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COMMENT

A Comment on *The Limits of Liability in Promoting Safe Geologic Sequestration of CO_2*

by Raymond B. Ludwiszewski and Karyn B. Marsh

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David Adelman and Ian Duncan provide a reality-check for potential liability arising out of geologic sequestration in their article, *The Limits of Liability in Promoting Safe Geologic Sequestration of CO_2*.[1] As a Research Scientist in the Bureau of Economic Geology at the University of Texas at Austin, Ian Duncan gives a much-needed scientific perspective on the material risks that geologic sequestration of carbon dioxide ("CO_2") actually poses, and using law and economic analysis, Professor Adelman, the Harry Reasoner Chair in Law at the University of Texas, adeptly translates how these risks might be mitigated through common law and *ex ante* regulation. Their proposed approach, new federal legislation that combines regulation and tiered-tort liability, is sensible given the technical characteristics of geologic sequestration, and would adequately address the probable risks.

Yet, while acknowledging the current anti-regulatory sentiment in Washington, D.C. and concerns over federalism, the authors fail to supply either sufficient detail on the proposed federal legislation embodying their approach or practical suggestions for overcoming the lack of general consensus among lawmakers for the need to address climate change nationally, which is the fundamental hurdle for geologic sequestration.

I. The Real Risks of Geologic Sequestration

The lack of effective regulatory and liability policies with respect to long-term legal liabilities for CO_2 releases has been cited as one of the greatest barriers to deployment of carbon capture and storage ("CCS") via geologic sequestration.[2] The public reaction to geologic sequestration has generally been fear of catastrophic environmental damage or personal injury, either from leakage of CO_2 into drinking water supplies or sudden releases of CO_2 to the ground surface.[3] On that assumption, commentators, advocates and both federal and state regulators have proposed regulatory and legal frameworks addressing primarily the risk of CO_2 releases.

Interestingly, injection of CO_2 (albeit in smaller quantities than for geologic sequestration) into oil bearing formations at similar depths (e.g., over 5,000 feet) has been conducted safely for enhanced oil recovery for over 40 years, and natural gas is routinely stored in underground reservoirs similar to those proposed for geologic sequestration (although for shorter periods). Under the Safe Drinking Water Act ("SDWA") Underground Injection Control ("UIC") Program, EPA has been regulating the disposal of industrial hazardous wastes into deep wells for over 30 years.

Duncan and Adelman largely dispel the fears regarding CO_2 leakage by providing a reasoned examination of the data and conclusions of recent studies on geologic sequestration.[4] In so doing, however, they paint a more complex picture of the risk landscape that geologic sequestration poses.[5]

Up to this point, most scientists supposed that the CO_2 plume would move quickly during active injection operations, but would gradually slow down after injection ceased as the CO_2 dissolved into the formation and associated water or brine. This physical retardation and chemical trapping of the CO_2 meant that the risk of CO_2 leakage to

1. David E. Adelman & Ian J. Duncan, *The Limits of Liability in Promoting Safe Geologic Sequestration of CO_2*, 22 Duke Envtl. L. & Pol'y F. 1 (2011).
2. *See* U.S. Gov't Accountability Office, GAO-08-1080 Report to the Chairman of the Select Committee on Energy Independence and Global Warming, House of Representatives: Climate Change, Federal Actions Will Greatly Affect the Viability of Carbon Capture and Storage as a Key Mitigation Option 15 (Sept. 2008).
3. *See, e.g.*, Greenpeace Int'l, False Hope: Why Carbon Capture and Storage Won't Save the Climate 30 (2008), *available at* http://www.greenpeace.org/international/en/publications/reports/false-hope/ (last visited Mar. 4, 2013) (discussing the release of CO_2 from volcanic Lake Nyos in Cameroon, which was due to a natural phenomenon not related to geologic sequestration).
4. Adelman & Duncan, *supra* note 1, at 4-5.
5. *Id.* at 14.

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the surface decreased significantly over time after cessation of injection operations. Advocates for geologic sequestration would often cite this expected behavior to quell fears of release of CO_2 in the distant future, e.g., 50 years after the last injection of CO_2. The recent studies bear this concept out: showing that migration of the CO_2 plume would be very slow, moving about 11 feet on average per year, and that 87 percent of the injected CO_2 would be immobilized in the rock formation after 200 years.[6] Thus, the average areal limit of the CO_2 plume would be less than three miles around an injection site after 50 years and about eight miles after 200 years.

In contrast, however, these recent studies also show that the *brine* displaced by the CO_2 moves more quickly and further over time. Simulations of the pressure front driving brine movement would extend to around 93 miles from the injection well after 50 years of injection operations.[7] Furthermore, if there are other CO_2 injection wells in the area, simulations using 20 injection wells in one brine reservoir indicate that the pressure fronts from these individual wells would interact with each other within *a half-year* and the net pressure front from all the wells would extend to approximately a 170-mile radius after only 50 years of injection operations.[8] Factoring in abandoned oil and gas wells or faults in the large areas impacted by the pressure front, the simulations indicate that brine leakage through these conduits would occur from 50 to 150 years after CO_2 injection ceased.[9] Thus, the intrusion of brine, as opposed to CO_2, into drinking water aquifers appears to be the more probable risk arising out of geologic sequestration,[10] and these fundamental differences between the behavior of brine and that of CO_2 in the subsurface have significant implications for the effective regulation of CCS.[11]

II. Adelman and Duncan's Suggested Legal Framework

Both the federal and state agencies have enacted regulations addressing geologic sequestration. In December 2010, the United States Environmental Protection Agency ("EPA") promulgated final rules for CO_2 injection wells under the UIC Program. These rules include standards for siting, construction, operation, monitoring and closure of CO_2 injection wells.[12] Additionally, EPA issued a draft guidance, which provides that operators must conduct post-closure care and monitoring for 50 years unless they can show that the CO_2 plume and pressure fronts no longer pose a risk of endangerment to drinking water sources.[13] Several states, including Wyoming, Texas, Oklahoma, Kansas, and North Dakota, have also promulgated similar regulations.

The Sword of Damocles in all of this is the imposition of liability under State common law or federal environmental law for releases of CO_2 or brine into drinking water aquifers. The CCS industry argues that the prospect of open-ended and debilitating liability for releases in the distant future is deterring the implementation of CCS today.[14] Consequently, transfer of long-term liability for these sites to a governmental agency after a certain amount of time has been proposed to encourage implementation of CCS.[15] Shifting the risk for environmental harm to innocent parties, however, raises the concern that it will dis-incentivize CCS operators from taking all precautions to prevent future releases.

Adelman and Duncan, however, challenge this concern by arguing that fear of long-term and latent tort liability has a minimal deterrent effect on current behavior, and that tort liability's utility arises only when the prospect of loss is in the near term.[16] Thus, to the extent brine intrusion occurs during the period of active CO_2 injection or the first few years after cessation of CO_2 injection, the CCS operator will be motivated to exercise due care in siting, operating and monitoring the injection well. However, to the extent a release of either brine or CO_2 occurs beyond the operational and closure phases, the only effective tool for limiting this long-term risk is governmental regulation.[17]

When it comes to geologic sequestration, the bottom line is that the actions or omissions of CCS operators in the present will largely determine the long-term liabilities. Adelman and Duncan support the use of federal regulations because they can establish baseline standards of care for the siting, operation, and closure of geologic sequestration sites, provide expertise to States that may not have the resources to formulate effective regulations, and prevent the creation of a patchwork of standards by individual States. Nevertheless, the authors point out that the geologic sequestration rules set by EPA do not motivate CCS operators to exceed minimum standards[18] or to develop the best sites with the lowest risk profile.[19] That motivation, they argue, can only come from the threat of tort liability.

6. Quanlin Zhou et al., *Modeling Basin- and Plume-Scale Processes of CO_2 Storage for Full-Scale Deployment*, 48 Ground Water 494, 500 (2010).
7. *Id.* at 506-507.
8. *Id.* at 509-10.
9. *Id.*
10. Adelman & Duncan, *supra* note 1, at 5.
11. *Id.* at 10.
12. Federal Requirements Under the Underground Injection Control (UIC) Program for Carbon Dioxide (CO_2) Geologic Sequestration (GS) Wells, 75 Fed. Reg. 77230 (Dec. 10, 2010).
13. EPA Draft Financial Responsibility Guidance for UIC Class VI Program, Dec. 2010, 99-100.
14. Adelman & Duncan, *supra* note 1, at 1.
15. *See, e.g.*, Wendy B. Jacobs & Debra Stump, Proposed Liability Framework for Geological Sequestration of Carbon Dioxide (Harvard Law Sch., Emmett Envtl. Law & Pol'y Clinic, Working Paper, 2010).
16. Adelman & Duncan, *supra* note 1, at 2-3.
17. *Id.* at 7.
18. *Id.* at 11.
19. *Id.*

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Accordingly, they suggest that the best approach will ensure that geologic sequestration sites are properly selected and operated and to that end, propose a complimentary system of *ex ante* regulation that ranks potential geologic sequestration sites and tort liability, which assigns essentially a negligence standard to high-quality, low-risk sites and a strict liability standard to lower-quality, but high-risk sites.[20]

III. Implementing a Pragmatic Approach

If we are to promulgate effective regulation of geologic sequestration, we must have an understanding of the probable risks. Adelman and Duncan's article provides important insights into these risks. In light of these scientific studies, their proposed legal framework recognizes the inability of State common law to mitigate long-term risks posed by geologic sequestration, particularly if the reservoir extends across State lines and is utilized by several operators, and the efficiency of uniform federal standards, while allowing flexibility for a State's regulation of its natural resources.

Unfortunately, although Adelman and Duncan provide a strong theoretical basis for their approach, they do not provide specifics on the actual federal legislation that might be introduced in Congress. For example, they recommend retention of the current SDWA UIC regulations for geologic sequestration wells,[21] but do not provide further details. Will the new legislation's geologic sequestration site ranking be similar to the site ranking system promulgated under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA")? Will the United States Geological Survey or the EPA be the primary agency? What role will State agencies have in enforcing the new federal law? Will the federal law provide a cause of action against CCS operators, like CERCLA's cost recovery or contribution provisions, sections 107(a) and 113? If so, who would be able to sue and for what damages? How would differences in State property law regarding mineral estates and pore space be addressed? How would State regulations for geologic sequestration relate to federal regulations? Would the new law exempt geologic sequestration from federal laws, like the Resource Conservation and Recovery Act and CERCLA? Would the current UIC regulations need to be amended to address the issue of brine intrusion? These and other questions will be essential considerations for lawmakers devising, debating and amending a draft bill.

CCS and geologic sequestration are intimately bound up with greenhouse gas regulation. In spite of the attention President Obama gave to climate change in his second inaugural speech, the prospect of any new federal law addressing CO_2 emissions passing in the 113th Congress remains doubtful. Powerful elements in Congress believe any federal climate change regulation would be detrimental to the United States' economy and intrude on the prerogatives of the States. Adelman and Duncan acknowledge the debate over federalism and environmental regulation, but go no further in addressing the issue.[22] Yet, it is this key opposition to greenhouse gas regulation that is the true barrier to the implementation of CCS and geologic sequestration. Until Congress comes to some agreement on greenhouse gas regulation, national efforts to promote CCS and geologic sequestration will continue to flounder.

20. *Id.* at 9, 12-13.
21. *Id.* at 11.
22. *Id.*