Although the section itself applies to the exploitation of the non-living resources of the extended continental shelf,[82] in effect it only applies to licenses granted under section 4[83] for petroleum, and section 5AA for other minerals. However, the obligation for payment to the ISBA under UNCLOS is wider, requiring that payment be made for the exploitation of all natural resources of the extended continental shelf. The calculation of such a payment or whether it is in fact required appears uncertain at an international law level. However, in practice this is not likely to be an issue, because CCS on the extended continental shelf appears unlikely in the foreseeable future.

11 Resource Consents Required under the Resource Management Act 1991

A coastal permit under section 12 of the Act is required for any disturbance of the seabed likely to have an adverse effect, the erection of structures, the deposit of any substance into the seabed likely to have an adverse effect, or an occupation of any part of the area, unless expressly allowed by a national environmental standard (NES), or rule in both a regional coastal plan and proposed regional coastal plan. Under section 12(3), no person may carry out any activity in the coastal marine area or in relation to any of its natural and physical resources that contravenes an NES or rule in coastal plan, unless consent is first obtained.[84] The above restrictions would apply to the construction of CCS injection platforms, the occupation of the area required for injection or storage, and the drilling of wells. However, section 12(6) states that section 12 restrictions do not apply to anything to which section 15A or section 15B apply. Similarly, the restriction in section 15, on discharges generally, does not apply to anything to which sections 15A or 15B apply.

Section 15A is reflective of the dumping provisions in the EEZ Act, and provides that no person may dump any matter in the coastal marine area from an offshore installation unless allowed by a resource consent (a coastal permit). In line with the approach in the LDP, such dumping must not be classified as a permitted activity.[85]

An "offshore installation" is defined in the Act with reference to the definition in section 222(1) of the MTA, which requires that an installation be for the purposes of exploring for, exploiting or processing

81 To the extent this was not within the safety zone around an installation.

82 Continental Shelf Act 1964, 5A(1).

83 Which is, effectively, section 25 of the Crown Minerals Act 1991.

84 Or the activity meets the requirements of an existing lawful activity.

85 Section 15A expressly requires a grant of resource consent.

minerals.[86] This would have the effect of excluding CCS from the restrictions on dumping in the RMA and, inconsistent with the LDP, would give regional councils the ability to list CCS as a permitted activity in a regional coastal plan.[87] Similarly, under section 15B, a CCS project would not currently require a consent (for discharge of contaminants from installations), nor would it require consent under section 15C (dumping or storage of hazardous and noxious substances from installations). The result of this is that CCS injection in the coastal marine area would instead require consent under section 15 of the RMA (discharges generally).

We consider that it is artificial and against the intent of the Act for the RMA to distinguish between CCS installations and mineral installations for the purposes of its general regimes on discharges and dumping. In particular, the fact that an installation is used for a non-mineral purpose should not serve to allow the dumping of matter or the storage of radioactive or hazardous waste, which would otherwise be restricted or prohibited (as required by international law, and as provided for in section 15C and in regulations relating to dumping under section 15A). Section 15 alone would not impose the restrictions on CCS required by the LDP. As such, we recommend in Chapter 9 that the definition of an "offshore installation" in section 222(1) of the MTA be amended to include all man-made structures in the coastal marine area. The revised definition would automatically be imported into the RMA, and no amendment would be required to the definition in section 2 of the Act.

"Dumping" is defined broadly in section 2 of the Act as the "deliberate disposal" of waste or other matter. Assuming that an offshore installation is amended to include an injection platform, a coastal permit under section 15A will be required for CCS injection. One complicating factor is that section 15A(3) effectively provides that section 15B is the applicable section where dumping amounts to a "discharge" governed by that section. It is uncertain whether the intention in section 15A(3) is to refer to all discharges under section 15B, or only the discharge of harmful substances (and not contaminants in general).

Section 15B provides that no person may discharge a contaminant from an offshore installation into water, land or air in the coastal marine area unless it is a permitted activity in the relevant region, authorised by regulations or a resource consent, or meets certain criteria when discharged to air or water (unless prohibited by regulations or a rule). Although the heading of section 15B refers only to the discharge of harmful substances, the section itself applies to the discharge of all contaminants.[88] The result is that the exception to dumping in section 15A (relating to discharges) may be wider than the general rule on dumping, if section 15A(3) were read as referring to the discharge of any contaminant that would contravene section 15B. This issue arises equally in the context of the Resource Management (Marine Pollution) Regulations 1998, where its broad prohibition on dumping (with only limited specific exceptions) does not apply to any discharge governed by section 15B.

In practice, given that CCS injection meets the definition of dumping, section 15B would not likely be read as imposing further restrictions. The prohibition under section 15A on classifying CCS injection in a regional plan as a permitted activity reflects New Zealand's international obligations under the

86 Resource Management Act 1991, s 2.

87 The effect of this would be that, technically, none of sections 15A, B or C would apply to CCS, since all apply to "offshore installations". Section 15 would be triggered instead.

88 In this sense section 15B of the RMA is more restrictive than its equivalent provisions in the EEZ Act, the latter of which applies only to the discharge of "harmful" substances.

LDP, whereas the less restrictive approach in section 15B would not. In the case of ambiguity the Courts would favour an interpretation consistent with international law.[89] Nevertheless, the potential breadth of the exception to dumping in section 15A(3) may mean that the appropriate permit for CCS would not be immediately apparent to a prospective applicant.

Section 15C of the RMA also imposes a narrow prohibition on the storage of hazardous and toxic waste in or on land or in water. Toxic and hazardous waste is defined in section 15C(2) through reference to the definition in regulations. Such regulations are most likely the Hazardous Substances (Minimum Degrees of Hazard) Regulations 2001. To be classed as a hazardous substance, a substance must have the minimum degree of hazard in one of Schedules 1 to 6. Given that section 15C refers to hazardous *and* toxic substances, the relevant schedules are likely either Schedule 4 (hazardous substances with toxic properties) or Schedule 6 (hazardous substances with ecotoxic properties). Carbon dioxide would not meet the minimum degrees of hazard in these schedules.

A related issue is the extent to which the RMA regulates the leakage of CO_2 from an offshore storage formation out of the seabed into the water column, during or after injection.[90] Here, section 15 might apply and require consent to be obtained, because the discharge would not be from an offshore installation or ship, and therefore sections 15A and 15B would not apply.

For completeness, the general duty in section 17 of the RMA to avoid, remedy or mitigate any adverse effects on the environment from an activity would also apply to CCS operations. Furthermore, ancillary discharges from CCS installations will require consent under section 15B. Certain kinds of ancillary discharges, which are dealt with in the Marine Pollution Regulations, will be subject only to the regulations rather than the provisions of the relevant regional plan (unless provided otherwise in the Regulations).[91] These include oil (more specifically, those substances listed in Schedule 1 of the Regulations), noxious liquid substances (those substances listed in Schedule 2 of the Regulations), grade A and B treated sewage, garbage, and ballast water, along with discharges "made as part of normal operations of ship or offshore installation" (as described in Schedule 4 of the Regulations).

12 The Effect of the Resource Management (Marine Pollution) Regulations 1998

The effect of clause 4 of the Resource Management (Marine Pollution) Regulations is that "dumping" of CO_2 from a ship or offshore installation in the coastal marine area cannot be classed as a discretionary activity in a regional coastal plan, or proposed regional coastal plan.[92] Section 360(ha) of the RMA empowers these regulations to deem any activities to which section 15A of the Act applies (dumping) to be prohibited activities. This prohibition is then deemed to be included in all regional coastal plans, with the result that a person cannot apply for resource consent for that activity.

89 *Police v Teddy* [2013] NZHC 432, [2013] NZAR 299.

90 This is discussed in full in Appendix F, Part 15.

91 Marine Pollution Regulations, reg 16; Resource Management Act 1991, s 15B(3); *Wood v West Coast RC* [2000] NZRMA 193 (EnvC).

92 Because it takes the approach (as in the LDP) that only the listed substances can be authorised for dumping.

CCS therefore appears to be prohibited in the coastal marine area, assuming that the definition of an offshore installation were expanded to include an injection installation (as discussed in Part 11 of this Appendix).

However, there are exceptions to this prohibition. If the matter to be dumped is directly from or related to the exploration, exploitation, or offshore processing of seabed mineral resources then the prohibition does not apply.[93] As discussed earlier in Part 11 of this Appendix, this exception is unlikely to apply to CCS unless it amounted to EOR/EGR or the injection of CO_2 stripped from offshore natural gas resources and processed offshore.

Confusingly, the prohibition on dumping in the Regulations also expressly does not apply to a discharge made in accordance with section 15B of the RMA.[94] This is the opposite approach to that taken in the EEZ Act (in which anything that amounts to the more specific concept of "dumping" is excluded from the wider concept of a "discharge"). In relation to discharges, the Marine Pollution Regulations only impose specific restrictions on certain discharges (which do not include CO_2), and no blanket prohibitions. The characterisation of CCS as either "dumping" or a "discharge of a contaminant" is thus practically very important under the Regulations. If it is treated as dumping, it is prohibited in all regions (again, assuming that the definition of an offshore installation is extended). Under section 104(3)(c)(iii), resource consent cannot be granted to an activity contrary to regulations. In contrast, if injection is treated as a discharge, it will not be prohibited unless an NES or rule in a regional plan deems it to be prohibited. Under the LDP, New Zealand is required to prohibit CCS to the extent that it does not meet the requirements set out in Annex 1. If treated as a discharge, CCS injection would also be able to be classed as a permitted activity, which would be inconsistent with New Zealand's international obligations under the LDP.[95]

Ultimately, CCS is more likely to fall within the definition of "dumping" under the RMA, a conclusion which would be in line with the approach in the EEZ Act and the LDP. It is therefore hard to escape the conclusion that marine CCS injection would be prohibited under the Marine Pollution Regulations where it occurred within the coastal marine area if the definition of an offshore installation were expanded to include CCS installations. However, this does not detract from our ultimate conclusion that, although CCS would currently amount to "dumping", this is still not an appropriate characterisation of the activity for New Zealand's domestic law.

13 Policy Guidance for Marine CCS under the New Zealand Coastal Policy Statement 2010

The New Zealand Coastal Policy Statement 2010 (NZCPS) is a national level document that provides policy guidance relevant to consent decisions on marine CCS injection. Regional policy statements

93 Resource Management (Marine Protection) Regulations 1998, reg 4 (3).

94 Resource Management (Marine Protection) Regulations 1998, reg 4 (3).

95 New Zealand is not under an international obligation to treat CCS injection as "dumping" under domestic law, but it is under an obligation to impose the requirements of the LDP irrespective of whether CCS is deemed to be "dumping". For example, New Zealand could legitimately treat CCS as a "discharge" under the RMA, but would still be obliged to prohibit such a discharge to the extent it did not meet the requirements of Annex 1.

and plans are required to give effect to the NZCPS.[96] Therefore the provisions of the NZCPS impact on consent decisions in two ways: they can determine the policy direction of lower level policy documents, and itself be a matter to which regard must be had directly under section 104. In addition, if an activity is specified as a restricted coastal activity in a regional plan, the application is decided by the Minister of Conservation rather than a regional council.[97]

Importantly, and consistent with section 3(b) of the Resource Management (Energy and Climate Change) Amendment Act 2004, the objectives and policies in the NZCPS do not include a focus on mitigating the causes of climate change. Objective 5 provides only for adaptation to effects of climate change. The remainder of the objectives in the NZCPS focus on the protection of the coastal environment and its ecosystems, natural character, the principles of the Treaty of Waitangi, the importance of public space and access, and the importance of the use and development of the coastal environment to enable people to provide for their wellbeing. Most of these objectives appear to tend against the granting of consent for CCS injection into the coastal marine area.

Although arguments are inevitable over the extent of the adverse effects of CCS on the environment, it clearly represents a potential threat, rather than a benefit, to the local natural environment, ecosystems, and natural seascapes around an injection site or pipeline route. Similarly, the visible presence of injection platforms could be considered to affect adversely the natural character of the coast, and Māori may view the injection of gas as pollution or poison. CCS injection would also limit the space available to the public to access and enjoy the coastal marine area,[98] especially if safety zones were set up around installations under the CSA.[99] Even Objective 6 of the NZCPS, concerning the value of use and development, contains strong protective elements. Furthermore, this Objective and Policy 6 contain a focus on the value of renewable energy resources in the coastal marine area. In the future, CCS injection may facilitate the development of non-renewable, emissions intensive energy resources that would otherwise not be financially viable under the ETS, and adversely affect the relative viability of renewable energy sources.

Objective 6 does recognise that appropriate development has value, that some uses are important for the wellbeing of people and communities, and that some uses can only be located in the coastal marine area. However, Policy 6 only specifically recognises the importance of mineral extraction, the supply and transport of energy and the provision of infrastructure. On balance, the NZCPS seems to lead to a more protection focused approach in the coastal marine area than in a terrestrial context and (depending on the specific context) seems more likely to discourage the granting of consent for CCS injection.

Policy 6(2)(d) of the NZCPS provides that where there is no functional need for an activity to be located in the coastal marine area, it should not generally be located there. CCS injection is capable of occurring under land, and arguably under the NZCPS there is no functional need for marine CCS injection if land based formations are available. We recommend that injection be removed from the RMA regime, and that an NPS be developed on CCS (and/or the NZCPS amended) to provide positive

96 Resource Management Act 1991, ss 62 and 67.

97 Policy 29 of the NZCPS states that no activities are currently required to be specified as a restricted coastal activity in regional coastal plans, and that any activity specified as such is deemed to be a discretionary or non-complying activity.

98 Policy 6(2)(b) of the NZCPS also focuses on the value of this.

99 The power to impose such zones under the CSA does not appear to be limited to the EEZ.

policy direction on those aspects of CCS remaining under the RMA (such as coastal occupation, the erection of structures, the disturbance of the seabed, and incidental activities).

For completeness, Objective 7 of the NZCPS provides that New Zealand should recognise and comply with its international obligations. This obviously includes compliance with the LDP. However, this objective is at best neutral in the context of marine CCS, because the LDP does not actually require New Zealand to enable CCS. In fact, the LDP expressly states that its provisions do not prevent States prohibiting the dumping of matter contained in Annex 1.[100]

14 Coastal Occupation under the RMA

Part 7A of the RMA provides that regional councils can manage the occupation of the coastal marine area on a proactive basis by including rules in a regional coastal plan. Such rules can provide for the staged release of areas for development, that applications to occupy the same space or proximate spaces can be heard together,[101] and for the allocation of space based on competitive tender.[102] The Act provides for tenders for authorisations, being exclusive rights to apply for a coastal permit to occupy. Offers for authorisations (including via tender) can provide that an annual rental is to be paid under a coastal permit to occupy. Although this method of allocation was designed for aquaculture purposes and is not in widespread use (the default rule remaining the "first in, first served" rule), it poses potential problems for CCS if it were to become more widespread. Tendering for authorisations to occupy for CCS projects would be inappropriate. Due to the competitive nature of a purely financial tendering process, early applicants for CCS in the marine and coastal area could be disadvantaged,[103] given that the most efficient or profitable use of the seabed where suitable formations were located may be the mining of petroleum or other activities.[104]

However, we consider that (as on land), the RMA is the appropriate place for CCS coastal occupation rights (of the surface of the seabed) to be regulated. We recommend that RMA requirements for a coastal permit for occupation of coastal space on the surface of the seabed apply to CCS operations (including exploration), subject to restrictions in an NES to prevent a CCS application from being classified in a regional plan as non-complying or prohibited; and to ensure that they are evaluated on a first-in-first-served basis rather than any other allocation method. Call in procedures should also be used to enable this aspect of a CCS project to be considered by a board of inquiry at the same time as others.

Existing coastal permits granting rights to occupy the surface of the seabed should not be allowed to present absolute obstacles to CCS projects, in much the same way as powers of compulsory acquisition on land provide network utility operators with a means to overcome landowner

100 London Dumping Protocol, Art 4(2).

101 Resource Management Act 1991, s 165F.

102 Resource Management Act 1991, s 165G. Other allocation methods are possible, subject to the approval of the Minister of Conservation.

103 Depending on the costs involved in deploying CCS technology and the price of emissions at the time.

104 Although Part 7A would allow for the development of a weighted attributes tendering process, where non-financial characteristics could be taken into account. Whether the concept of the "public interest" could defensibly be included in such a process is uncertain, and could be subject to legal challenge.

opposition. A ministerial power to compel the surrender of occupation rights could be inserted into the CCS Act, along with provision for appropriate procedures and compensation modelled on the RMA's compulsory acquisition provisions.

There may also be some uncertainty as to whether authorisations to occupy can relate to the subsurface only. If the ongoing presence of stored CO_2 in the subsurface could be considered to amount to "occupation", an injector would require a permit in perpetuity This could be potentially significant, as the area required for storage of injected gas is much larger than the surface area required for injection, and a storage formation could extend below an area over which a separate exclusive occupation right had been granted. Depending on the nature of the neighbouring activity, allowing the "occupation" of the subsurface could amount to a derogation from an existing grant to occupy the surface above a formation. An addition, Councils would need to take care to issue subsequent seabed occupation permits, where they involved an activity above a storage formation, subject to conditions enabling adequate access to the sub seabed-formation for monitoring and remedial works.

To resolve these issues, we recommend that the use or occupation of the subsurface of the coastal marine area for CCS purposes, including storage formations and pore space, be removed from control under the RMA, chiefly section 12(2), in the same manner as it is removed from control by land owners on shore. A coastal permit under section 12 should not be required for the initial or ongoing occupation of the subsurface by injected CO_2, but should still be required for the occupation of the surface of the coastal marine area (for example, for the footprint of the injection site and for the pipeline route). We recommend an amendment to section 12 of the RMA, to clarify that the presence of injected CO_2 under the seabed for the purposes of CCS does not amount to a coastal occupation for the purposes of the Act or require consent by virtue of section 12.

15 The Regulation of a Post-Injection Discharge under the RMA

Because an escape of gas from a sub-seabed storage formation would not be deliberate, it would not be classed as dumping or be in breach of section 15A of the RMA. Given that section 15B requires a discharge of a contaminant to be from a ship or an offshore installation, this section would also not be infringed by the escape of CO_2 from the seabed, unless the definition of an offshore installation were artificially extended by amendment to include a storage formation. The escape of gas from a storage formation would, however, constitute a discharge of a contaminant to water and thus be caught by section 15 of the Act.[105] An injector would likely have the requisite awareness and control over the stored gas to establish causation under the Act for leakage.[106]

105 Resource Management Act 1991, s 15(1)(a).

106 *McKnight v NZ Biogas Industries Ltd* [1994] 2 NZLR 664, at p 14. This case held that it is sufficient, in order to establish a causal connection between the person and the discharge, for the person to have awareness of facts from which a reasonable person would recognise that escape could occur. The Court of Appeal stated at page 8 of its judgment that the section encompasses the consequence of activities carried out by a person.

The restriction in section 15 does not apply if a discharge is expressly allowed by an NES, regulation, rule, or resource consent. No current NES applies to the discharge of a contaminant to the water column, nor do the Marine Pollution Regulations restrict the discharge of CO_2 from the seabed. There is the potential for the leakage of CO_2 from the seabed to be deemed a permitted activity under a rule in a regional coastal plan, given that the effects of such a leak may not give rise to any of the effects in the receiving water listed in section 70 subsections (c) to (g). Given that regional councils, when making rules, cannot consider the effects on climate change of the discharge to air of greenhouse gases,[107] there may be little environmental justification for regional councils imposing an activity status other than permitted.

In light of the purpose of CCS, it would also seem unlikely that a resource consent for injection would ever expressly allow leakage from a storage formation. However, if a consent authority could not consider the effects of such an escape on climate change, and the leakage had no other adverse environmental effects, it is questionable whether a condition could be imposed requiring that no escape occur. Conditions must reasonably relate to the effects of the activity consented.[108] It would appear to be consistent with the purpose of the 2004 amendments to the RMA that conditions must also reasonably relate only to effects that are able to be lawfully considered by a consent authority.

It is clearly desirable to provide for regulatory control over escapes of CO_2 from a formation. There are a number of justifications for this: the substantial interest the public would have in retaining the gas underground, regulators' responsibility to ensure that suitable formations are used as efficiently and effectively as possible, and the Crown's interest in the proper maintenance of formations given (potentially) its eventual assumption of responsibilities and liabilities.[109]

The above issues could be resolved through the use of an NES, which would be able to provide that the effects on climate change of a discharge from a sub-seabed storage formation to the water column is able to be considered in making regional rules.[110] However, we consider that a more targeted approach would be a better option. We recommend that post-injection leakages from a formation be subject to detailed regulation under a new CCS Act, and removed from the scope of the RMA.

16 The Marine and Coastal Area (Takutai Moana) Act 2011

The effect of the Marine and Coastal Area (Takutai Moana) Act 2011 (MCAA) was to repeal the Foreshore and Seabed Act 2004 (FSA), which had vested the foreshore and seabed in the Crown. The MCAA reclassifies the legal status of the foreshore and seabed as a "common coastal and marine area",[111] thereby removing property rights and guaranteeing public access.[112] It also revives Māori

107 Discussed in Chapter 2.

108 *Sampson v Waikato Regional Council* EnvC A178/02, 2 September 2002.

109 See Chapter 10 for a discussion of liability.

110 Resource Management Act 1991, ss 70B and s104F.

111 The common coastal and marine area is identical to the coastal marine area under the RMA, except for the exclusion of privately owned and certain Crown owned land (Marine and Coastal Area (Takutai Moana) Act 2011, s 9).

112 Including navigation under section 27 and recreational access under section 26.

customary interests that had been extinguished by the FSA, although these are now recognised and regulated according to statutory criteria.[113]

Māori can apply for recognition of customary marine title (CMT) and protected customary rights (PCR). These are interests granted under the statute and not proprietary title.[114] The recognition of a CMT requires there to have been exclusive use and occupation from 1840 without substantial interruption.[115]

A recognised PCR removes the need to obtain resource consent under RMA for the recognised activity. Because a PCR is not subject to the restrictions in sections 12 to 17 of the RMA,[116] an NES would also have no effect on it.

A CMT does not remove the need to obtain a resource consent under the RMA to undertake an activity that is not permitted. Subject to the sustainable management purpose of the RMA, a regional council must recognise and provide for the matters contained in a planning document prepared by a CMT group for the CMT area. However, the primary significance of a CMT is that an applicant for a coastal permit to conduct an activity within a CMT area will generally require an RMA permission right from the holder of the CMT. This permission right is discretionary, subject to no statutory guidance (including any NES or NPS), and not subject to appeal or objection.[117]

Section 26(1) of the MCAA prevents a CMT group from charging for access or for recreational activities within a CMT, but does not appear to prevent a CMT group from charging for the exercise of a permission right in relation to an activity for which resource consent is required. Given that Māori may see CCS as pollution, there is a risk that such permission may be refused irrespective of any NES or NPS that is developed on CCS. Such broad discretion has the potential to provide investment uncertainty to CCS proponents if suitable formations were located beneath an area subject to a CMT, especially if permission rights were subject to discretionary fees.

An important exception is that an activity can occur without an RMA permission right if it amounts to an accommodated activity under section 64. However, at present CCS does not amount to such an activity.

Given that an RMA permission right applies only to activities carried out under a resource consent,[118] deeming CCS to be a permitted activity in a regional coastal plan would avoid the need for such permission. However, such a rule would be unlikely to be possible given the weight that has to be given to a planning document prepared by the CMT group. Furthermore, this option would mean detailed conditions would not be able to be imposed on a particular CCS project under a resource consent, and it would breach the requirement in the

RMA and the LDP that dumping not be classified as a permitted activity.

113 Marine and Coastal Area (Takutai Moana) Act 2011, ss 6, 11.

114 Section 54.

115 Section 58.

116 Section 52.

117 Section 68.

118 Marine and Coastal Area (Takutai Moana) Act 2011, s 66.

An alternative option would be the inclusion of CCS activities in the list of accommodated activities, by inclusion in the list of "deemed accommodated activities".[119] This could be achieved by enabling CCS operators to apply to become network utility operators, by expanding the list in section 166 of the RMA.[120] The construction of CCS infrastructure would still be required to be either approved by the relevant CMT group or classified by the Minister in accordance with the requirements in Part 1 of Schedule 2 of the Act.[121] The CMT order would also remain a relevant consideration under an application for resource consent for CCS.[122]

Furthermore, to qualify as a deemed accommodated activity, CCS infrastructure would have to be unable to operate in any other location, and be essential for the social or economic well-being of the nation or region in question. These requirements may still provide a barrier to CCS in a CMT area. No reference is made in the Act to infrastructure being "essential" for environmental reasons, let alone *global* environmental reasons. Even if there were such a reference, it would be difficult to establish that any given CCS operation would be "essential" in mitigating or even have a significant effect on *global* climate change.

The recommended option is that injection and the management of storage formations be removed from the scope of the RMA. This would remove the need to obtain an RMA permission right for injection, because such permission is required only in relation to those activities requiring consent under the RMA. For clarity, storage formations could also be expressly vested in the Crown, or removed from the CMT regime, by an express statutory provision.[123] We recommend that the use of the subsurface of land for CCS injection and storage purposes under either a protected customary right area or a customary title area be vested in the Crown, as are such rights elsewhere. Options are available, however. Such a vesting could apply to protected customary right areas only, if the size and number of customary title areas is unlikely to interfere with foreseeable CCS operations, with the possibility of obtaining accommodated activity rights instead.

The need for CMT holder permission would remain for CCS activities that remained under the RMA regime (for example, the construction of installations). To address this issue, CCS operators should be classed as network utility operators under the RMA, which would be one step to these activities being "deemed accommodated activities". However, providing for these activities as deemed accommodated activities may not in practice be necessary unless CMT areas expanded into areas where CCS could realistically occur, or it was seen that RMA permission rights were being exercised in a manner that unduly hampered the development of the technology.

119 Section 64(2)(h) provides that deemed accommodated activities under section 65 amount to accommodated activities.

120 Which would also enable, in a terrestrial context, the compulsory acquisition of land for injection.

121 This involves the provision of certain information in an application to the Minister, and a discretionary decision by the Minister as to whether RMA permission rights should be waived. It also requires, among other requirements, that the activity become a deemed accommodated activity before consent is applied for under the RMA.

122 Marine and Coastal Area (Takutai Moana) Act 2011, Sched 2, Part 1, cl 10(d).

123 Similar to the manner in which certain Crown owned minerals are excluded from CMT management under section 83(2).

For completeness, status as an accommodated activity only negates the need to obtain an RMA permission right, and does not affect the exercise of the right to protect wahi tapu under a CMT.[124] If a wahi tapu protection right is recognised in a CMT, this may restrict access to a formation to the extent recognised in that right, with only limited exceptions for fisheries.[125]

17 Legislation Applicable to the EEZ and Coastal Marine Area

The Building Act 2004 requires approval for the construction, alteration, demolition and removal of buildings, under section 40 of the Act. It is unlikely that the Act will apply to any activity involved in marine CCS injection. "Building" is defined as expressly excluding any vessel or boat, and construction standards applicable to ships are governed under the MTA. Similarly, any "offshore installation" used for petroleum mining, as defined in the MTA, is excluded from the definition of a building.[126] As has been discussed earlier in this Appendix, an injection platform for CCS does not at present amount to an offshore installation under the MTA, nor will it generally be used for petroleum mining (although in some cases it might). Thus, technically, CCS injection platforms would amount to "buildings". However, the Building Act does not appear to apply outside the coastal marine area. There is a general presumption against the extraterritorial application of legislation unless the purpose of a statute suggests this interpretation is intended,[127] and the bodies responsible for granting building consent under the Building Act are territorial authorities and regional councils (which possess no jurisdiction in the EEZ).[128]

The broad intent of section 9 of the Building Act suggests that such structures should not be regulated under that Act, given the similarities between CCS platforms and offshore petroleum installations. The construction of offshore installations for petroleum are currently regulated under the Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013, which provide for certificates of fitness and inspections in Part 5.

As discussed in Chapter 6, the Regulations do not currently apply to CCS, given that CCS does not relate to petroleum operations. However, the Regulations appear to be broadly appropriate for regulating the construction and operation of offshore CCS injection installations in both the coastal marine area and EEZ,[129] although express reference to CCS specific standards could be usefully incorporated in the certificate of fitness process. We recommend that these regulations be amended to govern CCS installations, and provide for CCS specific design and construction requirements. The HSEA should also be amended to clarify that the Act and regulations apply to CCS installations in the EEZ and over the extended continental shelf. At present this jurisdiction is unclear.

124 Marine and Coastal Area (Takutai Moana) Act 2011, s 64(1)(c).

125 Sections 78, 79.

126 Building Act 2004, s 9(f).

127 *Police v Teddy* [2013] NZHC 432, [2013] NZAR 299 at [5], [15].

128 Building Act 2004, ss 12 and 13.

129 Under regulation 3, an "offshore" installation means an installation "anywhere that is the seaward side of the mean high-water mark".

18 Civil Liability for Marine Pollution resulting from the Escape of CO_2 from a Submarine CCS Pipeline

Currently, Part 25 of the MTA imposes civil liability on the owner of a marine structure or person in charge of any marine operation for pollution damage in continental waters caused by the escape or discharge of a harmful substance, or caused by matter that is dumped. Given that the escape of gas from a pipeline does not amount to dumping (or damage from matter that has been dumped), and a marine "operation" requires that an operation be connected with the exploitation of mineral resources,[130] liability for pipelines under Part 25 is currently limited to where damage is caused by the release of a harmful substance from a structure. A "structure" is defined as expressly including a pipeline.[131] "Pollution damage" is defined widely as including "damage or loss of any kind", and including losses of profit from the impairment of the environment.[132] However, CO_2 is unlikely to amount to a "harmful substance" as defined in the Marine Protection Rules. If CO_2 did amount to a harmful substance and a leak occurred from a pipeline into the water column, the liability of a person in charge of the operation would not currently be capped (as it would in the case of marine pollution from ships).[133]

Proposed Part 26A, introduced by clause 62 of the MLB, is set to make changes to the regime for civil liability in relation to pollution damage from marine structures and operations, but no changes in relation to ships. Sections 355 to 360 of the existing Part 25, relating to marine structures and operations, are repealed. Instead, a new Part 26A will provide for liability in relation to pollution damage from marine structures and operations.

Under proposed section 385C of the MTA, the owner of a marine structure (which would continue to be defined broadly enough to include a pipeline) or the person in charge of a marine operation (which would not include any operation in connection with CCS except to the extent this also amounted to EOR/EGR),[134] would be liable in damages for pollution damage caused by a harmful substance discharged from that structure or operation, or by any matter dumped from that structure or operation. Liability would also extend to any cleanup costs by the Crown, or preventative measures taken by the Crown where there were a grave and imminent threat of such a discharge.[135] The wide definition of pollution damage would remain the same as under the existing Part 25.[136]

Therefore, as under Part 25, a CCS pipeline under Part 26A would amount to a "structure", and a leak that caused damage to the marine environment could amount to "pollution damage". However, as in Part 25, a release of CO_2 would not amount to the release of a "harmful substance" as defined in the Marine Protection Rules, and thus proposed section 385C would not impose civil liability in relation to a discharge from a pipeline.

130 Thus where CCS amounts to EOR or EGR, this will be caught by the definition of a marine operation.

131 Maritime Transport Act 1994, s 247.

132 Section 342.

133 There is no equivalent of section 347 (regarding limitation of liability for ships) in Part 25 of the MTA for marine pollution caused by structures.

134 Because "marine operation" as defined in section 222 of the MTA requires an operation to be "for, or connected with, the exploration for, or the exploitation or associated processing of, any mineral in the sea or the seabed".

135 Maritime Transport Act 1994, ss 385B and 385C(b).

136 Maritime Transport Act, s 385A, in the Marine Legislation Bill, cl 62.

As discussed in the context of installations and formations, an option would be to classify CO_2 as a harmful substance for the purposes of Parts 25 and 26A of the MTA, and thus make a pipeline owner subject to liability for any escape of CO_2 that caused pollution damage. We consider that there is not a strong case for doing so, given that more than minor adverse effects on the environment seem unlikely and due to the risk of disincentivising CCS. A lack of liability under section 385C would not restrict the ability of a person to take other forms of civil action for any private loss that did occur from an escape of CO_2,[137] thus not infringing the requirement in Article 235 of UNCLOS that states provide some form of legal recourse for pollution damage. If CO_2 is classified as a harmful substance under the MTA, it should be done for the purposes of Parts 25 and 26A only, and not for the wider purposes of the Act; that would cause an overlap of jurisdiction by enabling MNZ to take action in relation to hazardous pipelines under Part 20 of the MTA.

We consider that liability for damage is an inadequate basis on which to regulate marine CCS pipelines. As discussed in Chapter 9, regulation would better achieved under health and safety regulation, the RMA, and CCS specific legislation.

19 The Impact of Part 20 of the MTA

Part 20 of the MTA outlines the powers of the Director of Maritime New Zealand in relation to hazardous structures, offshore operations and ships. Part 20 therefore potentially impacts on CCS injection and pipeline transport in terms of hazardous structures.

In the context of the injection phase of CCS, Part 20 of the MTA has twofold significance: in relation to injection installations, and in relation to the discharge of CO_2 from a storage formation. Part 20 has no general restrictive sections, but rather provides broad powers to the Director under section 249 to take measures to address hazardous structures and operations. Effectively, Part 19 establishes duties and liabilities for those conducting activities involving discharges of harmful substances, whereas Part 20 allows wide measures to be taken to pre-empt, prevent and address such discharges. These Part 20 powers are not proposed to be transferred to the EEZ Act regime under the MLB, even though they involve discharges.[138]

A hazardous structure includes a hazardous installation and a hazardous pipeline. A hazardous installation is defined as "an offshore installation in New Zealand continental waters that is discharging, or is likely to discharge a harmful substance into New Zealand continental waters or the seabed below them", and a hazardous marine operation has an equivalent definition.[139] Part 20 will not apply to injection if CCS is classed as "dumping" rather than a discharge.[140] Nor will it apply if CO_2 is not a "harmful substance". It will also not apply to escapes of gas from an injection installation or storage formation, because neither is an "offshore installation" (an offshore installation is defined only as those relating to petroleum operations).

137 A restriction on taking other forms of civil action applies only to ships (Maritime Transport Act 1994, s 352).

138 Maritime Transport Act, s 467A, in the Marine Legislation Bill, Sched 3.

139 Maritime Transport Act 1994, s 247.

140 Because the definition of "discharge" excludes anything that amounts to "dumping".

The definition of a pipeline in the MTA would include a CCS pipeline, but a "hazardous" pipeline requires that a pipeline be likely to discharge a harmful substance, which CO_2 is not.

The Director's powers to take action under section 249 are not limited to where discharges are likely to occur from an offshore installation, but apply to all "operations". However, a "marine operation" is defined in section 222 as being connected with the exploitation only of minerals.

It is also unlikely that the Director would currently have the legal power to take measures in relation to CCS injection or CCS pipelines under section 250 of the MTA. This section imposes additional matters required for action to be taken under section 249, and provides (emphases added):

> The Director shall not issue any instructions, or take any measures, under section 248 or section 249 unless the issue of such instructions, or the taking of such measures, appears necessary to the Director **to avoid, reduce, or remedy pollution**, or a **significant risk** of pollution, by a harmful substance that is causing, will cause, or will be likely to cause **serious harmful consequences to the marine environment or marine interests**.

Injection is unlikely to amount to "pollution", or meet the high threshold of being likely to cause "serious harmful consequences to the marine environment".

An escape of CO_2 from a formation to the water column may have consequences for the marine environment and marine interests and be classed as "pollution", although "serious harmful" consequences is a high threshold and seems unlikely to be met in most cases.

Thus the Director currently has no powers to issue instructions or take measures in relation to leaking CCS injection installations or storage formations. In the context of section 250, it is worth noting here that changes are to be made by the MLB in relation to the kinds of substances subject to the section.[141] However, the changes in the MLB do not include changes to section 249, and therefore action could still only be taken under Part 20 in relation to "structures" and "operations" that would be likely to discharge a "harmful substance".

An option would be for amendments to be made to the MTA to classify CO_2 as a harmful substance, and an injection platform and storage formation to be deemed to be offshore installations. However, we consider that there is not a strong case for including CO_2 as a harmful substance for the purposes of Part 20, given that this would produce an undesirable overlap in jurisdiction relating to pipelines (which are, in Chapter 9, recommended to be governed under health and safety regulations, the RMA and CCS legislation), storage formations (which are recommended to be governed under targeted CCS legislation) and injection installations (which are recommended to be governed under the RMA, EEZ Act and health and safety regulations, along with CCS legislation for discharges of CO_2 to the atmosphere). For the same reason, storage formations should not be included within the definition of a "structure" or "offshore installation". However, we consider that injection installations should be included within the definition of an "offshore installation", to ensure that the powers in Part 20 apply when there is a risk of a discharge of a other substances already classified as hazardous. The purpose of a CCS installation should not exempt it from the requirements of the Act in relation to all hazardous substances.

141 Clause 47 of the Marine Legislation Bill replaces section 250 of the MTA. This has greater significance in relation to discharges from ships.