Networks of Centres of Excellence

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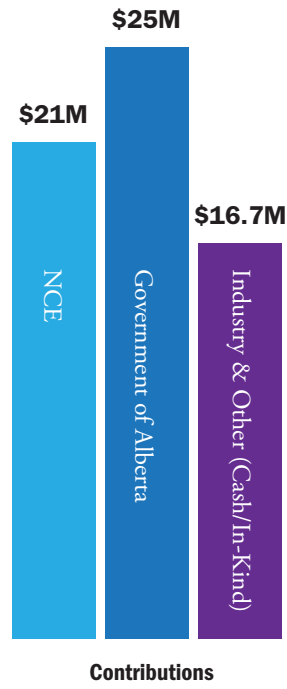
Carbon Management Canada

Achievements 2009–2013

A key achievement of Carbon Management Canada (CMC) has been the development of a cohesive, integrated cross-Canada network of researchers from multiple disciplines all with a common interest in CO_2 emission reduction.



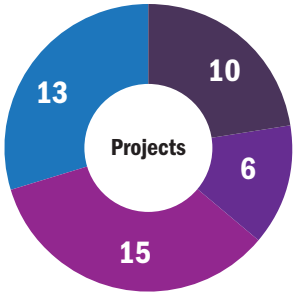
Achievements

A key achievement of Carbon Management Canada (CMC) has been the development of a cross-Canada network of researchers from multiple disciplines all with a common interest in CO_2 emission reduction. The network, hosted at the University of Calgary, has a robust portfolio of 44 multi-institutional, multidisciplinary research projects with a funding commitment from CMC of $22 million.

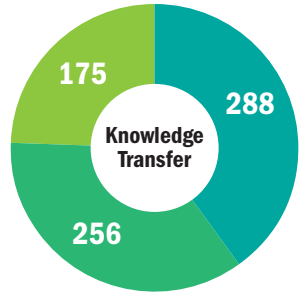
In only three years these projects are producing valuable and high profile outputs that are developing solutions to carbon management challenges in Canada and abroad. Several groups are taking their basic research toward commercial deployment and within the network there have been five invention disclosures, four patents filed or granted, three spin-off companies started, and one license under discussion. Research results have been widely disseminated with over 280 refereed publications, invited talks in 17 countries, and over 100 media reports. CMC's efforts have drawn the attention of industry and media to several projects leading to new collaborations with industry.

Through conferences, workshops and meetings, scientists have been exposed to challenges and ideas outside of their usual frameworks, which has led to new collaborations and directions in research.

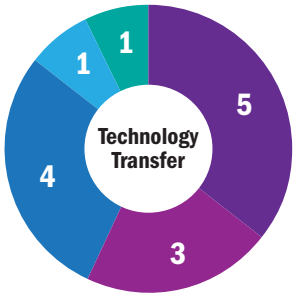
Networking has also been beneficial to Highly Qualified Personnel who have been able to work with some of the most highly regarded scientists in Canada. CMC has provided exposure to venture capital experts, offered opportunities for international travel through exchange programs and international summer schools, and held workshops and seminars to enhance the education experience of HQP.



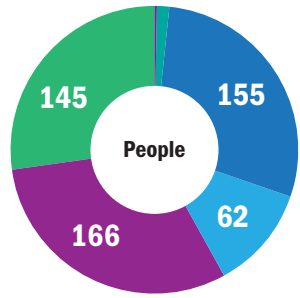
10 Recovery, Processing and Capture Technologies
6 Enabling and Emerging Technologies
15 Secure Carbon Storage
13 Accelerating Deployment of Low Carbon Emission Technologies



288 Refereed publications
256 Non-refereed publications
175 Presentations/reports



5 Invention disclosures
3 Start-up companies
4 Patents filed/granted
1 License under discussion
1 Freedom to operate search conducted



2 Governments
7 Industry sponsors
155 Investigators
62 Postdoctoral fellows
166 Graduate students
145 Research associates

Noteworthy accomplishments

• The Sinton group at the University of Toronto, which is developing microfluidic chips to measure CO_2 behavior at the pore scale in reservoirs, and the Risk group at St. Francis Xavier University, which is working on sensor development, have attracted additional projects from industry based on their research with CMC;

• Through a research project led by Warren Mabee, CMC has joined forces with Lafarge Canada, Natural Resources Canada and researchers at the Queen's Institute for Energy and Environmental Policy on an $8 million initiative to develop low carbon solutions to power cement plants;

• Several CMC researchers have achieved international-level recognition for their work: Douglas Stephan, University of Toronto, was elected a fellow of the Royal Society (UK); and Steve Larter, CMC Scientific Director, and Viola Birss, University of Calgary, were elected to the Royal Society of Canada; and

• Funds were committed to send nine Canadian students on an international exchange; seven international students will be brought to Canada; five students took part in the UK Energy Research Centres' Energy Summer school; and six students were sent to Banff for an Entrepreneur Boot Camp and Banff Venture forum where they networked with venture capital and angel investors.

• Funding was secured from seven industry sponsors: Capital Power Corporation, ConocoPhillips Canada, Suncor Energy, ATCO Power, Canadian Natural Resources Ltd., Cenovus Energy and Spectra Energy.

Carbon Management Canada supports the reduction of carbon emissions from large industrial emitters.

Below are a few examples of projects that have the potential to bring about a reduction of CO_2 emissions.

Project	Description	Progress
Designing easy-release CO_2 capture at the molecular level	This project focuses on developing better CO_2 capture materials from a Metal Organic Framework (MOF) molecular perspective.	The team has developed computational chemical methods to develop an MOF sorbent screening method that will save years of difficult lab work in assessing promising sorbent targets. Researchers have developed and filed a patent on a water stable MOF with excellent capacity for which licenses are being negotiated.
A pore scale microlab to perform fundamental laboratory-based studies of CO_2 transport and reactivity in reservoirs	The team is developing small scale testing systems with microfluidic chips for measuring bitumen-gas interactions.	The key development of this project has been the ability to create stable, fluid resistant microfluidic chips able to operate at appropriate temperature and pressure in which key fluid transport and reactivity properties can be examined. Suncor has partnered on a next phase of the project.
Assessing the potential of low carbon fossil fuel derived technologies	The project aims to improve the scientific understanding of the life cycle implications of GHG mitigation strategies that could be applied to Alberta's oil sands.	Investigators have been working closely with industry and have developed an integrated approach to life cycle assessment of technologies in the oil sands. Common metrics for data sharing and reporting have been established, allowing for a better informed decision making process around the introduction of carbon management technologies in the oil sands.
Gasification with CO_2 capture sorbents and/or catalysts	Researchers are developing solid sorbents capable of retaining their CO_2 capture efficiency through multiple uses in a fluidized bed gasification process.	Teams are testing three novel sorbents; the attrition characteristics and capture efficiency of sorbents are being monitored at two universities; and a novel thermogravimetric analysis technique is being developed. At the University of British Columbia a pilot scale dual-bed gasifier is being refurbished to permit testing of new sorbents.
Distributed all-optical CO_2 sensing for field-scale subsurface carbon management	The objective is to develop, validate and field test a fibre-optic method for large-scale distributed measurement, monitoring and verification of CO_2 sequestered in geologic formations.	Significant breakthroughs have been achieved in measuring concentrations of CO_2 in saline solutions based on the refractive index at pressures and temperatures typical of the downhole environment.
Carbon mineralization in mine waste	The aim of this project is to accelerate the permanent fixation of CO_2 into hard rock mine waste.	Milestones have been achieved in two process routes: targeting minor mineral phases with high reactivity, and photosynthetic acceleration of direct capture of CO_2 from the atmosphere. It is estimated that each of these process routes would be capable of fixing CO_2 at rates of 100,000 to 500,000 tonnes per year if scaled up to mine-sized operations.

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