Columbia Climate Center Workshop in Carbon Management Education and Practice: Summary and Discussion

By Kate Brash, Anna Mazhirov, Mary-Elena Carr, Theresa E. Hernandez

Why Carbon Management?

Since the industrial revolution, economic development and improved living standards have been made possible in significant part by the burning of carbon intensive fossil fuels. Access to affordable, reliable and safe energy remains a necessary condition for progress toward greater human well-being. As fossil fuels are the cheapest and most accessible source of energy, reducing energy poverty to improve living standards will increase carbon dioxide emissions. However, emissions of carbon dioxide and other greenhouse gases, through their impact on climate, will ultimately limit the well-being of all societies, particularly in the least developed countries. In order to address climate change and preserve opportunities for prosperity in our own and future generations, we must manage carbon.

The de-coupling of economic development and carbon emissions is thus a central challenge for the 21st century. It requires large-scale mobilization of human and economic resources and major societal transformations, demanding new and potentially far-reaching solutions. We posit that defining a new discipline of carbon management will help generate these solutions. Carbon management education, as we envision it, is designed to train a workforce to meet the challenge of implementing emission reduction strategies globally and across sectors.

Workshop in Carbon Management Education and Practice

To help us map the emergence and contours of carbon management as a discipline and practice, and to begin establishing the community of scholars and practitioners needed to advance the field, the CCC hosted a workshop, "Carbon Management: Education and Practice," on November 3-4, 2011 at Columbia University.

Participants were drawn from academia, government, NGOs, and the private sector. Their areas of expertise include the whole spectrum of carbon management: carbon capture and sequestration, engineering, electric utility strategic planning, education, terrestrial ecology, carbon cycle science, policy

development and implementation, monitoring, reporting and verification of emissions reductions, carbon finance, and decision science.

Sectoral Challenges

The workshop was organized into sector-based panels and individual presentations followed by moderated discussion with the entire group of workshop participants. Presentations were grouped around Carbon Finance and Business; Governance, Law and Policy; Transportation, Energy and Infrastructure; Terrestrial Carbon Management; Carbon Capture and Sequestration; Carbon Management Education and Pedagogy; and Decision Science. Each sector is critical in addressing the anthropogenic carbon problem, and each faces an array of challenges.

For carbon finance and investment, the lack of price on carbon was identified as a decisive obstacle, as the sector exists to commodify and trade units of carbon emission and abatement. Other areas of carbon finance, such as clean tech investment, operate independently of the carbon markets, but may not reach their potential without a price signal. There have been some notable steps in this area, such as the recent progress of the State of California toward a carbon market, but globally, uncertainty continues to dominate.

The central challenge facing policy and governance as a tool for carbon management is the lack of a binding international treaty. Currently, the most ambitious actions to reduce carbon emissions are being taken at sub-national levels as international discussions continue to stall. Vulnerability to climate change will be experienced locally, and accordingly local governments are taking proactive steps to mainstream climate change into policy and planning. For example, new building codes and retrofitting requirements are being enacted in cities across the world, where buildings are the major emission source.

The energy and transportation sectors, which together produce most of the world's carbon emissions, will not be easily transformed. Existing energy systems represent massive investment over many decades – significant change will be expensive. The energy industry is also characterized by strong vested interests: incumbent companies, labor unions, politicians and investors. Mustering the political will needed to change policies and investment incentives is therefore a formidable challenge. In theory, a high enough carbon price could dislodge even this obstacle to carbon management, but will not likely be achieved unless these very powerful interests support the necessary policies.

Agriculture and forestry produce about 30% of global annual CO_2 emissions. Managing these emissions is complex because of their dispersed nature and the myriad practices involved in creating them. A market for forest carbon could help reduce these emissions and a concerted effort (by Reducing Emissions from Deforestation and Forest Degradation, REDD) to create such a market is underway. One of the primary obstacles to this effort is the uncertainty in estimates of biomass carbon storage and rates of land use change, the basic metrics needed to make forest carbon into a tradable commodity. In spite of this and a host of other difficulties, REDD represents potential economic development alternatives to deforestation for tropical forest nations, and is regarded as a critical tool for managing carbon.

Carbon capture and storage (CCS) refers to technologies and methods that prevent carbon dioxide emitted as a result of fossil fuel combustion from reaching the atmosphere. There exist viable technologies to capture, transport and store emissions from large point sources such as power plants, but important technical questions remain, particularly with regard to storage. Five integrated demonstration projects are currently underway worldwide, and the IEA estimates that 100 must be operating by 2020 to achieve the necessary scale up to meet a 450 pathway by 2050. CCS is expensive, and there is essentially no incentive for private investment, since emissions don't carry a cost. Again, policy certainty and a price on carbon are needed to drive this carbon management technology forward.

Our final panel, on carbon management education and pedagogy, provided a window into the diverse nature of this emerging discipline. Three different educational programs were presented, each with its own specialized focus and approach. The Greenhouse Gas Management Institute trains professionals to support greenhouse gas and sustainability metrics, while the Research Experience in Carbon Sequestration program exposes graduate students to hands-on field activities associated with deploying CCS projects. The mission of the Applied Carbon Management MSc at the University of Glasgow is to develop the workforce to enable Scotland to meet its ambitious carbon reduction targets. Each program has evolved to fill a niche in the carbon management ecosystem.

During the group discussions, two notable, related points of agreement emerged. A number of practitioners stressed the importance of co-benefits, noting that success of their current and future projects relied on motivations beyond carbon emissions reductions. Rajendra Pachauri, of the

International Panel on Climate Change, spoke about the co-benefits resulting from the linkage between development and mitigation, such as energy security, improved air quality and therefore improved health, and rural employment. Lawrence Burns, of the University of Michigan, stressed the significance of this strategy by suggesting a shift from 'either-or' to 'and' approaches. Sean Smukler, of Columbia University, presented terrestrial carbon management as a triple-win for mitigating climate change, improving livelihoods, and preserving biodiversity. Wandi Bruine de Bruin, of Carnegie Mellon, discussed co-benefits from a decision-science perspective, noting that they may not be motivating for all audiences.

In another overarching theme, the group strongly agreed on the need for training requisite to provide boundary–crossing functions and facilitate coordination among the disparate organizations, sectors and disciplines involved in managing carbon. For instance, Greg Dipple, of the University of British Columbia, conducts research on carbon sequestration in mine tailings, which requires interaction with local governments, regulatory agencies, environmental groups and other stakeholders. Keith Grocock, of the World Bank Carbon Finance team, described his group's need for people with a broad set of competencies encompassing everything from financial markets to forest livelihoods. Jim Gallagher, Head of the Strategic Planning office for the New York Independent System Operator, in recounting his own career path, emphasized the importance of cross-boundary thinking, openness to different perspectives and interpersonal skills.

The emphasis on cross-boundary thinking and the importance of co-benefits reflect a need for rigorously interdisciplinary and cross-sectoral approach to carbon management education and practice. Some of the barriers to such collaboration were evidenced in the workshop itself. The use of specialized vocabularies, which eases communication between insiders but complicates attempts to reach beyond a small community of experts, is pervasive. This language barrier extends to the definition of "inter-disciplinary" itself. From the perspective of a physical oceanographer, for instance, working with a biological oceanographer is an inter-disciplinary collaboration. From the perspective of implementing big, integrated solutions, scientists and engineers will have to collaborate with policy makers, stakeholders, and citizens, with each group possessing at least a basic understanding of the tools used by the other group. Carbon managers will need to be able to navigate these differences in professional and disciplinary language and culture.

The workshop concluded with a breakout session during which participants were asked, among other things, to arrive at a group definition of carbon management. The responses were diverse, but converged on the idea of designing and managing systems for reducing atmospheric greenhouse gas emissions to achieve a net positive balance in terms of energy, finance and environmental impact. This definition will continue to evolve in our forthcoming white paper and, we hope, in ongoing discussions with the participant group and others.

We believe that training carbon management professionals has the potential not only to meet existing and anticipated future needs based on mitigation commitments, but also to build momentum for political action on climate change by creating the human resources and social infrastructure necessary to address the problem. Students trained in integrated carbon management will serve as agents of knowledge transfer, helping transform social norms with regard to carbon emissions, wherever their professional lives take them.

We hope to contribute to the advancement of carbon management as an academic and professional field by offering a forum for ongoing discussion and collaboration between workshop participants, as well as other interested educators and practitioners.