



GLOBAL
CCS
INSTITUTE



LEGAL LIABILITY AND CARBON CAPTURE AND STORAGE

A COMPARATIVE PERSPECTIVE

IAN HAVERCROFT AND RICHARD MACRORY
OCTOBER 2014

ISBN

978-0-9871863-4-8

© Global Carbon Capture and Storage Institute Ltd 2014

Unless stated otherwise, copyright to this publication is owned by the Global Carbon Capture and Storage Institute Ltd (Global CCS Institute) or used under license. Apart from any fair dealings for the purpose of study, research, reporting, criticism or review as permitted under the Copyright Act 1968 (Cth), no part may be reproduced by any process without the written permission of the Global CCS Institute.

Disclaimer

The Global CCS Institute has tried to make information in this publication as accurate as possible. However, it does not guarantee that the information in this publication is totally reliable, accurate or complete. Therefore, the information in this publication should not be relied upon solely when making investment or commercial decisions.

The Global CCS Institute has no responsibility for the persistence or accuracy of URLs to any external or third-party internet websites referred to in this publication and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

To the maximum extent permitted, the Global CCS Institute, its employees and advisers accept no liability (including for negligence) for any use or reliance on the information in this publication, including any commercial or investment decisions made on the basis of information provided in this publication.

ACKNOWLEDGEMENTS

We are grateful for advice and comments from a number of individuals including, Professor Nigel Banks (University of Calgary), Paul Bowden and Alistair Tyrell (Freshfields Bruckhaus Deringer LLP, London), Chris Clarke (University College London), Professor Michael Crommelin (University of Melbourne), Ward Goldthorpe and Shabana Ahmad (The Crown Estate), Professor Stuart Haszeldine (University of Edinburgh) Dan Johnson and Billie Fortier-Neufeld (Borden Ladner Gervais, Calgary), and Professor Gerd Winter (University of Bremen). Rob Amos (UCL Carbon Capture Legal Programme) provided invaluable research support. Needless to say, responsibility for the final content rests with us. We have tried to provide a fair representation of the current state of the law in key areas but the content should not be taken as substitute for any professional legal advice.

Contents

1. Context and Purpose of the Report
2. What Do We Mean by Legal Liability?
3. The Legal Contexts
 - (a) State of Victoria, Australia
 - (b) Province of Alberta, Canada
 - (c) The United Kingdom
4. Storage and Leakage
5. Civil Liability Principles
 - 5.1 Trespass to Land
 - 5.2 Private Nuisance
 - 5.3 Rylands v Fletcher
 - 5.4 Public Nuisance
 - 5.5 Negligence
 - 5.6 Ownership of CO₂ and Liability
6. Special Issues Arising from Civil Liability
 - 6.1 Economic Damage
 - 6.2 Statutory Authority and Permit Defences
 - (a) Statutory Authority
 - (b) Permit Defences
 - 6.3 Injunctions
 - 6.4 Limitation of Actions
 - 6.5 Causation Issues
7. Administrative Liability
 - 7.1 Key Issues Concerning Administrative Liability
 - 7.2 United Kingdom
 - (a) Directions under CCS Legislation
 - (b) The Crown Estate
 - (c) Environmental Liability Remediation Notices
 - (d) Marine Management
 - 7.3 Province of Alberta
 - (a) Directions under the Oil and Gas Conservation Act
 - (b) Environmental Protection Orders under Environmental Protection and Enhancement Act
 - (c) Water Management Orders under Water Act
 - 7.4 State of Victoria
 - (a) Notices and Directions under The Greenhouse Gas Geological Sequestration Act 2008
 - (b) Notices under the Environment Protection Act 1970
 - (c) Water Act 1989
8. Greenhouse Emissions Liability

9. Transfer of Liabilities and Responsibilities

9.1 Conditions for Transfer

- (a) United Kingdom
- (b) Alberta
- (c) State of Victoria

9.2 What Responsibilities or Liabilities are Transferred?

- (a) EU CCS Directive
- (b) United Kingdom
- (c) Alberta
- (d) Victoria

9.3 'Claw-Back' Provisions

- (a) EU Directive
- (b) United Kingdom
- (c) Alberta and Victoria

10. Financial Security Against Liability

10.1 EU Directive and Implementation in the UK

- (a) Financial Security
- (b) Financial Mechanism
- (c) Project level experience

10.2 Victoria

10.3 Alberta

10.4 Extending Potentially Liable Parties

Appendix I: Index of Case Law and Legislation referred to in the Report

Appendix II: Bibliography on CCS Liability Issues

Key findings

1. Legal liability issues remain critically important for the commercial development of carbon capture and storage (CCS). A well-characterised legal and regulatory regime should perform a number of functions – it can clarify operators' potential liabilities, promote high standards, and help to encourage investment; it can raise public confidence in the technology to the extent there is a visible model for addressing or remediating any harm caused by CCS activities; and it can provide clear parameters for regulators as to their responsibilities and power of recourse where action is necessary.
2. This report largely focusses on the storage aspect of the CCS process, because that is where the most distinctive liability challenges lie, largely due to the long time-scales involved. It addresses three types of legal liability – civil liability where third parties who have suffered harm seek compensation or a court order; administrative liability where authorities are given powers to serve some form of enforcement or clean-up order; and emissions trading liability where an emissions trading regime provides a benefit for CO₂ storage and an accounting mechanism is in place should there be subsequent leakage.
3. The study concentrates on three jurisdictions: Alberta, Canada; Victoria, Australia; and the United Kingdom, operating with the relevant EU legislation on CCS. They are representative of countries where Governments are broadly supportive of the technology as a contribution to reducing climate change emissions, and where CCS legislation has recently been passed, providing well-characterised examples for approaching the liabilities associated with CCS operations. Many of the issues faced are common to each jurisdiction, though each has examples of different legal mechanisms being adopted.
4. Each jurisdiction has created a detailed regulatory system covering site selection, permitting, operator performance, and monitoring and verification, which is designed to reduce the likelihood of substantial leakage from a storage site to the minimum. Nevertheless, liability rules are needed to address and anticipate such incidents, however unlikely. Substantial CO₂ geological storage, in the context of climate change policy, is still in a demonstration phase and in the absence of significant regulatory experience, much of the commentary must remain speculative. Further refinement of the novel aspects of the regulatory regimes are likely to be necessary in the light of technical and operational experience.

Civil Liability

5. The three jurisdictions share a common law tradition, where the principles of civil liability have largely been developed by the courts through case-law. Despite many common concepts, significant differences have emerged – for example, in the treatment of victims who have suffered purely economic damage. Principles concerning pollution incidents and land contamination will be applicable by analogy to leakage from a CO₂ storage site, but novel aspects of the CCS process and associated activities may introduce issues which have yet to be considered, or which will affect the approach adopted in the courts.
6. Two particular issues should be highlighted. CCS will be a highly regulated activity, and the relationship between regulatory compliance and potential civil liability is a question that courts have had to address in other areas. None of the jurisdictions studied provide that compliance with a permit offers an absolute defence to a civil liability claim, but the interactions between the two systems remain subtle and significant. Second, the potential long-time scales involved and the difficulties associated with discovering a leakage, mean that limitation periods for bringing a civil claim may well come into play. Each jurisdiction has legislation defining limitation periods, but with differing approaches, particularly as to whether the time for bringing a claim starts from when damage occurs or when it is reasonably discoverable. Only Alberta has a specific provision allowing a court to override statutory time-limits in the case of environmental pollution.

Administrative Liability

7. Each of the jurisdictions has a substantial amount of law and regulation governing administrative liability. These include new provisions found in CCS-specific legislation, as well as existing powers contained in broader regimes governing environmental protection, oil and gas activities, marine management and water protection.

These were not been drafted with CCS in mind, but definitions are broad enough to encompass leakage incidents from storage sites. Operators and regulators are likely to be familiar with many aspects of these pre-existing regulatory models, but in the case of CCS legislation the provisions remain untested, and the exact nature of the obligations and the associated costs are unlikely to be apparent until an incident occurs. Broadly worded obligations such as the duty to remediate, to the satisfaction of the relevant authority, are likely to be of concern to prospective operators especially if they are not accompanied by the right of appeal to an independent body or tribunal.

8. Although there are examples of explicit provisions which ‘carve out’ CCS from these broader regimes, there are inevitably many areas of considerable potential overlap among different regulatory bodies. This will require sophisticated administrative arrangements for co-operation between authorities to ensure the most efficient use of resources and to avoid unnecessary duplication of powers.

Emissions Trading Liability

9. Jurisdictions that provide some sort of economic benefit to CO₂ storage activities within an emissions trading system, in order to incentivize the technology, have to address the issue of accounting liability in the event of a subsequent leakage. The EU Greenhouse Gas Emissions Trading System has focused responsibility on the storage operator to purchase allowances to match subsequent leakages, until an eventual post-closure transfer of the site to the State. Coupled with the requirement for up-front financial security to cover these potential liabilities, the challenge of predicting a future allowance price over long time-scales poses real difficulties for operators unless the provisions are applied with a degree of realism and flexibility.

Transfer of Liabilities and Responsibilities

10. CO₂ storage is designed to be permanent and in geological terms, is likely to be well beyond the lifetime of a traditional corporate entity. All three jurisdictions have addressed this issue by providing for the possibility of transferring responsibility for a storage site to the State at some point after the cessation of operations. The transfer will generally include any future administrative liabilities, but it is clear that the operator will rarely be freed of all civil liability claims that may arise post-transfer as a result of activities when they were in possession and control of the site. Even the most generous example of liability transfer, as seen in the UK regulations, has significant ‘claw-back’ provisions allowing the State to recover costs from the operator where they are later discovered to have been at fault.
11. Critical questions in any transfer regime are precisely what liabilities and responsibilities are transferred, and the conditions necessary for the transfer. This raises questions as to the extent it is technically feasible to meet the criteria specified in legislation, and the capacity of current and future modelling and verification techniques to satisfy the requirements. In this context it is also important to stress the link between the regulatory regime and the transfer of responsibility and liability. All three regimes deliberately impose considerable ‘up front’ requirements on the operator - site selection and characterization, monitoring and verification during and post operations, and financial security – in an attempt to minimize the risks of leakage and exposure to the State of subsequent costs.
12. The three regimes offer quite contrasting approaches when considering the criteria necessary for effecting a transfer; including the necessary time-limits post-cessation of operations before a transfer may take place, and the actual responsibilities and liabilities that may be transferred. This reflects differing national and regional policy choices, but may in future raise issues as to the need for greater harmonization between regimes, especially where the CCS industry is operating internationally. Differing national standards and requirements are a familiar feature of contemporary environmental law and practice, but the problem that CO₂ storage is addressing is one of global rather than national significance, and may therefore justify a more consistent approach across national jurisdictions.

Financial security

13. All three jurisdictions have imposed specific requirements concerning financial security, reflecting the long-term nature of storage operations. These provisions are also designed to reduce the cost exposure of the State, should an operator go into liquidation or have insufficient resources to meet its obligations, particularly post-cessation of injection when no income stream is likely. Different approaches have been adopted, which draw heavily on prior domestic experience - especially in the oil and gas sector, and land-fill waste disposal. Doing so is likely to be of benefit to both operators and regulators, who will be familiar with many of the existing systems, but the provisions remain largely untested in the context of CCS, and in certain instances the detailed regulatory requirements and policy remains under development.

14. The issue of financial security demonstrates the importance of carefully balancing potentially competing goals – channelling financial and operational risks to the storage operator away from the public purse, but without imposing such high up-front costs against unrealistic risks such as to deter investment. Flexibility, regular review and adjustment, together with the opportunity for an operator to manage their exposure through payments during the operational phase of the project, are likely to be feature of an effective regime. In this context, the contrasting approaches to be found especially in relation to the operator’s obligations for the costs of long-term monitoring and verification are striking. The Alberta and Victoria regimes require operators to make annual contributions during the operational phase of a project’s lifecycle, thus enabling them to make payments while there is an income stream for the project, while the EU and UK model requires an operator to make a contribution payment at the point of transfer. This potentially places an operator on risk, where the eventual charges required by the government for these activities exceed those calculated or reserved by the operator during the operational phase.

Commercial considerations

15. All three jurisdictions currently assume that in time CCS will be an activity which will be commercially attractive to the private sector. From a legal perspective, most of the liabilities in connection with storage have been channelled to the storage operator. In practice where the storage operator is a distinct entity from those capturing and transporting CO₂, detailed commercial arrangements between the parties involved are likely to seek to share liability and risk in various ways. Despite precedents in areas such as the oil and gas industry, it is not easy at present to predict in any detail the complex contractual arrangements for risk sharing that may be made, and this report has deliberately not explored this area in any depth. This issue, however, is likely to be a crucial element of the process for ensuring confidence in financing and investment, and the extent to which liability provisions are both as clear and realistic as possible will be a critical building block in that process.

Context and purpose of the report

This report addresses the legal issues concerning liability for operations connected with carbon capture and storage (CCS). CCS activities involve three distinct operations – capture of CO₂ at power or industrial plants, transportation of CO₂ in a dense phase by pipe, sea or land transport, and long-term storage deep underground under land or sea. Liability issues connected with capture and transport are unlikely to be significantly different from those associated with any other industrial activity, and though there will be considerable overlap in the applicable law, the focus of this report is with storage because this can raise particular challenges in designing appropriate liability regimes: time-scales for storage are lengthy and the technology remains relatively novel.

The report is intended to highlight key themes that have emerged in thinking about the design of appropriate legal liability regimes for CCS, and uses as core examples for comparison three jurisdictions - the State of Victoria, Australia; the Province of Alberta, Canada; and the United Kingdom. It is not intended to provide a comprehensive analysis of the legislation in each of the jurisdictions. Instead it will examine the law in order to highlight the typical legal liability issues that need to be addressed in the design of legal and regulatory models for the technology. The study will consider the CCS liability issues that have emerged, and compare the differences that appear to exist, as well as the uncertainties that remain.

These jurisdictions have been chosen because each has adopted new legislation designed to facilitate deployment of CCS and to address the regulatory issues that arise. In respect of liability, both the approaches taken and the legal contexts differ in some significant ways, which may affect investment decisions and lead to differing liability risks over the lifetime of a CCS project. In each case, more detailed regulations or implementation strategies are still being developed with important questions still under discussion, leaving scope for stakeholder involvement in the final shape of the regulatory regime. The Governments in all three of these jurisdictions are broadly supportive of developing CCS as a potential abatement strategy in the context of dealing with greenhouse gas emissions. It may be noted, however, that the types of legal issues addressed in each of these jurisdictions are likely to be faced by any country which is developing a CCS legal and regulatory regime.

What do we mean by legal liability?

In this context we are considering liability as two distinct strands. First, liability for damage caused by storage operations to interests of third parties with whom there are no contractual relationships. In commercial practice (such as arrangements for transportation) the contractual relationship will define and establish many aspects of third party liability, and there is already considerable experience in the oil and gas industry concerning issues such as apportioning responsibility where oil and gas is carried in common pipes. Here we are focussed on liability principles where no such contractual relationship exists – in many jurisdictions known as tort liability – and in this report will be termed *civil liability*. Legislation or the courts define the conditions necessary for bringing such claims, and in practice these may often overlap and more than one type claim can be brought. Typically a claimant will be seeking compensatory damage for losses suffered, and/or an injunction where the damaging activity is continuing.

The second type of liability concerns the powers of a public authority to require the operator to take specified action including remediation in the case of leakage, and/or carry out remediation operations themselves and recover costs from the operator. In many areas of environmental law, similar statutory powers have been long given to government bodies and are designed to secure a rapid administrative response to a particular pollution problem. CCS legislation is no exception, and in all three jurisdictions the legislation has included such powers. This is termed in the report as

administrative liability. It is included in this analysis because, as with civil liability, the primary purpose is not to punish or sanction the operator but to secure practicable results. There is clearly an overlap with the civil liability principles, though in some cases administrative liability procedures may be the only mechanism available to impose clean-up costs on the operator because there is no-one in a position to bring a civil liability claim. This will be especially significant where the aspect of the environment threatened or damaged is not subject to any private ownership. It is important to stress that such powers are not primarily concerned to secure compliance with regulatory requirements (such as the conditions of a licence) or sanction breaches of regulatory obligations - these will be the subject of specific enforcement powers (involving typically a range of criminal sanctions, administrative penalties, or some combination). We emphasise the difference between what we have termed civil and administrative liability because terminology in discussing liability issues is sometimes used rather loosely, without making clear precisely what is being talked about.

Finally, in regimes that have introduced an emissions trading regime where operators of storage site will secure some form of credit in relation to the amount of CO₂ stored, the system has to handle the position where leakage occurs. This is essentially a form of administrative liability specific to CCS, but is different in kind and purpose from the type of clean-up administrative liability above.

3

The legal contexts

In each of the three jurisdictions there now exists comprehensive statutory provisions providing the core framework for regulating CCS. In Victoria, the Greenhouse Gas Geological Sequestration Act 2008 deals with onshore legislation and is supplemented by the Greenhouse Gas Geological Sequestration Regulations 2009. In State waters, the Offshore Petroleum and Greenhouse Gas Storage Act 2010 provides the regulatory model and in turn, is supplemented by the Offshore Petroleum and Greenhouse Gas Storage Regulations 2011. In Alberta, Part 9 of the Mines and Minerals Act, as amended by Carbon Capture and Storage Statutes Amendment Act 2010 provides the basis for the Province's regulatory model. In the United Kingdom the Energy Act 2008 establishes the core framework for the offshore licencing of CCS, supplemented by the Carbon Dioxide (Licencing etc.) Regulations 2010 and the Carbon Dioxide (Closure of Licencing) Regulations 2011. The position in the UK is legally more complex because the country is a member of the European Union (EU) and is therefore obliged to implement the 2009 EU Carbon Dioxide Directive¹, which it has done through the national legislation. The Directive contains certain minimum provisions concerning regulatory requirements, including those regarding liability (notably financial security and transfer of certain liabilities post-storage), but equally leaves many aspects of liability law to be determined at the discretion of Member States. Under general principles of EU law, national courts are obliged to interpret the national legislation in a way that is consistent with the Directive².

3a

State of Victoria, Australia

Australia was swift to both recognise and promote the potential benefits of CCS, and this has included the design and promulgation of State and Commonwealth legal and regulatory models to support the technology's deployment. The State of Victoria's Greenhouse Geological Sequestration Act provided one of the world's first regulatory models for onshore geological storage activities, when it entered into force in 2008. A further offshore Act³, governing storage operations within State waters, entered into force in January 2012. Both of these Acts have been supplemented by secondary Regulations.

1 Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006.

2 See Macrory, Madner and Mayr (2013) 'Consistent Interpretation of EU Environmental Law' in Jans, Macrory, and Molina (eds) National Courts and EU Environmental Law Europa Law Publishing.

3 *Offshore Petroleum and Greenhouse Gas Storage Act 2010*.

The Acts have adopted slightly different approaches to regulating CCS activities in the State; the offshore version amends existing petroleum legislation to include provision for geological storage activities in State waters, while the onshore Act establishes a stand-alone model – albeit modelled on the State’s Petroleum Act. The resulting frameworks introduce several new titles to address the exploration, retention, injection and monitoring phases of CCS activities. Both Acts include provisions which vest ownership of potential storage formations in the Crown, thus requiring the Crown to grant a right to explore or inject and store CO₂.

The State has also enacted secondary legislation to supplement the onshore and offshore Acts. The Greenhouse Gas Geological Sequestration Regulations 2009 entered into force in December 2009 and seek to ‘provide for the elimination or minimisation of the environmental, health and safety hazards and risks associated with greenhouse gas sequestration operations’⁴ and ‘prescribe various administrative matters, fees and other requirements authorised by the Act’⁵. These objectives are further manifested in the form of the requirements and detail associated with the various plans which are to be completed under the Act.

The Offshore Petroleum and Greenhouse Gas Storage Regulations 2011, which entered into force in January 2012, complement the Commonwealth Government’s offshore Regulations in this space, and are designed as far as possible to mirror the Commonwealth legislation in order to avoid regulatory and policy problems where CCS operations straddle jurisdictional boundaries. The Commonwealth and Victorian Regulations do, however, contain some substantive differences, but these are ‘not significant enough so as to jeopardise the mirror nature of the Victorian regulations’⁶.

3b

Province of Alberta, Canada

Provincial governments in Canada have led the way in the development of legislation to support the technology’s deployment. Alberta has been particularly active in recent years and has implemented several pieces of legislation, as well as completing a Regulatory Framework Assessment (RFA) exercise in 2013 to review its existing regulations.

In 2010 the Alberta Government enacted the Carbon Capture and Storage Statutes Amendment Act, which amends several provincial energy statutes to provide clarification around the regulation of CCS activities in the Province. While the Act does not provide a full regulatory model of the type established in Victoria or under the EU’s Directive, it does address a number of important issues related to the ownership of pore space in the Province and the management of long-term liabilities.

Of particular note are the amendments made to the Mines and Minerals Act, which clarify the Crown’s ownership of the pore space (save for existing Federally-owned land) and enable the Minister to ‘enter into agreements with respect to the use of pore space’⁷. Part 9 of the Act has also been amended to include new provisions that allow for the post-closure transfer of liability for stored CO₂ to the Province. These amendments also establish a ‘Post-closure Stewardship Fund’ to cover the costs associated with the Government’s assumption of post-closure liabilities.

To supplement the 2010 Act, the Province also adopted the Carbon Sequestration Tenure Regulation in April of 2011. The Regulation builds upon the Act and provides further detail with regard to the application procedure and obligations attaching to ‘evaluation permits’ and ‘carbon sequestration leases’, including the content of Monitoring, Measurement and Verification (MMV) and closure plans.

In 2011, the Provincial Government commenced a Regulatory Framework Assessment (RFA) exercise with a view to reviewing its existing regulatory model as it applies to the technology, as well as best-practice examples from around the world. The final report, which included seventy-one individual recommendations, was submitted to the Government in late-2012⁸.

4 Section 1. (a), *Greenhouse Gas Geological Sequestration Regulations 2009*.

5 Ibid, s.1 (b).

6 ‘Victoria’ contribution, *Carbon Capture and Storage: Legal and Regulatory Review*, International Energy Agency (Edition 3, 2012), at page 80.

7 Section 15.1(3), added to the Mines and Minerals Act.

8 Further information on the Regulatory Framework Assessment (RFA), including links to the final report, may be found on the Alberta Energy webpage: <http://www.energy.gov.ab.ca/Initiatives/3544.asp> (accessed 30 June 2014).

The United Kingdom

The United Kingdom has also taken a lead in designing legal and policy frameworks to support the development and deployment of the technology, both at the domestic and the international level. The Government enacted the Energy Act 2008, which establishes a licensing regime for offshore CO₂ storage activities, in advance of the release of EU Directive 2009/31/EC. The Act has been also been supplemented by the *Carbon Dioxide (Licensing etc.) Regulations 2010* and the *Carbon Dioxide (Closure of Licencing) Regulations 2011*, which provide much of the additional detail required for transposing the requirements of the EU Directive.

The offshore regulatory model for CCS activities in England and Wales builds upon the pre-existing model for offshore oil and gas activities and includes new provisions regarding the Crown's rights to an Exclusive Economic Zone (EEZ) and the designation of 'Gas Importation and Storage Zones'. Operators seeking to undertake CCS activities within this zone will now be required to obtain a lease from The Crown Estate in addition to the licence required under the regulations.

The Act, together with its accompanying Regulations, establishes a regulatory model which largely mirrors the requirements of the EU's Storage Directive, albeit with some notable departures⁹.

4

Storage and leakage

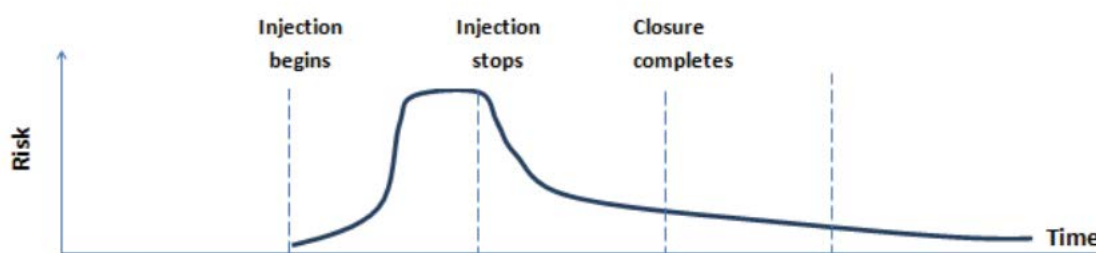
Current scientific evaluation indicates that with appropriate site assessment and selection the likelihood of any significant leakage of CO₂ is extremely low. Nevertheless, as has been noted, '*It is extremely difficult to state there will be zero leakages in all cases even though the overwhelming majority of simple future scenarios demonstrate zero, or minimal, leakage*'¹⁰. Various potential types of damage from CO₂ leakage have been identified, including risk to human health and harm to flora and fauna, but the current evaluation is that with proper site selection such risks are likely to be minimal. More realistic risks, though the extent and impact of these are still debated, include the potential of the injected CO₂ to cause the movement of brine from deep saline formations, which could contaminate sources drinking water supplies or sources of water for agricultural use, depending on the chemical characteristics of the brine. Another is the so-called transient 'pulse' where rapid injection of CO₂ into a saline formation can cause increase of pressure beyond the area of injection, and potentially impacting on other operations within the same saline formation, such as other storage operators or operators of oil and gas fields¹¹. Increased pressure does not necessarily always give rise to damage, and could indeed increase the productivity of an oil or gas field. In broad terms, then, it is useful to distinguish between the direct migration of injected CO₂, which intrudes onto, or damages, another's person's interests in some way, and intrusion caused by pressure from injected CO₂, which does not leave the site itself but through pressure causes other substances to intrude or damage another's interests. This distinction may affect the extent to which different civil liability principles apply.

Most commentators tend to divide the life-cycle of CCS storage into a number of phases – site selection, injection, closure, a post-closure period and transfer of long-term responsibility period – periods which are reflected in the regulatory structures. Current scientific literature suggests that risks of leakage rise during the injection phase, and then reduce considerably as pressure in the storage site reaches its maximum before closure, but with some residual risk remaining after closure.

⁹ A more detailed analysis of the United Kingdom's licensing regime and implementation of the EU Storage Directive, is provided in '*Case Studies on the implementation of the Directive 2009/31/EC on the geological storage of carbon dioxide – United Kingdom*', available from the Centre for Law and the Environment at University College London's Faculty of Laws.

¹⁰ S Haszeldine (2011) 'Geological Factors in Framing Legislation to Enable and Regulate Storage of Carbon Dioxide Deep into the Ground' in Havercroft, Macrory and Stewart Carbon Capture and Storage – Legal and Regulatory Issues, Hart Publishing, Oxford at 13

¹¹ *ibid*, 16



Source: Illustrative diagram extracted from Fig 4.1. from ClimateWise (2013) Managing Liabilities of European Carbon capture and Storage

5

Civil liability principles

The traditional aim of civil liability principles is to provide a compensation mechanism for those who have suffered harm through the actions of others. Terminology and the actual principles may differ between distinct jurisdictions – common law countries tend to use the term ‘tort’, while those based upon Roman or civil law traditions have adopted the term ‘delict’ – but the core purpose remains common. Essentially the principles are concerned with a fair distribution of historic costs and risks. Few legal systems provide a blanket requirement that any action that causes damage, even where fault is involved, will automatically give rise to an entitlement of compensation. Some risks fall on the victim, and others on the person responsible for the risk, and differing legal principles can apply depending on the nature of the interest to be protected and the type of operation giving rise to the damage. But civil liability principles are not only concerned with providing compensation for past damage. Remedies such as injunctions, available to claimants where the damaging activity is continuing, may have a preventative effect, while the nature of the liability principles may influence the behaviour and standards of the operator. But the extent to which these principles do in practice, or should be designed to, determine the standards of operators, or indeed be seen as substitute for intrusive regulation by government, remains hotly contested as both a matter of theory and practice.

In all jurisdictions principles concerning civil liability are defined either in legislation or have been developed by the courts through case law, or depend on a mixture of the two. All three jurisdictions considered in this study share a common law tradition, where core principles concerning civil liability have largely been developed and defined by the courts, based upon actual cases. Countries whose system of law is based to a larger extent on civil law traditions, will define the core principles of liability in legislation or codes, but many of the questions that have to be faced (such as the extent of liability, causation issues, limitation of actions) will be common whatever the predominant system of law.

As yet we have no examples of actual liability claims based on CCS, and it is therefore necessary to consider by analogy how these principles are likely to apply to the scenarios that could arise. Case law in all the jurisdictions studied have dealt with issues involving sub-surface pollution and contamination, and these are likely to provide the closest analogue. It is always open to legislatures to modify these principles in specific circumstances or for particular sectors of industry, but with the exception of transfer of long-term liability, in each jurisdiction the core case law principles have largely remained applicable. Even then there will be aspects of liability such as the limitation periods defining the time limits within which claims must be brought which are determined by legislation. The fact that the jurisdictions share a legal tradition, and tend to use the same basic legal concepts, does not mean that all the principles are necessarily the same. Case law from, say, England and Wales may be quoted in an Australian or Canadian court, and vice-versa, but there are often subtle differences in the way that the courts in each jurisdictions have developed the law.

In all the jurisdictions considered, the civil liability principles sit alongside a detailed statutory regulatory system of assessment and licencing, which will provide the primary motivator for operator standards. This in itself will raise difficult questions of the appropriate interaction between the two systems, and in particular the extent to which compliance with regulatory requirements should influence the potential for civil liability. This aspect is discussed further in section 6(b) below. Finally, civil liability principles may play a significant role in improving public confidence in a novel industry.

Governments may always introduce special liability regimes or exemptions from liability for particular sectors of industry, because of the distinct nature of the risks involved, but this in itself may suggest that there are particular problems over and above other industrial operations, and could reduce public acceptance. With the exception of the question of long-term liability issues, all the jurisdictions continue to apply the ordinary rules of civil liability to CCS operations¹².

A claimant considering a compensation claim in respect of damage as a result of storage activities would need to fall within the principles developed under a variety of distinct torts developed by the courts. The common law jurisdictions largely use the same categories of tort, though some important differences have developed, which are highlighted below¹³. In practice, these torts may often overlap depending on the factual circumstances, and claimants are unlikely to rely upon just one in any particular claim. The following consider the key torts that are likely to be most relevant

5.1

Trespass to land

Trespass can be defined as any unjustifiable intrusion into land in the possession of another. Although trespass is associated with the protection of interests in land, it is clear that it can extend to intrusion beneath the surface – see the 2010 decision of the UK Supreme Court in *Energy Weald Basin Limited and another v Bocardo SA v Star Energy UK Onshore Ltd*¹⁴.

The core principle concerning the person who is entitled to bring an action in trespass is that they must be in possession of the land, in turn defined as someone with a sufficient degree of physical custody and control combined with an intention to exercise such possession. Unless there is evidence to the contrary, an owner of land is deemed to be in possession. Similarly, someone holding a lease is in possession for the purposes of trespass. A licensee (in property terms rather than someone granted a regulatory licence) may also be able to sue in trespass depending on the terms of the licence and the extent to which it gives rights to the land in question¹⁵.

A further key principle of trespass law, and one which distinguishes it from other torts, is that no proof of actual damage is required to bring a claim. One consequence of not having to prove damage is that it is likely to be easier for a claimant to secure an interim injunction from a court to prevent a trespass continuing. Nevertheless in the United States, courts in some jurisdictions have insisted that where subsurface trespass is involved some sort of physical damage or interference with the use of property must be shown. This requirement does not yet appear to have been developed by Canadian, Australian or UK courts.

When it comes to indirect intrusion (by pressure) it is less likely an action in trespass could be maintained since the intrusion has to be a direct result of the defendant's activities, rather than an indirect consequence. As Lord Denning noted in *Southport Corporation v Esso Petroleum*¹⁶, where a ship had discharged oil into to an estuary which then polluted the beach:

'In order to support an action for trespass to land the act done by the defendant must be a physical act done by him directly onto the plaintiff's land...This discharge of oil was not done directly onto their foreshore but outside in the estuary. It was carried by tide on to their land but that was only consequential, not direct. Trespass, therefore, does not lie'.

12 CCS legislation in Queensland Australia explicitly protects owners and occupiers of land by providing that where someone else is carrying out the authorised storage activity, they will not be liable to anyone in a tort claim for damages provided they have not caused or contributed to the harm (s 338A Greenhouse Gas Storage Act 2009 Queensland)

13 The discussion concerning the United Kingdom focuses on principles developed by the courts in England and Wales. Similar principles exist in Scotland but with different terminology.

14 [2011] 1 AC 380. The decision is particularly important in the context of acquiring storage sites under land. It establishes that in the absence of legislative provisions to the contrary or compulsorily acquired rights, a landowner may maintain a trespass action against horizontal drilling deep under the surface, although any compensatory damages are likely to be small.

15 See *Manchester Airport plc v Dutton* [2000] QB 133 contrasted with *Countryside Residential (North Thames) Ltd* [2000] 34 EG 87 where a licence with only rights to enter the land in question for investigatory purposes did not have sufficient title to sue.

16 [1954] 2 QB 182 His approach in the Court of Appeal was approved of by the majority in the House of Lords on appeal

A similar distinction has been made by the Canadian courts¹⁷. The distinction between direct and consequential intrusion is one that is based on the historical origins of trespass law in the United Kingdom, and it is one that is often not clear cut in practice. However it is arguable that indirect intrusion caused by pressure is more analogous to noise, which is essentially a series of pressure waves and, in that case, an action in nuisance would be more appropriate. In the United States, though, courts appear to draw a rather less hard line between trespass and nuisance¹⁸.

It is not necessary to prove that the defendant intended to trespass or should have reasonably foreseen that his actions would cause a trespass as such. But an ingredient of the action is that the movement that takes place was either intentional or negligent at the least, even though the defendant was unaware that an actual trespass was involved¹⁹. Where there was no intention or negligence involved it is likely that no trespass is involved, although the principles are not entirely clear²⁰. However one can conclude that it is unlikely that an intrusion that was entirely unexpected and could not reasonably have been predicted would amount to a trespass in law.

5.2

Private nuisance

Private nuisance is also designed to protect interests associated with land and is concerned with an unreasonable interference with someone's enjoyment of property. It covers a multitude of activities including classic forms of pollution, such as smell or noise, and would be applicable to direct or indirect intrusion (such as interference caused by pressure). In general terms nuisance involves a degree of 'give and take', in that the courts must come to a judgment as to what amounts to an unreasonable interference.

As with a trespass action, the claimant must have an interest in land which is affected. As Lord Goff explained in the UK case of *Hunter v Canary Wharf*²¹:

'An action in private nuisance will only lie at the suit of a person who has a right to the land affected. Ordinarily, such a person can only sue if he has the right to exclusive possession of the land such as freeholder or tenant in possession or even a licensee with exclusive possession.'

Potential claimants will therefore need to show they have a sufficient proprietary interest to bring a claim. Owners and lessees of land clearly do, as do occupiers, though a mere licensee²² with no exclusive possession will be unable to do so. Owners of so-called incorporeal rights such as fishing rights are also in a position to bring a claim, but there may be difficulties where the rights derive solely from statutory law. For example, the UK Supreme Court, in the context of transfer schemes, doubted whether a right to discharge derived solely from statutory provisions could be characterised as property but was preferably considered a right²³. A potential complexity may arise in the case of offshore activities in determining exactly the nature of the claimant's interest. For instance, in the UK a storage operator is given a lease by the Crown Estate, meaning that an operator whose facilities are affected by leakage from another storage site clearly can bring a claim in nuisance or trespass. Oil and gas operators, however, are given no such lease, but operate solely under a statutory licence. Given that they will have exclusive possession of their extraction site this should be sufficient to bring a nuisance or trespass claim, but the point might be arguable.

The focus of a nuisance action is concerned with the type of harm caused rather than the motivation for the intrusion, and as such whether the conduct is intentional, reckless, careless, or accidental is largely irrelevant. Negligence as such is not an ingredient of a nuisance action, though it may be help to determine whether the use of defendant's land was reasonable or not.

17 e.g. *Mann v Sauliner* [1959] 19 DLR (2d) 130

18 'The US Courts seem rather less hidebound by these historic distinctions and no longer differentiate between trespass and nuisance to the same extent as UK courts', Wilde, M., *Civil Liability for Environmental Damage*, 2nd edition (Wolters Kluwer 2013, para 2.02(A)).

19 *Conarken Group Ltd v Network Rail Infrastructure* [2010] EWHC 1852 where the court suggested that where there was no intention or negligence involved, there might be no trespass. For an Australian case see - *Public Transport Commission (N.S.W.) v. Perry* [1977] HCA 32; (1977) 137 CLR 107

20 See, for example, Macbride and Bagshaw, *Tort Law* (4th edition Pearson 2012) pp 408-9.

21 [1997] AC 655.

22 In this context the term 'licensee' is used not to mean someone holding a licence under a regulatory system, but as it has developed in property law and generally implying a personal permission to be on the property, and someone with no exclusive possession.

23 *Manchester Ship Canal v United Utilities* [2014] UKSC 40, per Lord Neuberger, para 67

However, where damage is caused, the courts have held that the defendant will be liable only for the type of damage that could be reasonably foreseeable at the time of the actions that caused the nuisance. In *Cambridge Water v Eastern Counties Leather plc*²⁴, where spillages leaked through concrete into the ground eventually causing the contamination of water supplies, it was deemed that there was no liability in nuisance because at the time of the spillages the court held that no-one would have predicted this particular route of contamination. This principle might be relevant to a completely unexpected form of leakage from CCS site, although this conclusion needs to be applied with caution, since it refers to the type of damage involved rather than its particular form in the case in question. Thus a claimant could argue that leakage as such could be predicted as a problem even if the particular leakage route that occurred was not reasonably predicted (see further below section 6(e) causation issues).

Nuisance law is generally associated with some continuing state of affairs. An issue that may arise is whether a single isolated leakage could be said to amount to a nuisance because it is the consequence of some state of affairs (the storage in a potentially leaky area) or must fall within another category of tort such as negligence or, where it exists, *Rylands v Fletcher*. Case law produces differing results, and as a High Court judge in England and Wales noted in a recent case concerning an explosion: 'I must confess to having some difficulty in identifying the borderline between an isolated escape on the one hand and a state of affairs on the other'²⁵. But the court concluded, 'The position is that on appropriate facts there can be liability in private nuisance for a single or isolated escape as opposed to a state of affairs where there is both unreasonable or negligent user of land and foreseeability of escape'.

Nuisance cases in early mining law tended to produce some distinctive results, especially where natural flows of water were concerned, and it could be argued that they will be applicable where underground leakage of CO₂ or movements of brine water is involved. For example, *Smith v Kenrick*²⁶ involved neighbouring mine-owners where the defendant's mining activities caused water which was naturally present in the mine to flow into the neighbouring mine. The court held that an action in nuisance could not succeed, as each owner could work in manner most convenient to themselves, even though, 'the natural consequence may be that some prejudice will accrue to the owner of the adjoining mine, so long as that does not arise from negligence or malicious conduct of the party.' It seems unlikely that storage operators who accumulated the CO₂ could rely upon such a defence since the case revolved round the fact that the water was already naturally present in the area being worked, and in any event modern case law is much less sympathetic to the idea that a defendant has no responsibility for naturally occurring events on their property.²⁷

5.3

Rylands v Fletcher

*Rylands v Fletcher*²⁸ is a particular form of action concerning the escape of 'dangerous things' brought onto land. Liability is strict in that it is not necessary to show any fault or negligence on the part of the operator whose activities gave rise to the escape. Contemporary case law in England and Wales now considers the action as a sub-set of nuisance and the courts have in recent years narrowed its application. In *Transco plc v Stockport Metropolitan Borough Council*²⁹ the House of Lords confined its application to where a person '*has done something which he recognised or judged by the standards appropriate at the relevant place and time, he ought reasonably to have recognised, as giving rise to an exceptionally high risk of danger or mischief if there should be an escape, however unlikely an escape may have been thought to be*'.³⁰ It will be a matter of judgment whether CCS storage would be considered to pose such an exceptional risk to fall within the rule, but it is unlikely. As with nuisance, there is only liability for the total extent of the type of damage that could be reasonably foreseen.

It has been held by the Scottish Court of Sessions that the suggestion that the decision in *Rylands v Fletcher* had any place in Scots law is 'a heresy which ought to be extirpated'³¹.

24 [1994] 2 AC 264

25 *Colour Quest Ltd and others v Total Downstream and others* [2009] EWHC 540 (Comm) Mr Justice Steele.

26 (1849) 7 CB 515

27 See *Goldman v Hargrave* [1967] 1 AC 645 and *Leakey v National Trust* [1980] QB 485

28 (1868) LR 3 HL 330.

29 [2004] 2 AC 1

30 Per Lord Bingham, *ibid*, at [10].

31 Per Lord Fraser, *RHM Bakers v Strathclyde Regional Council* (1985) SLT 214.

In Australian law, *Rylands v Fletcher* similarly no longer exists as a separate cause of action since the decision of the High Court in 1994³²:

‘The rule in Rylands v Fletcher, with all its difficulties, uncertainties, qualifications, and exceptions, should now be seen ... as absorbed by the rules of ordinary negligence. Under those principles, a person who takes advantage of his or her control of premises to introduce a dangerous substance, to carry on a dangerous activity, or to allow another to do one of those things, owes a duty of reasonable care to avoid a reasonably foreseeable risk of injury or damage to the person or the property of another’.

In Canada, though, the Supreme Court has continued to recognise *Rylands v Fletcher* as continuing to provide a basis of liability, distinct from nuisance or trespass³³. In 2011, the Court of Appeal in Ontario accepted the applicability of the principles in *Rylands v Fletcher*, but refused to extend it to create a general principle of strict (no fault) liability for hazardous activities:

*‘Strict liability under Rylands v. Fletcher aims not at all risks associated with carrying out an activity, but rather with the risk associated with the accidental and unintended consequences of engaging in an activity’.*³⁴

5.4

Public Nuisance

Public nuisance has been described as a nuisance that is ‘so widespread or indiscriminate in its effect that it is not reasonable to expect one person to take proceedings on his own responsibility or put a stop to it, but it should be taken on the responsibility to the community at large’³⁵. Quite how many people need to be affected is largely a question of fact, but recent case law has used the terminology of a ‘common injury’ and an ‘injury suffered by the community or a significant section of it’³⁶.

Public nuisance is a crime³⁷, and responsibility for bringing proceedings (either a criminal prosecution or a civil injunction to prevent continuance of the nuisance) generally rests with the Attorney General or similar public official. In relation to civil liability, claims can be brought by individuals affected, and unlike private nuisance or trespass claims, it is unnecessary to show any interest in land or property affected. In order to prevent a multiplicity of claims however, any claimant must show that they have suffered ‘special damage’ – that is, some damage that is over and above the damage suffered by the public at large. This is a difficult concept, and case law suggests that courts have sometimes taken a fairly narrow approach, insisting that the damage suffered is different in kind as well as degree. So in the Canadian case of *Hickey v Electric Reduction Co of Canada Ltd*³⁸ a court held that fishermen in public waters who suffered losses as a result of a pollution incident had suffered no more than anyway else who might exercise public rights to fish. That decision was subsequently criticised, and the more modern approach appears to be look more for a difference in degree rather than kind which distinguishes the claimant from the general public affected.

There is clearly some overlap with private and public nuisance, and depending on the facts, those affected by a public nuisance may also be entitled to bring a claim in private nuisance if they possess interests in land. But there remain significant distinctions, which relate to the historical origins of the torts. Claimants in public nuisance do not have to show any interest in land or property, and can claim for personal injuries³⁹. Further, case law indicates that there is an element of fault in public nuisance in that a person who creates a public nuisance will only be liable ‘if he knew or ought to have known (because the means of knowledge were available to him)’⁴⁰ that his actions would create a nuisance. This aspect, though not without doubt, might be relevant where a totally unexpected and unpredictable leakage occurred by a CCS storage site.

32 *Burnie Port Authority v General Jones Pty Ltd* (1994) 179 CLR 520

33 *Tock v. St. John’s Metropolitan Area Board*, 1989 CanLII 15 (SCC),

34 *Smith v Inco Ltd* (2011) 107 O.R. (3rd) 321

35 per Denning LJ in *Attorney-General v PYA Quarries Ltd*.

36 *Lord Bingham, R v Rimmington and Goldstein* [2006] 1 AC 459.

37 see, for example, s 165 Criminal Code of Canada

38 (1971) 21 DLR (3d) 368

39 See the decision of the British Court of Appeal in group litigation concerning alleged personal injuries from contaminated land: *In re Corby Group Litigation* [2009] QB 335. The action was subsequently settled.

40 *R v Goldstein* [2006] 1 AC 459

5.5

Negligence

Negligence is a very broad ground of action which does not depend on ownership or occupation of land as such, and can encompass personal injury as well as injury to property. Essentially the defendant must have fallen below the standards that could be reasonably expected of someone in his position at the time of the event causing damage.

Four key elements predominate in establishing a negligence claim – a duty of care, a breach of that duty, causation, and damage. A defendant must owe a ‘duty of care’ to the person bringing the claim, in the sense that they fell within a class of interests which the law considers should be protected. The ‘duty of care’ concept is one fairly distinct to common law jurisdictions, and it has been observed that it is one with no precise equivalent in many civil law traditions, where other means such as the concept of fault are used to provide a legal means of classifying claims as admissible or not⁴¹. There is a breach of that duty involving a failure to take reasonable care. Causation must be proved, and the type of damage alleged must be protected by the law. All the elements can involve what are essentially policy decisions by the courts in determining where risks should lie.

Applying traditional standards of negligence to a comparatively new technology such as CCS may prove challenging where not all the risks are predictable, and there is a lack of established industry practice on which to base acceptable standards. It is arguable that in dealing with a novel activity with unpredictable risks an industry is under a duty to adopt especially high standards. In this context, the precautionary principle, increasingly recognised in international environmental law, might be invoked, though to date it is generally considered to be applicable to public policy as a justification for government action rather than affecting standards of behaviour in the private sector. The precautionary principle is given legal effect in the environmental provisions of the EU Treaty, but in that context is only applicable to EU legislation and policy. British courts so far have been reluctant to consider it as a distinct ground that would affect liability under national law⁴², though it has been invoked by both Canadian and Australian courts, but again in the context of litigation involving public bodies rather than the liability of private parties⁴³.

In all three jurisdictions considered, CCS will be a highly regulated industry, and a storage operator fully complying with detailed requirements of a permit or licence should be able to successfully resist a claim based solely in negligence. Storage operations conducted for the purpose of avoiding CO₂ emissions are being actively promoted and encouraged by government in the jurisdictions studied here in the public interest. Courts are also likely to take this factor into account in assessing the level of standard of care required, and will probably resist imposing excessive requirements provided there has been full regulatory compliance. The particular issue of ‘permit defences’ is highlighted in section 6(b) below, but it should be noted that the British Compensation Act 2006 provides that:

*‘A court considering a claim in negligence or breach of statutory duty may, in determining whether the defendant should have taken particular steps to meet a standard of care (whether by taking precautions against a risk or otherwise), have regard to whether a requirement to take those steps might (a) prevent a desirable activity from being undertaken at all, to a particular extent or in a particular way, or (b) discourage persons from undertaking functions in connection with a desirable activity’.*⁴⁴

CCS though a commercial enterprise, would arguably be a ‘desirable activity’ in this context rather than something conducted solely for private economic gain, and it is a factor that is likely to play some part in any consideration by the courts of the appropriate standard of behaviour required by the law. This argument will be relevant where the storage is being carried out in the context of climate change abatement and the reduction of CO₂ emissions, but will be less convincing where the CO₂ injection is solely in connection with enhanced oil recovery activity.

41 Markesinis and Deakin, *Tort Law*, (2008) p 116

42 *R v Secretary of State for Trade and Industry ex parte Duddridge* [1995] Env. L.R. 151 and *R (on application of Amvac Chemicals v Secretary of State for Environment, Food and Rural Affairs* [2001] EWHC 1011

43 See Tollefson, Chris and Jamie Thornback (2008). *Litigating the Precautionary Principle in Domestic Courts* 19 J. Env. L. & Prac.33

44 Section 1. The Explanatory Notes indicate this provision reflects modern case law on the issue.

5.6

Ownership of CO₂ and liability

Where capture, transport and storage activities are carried out by distinct entities, it would be sensible commercial practice to make clear who owns the CO₂ at any particular point in the chain. Captured CO₂ would be treated initially as a chattel in law and owned as such by the operator carrying out the capture, and in the absence of any commercial arrangements transferring the ownership, it would appear that the operator would subsequently be treated in law as the 'bailor' of CO₂⁴⁵ once it has passed out of his direct control⁴⁶. But providing the operator has used reasonable care in selecting the transporter and storage operator, and has no further control over the CO₂, remaining a bailor should not expose the operator to any civil liability should there be a subsequent leakage from the storage site since the bailee is not considered the agent of the bailor⁴⁷. The essence of civil liability principles in trespass and nuisance rests not on ownership as such but on control and possession.

Once the CO₂ has been stored underground, the courts have developed a number of principles to determine whether a substance is a chattel in law or becomes a fixture and in essence is then merged with the land. Former ownership of the chattel is then automatically extinguished and it vests in whoever owns the land. The distinction between a chattel and fixture is not always clear, and the earlier approach was to look to the degree of physical attachment to the land - the more irreversible the attachment the more likely the substance would be treated as a fixture.

As noted in *Holland v Hodgson*⁴⁸, where 'the article in question is no further attached to the land by its own weight it is generally considered to be a mere chattel'. The more modern approach lays rather more emphasis on the purpose or object of the annexation⁴⁹. In this context, since the object of CCS storage is permanent containment, it is highly likely that once it has been stored it would be treated as a fixture⁵⁰:

*'The test of whether a chattel which has been, to some extent, fixed to the land is a fixture is whether it has been fixed with the intention that it shall remain in position permanently, or for an indefinite or substantial period, or whether it has been fixed with the intention it shall remain in position only for some temporary purpose. In the former case it is a fixture...'*⁵¹

As noted below in the transfer of liability section, some legislation has made it clear that on transfer ownership of the CO₂ is vested in the State. Ownership as such is not a basis of civil liability, and these provisions may have been included as a result of 'abundance of caution'⁵². Until transfer has taken place, it is likely that any owners of land who may by the operation of these principles of property law become owners of the CO₂ will and should agree indemnification arrangements with storage operators if these are separate entities. For instance, see the indemnification provisions in the UK Crown Estate CO₂ master lease for offshore storage⁵³.

45 According to Lord Hope in *TRM Copy Centres (UK Ltd v Lanwell Services Ltd)* [2009] UKHL 35 bailment 'embraces all situations in which possession of goods is given by one person to another upon the condition that they shall be restored to the person by whom possession has been given, or dealt with as he directs, upon expiry of the agreed period of possession' (para 10)

46 For a recent analysis and critique of the concept of bailment, see G McBain (2008) 'Modernising and Codifying the law of bailment' *Journal of Business Law* 1, 1 - 63

47 *Smith v Bailey* [1891] 2 QB 403, *Samson v Aitchison* [1912] AC 844

48 (1872) LR 7 CP 328 per Blackburn J at 335

49 For example, *Palumberi v Palumberi* (1986) NSW Conv R 55-287

50 The position will be different where CO₂ is being recycled in the context of EOR operations

51 *Australian Provincial Assurance Ltd v Coroneo* (1939) 38 SR (NSW) 700 per Jordan CJ at pp 712-713

52 N. Bankes (2013) 'The Developing Regime for the Regulation of Carbon capture Projects in Canada' in Barton et al, *Carbon Capture and Storage: Designing the Legal and Regulatory Framework for New Zealand* University of Waikato.

53 Clause 5.3 Crown Estate CO₂ Storage Master Lease <http://www.thecrownestate.co.uk/media/5291/CO2%20storage%20master%20lease.pdf> accessed July 24 2014

Special issues arising from civil liability

This section highlights some distinct issues which are likely to be of relevance in considering the application of civil liability principles to the potential leakage from a regulated CCS storage site.

6.1

Economic damage

A potential claimant in a civil law action relating to leakage from a CCS storage site is likely to have suffered some physical intrusion, damage to property or possibly personal injury. As such any economic loss that directly results from such damage, such as loss of value in property or loss of business, may be included within a claim.

Others, however, may also be indirectly economically affected by a leakage – for example, damage to a neighbouring oil-well or storage site could affect business interests of third parties providing services to that site. The courts in all of the jurisdictions covered under this study have tended to restrict claims in negligence where claimants seek compensation for pure economic to a number of fairly well-defined categories (negligent misstatements, defect products or buildings, public authorities in limited circumstances etc.) using the concept of a duty of care and special relationships. The precise rationale for the categories of cases where pure economic loss claims are permissible is sometimes difficult to discern, though it is one that is seen in many jurisdictions. The possibility of open-ended litigation, causation difficulties, and the creation of unpredictable liabilities have all been used to justify a limitation on the types of actions where solely economic loss is concerned. In a commercial world it is also arguable that contractual relationships should best define the circumstances in which claims for economic losses can be made.

The most likely type of economic loss to be of most relevance to claims in respect of leakage from storage sites relates to what is termed ‘relational economic loss’ – economic damage to the claimant that is consequent on physical damage to a third party. The British courts are still reluctant to allow such claims, as may be seen in *Spartan Steel and Co v Martin*⁵⁴. Australian courts have shown more flexibility – in *Caltex Oil (Australia) Pty v Dredge Willemstad*⁵⁵, the High Court allowed a claim by a company using a pipeline owned by a third party which had been negligently damaged by the defendant. A key justification was that the claimant belonged to a class of persons who could have been identifiable as likely to suffer losses in the circumstances. Similarly, the Canadian Supreme Court in *Canadian National Railway v Norsk Pacific Steamship*⁵⁶ reviewed the authorities and was prepared to allow a claim for economic losses (the costs of re-routing traffic) suffered by the user of a railway bridge owned by a third party that had been damaged by the defendant’s ship. The core concept used was one of proximity, limiting the number of potential claimants who might be financially effected by the physical damage, and thus avoiding potential floodgates arguments. Significantly in that case, the claimant’s contract with the bridge-owner expressly provided there would be no indemnity for re-routing costs in the case of bridge repairs – a provision negotiated by sophisticated commercial interests and which the dissenting judge argued should have determined where the insurable risks should lie.

Predicting how these principles might be applicable to a CCS leakage is more difficult, and much will depend on the nature of the potential interests affected and the extent to which this is predictable or known. A CCS operator in a geological field with other storage operators or operators oil and gas wells in proximity might, through modelling, be expected to consider and assess the risk of physical damage through pressure induced by leakage. The extent to which third parties who have economic relationships or dependences on these operators can be considered to be proximate in the sense used by the courts in recent case law will largely depend on a factual assessment by the courts.

54 [1973] 1 QB 27

55 [1976] 136 CLR 529

56 (1991) 91 DLR (4th) 289

6.2

Statutory authority and permit defences

a. Statutory authority

Given that CCS is a regulated activity the relationship between potential tort liability and the regulatory regime is a live issue. In negligence claims compliance or non-compliance with a permit is generally treated as often highly relevant, though not conclusive evidence either way, and much will depend on the detail and scope of the regulatory system in question. In claims of nuisance, courts have accepted that legislation (rather than merely a permit) which expressly authorises something to be done will grant an immunity to any nuisance that inevitably follows, provided no negligence was involved. It will be a matter of construction of the legislation in question to determine precisely what was being authorised. See, for example, *Allen v Gulf Oil Refinery*⁵⁷ where the British House of Lords considered that a Private Act of Parliament authorising the construction of an oil refinery granted immunity of actions in nuisance from its operations. In Australia similar principles apply, see for example the case of *Kempsey Shire Council v Lawrence*⁵⁸. The Supreme Court in Canada reviewed the principles in *Tock et al. v. St. John's Metropolitan Area Board*⁵⁹ and largely upheld them⁶⁰.

The British Planning Act 2008 has gone further by providing that for a range of national infrastructure projects, subject to special consent procedures under the Act (including development in relation to underground gas storage facilities⁶¹), statutory authority is granted '*for the purpose of providing a defence in civil or criminal proceedings for nuisance*'. In such cases, compensation is then restricted to compensation for land injuriously affected by the works under the Land Compensation Act 1973, which will be more restricted than damages claims under nuisance.

The principles of statutory authority have been developed in the context of nuisance law, but it is less clear whether they apply to actions in trespass. It is a good defence in a trespass case to show that the action was justified – where, for example, the defendant has a licence to enter the land, or where legislation has granted rights of entry to the property – but it is doubtful that these principles would apply here, since CCS storage presents a rather different scenario in that the defendant has been given a licence or consent to store the CO₂ in a particular area, but not to allow it to leak into another person's property.

b. Permit defences

When it comes to a permit, courts have generally held that compliance with a permit does not in itself provide a defence to a nuisance claim on the grounds that the civil liability and regulatory controls are performing separate functions. The Court of Appeal in England and Wales recently overturned the decision of the High Court, which had held that such was the density of modern waste regulation that compliance should now be a defence in a nuisance action arising from pollution from a landfill site. Nevertheless the more simplistic approach that compliance with a permit is irrelevant may be less sustainable in the context of a contemporary regulated industry⁶². The relationship of permit compliance to civil liability may well differ in other jurisdictions, or be made more explicit in legislation. Belgian law explicitly provides that an environmental permit has no influence on third party liability⁶³. German law, in contrast, provides that no injunction is available in respect of 'dangerous installations' operated in accordance with permit conditions⁶⁴.

When it comes to a claim based on negligence, compliance with regulatory requirements relevant to the claim is likely to provide powerful evidence that no negligence was involved, though not conclusively so⁶⁵. Legislation in Alberta, for

57 [1981] AC AC 1001.

58 (1996) Aust Tort Reports 81-375

59 (1989), 64 D.L.R. (4th) 620

60 Although at least one of the judges questioned whether the 'inevitable consequence' test was appropriate for providing immunity: 'The costs of damage that is an inevitable consequence of the provision of services that benefit the public at large should be borne equally by all those who profit from the service'.

61 The statutory definition of 'gas' in the Act simply 'includes natural gas', but seems unlikely to encompass a CCS storage site. But CCS facilities could be added to the list by regulation.

62 In *Coventry and others v Lawrence* [2014] UKSC 13 (a case concerning the relationship of planning law and noise nuisance) Lord Carnwath quoted a perceptive Professor Lee's comment that 'It is not realistic to look for a single, across the board response to the complicated relationship between tort and regulation, or even just nuisance and planning permission... Courts are not generally in a position to assess the substantive quality of regulation...' (Nuisance and Regulation in the Court of Appeal [2013] JPEL 277, 284)

63 For example Art 8 Decree of the Flemish Region of 28 June 1985 concerning environmental permits.

64 § 14 Federal Law on Immissions, Bundesimmissionsschutzgesetz - BImSchG) CO₂ storage is not yet listed within these industrial categories.

65 See Budden et al v BP et al [1980] JPL 586 where the British Court of Appeal struck out a claim in negligence against producers of leaded petrol by claimants alleging harm from the ingestion of lead contained in fumes from motor vehicles on the grounds that the product met statutory standards concerning lead content which must be presumed to be reasonable at the time.

example, provides that an applicant for a CCS storage facility licence must demonstrate that its CCS project will not have an adverse effect on existing or future oil and gas production or an existing gas storage facility⁶⁶. A licence issued in the light of this sort of analysis should be a strong defence against a negligence claim brought by an oil and gas operator who later alleges harm from storage operations.

6.3

Injunctions

Civil liability claims concerning leakages from CCS storage sites are likely largely to revolve around claims for financial compensation for losses occurred. In cases where there is a continuing potential damage rather than a one-off incident (typically in nuisance cases), claimants often seek an injunction to prevent the harmful activity continuing. Given the lengthy time-scales and distances that could be involved in CCS leakage, it may be difficult to envisage that preventing any further storage operations will inevitably prevent further leakage in the area complained of, but the remedy may still be sought. Courts are given discretion whether or not to grant an injunction.

There is power to grant damages for future losses, in lieu of an injunction, but until recently British courts were reluctant to do so in nuisance cases unless the damage was very small. This position was adopted largely on the grounds that it appeared to give defendants an opportunity to buy the right to pollute. Injunctions in continuing nuisance cases were largely granted as of right, though often suspended to give the defendant the opportunity to remedy their affairs. In 2014, however, the Supreme Court⁶⁷ refused to follow slavishly principles laid down in Victorian case law (the so-called *Shelfer* principles), and indicated that a more flexible approach should be adopted in future, and that the public interest in the activity concerned should be a relevant factor for the court in deciding how to exercise its discretion. Injunctions to prevent the continued operation of a CCS storage site, operating in compliance with regulatory requirements and clearly performing a function in the public interest of climate change reduction, are less likely to be awarded. In the United States, the utility of the operation to the public good appears to be a much stronger factor in deciding whether to grant damages in lieu of an injunction⁶⁸, Canadian courts appear sometimes to have been more ready to refuse an injunction where there is value to the general community in the operation under consideration, though have not yet sanctioned a full reappraisal of principles signalled by the British Supreme Court. Nevertheless, specific legislation may restrict the availability of injunctions for specific types of operation⁶⁹. Australian courts have generally followed the *Shelfer* principles (see for example *Munroe v Southern Dairies* [1955] VLR 332. A similar approach is adopted in New Zealand – see for example the judgment of *Hardie Boys J*⁷⁰, quoted in the British Supreme Court at page 535:

‘To the extent that this is an appeal to set the public interest ahead of the private interests of the plaintiffs, then I regret that authority requires me to close my ears to it’.

An injunction is clearly an extremely serious remedy for an operator, and legislation in some jurisdictions has restricted the right to seek an injunction at least where an operation is permitted under a regulatory regime. In the context of CCS, for example, section 40 of the Alberta Oil and Gas Conservation Act provides that no injunction may be granted in respect of an act required to be done under an approved storage scheme under the Act.

66 Section 39 Oil and Gas Conservation Act

67 *Coventry and others v Lawrence* [2014] UKSC 13

68 See for example *Boomer v Atlantic Cement Co* (1970) 257 NE 2d 870

69 For example, section 40 of the Alberta Oil and Gas Conservation Act provides that any scheme approved under section 39, including CO₂ storage, may not be prevented or restrained by an injunction.

70 *Bank of New Zealand v Greenwood* [1984] 1 NZLR 525

6.4

Limitation of actions

All legal systems provide time limits for the bringing of civil claims in order to bring some degree of certainty to legal and commercial relationships. In the common law systems, legislation rather than the courts define the core times in which claims must be brought, but inevitably will give rise to a considerable degree of judicial interpretation and judgment in their application to the facts of any claim. Limitation will be of particular importance in the case of underground CCS leakage where there could be very long time periods between the actual leak and its intrusion into a third party's interest, and there are likely to be real problems in discovering that some sort of damage has taken place. Limitation has to deal with potential conflicting policy goals – the need to provide fairness to third parties who have suffered damage which was not possible to discover until many years after the event, and the need to provide industry, and insurers, with some degree of certainty that a time eventually arises when no actions can be commenced.

Limitation periods in tort were traditionally based on a period which began when the cause of action accrued, generally defined as the time when the damage actually took place, even though it was not discoverable. The potential unfairness of this approach in the case of latent illnesses and defective building and products, where defects may not become apparent for many years, led to reform in specific areas, allowing the time limit for actions to begin when the damage was reasonably discoverable. This is usually accompanied by setting a longer overall time limit for bringing claims whether discoverable or not. This rather complex approach, of a combination of general rules with specific exceptions, is seen in England and Wales and Australia. The more modern approach, advocated by many Law Commissions, and seen in legislation in Alberta and Ontario is to base the general starting point at when the damage was discovered or reasonably discoverable, setting a rather shorter period for then bringing actions, and finally providing an overall time limit for bringing claims. A further qualification seen in limitations systems is the postponement of limitation periods where facts relevant to a claimant's right of action have been deliberately concealed by the defendant⁷¹. A storage operator who disposes secretly of unlicensed substances within the storage site could find themselves caught by such provisions.

In England and Wales the basic principle under the Limitation Act 1980 is that actions in tort must be commenced six years from the date on which the cause of action arose, whether or not the claimant was aware of the potential claim. Special provisions apply in the case of personal injury where three years is the normal date but starting from the date on which the cause of action arose or when the person first had knowledge of the injury⁷². The Act was subsequently amended to provide a period of three years for negligence claims where the facts were not known at the date on which the negligent action took place - the starting point is then the date on which earliest date on the claimant 'had both the knowledge required for bringing an action for damages in respect of the relevant damage and a right to bring such an action'. There is an overall fifteen year period for the commencement of such claims. As might be expected, the legislation adds further details as to what constitutes knowledge and essentially provides that it is not the actual knowledge but the knowledge that one might reasonably expect the claimant to have in the circumstances including that of 'facts ascertainable by him with the help of appropriate expert advice which it is reasonable for him to seek'.

These special provisions apply only to claims in negligence. In 2001, the British Law Commission recommended that they be applied to all torts⁷³, (i.e. three years from discoverability and a long-stop limitation of ten years) but this was rejected by Government in 2009. This means that traditional periods will apply to claims in trespass, nuisance and *Rylands v Fletcher*, with action in nuisance and *Rylands v Fletcher* commencing when damage takes place and trespass when the act of trespass actually takes place⁷⁴. But in the case of trespass and nuisance the wrong is considered to be a continuing one, as long as the intrusion is taking place, and this concept of a continuing tort may help to lessen the potential injustices raised by undiscoverable leaks. But it is possible to envisage, say, a sudden pressure increase being characterized as a 'one-off' rather than a continuing intrusion, and if no negligence is involved, there might be real problems with the current position on limitations if the damage was not discovered within six years.

Under Canadian law, limitation is more nuanced and Province-based, but with a trend of introducing rules based on rights of action starting when the claim was reasonably discoverable, but with shorter periods for then commencing

71 See, for example, section 32 of the UK Limitation Act 1980, section 4(1) of the Alberta Limitations Act 2000, and section 27 Victoria Limitations Act 1958.

72 The Act contains specific detail defining this 'date of knowledge'.

73 Law Commission (2001) Limitation of Actions Law Commission Report 270 HC 23

74 A similar position in Australian law - *Green v Walkley* (1901) 27 VLR 503. H

action, and overall long-stop limitations – essentially, a discovery period and an ultimate period. In Alberta the Limitations Act introduced in 1999 led the way for reform, and simplified the law by introducing a general rule of bringing a claim within two years after the person knew or ought to have known of the claim. A fairly tough overall ten-year limit applies whatever the position. Despite a general two year period for bringing an action, in Alberta the Environmental Protection and Enhancement Act 2000 allows a judge to extend the period where the claim is based on the impact of releases of substances into the environment⁷⁵. The potential prejudice to the defendant in granting an extension must be considered by the judge before make such an order. An extension was granted in *Wainwright Equipment Rentals Ltd. v. Imperial Oil Ltd.*⁷⁶, where storage activities giving rise to contamination ceased in 1965, but the actual contamination was not discovered until 1999. Other Provinces have different limitation periods – for example, the new Brunswick Limitation Act introduced in 2012 provides for a two year period from date of discoverability but a fifteen year overall limitation.

The Limitations Act 1968 in Victoria provides a general time-limit of six years from when the action accrued. There are special provisions concerning personal injuries, providing a three year period from when the damage was discoverable, but this type of model has not yet been extended to contamination claims of the type considered here, or generally to tort claims.

Table 1: Comparison of the limitation periods for actions in tort in the three jurisdictions

	General Rule	Exceptions	Overall time limit to bring a claim	Court power to override
England and Wales	Six years from when the damage occurs	Three years from when the claimant discovered the damage, or from when the damage was reasonably discoverable, in cases of negligence or nuisance involving personal injury, and in negligence cases concerning property damage	Negligence involving property damage are subject to a fifteen year overall time limit	Yes, in negligence and nuisance actions involving personal injuries where the court considers it equitable to do so (section 33 of the Limitation Act 1980)
Alberta	Two years from when the claimant knew, or should have known, about the damage	None	Ten years	Yes, under the Environmental Protection and Enhancement Act 2000 for claims based on releases into the environment
Victoria	Six years from when the damage occurs	Three years from when the damage was discovered, or from when the damage was reasonably discoverable, in negligence and nuisance cases involving personal injury	Negligence and nuisance actions causing personal injury are subject to a twelve year overall time limit	Yes, in cases involving negligence and nuisance involving personal injuries where the court considers it just and reasonable (section 23A of the Limitations Act 1958)

⁷⁵ Definitions of 'environment' and 'substance' in the Act are sufficiently broad to encompass the storage of CO₂.

⁷⁶ 2003 ABQB 898

6.5

Causation Issues

A key element of any liability claim is the need to prove some causal connection between the defendant's activities and the damage suffered. Traditionally the courts have initially employed the 'but for' test, asking whether the damage or loss would have been sustained but for the relevant act or omission in question, and causation must be proved by the claimant on the balance of probabilities, implying a more than 50% likelihood. In the case of a leakage from a storage site this is likely to require scientific and geological expert evidence involving modelling and predictions. Where there are several storage sites in reasonable proximity to each other, it is likely to prove a sensible precaution to require as a licence condition some sort of marking for each individual operator's CO₂, utilising small traces of gases or compounds to assist in determining its origin⁷⁷. This type of bespoke labelling of substances, however, will be of little assistance where the damage is caused, say, by injection pressure leading to movements of sub-surface brine water.

But it is equally clear that causation is not solely a question of assessing scientific fact, but also involves questions of law and policy. As Lord Hoffman put it in a case concerning criminal pollution where the legislation used the term 'causes', *'one cannot give a common sense answer to a question of causation for the purpose of attributing responsibility under some rule without knowing the purpose and scope of the rule'*⁷⁸. Courts in these cases typically also apply in addition various tests to determine whether there should in the circumstances be a legal responsibility for the damage occurred, using various concepts such as 'proximity', 'foreseeable' and 'remoteness'.

It is also clear that where scientific evidence cannot determine causation in a conventional sense, courts can sometimes be fairly imaginative in departing from normal rules if it is felt this would lead to unjust results. To take one example, successive employers negligently exposed an employee to asbestos, but it was scientifically impossible to determine which exposure actually caused the fatal disease. A conventional approach might have held none of the employers liable since none of them could be proved to have caused the illness, but the House of Lords, drawing on German legal approaches, was prepared to hold each liable in proportion to the length of time of the employment⁷⁹. In other cases, where scientific evidence is unable to conclusively establish a link between the damage and act complained of, the courts have in effect reversed the burden of proof where the defendant was considered to have created a risk of the damage occurring:

'It is a sound principle that where a person has, by breach of duty of care, created a risk, and injury occurs within that area of risk, the loss should be borne by him unless he shows that it has some other cause'.⁸⁰

It has been questioned whether this ruling represented a true reversal of the burden of proof and that the claimant still had to establish an inference that the defendant's action contributed to the loss. The Supreme Court of Canada, for example, accepted in *Snell v Farrell*⁸¹ the burden of proof still rested on the claimant but that *'in the absence of evidence to the contrary adduced by the defendant, an inference of causation may be drawn, although positive or scientific evidence of causation has not been adduced'*. A further qualification to the extent of damages that may be claimed is the principle that in negligence, nuisance, *Rylands v Fletcher* and trespass claims, a defendant is not liable for the kind of damage that is not reasonably foreseeable at the time of the actions concerned – for a good example of the application of that principle in the case of underground seepage, see the 1994 decision in *Cambridge Water* discussed in 5.2 above.

Predicting how these sorts of principles would be applied in a claim concerning geological leakage from a CCS storage site is not as easy. Under the current state of scientific knowledge seepage or pressure on brine water is clearly a predictable type of risk, even if the exact pathways cannot be determined. It is unlikely that a defendant could successfully argue this was a kind of risk not reasonably foreseeable. On the other hand, if the CO₂ reacted in some way

77 In its 2012 decision to approve Shell's CCS scheme for the Quest Carbon Project, the Alberta Energy Resources Conservation Board noted that Shell indicated that it is conducting a study to determine whether an artificial tracer could be effectively attached to the injected CO₂ molecules so that its movement could be tracked. Currently, Shell is investigating the potential issue of miscibility of a tracer and CO₂. Shell said the technical challenge is developing a tracer that will travel with the CO₂ and not react with the components of the varying lithologies—carbonates, siliciclastics, evaporites, and coals—or with changing pressure and temperature conditions. The Board required that results of the study be submitted at least one year before injection commences. ERCB (2012) *Shell Canada Limited Application for the Quest Carbon Capture and Storage Project* 2012 ABERCB 008 July 12 2012

78 *Empress Car Company v National Rivers Authority* [1999] 2 AC 22

79 *Fairchild v Glenhaven Funeral Services Ltd* [2003] 1 AC 32.

80 per Lord Wilberforce in *McGhee v National Coal Board* [1973] 1 WLR 1

81 [1990] 72 DLR (4th) 289

with an underground substance that was unknown at the time of storage and in a way that was unpredictable, questions of remoteness may well be applicable. More difficult will be the issue where two or more storage sites are operating in the same area, and where it is impossible to tell from which site the leakage occurred.

The cases concerning proportionate damage mentioned above are not directly analogous since they involved companies who were all in breach of their duties and therefore it was considered fair that each should bear a portion of the loss. Other cases, such as the Canadian case of *Cook v Lewis*⁸², where the courts have adopted imaginative approaches where more than one defendant may have caused the damage concerned, again involved situations where both defendants were at fault. A more controversial approach was adopted by the Supreme Court of California in *Sindell v Abbot Laboratories*⁸³ where it was impossible to tell which of the producers of a drug had caused the damage in question, and liability was imposed on the producers based on their market share of the product. But again in that case the court found that all the manufacturers should have known of the dangers of the product and failed to give adequate warnings. Again there is no direct analogy to the situation of legitimately operated storage sites in the same vicinity where leakage from one causes the damage in question, and it would be bold decision of the courts to impose liability on all, say in proportion to the amount of CO₂ stored in each. It is likely in such a case that if expert evidence cannot pin-point the originator on the balance of probabilities, a claim simply could not succeed.

7

Administrative Liability

7.1

Key Issues Concerning Administrative Liability

In this context, we use the term 'administrative liability' to refer to powers given to a public body to require an operator to carry out some sort of remedial action in the light of actual or potential environmental damage. Typically such powers will also include provision for the body to carry out works themselves and recover the costs of doing so. These sorts of powers are a feature in many areas of environmental legislation, and are designed to provide a rapid means of responding to some type of environmental incident. They should generally be considered distinct from the enforcement powers that provide for penalties (whether criminal or administrative penalties⁸⁴) for a breach of a licence or consent, or other contraventions of environmental legislation.

Analysis of administrative liability powers in relation to CCS raises a number of issues. First, and most important, legislation will define the conditions under which the powers may be exercised, and against whom they may be exercised. In some cases, they may be explicitly related to a breach of licence conditions, and in others they may be wholly independent of the licence. A significant question in this context is the extent to which authorities have a duty to take action in certain circumstances, or whether these are purely discretionary powers. Equally important is whether powers can be exercised before any damage has taken place on the basis of potential risk. The power to take preventative action is clearly valuable in an environmental context, but at the same time gives considerable power to authorities to impose costs on an operator on the basis of their judgment as to likely risks.

This then raises the issues of what happens where the operator wishes to challenge the exercise of these powers if they feel the authority is mistaken in its assessment, is placing unreasonable demands, or has misinterpreted the relevant law. Does the operator have the right to appeal to a court or other body, and what are the grounds of appeal? In some systems

82 [1951] SCR 830. The victim was shot by a bullet from one of two hunters acting carelessly but it was impossible to prove who shot the actual bullet. The burden of proof was shifted to the defendants to prove their innocent, and both were held liable in the absence of such proof.

83 (1980) 607 P 2d 924

84 Legislation may give power to enforcement bodies to impose financial penalties directly on those in contravention of the law rather than prosecuting through the criminal courts. Administrative penalties are extensively used in Canadian and Australian environmental law. Usually termed 'civil penalties' in UK law (see Regulatory Enforcement and Sanctions Act 2008) they are being gradually introduced in the environmental field.

they may have the right of a full merits appeal – in effect to have the whole issue reconsidered by the appeal body – or the grounds of appeal may be limited, perhaps just to questions of law. Finally, one needs to ask whether third parties, such as non-governmental organisations, are given any rights in respect of administrative liability powers where they feel the authority should have exercised their powers, but have chosen not to do so.

Administrative liability powers may be contained in specific CCS legislation, but are also typically contained in a range of environmental laws, such as those relating to water pollution. In any given situation there may be potentially a number of different bodies with the power to act, depending on the type of damage involved. Legislation may attempt to carve out clear areas of responsibility to avoid duplication, and has done so in certain cases, but in reality there may often be overlapping jurisdictions and responsibilities. As a matter of good governance, it will therefore be important to establish clear lines of administrative responsibility and coordination between different bodies with a potential interest in order to minimise regulatory effort and ensure that operators are not faced with conflicting demands. Early exchange of information, liaison arrangements, and possibly the appointment of a lead authority are likely to be important features. An example from England and Wales is the Memorandum of Understanding agreed between the Environment Agency and the Health and Safety Executive where both have responsibilities for regulatory enforcement over the same plants or processes⁸⁵.

The following sections consider key areas of administrative liability powers relating to CCS in each of the three jurisdictions being considered. They are not intended to be an exhaustive examination of all the powers potentially available, but aim to illustrate and compare how each jurisdiction has handled some of the core issues associated with the administrative liability powers highlighted above.

7.2

United Kingdom

Current policy limits potential storage sites to offshore areas, and the focus will therefore be on administrative liability provisions relating to offshore operations.

a. Directions under CCS Legislation

Chapter 3 of the Energy Act 2008 provides the core framework for the licencing of CO₂ storage, and section 24 provides the licencing authority (the Secretary of State for Energy and Climate Change in the case of storage beyond twelve mile limit of the territorial seas) with the power to give directions to a licence holder, but these are limited to where the licence holder has failed to comply with a provision of the licence. The directions may require the licence holder *‘to take steps which the licensing authority considers necessary or appropriate to comply with the provision within a period specified in the direction’*. Prior consultation with the licence holder is required before directions are made. If the licence holder fails to comply with directions the authority may itself comply with the requirements of the direction or appoint another person to do so, and recover from the licence holder reasonable costs incurred. The failure to comply with a licence provision is also a criminal offence, as is the failure to comply with a direction, but the legislation specifically provides that the use of directions is without prejudice to any other enforcement provisions. The legislation does not provide for any form of appeal against directions - an operator questioning the use of the powers would have to consider a judicial review, or more likely wait until prosecuted and raise a defence.

The section 24 direction powers are clearly not applicable where there is an unexpected leakage which is not related to a breach of licence conditions. The 2010 Storage Regulations⁸⁶ fill this gap by providing that where *‘a significant irregularity or a leakage has been detected’* while the licence remains in force, the Secretary of State, after consulting with the operator, may direct the operator to take ‘corrective measures’ and any measure to protect human health. As with the section 24 powers the Secretary of State may, where the directions are not complied with, carry out the works themselves, or arrange for someone else to do so, and recover the associated costs. ‘Corrective measures’ is a term derived from the EU CCS Directive and defined to mean *‘any measures taken to correct significant irregularities or to close leakages in order to prevent or stop the release of CO₂ from the storage complex’*⁸⁷.

85 <http://www.hse.gov.uk/aboutus/howwework/framework/mou/ea-mou.pdf> accessed June 10 2014

86 The Storage of Carbon Dioxide (Licensing etc.) Regulations 2010 SI 2010/2221

87 Art 3 Directive 2009/31/EC

Similarly 'significant irregularities' and 'leakage' are also defined in the Directive⁸⁸. There is, however, a certain amount of duplication of provisions in that the 2010 regulations also provide⁸⁹ that one of the conditions of any permit must be that if the operator becomes aware of any leakages or significant irregularities, the operator must take the necessary corrective measures. Failure to do so would be a breach of permit conditions, and the section 24 powers of direction rather than those under the Regulations could be invoked. On that analysis, the powers in the regulations are more appropriate where the authority becomes aware of a leakage but the operator is not.

b. The Crown Estate

A distinctive feature of the UK regulatory regime for CCS is that in addition to a storage permit from the Secretary of State, the offshore operator must also obtain a lease from the Crown Estate as owner of the sea-bed. In practice, the Secretary of State and the Crown Estate coordinate to avoid duplication of obligations⁹⁰, but the model lease contains a number of obligations on the operator relevant to potential environmental damage which could be enforced by leasehold law. For example, the lease provides that the operator must not perform any act or exercise any right under the lease which '*(a) maybe, becomes or may cause a danger, nuisance, damage or injury to the Commissioners or any other person or premises; or (b) may cause or contribute to Pollution*'⁹¹. The operator is obliged under the lease to take steps to abate the nuisance and remedy any damage caused, and the Crown Estate may require the operator to carry out all works and operations as a result of the pollution. The model lease also contains indemnity provisions should the Crown Estate be liable to a third party as a result of migration of CO₂.

The provisions of the lease are essentially long-stop provisions mainly designed to protect the Crown Estate's interests, and in practice the Crown Estate would largely leave it to the Secretary of State to take the lead to enforce the regulatory requirements.⁹²

c. Environmental Liability Remediation Notices

These provisions under the Energy Act are clearly largely focused on the prevention of further leakage, and do not cover any environmental remediation costs where there has been actual damage to the environment. Here key provisions are to be found in the Environmental Damage (Prevention and Remediation) Regulations 2009⁹³ (and subsequently amended), which implement the EU Directive on Environmental Liability (Directive 2004/35/EC). The Directive was amended in 2013 to cover marine waters⁹⁴.

The Directive is focused on remediation and clean-up powers rather than principles of civil liability, which is left to Member States to determine. The Directive applies to CCS storage, but does not cover all types of environmental damage. The categories of damage covered by the Directive (essentially land contamination affecting human health, damage to surface waters and groundwater waters covered by the EU Water Directive and damage significantly affecting the environmental status of marine waters, and damage to protected species or habitats under EU nature conservation law) are not wholly logical, and reflect the intense political discussions leading to agreement of the Directive. According to the UK Guidance on the Regulations, these limitations mean they are expected to cover only around 1% of the total number of cases of environmental damage in England and Wales⁹⁵.

In relation to offshore CCS activities, the amended Directive coming into force in 2015 applies to damage to the 'environmental status' of marine waters, a term given a broad definition⁹⁶.

88 'significant irregularity' means any irregularity in the injection or storage operations or in the condition of the storage complex itself, which implies the risk of a leakage or risk to the environment or human health; 'leakage' means any release of CO₂ from the storage complex.

89 Schedule 2, para 6 2010 Regulations

90 See Milligan B (2014) Planning for offshore CO₂ storage : Law and Policy in the United Kingdom *Marine Policy* Vol 48 162

91 Para 3.6.2 Crown Estate Model Lease for CO₂ storage : <http://www.thecrownestate.co.uk/media/5291/CO2%20storage%20master%20lease.pdf> accessed July 24 2014

92 pers. com July 2014

93 SI 2009/153

94 Directive 2013/30/EU. Member States must bring in this extension of coverage by July 2015

95 Environmental Damage (Prevention and Remediation) Regulations 2009. Guidance for England and Wales. November 2009, 2nd update.

96 'the overall state of the environment in marine waters taking into account the structure, function and processes of the constituent marine ecosystems together with natural physiographic, geographic, biological, geological and climatic factors, as well as physical, acoustic and chemical conditions, including those resulting from human activities inside or outside the area concerned', Art 3, Directive 2008/56/EC as applied in the amended Environmental Liability Directive. In July 2014 the UK Government issued a consultation paper on arrangements to transpose the extension of the Liability Directive to marine waters: <https://consult.defra.gov.uk/better-regulations/amending-the-environmental-damage-regulations-2009/consultation> accessed 4/8/2014

Those provisions relating to the protected species and habitats also apply offshore, covering the seabed out to the limits of the continental shelf, and out to the limits of the Renewable Energy Zone (around 200 miles). Some twenty sites in UK offshore waters have to date been designated as EU protected sites (Special Areas of Conservation). Because CCS is a designated activity under the Directive, the provisions apply to damage or potential damage caused by the operator, whether or not there was fault or intention. However, the Directive provides for a number of defences for the operator (see below) which Member States may incorporate into their system when transposing the Directive into national law.

The offshore enforcing authority is the Secretary of State. Operators have a duty to take preventative steps where there is an imminent threat of damage, and to take steps to prevent further damage if damage has already occurred. In both cases they must notify the authority. Significantly, the enforcing authority has duties rather than discretionary powers to take action where they consider that environmental damage as defined in the Directive has been caused that falls within the scope of the Regulations. This means that they are vulnerable to a challenge by third parties such as non-governmental organisations should they fail to act. Once they decide that they must require the operator to submit proposals concerning the remediation of damage, and then must serve a remediation notice specifying the remediation measures to be taken. If the operator fails to comply with a remediation notice, the authority has the power (but not the duty) to carry out remediation steps themselves and recover the costs. There are complex provisions concerning exactly what is meant by remediation, and this can include the provision of compensatory measures elsewhere where actual environmental damage cannot be remediated.

Operators have the right to appeal, and currently appeals are held by the Planning Inspectorate rather than a tribunal or court – the Inspectorate is an independent executive agency of the Department of Local Government and Communities. The grounds of appeal are extensive, including an appeal on the grounds that the operator's activity did not cause the environmental damage, but oddly they do not explicitly cover the reasonableness of the remediation measures required. In the context of CCS as being a new technology two potentially significant grounds of appeal exist in the UK legislation, reflecting defences available under the EU Directive. First, the so-called 'state of the art' defence – the operator was not at fault or negligent, and the damage caused '*was not considered likely to cause environmental damage according to the state of scientific and technical knowledge at the time when the emission was released or the activity took place*'⁹⁷. Second, a permit compliance defence where the operator was not at fault or negligent, and the emission causing the damage was authorised or fully in accordance with a permit. The relevant permits in this context are listed in the Regulations, but at present they do not yet appear to include a CCS storage permit.

One further aspect of the environmental liability regime is distinctive, and again reflects provisions of the European Directive. Third parties who have either been affected by the damage or are considered to have 'sufficient interest' have the right to notify the enforcing authority of environmental damage, or the imminent threat of such damage. The authority must consider the information and notify the third party of their decision of any action it intends to take or not take. This is hardly an *actio popularis*⁹⁸, but unless the authority can dispute the information about the damage, their duties to take administrative steps under the Regulations come into play. If they fail to take steps they would be then vulnerable to a challenge by way of judicial review. The term 'sufficient interest' is not defined in the Regulations, but the Directive expressly states that non-governmental organisations promoting environmental protection and meeting any requirements of national law are deemed to have sufficient interest⁹⁹.

d. Marine Management

Under the Marine and Coastal Access Act 2009 a new body, the Marine Management Organisation (MMO), has extensive powers concerning marine planning and the licencing of specific activities in marine waters. The Act requires the preparation of Marine Policy Statements and Marine Plans, and provides that all public authorities in the UK are required to take any authorisation or enforcement decisions in accordance with the Marine Policy Statement and relevant Marine Plan, unless 'relevant considerations indicate otherwise.' The MMO has power to serve remediation notices where a licence has been breached and require remediation or compensatory measures where there is, or is likely to be, harm to the environment or human health. These powers of licencing, however, expressly do not apply CCS, as well as activities licenced under oil and gas legislation.¹⁰⁰

97 Environmental Damage (Prevention and Remediation) Regulations 2009, reg 19(3)(e)

98 Refers to a public or general right to initiate a claim in the interest of the public good without having to show any private interest affected

99 By failing to include this provision in the transposing regulations, the UK is probably open to enforcement action by the European Commission. In any event, a court is likely to interpret the national regulations in the light of the Directive.

100 Supra, note 7 above.

7.3

Province of Alberta

The core legal framework for CCS storage is contained in the Oil and Gas Conservation Act and Part 9 of the Mines and Mineral Act, as amended. The Mines and Mineral Act, however, is largely focused on ownership and royalty issues, and does not contain dedicated provisions concerning administrative liability. Storage without an injection agreement from the Minister is a criminal offence¹⁰¹. Part I of the Act contains general provisions relating to agreements, though again nothing specific on administrative liability powers. There is broad power to make regulations respecting agreements including conditions and terms, and the imposition of penalties, but the powers do not expressly refer to administrative liability requirements in the sense we are using the term.

The legislation highlighted below all contain various forms of administrative liability provisions, but by no means covers all the areas of environmental law that might come into play. Depending on the circumstances and environmental effect of a CCS leakage, it is clear that different provisions under different Acts could become relevant, and in practice considerable coordination is likely to be required between different parts of the administration to ensure no unnecessary duplication. In 2012 the Carbon Capture and Storage Regulatory Framework Assessment, conducted by the Alberta Government, acknowledged the complexities of the regulatory process, and the final report recommended that to ensure the effectiveness and efficiency of the CCS system the Government should clarify the roles and responsibilities amongst the various Government Departments, and make the information readily available.¹⁰²

a. Directions under the Oil and Gas Conservation Act

The Act contains the core CCS regulatory provisions, including the requirement of a licence for injection operations (section 11) and approval of 'schemes' by the Alberta Energy Regulator for the storage of substances in underground formations. It specifically provides that a scheme may not be approved if this would interfere with the recovery of oil and gas (section 39(1.1)).

Where the operation of a facility is not in accordance with an order, direction or requirement of the regulator, section 100 gives a general power to the regulator to authorise any person to carry out '*whatever the regulator considers necessary*' to comply with its requirements. The costs involved may be allocated by the regulator to the licensee¹⁰³, and recoverable as a civil debt. There are no specific administrative appeal procedures against the imposition of such costs, and presumably the person charged would need to resist a civil claim by the regulator if they wished to challenge the action, though the discretion given to the regulator is extremely broad, making this difficult. There is, for example, no mention of 'reasonable' costs.

There are a number of specific powers relating to escapes which, though clearly drafted with oil spills and similar incidents in mind, could be applicable to CO₂ leakage. Section 41 provides broad powers where there is an escape, which would be applicable to a leakage from a storage site. If '*the flow or escape of oil, gas, water or any other substance from a facility, or from a well or any underground formation that the well enters, is not prevented or controlled*' the regulator may take any means necessary to prevent or control the situation. There are very broad powers to impose the costs involved on anyone whom the regulator determines¹⁰⁴. Section 104 also contains powers with respect to substances which have 'escaped' from a facility, and gives power to the regulator to direct the licence holder to take steps to contain and clean up the escaped substances, prevent further escapes, or do anything else 'necessary to ensure the safety of the environment'. The regulator also has power to enter the area where the substances have escaped and to carry out any clean-up and containment operations. The regulator also has broad powers to direct who shall pay the costs of doing so. Section 105 gives further powers concerning the enforcement of orders made by the regulator, to allow him them to take control of the facility, and to take any steps necessary to prevent flow or escape of substances.

With respect to appeals, regulations provide for appeals to be made against the imposition of administrative penalties under particular provisions of the Act and specified orders made by the regulator under the Oil and Gas Conservation

101 Section 117 made an offence under s 63(1).

102 Carbon Capture and Storage Summary Report of the Regulatory Framework Assessment Government of Alberta 2012, para. 10.2

103 As well as the approval holder and working interest participants.

104 Oil and Conservation Act, s 105(4).

Act.¹⁰⁵ There do not, however, appear to be dedicated administrative appeal rights in respect of the decisions by the regulator under sections 41, 104, and 105, described above.

b. Environmental Protection Orders under the Environmental Protection and Enhancement Act

The legislation contains various provisions concerning administrative liability where environmental harm is threatened or caused and which could come into play following leakage from a CCS storage site. It should be stressed that as with the Water Act, discussed in the sections below, these provisions have not been drafted with CCS storage in mind, though many appear sufficiently broad in terms to cover the most probable scenarios that could occur. There is, for example, a general prohibition of knowingly releasing or permitting the release of substances in excess of amounts, concentrations, levels or rates of release in excess of those prescribed in any approval, code of practice or regulations (section 108). Where there is no such approval, code of practice or regulations, there is a general prohibition of releases that cause or may cause significant adverse effects (section 109). Once aware of the release the person in control of the substance must report the fact the authorities, and has a duty to take all reasonable measures to repair, remedy and confine the effects of the substance, and to restore the environmental to the condition satisfactory to the Director.

Where the Director considers that a release¹⁰⁶ of a substance is causing, or has caused, an adverse effect, the Director has the power, though not the duty, to serve an environmental protection order on the person responsible. These powers may also be used in a preventative situation, where the release and adverse effects may occur, and an order will require the operator *inter alia*, to take action to prevent the release, minimise or remedy the effects of the substance on the environment, and carry out remediation, (section 113).

There is a qualified form of permit defence in that an environmental protection order may not be issued where the release was expressly authorised or in compliance with an approval, code of practice or regulations. This limitation does not apply where the Director considered the adverse effect was not reasonably foreseeable at the time of the approval, or the making of the code of practice or regulations. It seems unlikely, though, that this restriction would apply in the case of a CCS leakage. While the storage of the CO₂ in a specified site will be included, leakage will not be permitted.

Part 6 of the Act is also likely to be relevant, and refers expressly to operators as including holders of licences or permits from the Energy Regulator or working participants in wells. Section 141 gives powers to inspectors to serve environmental protection orders, where satisfied that an operator 'has caused or allowed a substance to leave or escape from the specified land in respect of which the operator is or was carrying on an activity' regarding conservation and reclamation of the land affected.

The Act contains general powers concerning enforcement orders, and provides that where someone fails to comply with order the Director may take whatever action necessary to carry out the order. The Director may also recover the costs from the person served with the order (section 245). The Act contains general provisions concerning administrative appeals which will apply to the service of environmental protection orders. Appeals are heard by a specialised Environmental Appeals Board, and the legislation does not provide any restrictions on the grounds of appeal. Third parties, such as non-governmental organisations, have no right to take part in appeals, but the Board has the discretion to hear representations from 'any persons who the Board considers should be allowed to make representations' (section 95(6)).

c. Water Act

Leakages from a CCS storage site that, say, though their effect on the movement of brine water have an impact on groundwater and underground aquifers, could also bring into play provisions concerning administrative liability under the Water Act. This will apply to 'activities' which, *inter alia*, include any undertaking in or on any land, water, or water body that 'causes, may cause, or may become capable of causing an effect on the aquatic environment' (section 1(1)).

Powers similar to environmental protection orders under the Environmental Protection and Enhancement Act are provided. An inspector or the Director may issue a water management order in respect of various activities, including

105 See Alberta Energy Regulator Rule of Practice Alberta Regulation 99/2013, Responsible Energy Development Act General Regulation Alberta Regulation 90/2013

106 The term 'release' is given a broad definition and includes leakages and seepages – section 1(hhh)

where no approval is required or where the inspector or Director considers that an adverse effect on the environment, human health, property, or public safety has occurred or may occur (section 97). An order may require the person responsible to take whatever steps the Director considers necessary, including restoring the area affected¹⁰⁷. Where there is a failure to comply with an order the Director may take whatever steps he considers necessary to effect the order, and to recover costs incurred against the person served with the order (section 103). There is a parallel system of enforcement orders which may be issued where the Director considers there has been a contravention of the Act, including breaches of any licences issued under it. As with equivalent administrative liability provisions, these are distinct from the powers to impose administrative penalties or criminal sanctions, and are designed to provide a practical response to remedy the contravention and prevent further harm. Orders can include requirements to minimise or remedy the effects on the aquatic environment, and restore and remediate the area affected (section 136). If the order is not complied with the Director may take whatever action considered necessary to carry out its requirements, as well as recover the associated costs from the person served with the order.

Part 9 of the Act contains provisions concerning appeals. Appeals against environmental protection orders and enforcement orders may be made to the Environmental Appeals Board.

7.4

State of Victoria

The Victorian model of administrative liability shares several similarities with those characterised previously in the legal and regulatory models of England, Wales and Alberta. The onshore and offshore geological storage Acts, together with the wider regimes governing water and environmental protection in the State, include a number of circumstances where a public authority may oblige an operator to undertake preemptive or remedial activities to prevent public harm or environmental damage.

a. Notices under the Greenhouse Gas Geological Sequestration Act 2008

Two Acts¹⁰⁸ provide the framework for the regulation of CCS activities onshore and within the State's territorial waters and, as such, provide the starting point for considering the scope of directions under CCS-specific legislation. For the purpose of this study of administrative liabilities, this section will focus upon the regime established under the onshore Act, which provides for a detailed system of permits and licences, regulating regulate the rights to explore, inject and store CO₂ within the regulated areas.

The Act includes several provisions where the Minister is afforded discrete powers to intervene in an operator's activities and determine a course of action. Improvement notices are linked to compliance with the legislation and authority - the Minister may issue such a notice where he or she believes that an operator ('holder of an authority') has contravened or failed to comply with some aspect of the Act,¹⁰⁹ or a condition of the authority, and can require '*the holder to take specified action within a specified period to stop the contravention, or failure to comply, from continuing or occurring again*'¹¹⁰. Failure to comply is sanctioned by a penalty and the payment of specified 'penalty units',¹¹¹ but it is a defence for the holder of an authority to demonstrate that they had not breached the conditions set out in the authority, or had not contravened the Act, or where the holder can demonstrate that they have taken 'all reasonable steps' to comply with a notice.

The legislation gives an authority holder the right to have the Minister's decision to issue a notice reviewed in the Victorian Civil and Administrative Tribunal (VCAT)¹¹² provided application is made within twenty-eight days in accordance with the terms and conditions specified in section 273(2) of the Act. Application for a review has the effect of suspending the Notice until the Tribunal's decision or withdrawal of the application¹¹³.

107 Where an inspector rather than a Director issues an order, the contents are more limited, and cannot include restoration requirements (section 99(2)).

108 *Greenhouse Gas Geological Sequestration Act 2008; Offshore Petroleum and Greenhouse Gas Storage Act 2010.*

109 Section 270 (1) (a)–(d)

110 Section 270(2)

111 These units translate to an individual financial unit, which is gazetted annually under the Monetary Units Act 2004 in Victoria.

112 The Victorian Civil and Administrative Tribunal Amendment Bill 2014 is designed to improve the efficiency of the Tribunal system and will, inter alia, give the power to the Tribunal at any time during the proceedings to invite the original decision-maker to reconsider their decision.

113 Section 271(3)

In situations where the Minister is convinced that an activity or event, which has occurred or is likely to occur, will create an ‘*immediate risk*’¹¹⁴ of personal injury, serious property damage, or, significant environmental damage he or she may issue a prohibition notice. This notice has the effect of preventing the authority holder from undertaking further monitoring or storage activities, related activities, or ‘*any specified action*’ in an authorised area¹¹⁵. A notice remains in force until the Minister certifies that there has been compliance with any directions contained in the notice, or the expiration of specified time period. As a part of this notice the Minister may include ‘*directions as to measures to be taken to remove or reduce the risk*’, as well as details of when the prohibition enters into effect.

Failure to comply with a prohibition notice is also sanctioned by a penalty, but since it is not linked with compliance with legislation or authorisation, there is no compliance defence as with improvement notices. The defence of taking all reasonable steps, however, is available. The authority holder also has rights of review before the VCAT but given the seriousness of the situation, the application for review does not suspend the effect of the notice.

Where the authority holder fails to comply with the terms of an improvement notice, the Minister may ‘*do anything that should have been done by the holder of the authority*’¹¹⁶. Any costs incurred by the Minister in meeting the requirements of the notice are deemed to be ‘a debt due by the person to the State’. Oddly, there is no equivalent power to step in and carry out works in the case of failure to comply with a prohibition notice. The legislation gives particular enforcement responsibilities to the Environmental Protection Agency (EPA) over monitoring and verification for injection wells, and as a result the EPA has been given distinct powers to serve improvement and prohibition notices¹¹⁷. These follow the model above, allowing the EPA to serve an improvement notice where they are satisfied the authority holder is not following an approved monitoring and verification plan. Similarly they may serve a prohibition notice where they consider failure to adhere to the plan as cause a risk of personal injury, serious property damage or significant environmental damage. The sanctions, defences and rights of review are the same as for improvement and prohibition notices served by the Minister.

The Act requires an operator to rehabilitate the land used for the activities permitted under an authority. Section 220 of the Act requires the holder of an authority, who intends to undertake injection activities, to therefore hold a rehabilitation bond approved by the Minister. The purpose of this bond is to ‘*secure the payment of a specified amount of money for any rehabilitation work, clean-up work or pollution prevention work that may be necessary as a result of a greenhouse gas sequestration operation*’.

Where an operator fails to rehabilitate a site, further rehabilitation is required, or a land owner requests it, the Minister may ‘do anything necessary’ to rehabilitate the land¹¹⁸. The only qualification to this action is that the Minister must have first requested the holder of an authority to undertake the necessary rehabilitation work, and that the holder has failed to do so within a reasonable period. Where the Minister is required to undertake any activities under this section, he or she may recover the costs of these activities from the rehabilitation bond. In instances where it may not be possible to recover costs from the bond the Minister may recover the costs as a ‘debt due to the Crown’.

Broad powers are also afforded to the Minister under section 182 of the Act to enable the issue a direction in the event of ‘serious situation’. A ‘serious situation’ is similarly broadly defined under section 6 of the Act and includes scenarios where there is leakage, the potential for leakage, or where injected substances are not behaving as modelled. In these instances the Minister may require an authority holder to do a wide range of actions set out in section 182, ranging from taking reasonable steps to ensure the injected CO₂ is injected in the directed manner, to taking any ‘*action as specified in the direction*’. Failure to comply a Minister’s direction under this section is an offence and again sanctioned by a financial penalty under the Act. There appear to be no appeal or review rights in respect of the exercise of powers under section 182 and any legal challenge would presumably have to be by way of judicial review on the grounds that the Minister had acted wholly unreasonably or had misinterpreted the law.

114 Section 273 (1)

115 Section 271(2)

116 Section 275

117 Sections 270A and 271A inserted by sections 312 and 313.

118 Section 222(1)

b. Notices under the Environment Protection Act 1970

The Act establishes a broad legislative framework for the protection of the environment in the State of Victoria and is predicated upon a number of environmental protection principles. The Act's scope is extensive and it includes provisions relating to clean water and air, noise pollution and the control of wastes in the State. The Act establishes the State's Environmental Protection Authority (EPA) and sets out the powers of that authority in relation to the administration of the Act and its subsequent Regulations.

Under section 31A of the Act, the EPA may issue a 'pollution abatement notice', with regard to '*a process or activity which is being carried on or is proposed to be carried on, or any use or proposed use of any premises*'; where it is satisfied that it has caused or is likely to cause, inter alia, pollution, an environmental hazard, an emission of noise, or a breach of an order, regulatory standard, or permit condition. A notice may require an operator to cease or modify their activities, supply further information, take specified measures, comply with specified measures, or provide monitoring equipment or monitoring information¹¹⁹. Pollution abatement notices, may be expressed as 'general' or be limited to 'particular times, places or circumstances', as well as specify a timeframe for compliance with their proposed requirements. The EPA may, by issuing a 'notice of amendment', amend or revoke a requirement in a notice, as well as extend a specified compliance period, where they are satisfied there is cause to do so.

A notice issued under section 31A comes into effect thirty days after its service and failure to comply with it, or contravention of its terms, is an indictable offence under the Act. A statutory penalty, in the form of penalty units, is payable where an offence is committed. In accordance with the EPA's Remedial Notice Review Policy¹²⁰, the recipient of a notice under this section is afforded the opportunity to have the notice reviewed by the EPA. An application for a review must be submitted to the EPA within seven days of the issue date of the original notice. Section 35(1) of the Act, however, also affords a right of external review, to '*a person whose interests are affected by a requirement specified in a pollution abatement notice or a notice of amendment*' issued to that person under section 31A. A review will be heard in the VCAT, where the notice may be confirmed, revoked or amended accordingly.

In situations where '*urgent action*' is required and the EPA is satisfied that the circumstances set out in section 31A are present, but the cost of compliance with the requirements of a pollution abatement notice will not exceed \$50,000, they may decide to issue a 'minor works pollution abatement notice' under section 31B. The notice, which may be issued to an '*occupier of the premises or on the person responsible for the process*', may require any of the activities under a pollution abatement notice, or further activities as specified in the notice. Provisions similar to those applicable to a pollution abatement notice, apply to minor works notices. The authority may specify time periods for compliance with a notice, amend or revoke a requirement in a notice, and extend a specified compliance period, where they are satisfied there is cause to do so.

A notice issued under this section takes immediate effect and failure to comply with its terms is an offence under the Act and subject to a statutory penalty where an offence is committed. There is no right of appeal at VCAT of the EPA's decision to issue or amend a notice, however it may be reviewed by the Supreme Court within sixty days from the date of issue¹²¹.

Further administrative powers in relation to clean-up and on-going management are available to the EPA under the Act. Under section 62A the EPA may issue a notice, directing an operator to '*take the clean-up and ongoing management measures specified in the notice*'. A notice may be issued to the occupier of a site, a person who is currently causing the pollution or has done so in the past, as well as a person '*who appears to have abandoned or dumped any industrial waste or potentially hazardous substance*'. The EPA can specify any 'condition, requirement, restriction, performance standard or level' that it deems necessary, and the notice will have immediate effect. The EPA's accompanying policy guidance document suggests that the aim of the notice is to '*prevent further contamination and impact on beneficial uses through: removal of waste; undertaking clean-up activities; ongoing management of pollution...*'

Failure to comply with the requirements of a notice is an indictable offence and subject to a statutory penalty, payable in the form of penalty units. A decision to issue a clean-up notice may be reviewed internally by the EPA, in accordance

119 Section 31A (2)(a)-(g)

120 Remedial Notice Review Policy, Publication No.1531, Environment Protection Authority Victoria, August 2013.

121 Remedial Notices Policy, Publication No.1418.2, Environment Protection Authority Victoria, August 2013.

with their Remedial Notice Review Policy. An application for review of the decision to issue a notice must be received by the EPA within seven days of the issue of the original notice. A right of appeal to the Supreme Court is also afforded to the operator, to seek review of the EPA's right to issue the notice and the appropriateness of any requirements contained in the notice.

Section 62 of the Act enables the EPA to undertake the clean-up of a site, where they deem it necessary. The EPA's own policy guidance on these clean-up provisions¹²² suggests that these powers will likely be used in instances where '*liable party/ies cannot be found, or cannot conduct the cleanup*'. Of particular note, is the ability of the EPA under section 62(2) to recover costs from a number of parties, beyond the operator of a site. Under this section, the EPA may recover any '*reasonable costs*' associated with these clean-up activities from 'those who caused the action to be undertaken', as well as 'the occupier of the premises' where the issue originated. The accompanying EPA policy publication highlights that the broad categorization of 'occupier' under the Act, will likely mean that 'site owners, tenants, landlords and future purchasers may be pursued for costs'.

An action for cost recovery under this section may be brought in any court of competent authority. Where the EPA is unable to recover from the occupier the costs may become a charge on the property.

c. Water Act

The Water Act 1989 provides a framework for the State's allocation of surface water and groundwater, but has been explicitly amended by the Greenhouse Gas Geological Sequestration Act 2008 to avoid duplication and overlap of responsibilities for CCS injection activities permitted under the 2008 Act. Section 76 of the Water Act, which requires an operator to make an application to the Minister of Water where they intend to "dispose of any matter underground by means of a bore", now includes a new subsection (7): "*This section does not apply to the holder of an authority under the Greenhouse Gas Geological Sequestration Act 2008 in relation to work carried out in accordance with an approved injection testing plan or an approved injection and monitoring plan*".

This section effectively removes onshore storage activities from the scope of section 76 of the Water Act, including the powers of the Minister to give directions under section 78¹²³. It should be noted however, that the Minister administering the Greenhouse Gas Geological Sequestration Act 2008 is still obliged to consult the Minister responsible for the Water Act in certain circumstances, including the proposed surrender of an authority.

8

Greenhouse Emissions Liability

Jurisdictions that introduce some form of greenhouse gas trading regime are also likely to incentivise CO₂ storage activities by ensuring that operators are credited, or receive a benefit in some manner under the scheme in respect of the amounts of CO₂ not emitted. This then raises issues of accounting liability under the regime, should subsequent leakage occur before surrender of any licence or permit. All trading regimes introduce some form of verification process for emissions to ensure the integrity of the system, and that there is no incompatibility with credits claimed, actual emissions, and allowances. A scheme such as the EU Emissions Trading Scheme (EU ETS) requires an annual reconciliation where operators of installations falling within the system must produce allowances (EUAs) equal to their emissions, or face financial penalties.

Integrating CCS into such a system raises distinct accounting and liability risks¹²⁴ because the benefits claimed for CO₂ stored are similar to a cheque that might – but is unlikely to – bounce many years in the future. The lengthy time-

122 EPA clean-up and cost-recovery under the Environment Protection Act, Publication No.1538, Environment Protection Authority Victoria, June 2013.

123 It should be noted that a project involving storage offshore, in Victorian waters, may still require an approval under s.76 of the Act.

124 There is not yet a commonly accepted term for this sort of liability. Some of the literature uses the term 'Climate Change Liability' but this is potentially misleading because it can also refer to potential civil liability arising from damage caused by climate change. In this report we therefore use the term 'Emissions Trading Liability'.

scales involved, the technical problems of measuring precisely the amount of CO₂ that has leaked into the atmosphere from a potentially wide area, and the difficulties in potential cost exposure which will depend on future market prices of allowances within the emissions trading regime all raise difficulties in constructing effective regimes. These factors make conventional insurability against such risks highly problematical.

The EU ETS, based on a cap and trade system,¹²⁵ represents the most developed system where CCS has been incorporated into an emissions trading system and illustrates some of the challenges involved. The CCS Directive is linked to the EU Emissions Trading Directive and, following 2009 amendments to the Emissions Trading Directive, provides that a CCS storage site permitted under the CCS Directive must be registered under the Emissions Trading scheme.¹²⁶ As the amended Directive notes, the main long-term incentive for capture and storage is that allowances will not need to be surrendered in respect of CO₂ emissions permanently stored¹²⁷.

In essence, the Directive provides that a registered emitter has no obligation to surrender allowances in respect of emissions which are verified as captured and transported to a storage facility, authorised in accordance with the CCS Directive. This clearly represents an economic benefit in that no allowances need be purchased or any surplus allowances can be sold on the market. A CCS storage operator must be registered and account for any emissions from the storage site, as defined in the European Commission's Monitoring and Reporting Guidelines as amended in 2010, to take into account CCS¹²⁸. These are defined as leakages from the storage complex, which are identified and lead to emissions or release of CO₂ to the water column,¹²⁹ and the obligations apply during the operational phase and post-closure period until surrender and transfer to the Member State. No allowances are allocated to the storage operator who, in the case of an identified leakage, may be required to purchase allowances at the market price, when annual reconciliation following leakage takes place. There are tough administrative financial penalties for the failure to purchase allowances equivalent to emissions¹³⁰, and the Court of Justice of the European Union confirmed in 2013 that Member States must impose these penalties whatever the circumstances, even where there was no intention to circumvent the rules¹³¹. An unpredictable leak where the operator had exercised all due care would still give rise to a penalty if the requisite allowances are not surrendered.

Channelling the liability on the storage operator in this way, until post-closure transfer to the State is accepted under the provisions of the Directive (see section 9 below), is probably the only practicable way of dealing with a storage site where CO₂ has been acquired from a number of different sources, even though it is the original emitters rather than the operator who have gained the direct financial benefit from the system, and clearly acts as a further incentive on storage operators to prevent leakage. Commercial arrangements made by the storage operator could provide for the recovery of costs involved, or a contribution, from the operator of capture sources and, assuming it is not possible to assign a leakage to a particular source of CO₂, could in theory be based on a proportionate formula based on the amounts that each source has provided, similar to commercial arrangements for the transport of oil and gas through common transport pipes owned by a third party can provide indemnity, or contribution arrangements on a proportionate basis. Nevertheless it is this open-ended exposure based on unpredictable future market prices that has caused particular anxiety.

The system is made more problematical because the CCS Directive requires Member States to ensure storage operators provide adequate financial security for these liabilities before the commencement of injection. Initially, worst-case scenarios suggested that this might require vast sums as up-front security, but Commission Guidance on financial security, published in 2011¹³², injected a note of realism and advised that in estimating the amount of potential leakage, Member States could use a conservative estimate of the maximum proportion of CO₂ that can be released (in most cases

125 See Russell S (2011) *Carbon Capture and Storage Projects within Emissions Trading System* for a discussion of the advantages and disadvantages of the EU cap and trade system compared to the Alberta intensity based emissions trading regime. Important regulatory details of the application of the Alberta system where essentially storage sites receive off-set credits which can be sold to entities within the scheme to meet their intensity reduction obligations are still under development, and we have therefore focused here on the EU system to highlight key issues likely to arise.

126 EC Council Directive 2009/29 amending Directive 2003/87/EC and applying during the Third Phase of the scheme 2013-2020. Before then Member States had the option of requesting the Europe Commission to include CCS schemes.

127 This assertion is clearly based on assuming a large increase in the currently depressed price of EUA's standing at just over 6 Euros an allowance - <https://www.eex.com/en/market-data/emission-allowances/spot-market/european-emission-allowances> accessed 24 July 2014.

128 Decision 2007/589/EC as regards establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC as amended Decision 10/345 of 8 June 2010

129 As defined in the CCS Directive to mean the vertically continuous mass of water from the surface to the bottom sediments of a water body

130 In addition to the actual purchase of allowances needed, a penalty of 100 Euro per tonne of CO₂ equivalent emitted for which no allowance emitted. Following the 2009 amendments to the ETS Directive, the penalty increases from January 1 2013 in accordance with the European index of consumer prices.

131 *Billerud Karlsborg v Naturvårdsverket* C-203/12 Court of Justice of the European Union 17 October 2013

132 European Commission (2011) *Implementation of Directive 2009/31/EC on the Geological Storage of Carbon Dioxide Guidance Document 4*

much less than 100%) or ‘a calculation of the potential leakage amount based on a probability distribution of the amount of leakage from the storage complex’.¹³³ As to the future cost of Allowances under the trading system, the Commission advised that making long-term estimates of future Allowance prices should be avoided. Instead, Member States should use current prices or estimates for near-term allowance prices over the next three – five years, and then update the financial security periodically, for example three – five years, to take into account price adjustments.

Despite this Guidance, a 2012 report from a global insurance leadership group advised that conventional ‘off the shelf’ insurance solutions to address this type of liability do not currently exist¹³⁴. A policy such as Zurich’s Carbon Capture and Sequestration Insurance Policy¹³⁵ can encompass third party civil liability claims, but does not encompass any liability in respect of EU allowances under the emissions trading regime. The report advised treating separately the operational phase from the post-closure period, and advocated an innovative form of insurance based on an annually renewable policy that might be able to cover at least some of the risks. But it noted that, ‘By linking the liability to the unknown future price of EUAs under the ETS, the EU CCS Directive does not cap the size of this liability for operators. Ultimately, neither insurers nor storage operators will be able to bear unlimited liabilities, so where liabilities are not limited in either size or time, risk sharing with government will be required to develop CCS at scale in Europe’¹³⁶.

Although liabilities under the ETS Directive are transferred to the State, under the surrender and transfer provisions discussed below, an individual Member State could not under the current ETS Directive limit liabilities for the storage operator before surrender, and it would require amendment to the legislation at EU level if this were to happen. Alternatively a Government could agree to contribute to the cost of purchasing EUAs, but this would almost certainly be treated as a form of state aid requiring approval from the European Commission under EU Competition Law. Some form of cap on operator’s liability might be a sensible way forward, but it would require EU policy makers to be convinced that while included in the Emission Trading System, the nature of CCS justifies a distinct treatment from other operators within the scheme, and that special treatment would not undermine its overall viability and logic.

9

Transfer of Liabilities and Responsibilities

The need to address the transfer of legal responsibility and/or liabilities for stored CO₂ or other greenhouse gas substances to the Government after active injection operations has been one of the distinctive features of emerging CCS regulation. Most governments legislating for CCS have considered the argument that the ultra-long term nature of the containment requirements for CO₂ storage make it unrealistic to expect the operators to retain responsibility indefinitely, given the normal lifespan of a commercial or corporate entity, and that the urgency of climate change mitigation demands special arrangements if decarbonisation targets are to be achieved.

But it is important in this context to distinguish between continuing legal responsibilities for a closed storage site (monitoring, taking action in the case of a leakage, and so on) and legal liabilities to third parties that may result from a leakage of the type described in the section of civil liability above. In the case of civil liabilities, it is equally important to distinguish between historical liabilities arising from leakage during the operational phase of a storage site but which, because of the slow nature of geological seepage, are not discovered or do not cause damage for many years after the event, and liabilities arising from leakages after the site has closed and been transferred. Many industrial activities or sectors, after their active operations have closed, remain potentially liable in perpetuity for any harm that later arises from their historical sites, and while limitation periods for bringing legal claims (described in section 6(4)) may provide some protection for operators, there are still plenty of examples around the world of companies being held liable for events which occurred or began several decades earlier.

133 *ibid*, page 17

134 ClimateWise (2012) *Managing Liabilities of Carbon Capture and Storage*

135 In January 2009 Zurich launched two new specialized insurance products, the Carbon Capture and Sequestration (CCS) Liability Insurance (covering pollution event liability and other operational risks) and the Geological Sequestration Financial Assurance (covering specified closure and post closure activities)

136 ClimateWise, *supra*, p. 47

It is therefore noteworthy that all three of the jurisdictions studied here have decided to include some form of responsibility/liability transfer in their CCS regimes, although both the scope of the protection offered and the details differ in potentially significant ways. None of the regimes offers an absolute or unconditional release from liability, but nevertheless a substantial reduction in the operator's long-term risk exposure is provided to varying degrees. Regimes providing transfer of long-term responsibilities and liabilities of various sorts are not unique to CCS, and while unusual, examples can be found in other sectors such as closed waste landfills, and the nuclear industry.

Each regime specifies which statutory obligations and/or liabilities are to be included in the transfer, thereby defining its scope in ways that leave out some other liability risks that could potentially remain with the operator. In each case, approval of the transfer is dependent upon the operator meeting a series of detailed conditions which, in principle, could allow the authorities to withhold, defer or limit the transfer, or in some cases re-open liability after it goes through, if something subsequently goes seriously wrong. For the time being, however, the broad legislative intention appears to be to offer genuine protection from significant long-term risk, provided the overall technical performance of the relevant operation is good and no really damaging event occurs at a later date.

In assessing transfer regimes, there are three main issues:

- the conditions that have to be fulfilled before transfer is allowed to take place, including any minimum period that has to elapse after active injection of CO₂ has ceased;
- what exactly will be transferred to the State in this process and, by implication, what might be omitted from the transfer, leaving the responsible operator on risk?
- and whether there are any specified circumstances in which the operator's liability may be re-opened ('claw-back' provisions).

9.1

Conditions for Transfer

As a key part of the responsibility/liability transfer process each regime sets a series of pre-conditions that have to be fulfilled, some on the permanent cessation of injection operations, others for surrender of the title to the facility. These conditions are intended to confirm the stability and integrity of the storage site, and to give the authorities confidence that the storage complex, including the sub-surface plume and related processes, will continue to behave in a predictable and safe manner. Once achieved, that should allow a reliable estimate to be made of the post-transfer tasks which the receiving authority will have to undertake and the likely costs of that work.

The list of what has to be demonstrated can be quite long and is generally additional to a requirement to complete the steps set out in the site's approved and periodically adjusted operational closure plan. Given the relative immaturity of CCS as a technology and the fact that the closure phase will not be reached for several decades ahead, the conditions have been defined in the legislation in a fairly generalised, high level way. Greater detail can then be added through supplementary regulations, standards, guidance documents, etc., and also through the adoption of project-specific goals which can feed back into the operational plans and take account of the peculiar characteristics of each storage site.

As in any new industry, this relatively flexible approach will have to be refined and developed over time. Nevertheless, the initial legislative wording needs to set objectives that are feasible and realistic, so that they can be the basis for workable standards, ideally drawing on past experience with similar technical requirements in other sectors. In that way, regulatory agencies have a better chance of putting the conditions into practice in a consistent and transparent manner, which all the relevant stakeholders can understand.

a. United Kingdom

EU CCS Directive

The UK legislation must be seen in the context of the EU CCS Directive, which provides a minimum set of requirements which every Member State must implement within their national legal systems. It should be stressed, though, that the EU Directive does not provide for the transfer of any legal liabilities relating to civil liability, and is confined to a restricted number of categories of liability arising under EU legislation, notably those relating to the Environmental Liability Directive, responsibilities for the storage site itself, and emissions trading liability. The extent to which other liabilities are transferred is left to Member States to determine under their national law as discussed in the next section.

As to conditions of transfer, Article 18(1) of the EU CCS Directive requires that after a storage site has been closed in accordance with the terms of its operating permit and the tasks in an approved post-closure plan have been fulfilled, the following conditions be met before any transfer of responsibility for the site can take place:

- 'all available evidence' indicates that the stored CO₂ will be completely and permanently contained;
- a minimum period determined by the authority has elapsed, with that minimum being no less than twenty years unless the authority is convinced before that that the first condition has been met;
- a defined financial contribution towards the authority's post-transfer costs has been provided; and
- the site has been sealed and the injection facilities removed.

The '*all available evidence*' test is a particularly stringent, and one which some might argue on a literal reading might be extremely difficult or impossible to fulfil in practice. It is drafted in objective terms rather than using language such as 'where the authority considers that...', meaning that any decision by an authority to accept a transfer would be rather easier to challenge by a non-governmental organisation or other third party by way of judicial review if they had persuasive contradictory evidence¹³⁷. And the term '*All available evidence*' rather than, say, 'the preponderance of evidence', might imply that a single dissenting view of an expert would mean the test is not fulfilled.

The strictness of the drafting which is in much tougher terms than in the other jurisdictions considered can in part be explained by the political background to the Directive which was agreed at a time when many Member States were (and remain) sceptical of the possibility of permanent CO₂ storage. Nevertheless, the potential unrealism of the test is tempered by the provision in Article 18(2) that the operator must prepare a report documenting that this condition has been met and demonstrating at least:

- the conformity of the actual behaviour of the injected CO₂ with the modelled behaviour;
- the absence of any detectable leakage; and
- that the storage site is evolving towards long-term stability.

The Directive provides that the Commission may adopt Guidelines on the assessment of the 'all available evidence' test as well as the minimum period and financial security, and Guidelines were adopted in 2011¹³⁸. These Guidelines very much focus on the report of the Operator and what it might contain, and advise that '*Once the CA is satisfied with the submitted transfer report that there is sufficient evidence for complete and permanent containment of the stored CO₂, i.e., that the condition referred to in Article 18(1)(a) is met, it shall prepare a draft decision of approval of the transfer of responsibility*'¹³⁹.

The Guidelines are not legally binding as such but are likely to be extremely influential, though at the end of the day, legal interpretation of the Directive rests with the courts and in the EU context ultimately the Court of Justice of the European Union. The Guidance tends to imply that if the Operator's report is satisfactory, that should be sufficient for the national

¹³⁷ Where the relevant statutory wording uses terms such as 'Where the Minister is satisfied', courts will be reluctant to go behind that decision unless there was a misinterpretation of the law or the Minister had acted irrationally. In practice, even where a test is in objective terms, most courts will pay considerable deference to the judgment of an expert government body.

¹³⁸ European Commission (2011) 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.

¹³⁹ *ibid* page 3

authority to accept transfer but that is not what the Directive actually says. It clearly states that the authority itself must be satisfied that the conditions in Article 18(1) are satisfied, indicating that it must exercise its own independent judgement, whatever the content of the Operator's report.

Implementation in United Kingdom

The Storage of Carbon Dioxide (Termination of Licence) Regulations 2011¹⁴⁰ repeat word for word the transfer conditions contained in Article 18(1) of the Directive, but add a further condition that any abandonment programme has been carried out in accordance with Part 4 Petroleum Act 1998¹⁴¹. A transfer report in compliance with Article 18(2) of the Directive must be supplied by the operator. The Regulations make it rather clearer than the Commission Guidance that before making a draft transfer decision, there are two distinct tests for the competent authority – it must (a) be satisfied that the operator's report complies with Article 18(2) of the Directive and they must also be satisfied that (b) the 'all available evidence' and minimum period conditions have been met¹⁴².

b. Alberta

The core transfer conditions before a Minister can issue a closure certification are contained in section 120(1) Mines and Minerals Act and provide that the Minister may issue a certificate, which will then trigger the transfer provisions, provided the Minister is satisfied:

- a. the lessee has performed all closure activities in accordance with regulations
- 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,
- e. the conditions specified in the regulations have been met, and
- f. the captured carbon dioxide is behaving in a stable and predictable manner, with no significant risk of future leakage.

From a legal perspective, it is noticeable that the fundamental criteria in (f) is drafted in less demanding and more realistic language than the 'all available evidence' test found in the EU Directive. It is based on the Minister being satisfied that the requirements are satisfied rather than objective language, meaning a decision would be less easy to challenge in the courts. And it refers to 'no significant risk' of leakage rather than complete permanent containment, implying that some degree of risk is acceptable.

Many of the detailed regulations relating to closure are still being developed. For instance the 2011 Carbon Sequestration Tenure Regulations¹⁴³ require the operator to provide initial closure plans which must be renewed every three years or on the date of a renewal of the carbon sequestration lease, whichever is the earlier, but does not contain details of a final closure plan. Energy Resources Conservation Board (ERCB) Directive 020 contains detailed requirements concerning the abandonment of injection wells and is designed to cover all non-saline groundwater and to isolate or cover all porous zones. It is currently being reviewed and though not expressly addressing CO₂ storage as such, the 2011 Regulatory Review Assessment considered that it adequately addresses conformity and containment requirements for the abandonment of wells used for CO₂ sequestration¹⁴⁴.

140 SI 2011/1483

141 This applies to carbon capture storage facilities as provided by s 30 Energy Act 2008.

142 Regulation 9(2) Storage of Carbon Dioxide (Termination of Licence) Regulations 2011. Part 4 of the 1998 Act deals with the approval of decommissioning programmes for off-shore installations, implementing international obligations, particularly those under Decision 98/3 made under the 1992 Convention on the Protection of the Marine Environment of the North East Atlantic (OSPAR)

143 O.C. 179/2011 A.R. 68/2011 April 28, 2011

144 RFA Conclusion 8, p 105

As to minimum periods, the RFA recommended that there should be a ten year minimum period, shorter than the twenty year period contained in the EU Directive, but with no provision for shorter periods as contained in the Directive and the requirement on the operator demonstrate compliance with performance criteria¹⁴⁵.

The criteria recommended by the RFA were that:

- *'Sequestered CO₂ and affected fluids are conforming to the objectives and regulatory requirements as described in the project application and approvals.*
- *There is no significant adverse effect of sequestered CO₂ or affected fluids to health, the environment and other resources (including but not limited to hydrocarbons, non-saline groundwater and pore space outside of the operator's sequestration lease).*
- *Sequestered CO₂ and affected fluids are contained in the sequestration complex.*
- *Sequestered CO₂ is behaving in a predictable manner.*
- *Sequestered CO₂ is expected to continue to behave in a predictable manner and is trending towards stability.*
- *The project-specific risk profile is decreasing and the risk of future leakage or adverse effects on health, the environment or other resources is acceptable.*
- *Decommissioning and abandonment is complete as required by the regulator.*
- *Surface reclamation is complete to the extent agreed upon with the regulator for the post-closure period.*^{146'}

c. State of Victoria

Sections 168 and 170 of the Greenhouse Gas Geological Sequestration Act 2008 provides the core framework conditions for the Minister to give consent to the surrender of 'authorities'¹⁴⁷ relating to onshore CCS, and provides for two distinct tests. Section 168 deals with the operator's own performance standards and requires the Minister to be satisfied that the operator has complied with all the requirements of the legislation relating to the authority and the conditions of the authority, and has plugged or closed off all wells made in the authority area. Even where they are not satisfied that these condition have been met, the Minister may still accept surrender where satisfied that the failure to comply with conditions *'was the result of one or more events beyond the control of the holder of the authority'*¹⁴⁸. This could come into play if, say, there was a condition relating to leakage where the cause of the leakage was totally unpredicted. The section also provides that the Minister may not unreasonably refuse the surrender under this section.

Section 170 provides a separate test of environmental criteria which must also be met, and is not subject to the section 168 override proviso, where events were beyond the control of the holder of the authority. The Minister must be of the opinion that:

- *the greenhouse gas substance that has been injected into an underground geological storage formation in the licence area is behaving and will continue to behave in a predictable manner; and*
- *the licence holder has reduced the risks associated with the permanent storage of the greenhouse gas substance to as low as is reasonably practicable; and Part*
- *the stored greenhouse gas substance will not present a risk to public health or the environment.*

In addition, the operator must under section 170 provide detailed information concerning the conditions of the storage site, an assessment of potential migration and leakage, a risk management plan in the event of leakage, and a long term monitoring and verification plan.

145 RFA Recommendation 63 p 103

146 Recommendation 63, p 104

147 Defined in section 3 to mean an exploration permit, a retention lease, an injection and monitoring licence or a special access authorisation.

148 s 168(4).

The criteria with its references to predictability and reduction of risks as low as reasonably practicable, is somewhat different from that contained in the EU Directive and the Alberta legislation, though as with Alberta it rests on the ‘opinion’ of the Minister. Two procedural provisions in the legislation are distinctive. First, the Minister may refer the application for surrender to an independent panel or other relevant authority for any recommendation concerning acceptance (section 172). Second, in relation to environmental risks, the Minister is obliged to consult with the Minister administering the Environment Protection Act 1970 and the Minister administering the Water Act 1970¹⁴⁹, and the Environment Protection Authority. These bodies effectively have a power of veto, in that if they are of the opinion that the stored greenhouse gas will pose an environmental risk, or that the risk management plan or long-term monitoring plan is inadequate, they may recommend that no surrender is accepted (or further conditions imposed) and the recommendation is binding if made within forty days.

Table 2: Comparison of the conditions for the transfer of liabilities in the three jurisdictions

	Core conditions	Post-closure time limit
The EU Directive	‘all available evidence’ indicates that the stored CO ₂ will be completely and permanently contained	Minimum period of twenty years unless the competent authority is satisfied that the core condition is met at an earlier date
United Kingdom	‘all available evidence’ indicates that the stored CO ₂ will be completely and permanently contained	Minimum period of twenty years unless the competent authority is satisfied that the core condition is met at an earlier date
Alberta	The Minister is satisfied that the captured CO ₂ is behaving in a stable and predictable manner, with no significant risk of future leakage	Not yet specified in the Regulations. The RFA recommends a minimum period of ten years, with no discretion for the authority to reduce this period
Victoria	The Minister is satisfied that: (i) the injected CO ₂ is behaving in a predictable manner, (ii) the licence holder has reduced risks to as low as reasonably practicable and (iii) the stored CO ₂ will not present a risk to public health or the environment	None specified in the legislation

9.2

What Responsibilities or Liabilities are Transferred?

a. EU CCS Directive

Provided the conditions are met, Article 18 provides for the transfer of a restricted number of obligations under EU law – these are (i) any obligations under the CCS Directive relating to monitoring and corrective measures; (ii) obligations relating to the surrender of greenhouse gas allowances under the greenhouse gas emissions trading regime in the case of leakage and; (iii) obligations relating to preventative and remedial action under the Environmental Liability Directive – as described in section 7(2)(c), this covers only certain aspects of environmental harm.

The Directive does not deal with the transfer of any liabilities relating to civil actions (tort claims), nor does it deal with any administrative liabilities under national environmental laws, which are not encompassed under the Environmental Liability Directive. The extent to these aspects of liability are transferred is left to each Member State.

149 Since April 2013 responsibility for these Acts has now merged and is borne by the Department of Environment and Primary Energies. Responsibility for the Carbon Capture Sequestration Act rests with the Department of State Development Business and Innovation.

b. United Kingdom

The Storage of Carbon Dioxide (Termination of Licence) Regulations 2011 provide first that on surrender of the licence, the obligations contained in Article 18 are transferred to the Secretary of State (regulation 14). The Regulations then provide that there will also be transfer of any 'leakage liabilities' incurred by the authority prior to the termination of the licence. The term 'leakage liability' is given an extensive definition to mean '*any liabilities, whether future or present, actual or contingent, arising from leakage from the storage complex to which the relevant licence relates and includes liabilities for personal injury, damage to property and economic loss*'¹⁵⁰.

These provisions are extremely broad and would encompass any sort of potential civil claim or administrative liability arising from a leakage, whether the leakage occurred before or after the transfer. In theory it could even cover a civil claim commenced (but not completed) before transfer took place, though in that case it seems unlikely that the conditions concerning 'all available evidence' could be satisfied, and the conditions for surrender could not take place. Where such a claim involved fault on the part of the operator, then the costs could be recovered by the Government from the operator (see the section on 'claw-back' below). The only liability not transferable is an actual debt or judgment debt implying in this context that damages arising out of a successfully completed civil claim before transfer.

There appears to be little in the way of published material justifying such an extensive transfer of liabilities beyond those contained in the EU Directive. The Explanatory Memorandum¹⁵¹ to the termination of licence regulations as laid before Parliament talks of an informal consultation taking place on the draft regulations, and states that the Government '*is committed to making the UK a leading player in carbon capture and storage (CCS)*'. The Memorandum then focusses on the way the Regulations implement the EU Directive, and does not mention these extended liability transfer provisions. In reality the transfer of present and future civil liabilities may not impose as significant risks to the public purse as first appears. There are important 'claw-back' provisions described in 9.3 below allowing the Government to recover costs from the operator in case of fault. And any transfer will not take place at least twenty years after cessation of operations, and the likelihood of any significant claim arising after that period is unlikely to be large.

c. Alberta

The Alberta legislation essentially transfers future responsibility for the stored CO₂ including any liabilities associated with it, but does not transfer any existing liabilities, including those arising out of civil actions, but instead provides an indemnification.

On the issuing of the closure certificate, the Minister becomes the owner of the stored CO₂¹⁵² and assumes obligations under various pieces of legislation including the Environmental Protection and Enhancement Act. In respect of future civil liability claims, ownership as such is not normally an ingredient of such a claim – being in control of the activity giving rise to the claim, and being the cause of the damage in question are generally the key ingredients. It has been commented by one legal expert that this section has been included 'out of an abundance of caution'¹⁵³.

Section 121(2) of the Mines and Minerals Act deals expressly with civil liability and provides that the Crown will indemnify a lessee for any liability in damages in an action in tort, 'if 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 any other conditions contained in regulations are met. Any further such conditions have still to be developed.

As discussed in the sections on civil liability, such claims could be commenced against the operator many years after the cessation of storage, depending on the principles as to when a claim arises in law and operation of Limitation Periods. Section 121(2) would therefore provide an indemnity to the operator from the Crown. But an indemnity is not the same as an assumption of liabilities (as in the UK regulations), and would mean it could not come into play if the operator no longer existed at the time of the claim.¹⁵⁴

150 It has been argued that while a Member State has power to introduce stricter requirements in transposing a Directive this extension of transfer may be in breach of EU law, and even constitute a state aid. At the time of writing the European Commission is still reviewing all Member State's transposing legislation to determine whether any enforcement action should be taken in respect of defective national laws. See C. Armeni (2011) *Case Studies in Implementation of Directive 2009/31/EC – United Kingdom*, Carbon Capture Legal Programme University College London <http://blogs.ucl.ac.uk/law-environment/files/2012/11/Chiara-Armeni-CCLP-EU-Case-Studies-UK-2011.pdf>.

151 *Explanatory Memorandum Storage of Carbon Dioxide (Termination of Licence) Regs 2011* Dept of Energy and Climate Change

152 Mines and Minerals Act s 121(1)

153 N. Bankes (2013) 'The Developing Regime for the Regulation of Carbon capture Projects in Canada' in Barton et al, *Carbon Capture and Storage: Designing the Legal and Regulatory Framework for New Zealand* University of Waikato.

154 Section 121(3) provides that if the operator ceases to exist before the issuing of a closure certificate, the Crown may assume ownership of the carbon dioxide,

If there was no operator in existence at the time of the claim, the claimant would have to consider a civil claim against the Crown on the grounds not that they actually caused the damage, but that they had now a liability because they were in control of the stored CO₂.¹⁵⁵ General principles of nuisance law imply that in the case of a continuing nuisance, which has been acquired by a subsequent owner or occupier, some degree of negligence must be proved – i.e. that ‘he neglected to remedy it when he knew or ought to have become aware of it.’¹⁵⁶

As yet, there are no provisions concerning the transfer of any liabilities in respect of greenhouse gas emissions trading. It is a gap identified by the 2013 Alberta Regulatory Framework Assessment, which recommended that the Mines and Minerals Act be amended to include the transfer of responsibilities under the Climate Change and Emissions Management Act and other provincial climate change legislation¹⁵⁷.

d. Victoria

The legislative provisions in Victoria are silent as to precisely what responsibilities or liabilities transferred to the State on surrendering of an authority. Presumably the original holder of the authority will no longer have any responsibilities in relation to future administrative liability obligations under the various relevant Acts which are initiated after surrender. No civil liabilities are transferred, and the operator could therefore remain potentially liable to a civil claim arising after surrender in respect of any operation they conducted and subject to limitation periods. The decision not to include any provision for the transfer of civil liabilities was consistent with recommendations of the Ministerial Council for Carbon Dioxide Capture and Geological Storage in 2005¹⁵⁸, and in discussion prior to the development of the legislation it was considered to be an ‘*approach would help ensure that strong financial incentive remains for CCS proponents to conduct their operations in a manner that is safe to human health and the environment*’.¹⁵⁹

Section 16 of the Act provides that on surrender of an injection licence the Crown becomes the owner of any injected greenhouse gas substance. As mentioned in the discussion of the Canadian legislation, ownership as such is not a basis of liability in tort, and any liability of the Crown in nuisance in respect of a leakage occurring and causing damage after surrender as taken place would depend on some degree of negligence being proved¹⁶⁰.

but here we are assuming the operator ceases to exist after the issuing of the certificate

155 Section 5(1) Proceedings against the Crown Act provides for Crown liability in tort in respect of any tort committed by any of its officers or servants.

156 Lord Wright in *Sedley-Denfield v O’Callaghan* [1940] AC 880 at 995. For similar principles in Australian law see *City of Richmond v Scantlebury* [1991] 2 VR 38

157 Alberta Regulatory Framework Assessment (supra), Recommendation 65

158 Australian Regulatory Guiding Principles for Carbon Dioxide Capture and Geological Storage, endorsed by the Ministerial Council on Mineral and Petroleum Resources on 25 November 2005

159 Department of Primary Industries (2008) *A Regulatory Framework for the Long-term Underground Geological Storage of Carbon Dioxide in Victoria. Discussion Paper*. The position can be contrasted with the Australian Commonwealth legislation dealing with off-shore storage where the Commonwealth provides an indemnity after transfer, and will also assume liabilities where the operator has ceased to exist. See generally N. Swayne and A. Phillips, ‘Legal Liability for Carbon Capture and Storage in Australia: Where Should the Losses Fall?’ (2012) *Environmental and Planning Law Journal*, 189. The authors consider there is an urgent need for greater consistency as to long-term CCS liabilities in Australian Commonwealth and State legislation.

160 Section 23 Crown Proceedings Act 1958 provides that ‘the Crown shall be liable for the torts of any servant or agent of the Crown or independent contractor employed by the Crown as nearly as possible in the same manner as a subject is liable for the torts of his servant or agent or of an independent contractor employed by him’.

Table 3: Comparison of the liabilities/responsibilities transferred in the three jurisdictions

	Body the liabilities transferred to	Liabilities transferred	Notes
The EU Directive	The competent authority	Obligations under the CCS Directive relating to monitoring and corrective measures, obligations relating to the surrender of EUAs under the ETS Directive in the event of leakage and obligations relating to preventative and remedial action under the ELD	
England and Wales	The competent authority (the Secretary of State)	Obligations under the CCS Directive relating to monitoring and corrective measures, obligations relating to the surrender of EUAs under the ETS Directive in the event of leakage and obligations relating to preventative and remedial action under the ELD. Also, any liabilities, whether present or future, actual or contingent, arising from leakage from the site	
Alberta	The Crown	Future responsibilities under various environmental legislation	The former lessee is indemnified from any liabilities in damages in torts. The RFA recommends that liabilities under the greenhouse gas emissions regime should also be transferred
Victoria	The Crown	Future responsibilities under environmental laws are presumed to be transferred, although are not specified	There is no transfer or indemnification in respect of liabilities for torts

9.3

‘Claw-Back’ Provisions

a. EU Directive

The Directive provides a distinctive provision allowing the recovery of costs, or ‘claw-back’, from the operator after transfer in the case of ‘fault’ by the operator – Article 18(6) provides that the authority shall recover costs incurred from the operator where there has been any fault on the part of the operator *‘including cases of deficient data, concealment of relevant information, negligence, wilful deceit or a failure to exercise due diligence’*. A broadly drafted provision and one clearly that puts a special onus on the operator to ensure that its post-closure report is as accurate as possible. But the provision is not confined simply to the content of Article. 18(2) post closure report, and could encompass other activities involving fault in relation to the storage which come to light at a later date, and give rise to costs for the State.

b. United Kingdom

Section 16 of the Termination of Licence Regulations transposes the Directive's claw-back provisions, by providing that the authority may recover costs 'to the extent that such costs arise due to fault on the part of the operator'¹⁶¹. Fault is defined in line with the Directive to include negligence, deceit, or a failure to exercise due diligence. These provisions do not just apply to the obligations and liabilities under the EU Directive which are transferred, but extend to all the other leakage liabilities (such as those arising out of tort) which are transferred. Clearly this implies that in a case of an action based on negligence against the authority in respect of pre-surrender activities, the authority could seek in effect an indemnity from the operator if they still exist. But 'fault', a term derived from the EU Directive, is not a concept used extensively as such in UK common law, and could also be said to encompass nearly every other tort including nuisance and trespass.

In this context it may be significant that the UK regulations give power to the authority after a termination notice is served to require the operator to provide 'all records, returns, maps, samples, data and other information that the licence holder holds in respect of the storage site.' Regulation 13(2)). This goes considerably further than the information requirements in the Directive, and could be used as an important check in determining whether any fault on the part of the operator existed.¹⁶²

c. Alberta and Victoria

The 'claw-back' provisions in the EU Directive and the transposing regulations appear to be distinctive, and no express equivalent is to be found in the Alberta or Victoria CCS legislation. As a matter of general principle of public policy, it is unlikely that an operator could gain the benefits from any statutory transfer provisions where there has been deliberate fraud or deceit on his part in securing the decision by the authorities to accept surrender, such as providing misleading information in reports. See, for example, the discussion by the UK Supreme Court in *Secretary of State v Welwyn Hatfield Borough Council*¹⁶³ where it was held that this principle should apply whether or not a criminal offence has been committed¹⁶⁴. As the court noted:

'Whether conduct will on public policy grounds disentitle a person from relying upon an apparently unqualified statutory provision must be considered in context and with regard to any nexus existing between the conduct and the statutory provision'.

It seems less likely that these principles could be successfully invoked where only negligence, rather than a deliberate fraudulent act, was involved.

10

Financial Security against Liability

The long-term nature of CO₂ storage obligations borne by the operator post-closure, for a storage site when no income stream is likely, and where there is the possibility of the storage operator going into liquidation, has raised distinctive regulatory challenges concerning the adequacy of financial provisions to meet continuing obligation relating to the site. They are not unique to CCS, and can be seen in other areas such as the landfill of waste where similar characteristics apply. This report is focussed on the nature of legal liabilities that may arise from storage activities, rather than the complete regulatory system for CCS, and a detailed evaluation of financial security arrangements designed to meet rather than create liabilities is therefore avoided. Nevertheless, it is worth highlighting some of the arrangements that have been developed, since they illustrate that very different approaches can be adopted.

¹⁶¹ The Directive provides that the authority 'shall' recover costs in the case of fault – the discretionary power in the UK transposing regulations appears, at least in respect of liabilities and responsibilities transferred under the Directive, to be an incorrect transposition.

¹⁶² In one of its Guidance documents the Commission has indicated that the operator would be expected to hand over all relevant raw data and documents relating to the site - *European Commission, Guidance Document 3- Criteria for the Transfer of Responsibility to the Competent Authority* p. 16.

¹⁶³ [2011] UKSCA 15

¹⁶⁴ For a crime of falsifying documents, see for example section 83A Crime Act 1958 (Victoria)

It should first be noted that the financial security arrangements under CCS legislation essentially deal with public obligations of the operator, rather than private civil liability claims. As examined in Section 8, following surrender and transfer, the State may decide to assume some or all these civil liabilities, or provide an indemnification, but if that has not occurred a claimant must assume that an operator has the financial resources to meet the claim, or effective third party liability insurance¹⁶⁵.

Each of the jurisdictions considered has adopted different mechanisms in relation to financial security, although the underlining policy goal of reducing the exposure of the taxpayer and general government funds is similar. Not surprisingly, it is clear that precedent and experience with similar systems within each national jurisdiction has played a large part in the choice and design of the different mechanisms which are then adapted to meet the particular characteristics of CCS. Within the EU, the procedures for financial security required under landfill legislation were clearly a strong influence. Victoria adopted models already used in the regulation of the petroleum and gas industry, while the Post Closure Stewardship fund in Alberta finds an analogue in the Stewardship Fund established for abandoned wells under the Province's oil and gas legislation.

10.1

EU Directive and Implementation in the UK

In respect of public liabilities, the EU CCS Directive has followed a financial model already developed under the 1999 Landfill Directive¹⁶⁶. This approach requires national authorities to not grant a landfill permit, unless they satisfied that adequate provision 'by financial security or otherwise' is made by the operator prior to disposal operations to ensure that the obligations of the permit including after-care provisions and closure procedures are followed, as well as potential greenhouse emissions liabilities under the EU Greenhouse Gas Emissions Trading Directive. The CCS Directive provides for two forms of financial mechanism: financial security (Art. 19) and financial mechanism (Art. 20)

a. Financial Security

Under Article 19 the applicant for a storage permit must provide proof by way of 'financial security or any other equivalent on the basis of arrangements to be decided by Member States', in order to ensure that any obligations under the permit including closure and post-closure obligations can be met. The financial security must remain in place until responsibility for the site is transferred to the State in accordance with the Directive.

Table 4¹⁶⁷ below, highlights the specific obligations that must be covered by the Article 19 financial security requirements.

Table 4: Obligations under the permit that must be covered by Financial Security under the CCS Directive

Operations period	Closure and post-closure period
1.A monitoring, updates of monitoring plan, and required reports of monitoring results	1.B monitoring, updates of monitoring plan, and required reports of monitoring results
2.A updates of corrective measures plan, and implementing corrective measures, including measures related to the protection of human health	2.B updates of corrective measures plan, and implementing corrective measures, including measures related to the protection of human health
3.A surrender of allowances for any emissions from the site, including leakages, pursuant to ETS Directive	3.B surrender of allowances for any emissions from the site, including leakages, pursuant to ETS Directive
4.A update of provisional post closure plan	4.B sealing the storage site and removing injection facilities
5.A maintaining injection operations by the Competent Authority until new storage permit is issued, if storage permit is withdrawn, including CO ₂ composition analysis, risk assessment and registration, and required reports of CO ₂ streams delivered and injected	5.B making required financial contribution (FC) available to the Competent Authority

¹⁶⁵ As the examples in Victoria and the UK Crown Estate lease indicate, taking out third party liability insurance can be required of the operator.

¹⁶⁶ See Art 8 Council Directive 1999/31 on the Landfill of Waste

¹⁶⁷ Reproduced from European Commission (2011) *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*, page 9.

As the wording of Article 19 indicates there is great flexibility in the form of financial security that may be acceptable, and Member States have considerable discretion in how they approach the issue. The European Commission Guidance discusses a number of different forms including discusses a number of potential options¹⁶⁸, including depositing funds with the CA, irrevocable trust funds, escrow accounts, bank and other credit guarantees, prepaid insurance policies covering closure and post-closure activities, liability insurance policies covering potential leakages and self-assurance by the operator based on a financial test. The document goes on to advise on criteria Member States may use in assessing appropriate forms of instrument:

- Certainty – Is it a valid instrument under the Member State’s legal system? Where does it vest control of the Financial Security: the operator, the national authority, or a third party? Will it be protected in the event of the operator’s bankruptcy?
- The amount of funds assured – For example is the amount dependent on the financial state of the operator, or do they mature over time and so full coverage will not be available if the site closes early?
- Liquidity – How easily can the funds be accessed?
- Duration – How often will the instrument have to be renewed? How does this compare to the duration of the permit?
- Flexibility with a view to necessary adjustments – For example can the instrument be easily adjusted if the required amount of Financial Security is increased?

The Directive provides further flexibility by allowing for periodic adjustment to the security, to take in account assessed rates of leakage and the estimated costs of obligations. No specified periods for adjustment are contained in the legislation, but the Commission suggests every three to five years during operations and every five to ten years after closure until surrender, though periods of high inflation may call for more frequent adjustment.¹⁶⁹ The Commission advises that Member States may wish to consider allowing operators to provide financial security in phases - rather than requiring an amount of financial security based on the ultimate size of the projected storage, Member States could accept amounts of financial security sufficient to cover the obligations as injection proceeds over time. The liabilities covered by the financial security include potential liabilities in respect of accounting for leakages under the EU Emissions Trading Scheme, which will involve predictions on the future prices of EU allowances. However, as discussed in section 7 above, the Guidance Document suggests a phased and risk-based approach can be adopted to avoid the unrealistic provision of security in respect of emissions trading liabilities.

Despite the potential for flexibility there are aspects of the EU approach that can be criticised. As mentioned above, it was clearly inspired by the EU model of up-front financial security developed for landfill sites where it is arguable there is a quite different range of operators than is ever likely to be seen in the CCS industry – from well-funded companies to small waste firms who may well not have sufficient financial resources for later clean-up and rehabilitation after income streams have ceased. Furthermore, despite parts of the Guidance advocating a flexible approach, it also rejects the use of probability approaches to calculating the financial security needed:

“The use of “expected value” techniques in determining amounts of FS coverage should be avoided. Such techniques apply probability weightings to costs of obligations that are uncertain to arise, such as costs of corrective measures, surrender of allowances, temporary operation of the site, and the like. A problem with applying such techniques to very low probability events is that the resulting expected values may be much too small to provide sufficient coverage via FS in the event that the obligation does arise.”¹⁷⁰

If this is taken literally to imply that each operator for each site must have advance security for the maximum possible liabilities covered by the Directive against a very low likelihood of large losses, the financial costs of servicing bonds or other mechanism in the financial sector (possible 1 – 2% of the amount secured in annual fees) would be significant extra cost over the lifetime of a project. Furthermore, the Directive does not deal with those liabilities - such as civil liability for damage to property or persons - which could be expected to be of most concern to the general public. In practice, national regulators may take a more realistic and sensible approach, as is shown with the experience with the Dutch

168 ibid p 4-7

169 ibid p 22-23

170 EU Commission Guidance Document No 4 section 2.4.

ROAD project discussed below. Nevertheless, for those countries where there is political resistance to CCS, opponents of the technology may well push for as strict application of the requirements as possible to ensure that cost-burdens on the operator are high enough to discourage take-up.¹⁷¹

The 2011 UK Storage of Carbon Dioxide (Termination of Licenses) Regulations largely reflect the wording of the Directive, but regulation 1 provides that financial security ‘includes— (a) a charge over a bank account or any other asset; (b) a deposit of money; (c) a performance bond or guarantee; (d) an insurance policy; (e) a letter of credit’. The use of the term ‘includes’ indicates that other forms of financial security could be acceptable.

b. Financial Mechanism

Article 20 relates to the post-transfer responsibility obligations of the operator, and requires the operator to make a financial contribution before transfer of responsibility takes place, which will cover at least the anticipated cost of monitoring for thirty years. According to Article twenty:

“This financial contribution may be used to cover the costs borne by the competent authority after the transfer of responsibility to ensure that the CO₂ is completely and permanently contained in geological storage sites after the transfer of responsibility.”

The financial contribution, according to the Commission Guidance Document, may encompass any of the liabilities transferred to the State under the Directive’s transfer provisions (monitoring, corrective measures, surrender of allowances under the Emissions Trading Directive, and preventive and remedial action under the Environmental Liability Directive).¹⁷² This may be a rather too generous interpretation of the Directive, since Article twenty itself, refers only to the costs involved in ensuring complete and permanent containment of the CO₂. Surrender of allowance costs and those associated with remediation or compensatory measures under the Environmental Liability Directive hardly fall within that category.

Again, the CCS Directive grants Member States wide discretion as to the amount of contribution operators must provide, subject to the minimum requirement of post-closure monitoring costs for thirty years. It could cover some of the costs or according to the Commission Guidance the full costs involved.¹⁷³

The UK implementation regulations¹⁷⁴, concerning the termination of licences, give very broad discretion as to the amount of contribution – the Secretary of State must determine the amount and form of financial contribution from the operator that the authority considers will be sufficient to cover the expected post-transfer costs. In determining the amount he must take into account the factors set out in Article 20(1) of the Directive and give operators twenty-eight days in which to make representations of any proposal. The Regulations do not provide for any administrative appeal against the Secretary of State’s decision, which could only be challenged by way of judicial review.

The Directive and the UK implementing regulations do no mention third party liability insurance as a condition of granting a storage licence, but in the UK an off-shore storage operator must also obtain a lease from the Crown Estate. The Master Lease requires the operator to maintain insurance for third party and public liability, and for physical damage to carbon storage infrastructure. The Crown Estate is entitled to review the insurance cover every three years and notify the operator of any additional requirements that may reasonably be required.¹⁷⁵

171 In relation to offshore storage projects, the issue of financial security has also been seen against the background of current general concerns of liability and adequate financial coverage for off shore oil and gas industry following the Deep Water Horizon incident. Within the EU, the 2013 Directive 2013/30/EU of the European Parliament and of the Council of 12 June 2013 on safety of offshore oil and gas operations and amending Directive 2004/35/EC extends the Environmental Liability Directive to marine waters generally, and, although the European Parliament pushed for compulsory financial security, the Directive currently leaves it to Member State when licencing off-shore oil and gas operations to take into account, inter alia, “the applicant’s financial capabilities, including any financial security, to cover liabilities potentially deriving from the offshore oil and gas operations in question including liability for potential economic damages where such liability is provided for by national law;” (Article 4.2 (c)). But the Directive the European Commission to deliver a report by 31 December 2014 on the availability of financial security instruments (art 39.1), and the Commission has commissioned at least one major study – see De Smedt Kristel et al (2013) *Civil Liability and Financial Security for Offshore Oil and Gas Activities* Final Report Maastricht European Institute for Transnational Legal Research. See also the Australian response to the June 2010 Report of the Montara Commission of Inquiry with the *Offshore Petroleum Greenhouse Gas Storage Amendment (Compliance Measures No. 2) Act 2013* requiring compulsory financial assurance (section 571(2)). It was intended that Regulations detailing requirements would be made by March 2014 but they are still under discussion. For the Department of Trade October 2013 Policy Statement on Financial Assurance and draft regulations see http://www.ret.gov.au/resources/upstream_petrolium/openenvironment/Pages/index.aspx

172 *ibid*, p 42

173 There might be a legal argument that the term ‘contribution’ implies only a partial coverage rather than the full costs.

174 The Storage of Carbon Dioxide (Termination of Licenses) Regulations 2011 reg 10

175 Clause 3.14 Crown Estate CO₂ Master CO₂ Storage Lease, footnote 53 *supra*

c. Project-level Experience

The ROAD project in the Netherlands, in a report on its permitting process to-date ¹⁷⁶, has provided a detailed overview of its experiences in determining which activities are to be included within the scope of financial security. As a part of this process the project “*mapped all of the activities and contingent activities it could think of*” and assessed these by reference to several criteria, including; “*if the operator goes bankrupt, which activities are essential to complete the project under current conditions or abandon the project, and how much would it cost the competent authority if it would need to take over the project*”¹⁷⁷. At the end of this process the project concluded that monitoring, contingency monitoring, abandonment, financial contribution and the cost of emissions allowances in instances of leakage, were the critical issues for the purpose of establishing the appropriate levels of security.

When it came to determining a suitable instrument to satisfy the requirements of Article 19 and the risks mapped by the project, ROAD successfully negotiated with the competent authority to accept a parental guarantee from the project’s parent company. The project had raised concern with the competent authority’s preferred instrument of a bank guarantee, on the basis that this type of guarantee would only be invoked where the operator and parent company were unable to meet the necessary costs. As such, a bank guarantee would “*give no/minimal additional security for the competent authority*”. The competent authority has accepted this approach, subject to the requirement of periodic adjustment and changes to risk assessment and estimated costs arising under the permit.

10.2

Victoria

A rather different model is adopted in Victoria, employing a number of different core mechanisms. Under section 218 of the Greenhouse Gas Sequestration Act 2008, the holder of an authority to store must, before operation commences, obtain a rehabilitation bond, defined as an “*instrument acceptable to the Minister securing the payment of a specified amount of money for any rehabilitation work, clean-up work or pollution prevention work that may be necessary as a result of a greenhouse gas sequestration operation*”. The provisions provide the flexibility for the Minister to increase the bond if he considers the amount will be insufficient, and the bond must be returned or discharged if the operator has carried out the required rehabilitation or other works. The mechanism of a rehabilitation bond is already found in the Petroleum Act 1998, which requires operators to take out a similar bond prior to operations.

The Act also requires that the authority holder obtains and maintains insurance against expenses and liabilities associated with the operation including “*the expenses of complying with directions with respect to the clean-up or other remedying of the effects of the escape of a greenhouse gas substance.*” (section 218). Again, a precedent is found in the Petroleum Act, which requires operators to take out similar insurance against liabilities and expenses, and landfill operators are required by the Environmental protection Authority to take out third-party liability insurance when applying for a licence.

In respect of long-term monitoring and verification costs, the holder of the authority must pay an annual instalment to the Minister, fixed by the Minister as a percentage of the total estimated costs (section 112). In theory a rehabilitation bond could cover such costs, but in developing the legislation the Government rejected this approach since bonds are usually refunded at the end of a specified time when certain conditions have been satisfied, and this did not appear appropriate for funding long-term monitoring and verification costs.¹⁷⁸ The effectiveness of this mechanism clearly is dependent on being able to predict the long-term verification and monitoring costs with some degree of accuracy, to ensure an even spread of fees and avoid any undue spikes towards the end of operations. But equally an advantage of this approach, compared to the EU financial mechanism system where contributions are payable after closure and before surrender, is that the annual fees are payable while there is an income stream to the storage operator. Under the EU system, the contribution is made many years after the income stream has ceased, and unless the operator ensures that any charges

176 Permitting Process: Special report on getting a CCS project permitted, Maasvlakte CCS Project C.V., January 2013, available at <http://www.globalccsinstitute.com/publications/permitting-process-special-report-getting-ccs-project-permitted> (Accessed 28 July 2014).

177 Ibid, at page 52.

178 Department of Primary Industries (2008), *A Regulatory Framework for the Long-term Underground Geological Storage of Carbon Dioxide in Victoria*, Discussion Paper January 2008, para 15.3.

it makes for storage fully reflect the eventual contribution required by Government (and the precise amount required will not be known until the surrender process starts), there is the possibility of a short-fall of funds.

Finally, the operator is required to pay a royalty to the Minister in respect of the volume of greenhouse gas substance injected (section 224) and where Crown land is involved rent to the Minister for the occupancy of the land (section 227). In its discussion on legislative development, the Government suggested that this income could be used to help fund long-term post-closure monitoring, verification and rehabilitation costs transferred to the State,¹⁷⁹ but the legislation itself has not ring-fenced the income from rent and royalties.

Failure to lodge a bond, maintain insurance or pay any instalment exposes the operators to penalties, and entitles the Minister to cancel the authority (section 175).

10.3

Alberta

A completely different approach has been adopted in Alberta, although the underlying goal of protecting the State from bearing too many costs associated with post-closure remains the same. Rather than have to establish their own financial mechanisms, operators must pay into the Post-closure Stewardship Fund¹⁸⁰, which is established by section 122 of the Mines and Minerals Act 2000. According to the Regulations, a fee per tonne of CO₂ sequestered is to be paid into the Fund, but the Regulations have left the actual rate to be determined by the Minister. This Fund is 'held and administered by the Minister'¹⁸¹, and the Minister may make payments from the Fund 'for the purposes of the Fund'¹⁸². These purposes are identified by section 122(2) as:

- Monitoring stored CO₂;
- Carrying out obligations under various environmental laws assumed by the Crown following transferral of responsibility;
- Costs associated with orphan facilities;
- Any other purposes listed in Regulations.

The model of a Stewardship Fund, funded by levies from operators, is clearly based on the example of the Orphan Fund established under Part 11 of the Oil and Gas Conservation Act. This Fund was established to pay for abandonment and rehabilitation costs for orphan wells and other facilities and funded by levies from operators. These provisions now extend to facilities used for the disposal of capture carbon dioxide¹⁸³.

Unless regulations were made otherwise, the Stewardship funds cannot be used to pay any civil liabilities imposed upon the Crown as a result of owning the CO₂ after surrender, nor in relation to any indemnities made by the Crown in respect of tort claim claims brought against the operator under section 121(2). It was a deliberate policy decision to exclude indemnification costs from the Stewardship Fund, in order to reduce fees payable by operators and thereby help to incentivise CCS. The 2013 Regulatory Framework Assessment endorsed this continued exclusion.¹⁸⁴ On the other hand it recommended that any liabilities associated with reconciling credits under the Alberta Greenhouse Gas scheme should be assumed by the Crown on surrender, but that the Stewardship Fund should be allowed to cover such costs.¹⁸⁵

The establishment of a Stewardship Fund, such as that in Alberta, may avoid some of the challenges of the individualised

179 *ibid* 15.4.

180 Regulation 20 of the Carbon Sequestration Tenure Regulation 2011

181 Section 122(4)

182 Section 122(6)

183 Oil and Gas Conservation Act s 68(vii)(3).

184 Alberta Government (2013) Carbon Capture and Storage Regulatory Framework Assessment Conclusion 9. There was not, though, complete consensus. One industry member of the Regulatory Working Group argued that there should not be post closure indemnification in the Mines and Minerals Act for tort claims, but if these were to continue, the Stewardship Fund should cover the costs to protect to general public from bearing the costs. An Institutional Member also argued that costs arising from indemnification should be an allowable use of the Stewardship Fund. See *Appendix D RFA Issue Recommendation Documents*, D12

185 *ibid* Recommendations 65 and 66

financial security arrangements contained in the EU scheme, and protect the general government resources from undue exposure. But it also can present its own problems. Assuming the funds are pooled, and as with any pooling arrangement, high standard operators may end up contributing to the costs imposed by those with lesser standards. This would particularly be the case if a flat fee were to be charged across the board. The RFA has to some extent addressed this issue by recommending that the fee should be set individually for each project, calculated on the risks and costs obligation of each project.¹⁸⁶ The methodology for calculating fees is currently being developed.

10.4

Extending Potentially Liable Parties

A rather different mechanism that Government can use in order to reduce potential costs to the public purse where the immediate operator may not have sufficient financial is to extend the ambit of potentially liable parties. There are examples of this approach in all three jurisdictions.

Under the Victoria Environmental Protection Act pollution clean-up directions under section 62A may be issued against a number of parties including the occupier of premises, the person who caused or permitted the pollution to occur, or a person who appears to have abandoned or dumped any industrial waste. In relation to the latter two categories, a notice may also be directed against a corporation where the person concerned was a subsidiary, related entity or associated entity of the corporation¹⁸⁷ and where the corporation was or should have been aware of the activities and did not take reasonable step preventative steps. As noted in s 7(4)(b) above, where clean-up is undertaken by the Environment Protection Authority, costs may be recovered from both the person who caused the pollution and/or the occupier of the relevant land which can include the owner, tenant or future purchasers.

The Alberta Environment Protection Act allows Environmental Protection Orders to be issued against an 'operator' of activities covered by the legislation, a term given a broad definition under section 134 of the Act to include a 'working interest participant' in a well, mine and other specified plants. A 'working interest participant' is defined to mean a person who owns or controls all or part of the plant in question under an agreement relating to ownership (section 134 (j)).

UK legislation dealing with the costs of decommissioning of off-shore oil and gas installations has gone even further, and section 30 Petroleum Act 1998 allows the Secretary of State to issue a notice requiring submission of an abandonment programme from all or any of the following:

- the person having the management of the installation or of its main structure;
- a person with rights to exploit oil or gas in the area which is carried out from the installation
- a person who is a party to a joint operating agreement or similar agreement relating to rights by virtue of which a person is within paragraph (b);
- a person who owns any interest in the installation otherwise than as security for a loan.

This type of provision can clearly be attractive to Government seeking to protect itself from any financial exposure in decommissioning costs, but in practice can raise major issues in the financing and re-financing of offshore assets. Any application of similar provisions to the emerging CCS industry would need to be handled with care if it is not to be an impediment to potential private sector financing and investment.

¹⁸⁶ *ibid* Recommendation 54

¹⁸⁷ the term 'related entity' and 'associated entity' are defined in the Australian Corporations Act.

Appendix I: Case Law and Legislation referred to in the Report

Case Law

Allen v Gulf Oil Refinery [1981] AC 1001

Attorney-General v PYA Quarries [1957] 1 All ER 894

Australian Provincial Assurance Ltd v Coroneo (1939) 38 SR (NSW) 700

Bank of New Zealand v Greenwood [1984] 1 NZLR 525

Billerud Karlsborg v Naturvårdsverket – Case C-203/12, Court of Justice of the European Union, 17 October 2013

Bocardo SA v Star Energy UK Onshore Ltd [2011] 1 AC 380

Boomer v Atlantic Cement Co (1970) 257 NE 2d 870

Budden et al v BP et al [1980] JPL 586

Burnie Port Authority v General Jones Pty Ltd (1994) 170 CLR 520

Caltex Oil (Australia) Pty v Drede Willemstad [1976] 136 CLR 529

Cambridge Water v Eastern Counties Leather [1994] 2 AC 264

Canadian National Railway v Norsk Pacific Steamship (1991) DLR (4th) 289

City of Richmond v Scantlebury [1991] 2 VR 38

Colour Quest Ltd and others v Total Downstream and others [2009] EWHC 540 (Comm)

Conarken Group Ltd v Network Rail Infrastructure [2010] EWHC 1852

Cook v Lewis [1951] SCR 830

Countryside Residential (North Thames) Ltd [2000] 34 EG 87

Coventry and others v Lawrence [2014] UKSC 13

Empress Car Company v National Rivers Authority [1999] 2 AC 22

Fairchild v Glenhaven Funeral Services Ltd [2003] 1 AC 32

Goldman v Hargrave [1967] 1 AC 645

Green v Walkley (1901) 27 VLR 503. H

Hickey v Electric Reduction Co of Canada Ltd (1971) 21 DLR (3d) 368

Holland v Hodgson (1872) LR 7 CP 328

Kempsey Shire Council v Lawrence (1996) Aust Tort Reports 81-375

Leakey v National Trust [1980] QB 485

Manchester Airport plc v Dutton [2000] QB 133

Manchester Ship Canal v United Utilities [2014] UKSC 40

Mann v Sauliner [1959] 19 DLR (2d) 130

McGhee v National Coal Board [1973] 1 WLR 1

Palumberi v Palumberi (1986) NEW Cov R 55-287

Public Transport Commission (N.S.W.) v Perry [1977] HCA 32; (1977) CLR 107

R (on the application of Amvac Chemicals) v Secretary of State for Environment, Food and Rural Affairs [2001] EWHC 1011

R v Rimmington and Goldstein [2006] 1 AC 459

R v Secretary of State for Trade and Industry ex parte Duddridge [1995] Env. L.R. 151

Re Corby Group Litigation [2009] QB 355

RHM Bakers v Strathclyde Regional Council (1985) SLT 214

Rylands v Fletcher (1868) LR 3 HL 330

Secretary of State v Welwyn Hatfield Borough Council [2011] UKSC 15

Sedleigh-Denfield v O'Callaghan [1940] AC 880

Sindell v Abbot Laboratories (1980) 607 P 2d 924

Smith v Inco Ltd (2011) 107 O.R. (3rd) 321

Smith v Kendrick (1849) 7 CB 515

Snell v Farrell [1990] 72 DLR (4th) 289

Southport Corporation v Esso Petroleum [1954] 2 QB 182

Spartan Steel and Co v Martin [1973] 1 QB 27

Tock et al v St John's Metropolitan Area Board (1989) 64 D.L.R. (4th) 620

Transco plc v Stockport Metropolitan Borough Council [2004] 2 AC 1

TRM Copy Centres (UK Ltd) v Lanwell Services Ltd [2009] UKHL 35

Wainwright Equipment Rentals Ltd. v Imperial Oil Ltd [2003] ABQB 898

Legislation – The European Union

Directive 2009/29/EC of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community

Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive)

Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (the ETS Directive)

Directive 2004/35/EC of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage (the Environmental Liability Directive)

Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No/ 1013/2006

Directive 99/31/EC of the European Parliament and of the Council of 26 April 1999 on the landfill of waste

Legislation – The United Kingdom

Carbon Dioxide (Licensing etc.) Regulations 2010, SI 2010/2221

Compensation Act 2006

Energy Act 2008

Environmental Damage (Prevention and Remediation) Regulations 2009, SI 2009/153

Land Compensation Act 1973

Limitation Act 1980

Petroleum Act 1998

Planning Act 2008

Regulatory Enforcement and Sanctions Act 2008

Storage of Carbon Dioxide (Termination of Licence) Regulations 2011, SI 2011/1483

Legislation – Alberta, Canada

Carbon Capture and Storage Statutes Amendment Act 2010

Carbon Sequestration Tenure Regulation, 179/2011

Energy Regulator Rule of Practice Regulation, 99/2013

Environmental Protection and Enhancement Act 2000

Limitations Act 2000

Mines and Minerals Act 2000

Oil and Gas Conservation Act 2000

Responsible Energy Development Act General Regulation, 90/2013

Water Act 2000

Legislation – Victoria, Australia

Environmental Protection Act 1970

Greenhouse Gas Geological Sequestration Act 2008

Greenhouse Gas Geological Sequestration Regulations 2009

Limitations Act 1958

Monetary Units Act 2004

Offshore Petroleum and Greenhouse Gas Storage Act 2010

Petroleum Act 1968

Victorian Civil and Administrative Amendment Bill (2014)

Water Act 1970

Appendix II: Bibliography on CCS liability issues

- D. Adelman and I. Duncan, 'The Limits of Liability in Promoting Safe Geologic Sequestration of CO₂' (2011) 22 Duke Environmental Law & Policy Forum 1, 1
- C. Bidlack, 'Regulating the Inevitable: Understanding the Legal Consequences of and Providing for the Regulation of the Geologic Sequestration of Carbon Dioxide' (2010) 30 Journal of Land, Resources and Environmental Law, 199
- E. Bluemel, 'Regional Regulatory Initiatives addressing GHG Leakage in the USA' in M. Faure and M. Peeters (eds), *Climate Change and European Emissions Trading, Lessons for Theory and Practice* (Cheltenham, Edward Elgar, 2008)
- S. Bode and M. Jung, 'Carbon Dioxide Capture and Storage – Liability for Non-Permanence under the UNFCCC' (2006) 6 International Environmental Agreements, 173
- P. Burrows, 'Combining Regulation and Liability for the Control of External Costs' (1999) 19 International Review of Law and Economics, 227
- G. Campbell, 'Carbon Capture and Storage: Legislative Approaches to Liability – Managing Long Term Obligations and Liabilities' (2009) AMPLA Yearbook, 324
- C. Clarke, 'Long-term Liability for CCS: Some Thoughts about Specific Risks, Multiple Regimes and the EU Directive', in I. Havercroft, R. Macrory and R. Stewart (eds), *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Hart Publishing, 2011)
- ClimateWise (2012) *Managing Liabilities of European Carbon Capture and Storage* University of Cambridge Programme for Sustainability Leadership
- M. De Figueiredo, *The Liability of Carbon Dioxide Storage*, PhD thesis, Massachusetts Institute of Technology (MIT), 2007, available at: http://sequestration.mit.edu/pdf/Mark_de_Figueiredo_PhD_Dissertation.pdf
- M. De Figueiredo, D. Reiner and H. Herzog, 'Framing the Long-Term in situ liability issue for geologic carbon storage in the United States' (2005) 10 Mitigation and Adaption Strategies for Global Change, 647
- M. De Figueiredo and E. Wilson, 'Geological Carbon Dioxide Sequestration: An Analysis of Subsurface Property Law' (2006) 36 (2), *Environmental Law Reporter*, 10114
- J. Dooley, C. Trabucchi and L. Patton, 'Design Considerations for Financing a National Trust to Advance the Deployment of Geologic CO₂ Storage and Motivate Best Practices' (2009) 4 International Journal of Greenhouse Gas Control 2, 381
- M. Faure and M. Peeters (eds), *Climate Change Liability*, Cheltenham (Edward Elgar, 2011)
- D. Gerard and E. Wilson, 'Environmental Bonds and the Challenge of Long-Term Carbon Sequestration' (2009) 90 Journal of Environmental Management 2, 1097
- M. Gibbs, 'Greenhouse Gas Storage in Offshore Waters: Balancing Competing Interests' (2009) 28(1) *Australian Resources and Energy Law Journal*, 52
- M. Gibbs, 'The Regulation of Geological Storage of Greenhouse Gases in Australia', in I. Havercroft, R. Macrory and R. Stewart (eds), *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Hart Publishing, 2011)
- Greenpeace, *False Hope. Why Carbon Capture and Storage Won't Save the Climate*, Amsterdam, Greenpeace International, 2008
- C. Haake and K. Marsh, 'The Trouble with Angels: Carbon Capture and Storage Hurdles and Solutions', *World Climate Change Report*, 8 May 2009
- D. Hawkins, G. Peridas and J. Steelman, 'Twelve Years after Sleipner: Moving CCS from Hype to Pipe' (2009) 1 *Energy Procedia*, 4403

- N. Hoffman, 'The Feasibility of Applying Strict-liability Principles to Carbon Capture and Storage' (2010) 49 Washburn Law Journal, 527
- International Energy Agency (IEA), Carbon Capture and Storage. Legal and Regulatory Review, Edition 2, Paris, IEA, May 2011
- W. Jacobs and D. Stump, Proposed Liability Framework for Geological Sequestration of Carbon Dioxide (Harvard University, Emmett Environmental Law & Policy Clinic, 2010)
- T. Kerr, I. Havercroft and T. Dixon, 'Legal and Regulatory Developments associated with Carbon Dioxide Capture and Storage: a Global Update' (2009) 1 Energy Procedia, 4395
- A. Klass and E. Wilson, 'Climate Change and Carbon Sequestration: Assessing a Liability Regime for Long-Term Storage of Carbon Dioxide (2008) 58 Emory Law Journal, 103
- H. Krupa, 'The Legal Framework for Carbon Capture and Storage in Canada', in I. Havercroft, R. Macrory and R. Stewart (eds), Carbon Capture and Storage: Emerging Legal and Regulatory Issues (Hart Publishing, 2011)
- M. Mace, C. Hendriks and R. Coenraads, 'Regulatory Challenges to the Implementation of Carbon Capture and Geological Storage within the European Union under EU and International Law (2007) 1 International Journal of Greenhouse Gas Control, 253
- C. Mackie, 'The Regulatory Potential of Financial Security to Reduce Environmental Risk' (2014) 26(2) Journal of Environmental Law 189
- N. Swayne and A. Philips, 'Legal Liability for Carbon Capture and Storage in Australia: Where Should the Losses Fall?' (2012) Environmental and Planning Law Journal, 189
- C. Trabucchi and L. Patton, Storing Carbon: Options for Liability Risk Management, Financial Responsibility, World Climate Change Report, The Bureau of National Affairs, 2008
- C. Trabucchi, M. Donlan and S. Wade, 'A Multi-Disciplinary Framework to Monetise Financial Consequences Arising from CCS Projects and Motivate Effective Financial Responsibility' (2010) 4 International Journal of Greenhouse Gas Control, 388
- E. Wilson, M. DeFigueiredo, C. Trabucchi and K. Larsen, 'Liability and Financial Responsibility Frameworks for Carbon Capture and Sequestration' (2007) 3 World Resources Institute Issue Brief: Carbon Capture and Sequestration
- E. Wilson, T. Johnson and D. Keith, 'Regulating the Ultimate Sink: Managing the Risks of Geological CO₂ Storage' (2003) 37 Environ. Sci. Technol., 3476
- E. Wilson, A. Klass and S. Bergan, 'Assessing a Liability Regime for Carbon Capture and Storage' (2009) 1 Energy Procedia, 4575



GLOBALCCSINSTITUTE.COM

The Global CCS Institute has tried to make information in this product as accurate as possible. However, it does not guarantee that the information is totally accurate or complete. Therefore, the information in this product should not be relied upon solely when making commercial decisions. The Global CCS Institute has no responsibility for the persistence or accuracy of URLs for external or third-party internet websites referred to in this publication and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.