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Climate Ethics

Ethical Analysis of Climate Science and Policy

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The Ethics of Allocating Public Research Funds for Carbon Capture and Storage

By DONALD A BROWN on October 16, 2008 6:14 PM| [0 Comments](#)

I. Introduction

This post examines additional ethical issues that arise when a government plans to eventually reduce its greenhouse gas (GHG) from coal-fired powered plants through the use of carbon capture and geologic storage technology (carbon capture and storage).

As more fully set out in prior posts on climateethics, carbon capture and storage is a very hopeful but not completely proven technology for reducing climate change's threat from the large and growing number of coal-fired power plants around the world. See (<http://climateethics.org/?p=46>) and (<http://climateethics.org/?p=38>).

As previously set out in these earlier posts, geologic carbon storage raises a number of ethical issues that should be considered when making decisions about this technology's deployment. Yet, all solutions to climate change, including geologic carbon storage, must consider the ethical issues each solution raises in the context of the enormous ethical issues raised by the problem that the solution is trying to prevent, namely human-induced climate change. That is, as a matter of ethics, it is not enough to identify potential harms created by different climate change solutions; those opposing specific solutions to climate change must also consider the potential reduction in harms from climate change that the solution could enable as well as other ethical issues entailed by the climate change solution under consideration. It might very well be the case, for instance, that geologic carbon storage raises certain ethical concerns because of potential harms that this technology could create yet the potential adverse impacts of this technology are less ethically problematic than continuing to release CO₂ from coal-fired power plants. If this were the case, then ethics would require those considering the deployment of this technology to compare ethical issues raised by carbon capture and storage with ethical issues raised by other viable options for reducing climate change's threat.

Nevertheless, as set out in the first post on geologic carbon storage because certain potential adverse impacts could be caused by this technology a number of ethical issues arise that are related to: (1) potential harms to those living near the disposal site, (2) potential harms from slow, long-term leakage of CO₂, (3) potential harms from earth quakes triggered by high pressure CO₂ injections, (4) potential harms that could come from delaying to reduce GHG emissions while waiting for this technology and, (5) several procedural justice issues. (<http://climateethics.org/?p=38>)

The second post on this subject examined in more detail ethical issues that could arise by waiting for geologic carbon storage to eliminate GHG emissions from coal-fired power plants in light of the fact that it may take decades to determine whether geologic carbon storage is a feasible and reliable technology for many places at which governments hope to deploy this technology. (<http://climateethics.org/?p=46>)

This post looks at a new issue not considered in prior posts about the ethics of carbon capture and storage, namely ethical issues that could arise if scarce research monies are applied to carbon capture and storage at the expense of research needed to deploy other viable climate change reduction technologies.

II. The Need of Geologic Carbon Storage Research

Most observers agree that significant research is needed before geologic carbon storage can be widely deployed at coal-fired power plants around the world. Although there are four industrial-scale carbon storage operations already in existence, significant research is needed to determine the efficacy and feasibility of this technology on a global scale. A recent Intergovernmental Panel Climate Change Report (IPCC) report on geologic storage identified the following knowledge gaps that need to be filled before this technology can be widely used despite the fact that the IPCC sees this technology as very promising:

- There are major gaps about storage capacity at global, national, and regional scales.



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- There are significant knowledge gaps about storage capacity in parts of the world that are likely to experience the greatest energy growth such as China, Southeast Asia, India, Russia, former Soviet Union, Eastern Europe, parts of South America, and Southern Africa.
- There is a need for greater knowledge about some storage mechanisms including: (a) the kinetics of geochemical trapping and long-term impact of CO₂ on reservoir fluids and rocks, and, (b) the fundamental processes of CO₂ adsorption and CH₄ desorption on coal during storage operations.
- There is some need to improve knowledge about: (a) risks of leakage from abandoned wells caused by material and cement degradation, (b) temporal variability and spatial distribution of leaks that might arise from inadequate storage sites, (c) microbial impacts in deep subsurface, (e) environmental impact of CO₂ on the marine sea floor, and (f) methods to conduct end-to-end quantitative assessment or risks to human health and the environment.
- There is a need to improve knowledge about quantification of potential leakage rates from more storage sites.
- There is need to improve reliable coupled hydrological-geochemical-geomechanical-simulation models to predict long-term storage performance;
- There is a need for better monitoring technology at the surface and subsurface for: (a) location of CO₂ in the subsurface, (b) detection of subaquatic CO₂ seepage, (c) leak detection at the surface, (d) fracture detection and characterization of leakage potential, and (e) long-term monitoring techniques. (Benson and Cook, 2005)

This research needed to assess the global viability of geologic carbon storage will continue to be very expensive not to mention the site specific characterization research needed to determine whether any proposed site satisfies siting criteria. One of the challenges of determining the viability of carbon capture and storage at the global scale is that it is difficult to draw conclusions about the global scale suitability of this technology from existing demonstration projects given that each site is likely to have unique geologic features. Many parts of the world have widely varying geologic structures that will prove to be costly and scientifically challenging to characterize, a step that is indispensable to assure that a site is adequate. Among other things, a site's adequacy will turn on the presence of the integrity of a cap rock needed to prevent upward migration of CO₂ and the absence of fractures or other leakage pathways. It is often scientifically challenging to determine fractures and leakage pathways over the large areas that will be needed to store CO₂ particularly when the site is comprised of widely varying geologic structures. For this reason, if this technology is going to be deployed widely at the global scale, it is practically important to greatly accelerate existing research to include many different kinds of geologic settings. Rather than rapid acceleration of research funding for carbon capture and storage, recently there has been some backtracking on financial research commitments. The highest profile US geologic sequestration research cancellation involved a project known as FutureGen, which President Bush announced in 2003. The project had been funded by a utility consortium with subsidies from the US government and was going to build a plant in Mattoon Illinois that tested the most advanced techniques for converting coal to a gas, capturing pollutants, and burning the gas for power. (Wald, 2008) The project design called for carbon dioxide from coal combustion to be compressed and pumped underground with monitoring devices determining whether gases would escape into the atmosphere. About \$50 million had been spent on FutureGen before the United States government pulled out of the project in January of 2008 when projected costs nearly doubled to \$1.8 billion accompanied by fears that costs would go even higher (Wald 2008) In addition, according to a New York Times report, electricity utilities have also been canceling their commitments to coal gasification plants that would make geologic sequestration more affordable with higher

Because of the huge research needs of geologic carbon storage, it has been predicted that the earliest that geologic carbon storage technology will be technically feasible at the utility scale is 2030. (WBCSD, 2006). This means that carbon capture and storage technology is not likely to be available until long after it is needed to begin to immediately reduce existing GHG emissions unless there is a massive acceleration in funding research. Others have predicted that it may not be widely available until mid-Century. (IEA, 2007) Yet, the world needs carbon reductions now.

Many coal and utility interests are seeking greatly expanded public monies to support geologic carbon storage research. In the United States, legislation introduced on Capitol Hill (Climate Security Act, S. 2191) allocates \$424 billion to a dedicated fund for carbon capture and storage. At the time of this post, both presidential candidates in the United States are promising to support expanded geologic carbon storage research.

For these reasons, funding needs are great for research for carbon capture and storage and many are supporting expansion of public funding of carbon capture and storage technology.

Yet, as we will see, the dedication of needed additional research to carbon capture and storage technology could divert resources from research needed to widely and rapidly deploy other climate change technologies. Of course the same could be said of any technology that receives

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funding support. For this reason, great care in the allocation of funding for climate change solution technologies is required and as we shall see has ethical implications.

It very well may be the case that carbon capture and storage is more than adequate for some sites but deeply problematic for others because of the unsuitability of local geologic conditions. And so although there is a great need to move quickly to examine the potential of this technology to reduce the threat of climate change for applications where it is a potential viable solution, given that the technology may not be appropriate for many sites around the world, there is also a need to support greater research on other promising technologies that can replace fossil fuel combustion in places where carbon capture and storage is not likely to work to isolate CO₂ from the atmosphere. For this reason, arguments can be made that there is justification for both speeding up carbon capture and storage research for sites where the technology is viable while rapidly moving away from reliance on this technology where it will not likely to be environmentally effective or economically viable. To sift through these conflicting needs, careful strategic planning about allocation of research funds is called for. This strategic planning needs to consider the effect of the allocation of large funds for some technologies in the context of reduced funding for other technologies.

As more fully set out below, given that research funds are limited, the choice of research priorities has practical and ultimately ethical consequences if the unproven potential of carbon capture and storage is used as an excuse by some nations for not taking steps to reduce their carbon footprint using other viable technologies.

Since most observers agree that there is no "silver bullet" solution to climate change, at first glance it appears to be appropriate to support research on all solutions to climate change. Yet because of the enormity and urgency of the need to begin to reduce the threat of climate change, it is also urgent to focus research on the most viable solutions, that is, on solutions that have the best potential to reduce GHG emissions in an amount and time that will put the world on emissions reduction pathway that will prevent catastrophic climate change. Since we may be running out of time to act to prevent dangerous climate change, the international community cannot wait decades to begin to deploy GHG reductions technologies that have questionable viability. Strategic planning on research funding allocation needs to take these issues into account.

III. Economic Limits To Wide-Spread Deployment of Carbon Capture and Storage

In addition to large costs of needed research for this technology, there are many uncertainties in determining the actual costs that will be incurred to widely deploy carbon capture and storage. (Friedman, 2003) For this reason, it is not clear that this technology will be economically viable even if proves to technically reliable as a method to isolate CO₂ from the atmosphere. It is very possible that this technology could prove to be environmentally benign in many places but economically unacceptable because cheaper methods of generating electricity without emitting GHGs become viable. It also could prove to be too costly for all sites if other technologies are developed that reduce carbon emissions at lower costs.

It is widely accepted that the additional energy needed to capture CO₂ from the combustion stream, transport it to the storage site, and then pump it under pressure to the target geologic strata will both reduce the efficiency of coal fired power plants at minimum by 20 % and increase the costs of coal production at least this much if not considerably more. It is not yet known, whether carbon capture and storage will be economically viable but if this proves not to be the case, then money spent on developing this technology could be wasted while delaying the deployment of other technologies assuming there are limited funds to be made available to increase the deployment of climate change solutions technologies.

As we explained in a previous post, because of the unproven potential of geologic carbon storage to allow continued use of coal combustion without adverse climate change impacts, the potential of geologic carbon storage could become an excuse for business-as-usual approaches to the use of energy even though there are open questions about the efficacy and cost-effectiveness of this technology to store CO₂ in the long-term.

In addition, since geologic carbon storage may be effective at some sites but not effective for other sites, the potential of this technology's use as a mitigation technique that can be applied to all existing and planned coal-fired power plants is somewhat dubious given the likelihood that existing coal-fired power plants may not be located near potential geologic carbon storage sites that are environmentally adequate locations for carbon storage. Moreover, it is believed that there are cost limits to how far CO₂ may be transported by high pressure pipe line from coal-fired power plant to geologic injection wells. For this reason, many existing and planned power plants may not be economically viable because of costs for transporting captured CO₂ to distant disposal sites.

Despite all of these potential problems with carbon capture and storage technologies, many countries have announced intentions to continue to use coal to generate electricity while acknowledging the need to eventually sequester carbon in geologic formations to reduce carbon emissions into the atmosphere.

It has often been argued by proponents of carbon capture and storage, that this technology is a much needed bridge to a climate change friendly energy future. This argument is premised on : (a) there are large amounts of coal in the world, (b) energy demand is increasing while petroleum supplies are diminishing, (c) the international community cannot in the short- to medium-term ramp up renewable energy to levels that can begin to meet energy demands, and, (d) carbon capture and storage technology is a great hope to provide a short- to medium-term solution to climate

change. For this reason, many proponents of swift action to reduce the threat of climate change support carbon capture and storage research. And so many put great hope in wide-spread deployment of carbon capture and storage. Others warn against carbon capture and storage as a false hope. (Greenpeace, 2008)

IV. Ethics of Resource Allocation Questions

Given the urgency of reducing GHG emissions in large quantities in the next several decades, the potential focus of limited research funds on carbon capture and storage technologies could result in the delay of the deployment of other viable GHG emissions technologies and strategies that urgently needed. For this reason, decisions about climate change research funding needs to be done with great care in the face of lobbying efforts that are working to increase government support for specific technologies.

Diverting funds from potentially effective climate change solutions to carbon capture and storage if this technology turns out to be environmentally or economically unacceptable may not only be imprudent but has ethical significance for the following reasons:

- Each nation has an immediate duty to reduce its existing and future GHG emissions to its fair share of safe global emissions. (Brown, Tuana et al, 2006)
- What each nation's fair share is, of course, raises additional complex ethical questions that are beyond the scope of this post, yet developed nations in particular cannot now make an argument that they are not already exceeding their fair share of safe global emissions nor that they do not have a duty to reduce their future emissions to levels which are consistent with what global justice requires of them. (Brown, Tuana et al, 2006)
- In fulfilling its responsibility to immediately reduce emissions and keep future emissions below what justice requires, each nation has a duty to adopt strategies that have a real hope of being implemented and thereby meeting the nation's obligations to reduce climate change harms.
- Because any nation which is exceeding its fair share of safe GHG emissions has an ethical duty to reduce its emissions, finding effective GHG emissions reduction strategies is not simply a matter of national prudence on which to evaluate its public policy options, but a matter of ethics, that is a matter of moral responsibility.
- Once a nation that is exceeding its fair share of safe global emissions has knowledge that there are options open to it that will effectively reduce GHG emissions, it may not rely on the fact that new less costly, but unproven solutions will be potentially be available in the future particularly when other viable options for reducing emissions can be identified. (Brown, Tuana et al, 2006)
- Although cost considerations are an important and valid basis for choosing among options that will discharge national responsibilities, cost analysis alone is not ethical justification for ignoring national obligations. For this reason, nations may search for cost-effective options to satisfy climate change obligations but they may not as a matter of ethics simply use cost as a basis for determining national obligations.
- Because some climate change solutions are more feasible than others for reducing the threat of climate change, each nation has a duty to assure that its national strategy on climate change evaluates and adopts climate change reduction strategies that can achieve actual reductions in GHG emissions. change. In other words, each nation must select a GHG emissions reduction strategy that has a good chance of working. In short, each nation as a matter of ethics has a duty to think carefully about what will work to reduce its emissions reductions obligations and develop a strategy that will actually reduce emissions. In developing this strategy, time is of the essence.
- If any nation chooses to rely upon the potential of carbon capture and storage to support business-as-usual use of coal combustion and diverts scarce research resources from other viable climate change technologies, it must assume the burden of proof of demonstrating that such an approach will reduce national emissions in a way that is consistent with its international obligations in a timely manner. That is, in developing national strategies to climate change no nation may simply identify unproven technologies to reduce GHG emissions obligations, it must adopt approaches to climate change that have a reasonable basis for reducing GHG emissions consistent with national obligations
- Because there may be "no silver" bullet solutions to climate change that will allow any nation to rely upon only one technology to satisfy its ethical obligations to reduce national GHG emissions, each nation may need to support research on multiple GHG reduction technologies and strategies. Yet because each nation has a duty to adopt climate change reduction strategies that will work, limited national climate change research budgets must allocate research funds to technologies that have the best potential to reduce national GHG emissions in a manner that is consistent with obligations. For this reason, national budget allocations for climate change solutions have ethical significance.

IV. Conclusion

The allocation of research budgets for all climate change solutions including carbon capture and storage has ethical as well as practical significance.

Because each nation has a duty to adopt solutions to climate change that are consistent with national climate change reduction obligations, different nations might have different obligations in budgeting scarce research funds. For instance, because some developing nation's emissions reductions obligations are arguably currently below their emissions reductions obligations, they could be considered to have more ethical leeway in waiting to see if carbon capture and storage is viable than developed nations that are already exceeding their fair share of global emissions and are often relying on burning large amounts of coal to meet high energy demand.

High emitting nations in particular have an ethical duty to select strategies that will most effectively reduce emissions in an amount that is timely consistent with national obligations. For this reason, no such nation may arbitrarily allocate funds in support on climate change solutions without regard to the potential efficacy of each solution to reduce the threat of climate change. Accordingly, each nation should use a careful strategic plan to allocate research funds among competing climate change technologies that considers both the timing, probability of success, as well as cost of alternative reduction strategies. Nations that choose to rely on technologies such as carbon capture and storage whose environmental efficacy and economic viability will not likely be known for decades must plan to implement strategies using other technologies to achieve emissions reductions obligations in the event that the unproven technology is not viable.

If it were proven to be true that there is no other way to reduce the threat of climate change in the short- to medium-term without the wide-scale deployment of carbon capture and storage, a claim contested by some, then governments should proceed with this research as quickly as possible. However, the international community needs to quickly examine this claim in more detail. At a minimum, nations should abandon plans to install carbon capture and storage at sites where this technology is not likely to be viable as quickly as possible.

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References:

Benson, S. Peter Cook, coordinating authors, et al, Underground Geologic Storage, in Intergovernmental Panel on Climate Change (IPCC), 2005, Special Report on Carbon Capture and Storage, Chapter 5. <http://www.ipcc.ch/pdf/special-reports/srccs/srccs_summaryforpolicymakers.pdf>, (visited January 2, 2008)

Brown, Donald, Nancy Tuana. Marilyn Averill, Paul Bear, Rubens Born, Carlos Eduardo Lessa Brandão, Marco Túlio S. Cabral, Robert Frodeman, Christiaan Hogenhuis, Thomas Heyd, John Lemons, Robert McKinstry, Mark Lutes, Benito Meuller, José Domingos Gonzalez Miguez, Mohan Munasinghe, Maria Silvia Muylaert de Araujo, Carlos Nobre, Konrad Ott, Jouni Paavola, Christiano Pires de Campos, Luiz Pinguelli Rosa, Jon Rosales, Adam Rose, Edward Wells, Laura Westra. (2006), White Paper on the Ethical Dimensions of Climate Change, The Collaborative Program on the Ethical Dimensions of Climate Change, Rock Ethics Institute, Penn State University, <http://rockethics.psu.edu/climate/whitepaper-intro.htm>

Friedmann, S. Julio, (2003) Thinking Big, Science and Technology Needs for Large Scale Geologic Storage Experiments, http://www.tyndall.ac.uk/events/past_events/large_scale.pdf (visited Oct. 4, 2008)

Greenpeace, False Hope: Why Carbon Capture and Storage Wont Save the Planet, 2008<http://www.greenpeace.org/usa/news/new-greenpeace-report-exposes>, (visited October 2, 2008)

International Energy Association (IEA), 2007, Greenhouse Gas R&D Program, CO 2 Capture Ready Plants, 20047/4

Wald. Mathew, 2008, Mounting Costs Slow the Push for Clean Coal. New York Times, May 30, 2008.

World Buisness Council for Sustainable Development. (WECDSD), 2006, Facts and Trends, Carbon Capture and Storage, <http://wbcsd.org/web/publications/facts&trends-ccs.pdf>.

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