



B.C. Carbon Capture Utilization & Sequestration Systems Visioning Workshop (March 22, 2022)

The climate emergency needs carbon capture and storage as part of the solution.

“Given the urgent need to decarbonize, we need renewable energy sources to replace fossil fuels to produce electricity. We aren’t disputing this fact,” says Naoko Ellis, Professor of Chemical Engineering at the University of British Columbia. “But this will take time, and it is here, through this transition period, that CCUS can provide a much-needed technical solution.”

With the ongoing climate emergency and nations’ commitments to meet net-zero goals by 2050, there is a heightened need to significantly reduce greenhouse gas emissions, through whatever means possible.

Carbon capture, utilization and sequestration (CCUS) utilizes technologies that concentrate carbon dioxide from various streams, including combustion stacks, industrial processes and air, and either make use of the carbon dioxide or store it away. The Intergovernmental Panel on Climate Change recognizes these technologies in its mitigation pathways, acknowledging multiple solutions are needed, each with differing time horizons, to address climate changes’ complexity.

Our federal government is also embracing CCUS by developing a substantial new investment tax credit as part of Canada’s 2030 Emissions Reduction Plan. Announced last week, this plan outlines \$9.1 billion in new investments, including support for;

“developing a carbon capture, utilization, and storage (CCUS) strategy; introducing an investment tax credit to incentivize the development and adoption of this important technology; and investing \$194 million to expand the Industrial Energy Management System to support ISO 50001 certification, energy managers, cohort-based training, audits, and energy efficiency–focused retrofits for key small-to-moderate projects”.

The complexity of climate change requires an interconnected approach.

“Complexity science tells us that to deal with complex problems, we need to apply non-linear thinking and be adaptive and learn,” says Ellis. “We need to look at the interconnectedness of dynamic systems and not just focus on one element at a time. Demonstration projects, with stakeholders working together, allow us to continuously learn about how technologies improve, how social systems react and adjust to changes, and how to change policies.”

There are currently a couple of million tonnes of CO₂ transported within Canada, mostly by pipeline and truck. By 2050, we may see 200 to 300 million tonnes of CO₂ transported annually. The infrastructure costs to manage this increase will be in the many billions of dollars, if the projects can get public and Indigenous consent to implement.

Our approach must be multi-faceted. By embracing carefully chosen CCUS technologies across the entire supply chain, we can try to reduce emissions quickly. At the same time, we continue to develop and improve them, we also deploy renewable long-term energy sources.

This work requires industry, government and academia to determine collective actions to advance regional CCUS ecosystems.



We need commitment and will....and imagination.

At this point, we no longer have the luxury of finding the one best solution that addresses such a complex problem as the climate emergency.

Key takeaways shared on priority research and policy needs from the regional ecosystem discussions include;

- 1) **Small-Scale Projects:** BC's industrial emissions profile requires innovation on small-scale CCUS technologies and infrastructure, enabled by funding calls that target the development of small-scale demonstration systems.
- 2) **Transportation:** CO2 transportation planning remains a complex challenge. Modelling multi-modal transportation networks under uncertain and changing conditions is critical to optimizing cost efficient scenarios and determining the need for major infrastructure investments.
- 3) **Storage:** Traditional (sedimentary basin) and non-traditional (basalt, ultramafic rock, shallow reservoir) CO2 sequestration opportunities need to be characterized to identify geographically-distributed carbon sinks co-located with industrial hubs across BC.
- 4) **Public Acceptance:** Early education and engagement of the public is vital to pave the way for wider CCUS deployment. There are process-specific risk factors that need to be further understood, mitigated, and communicated broadly.
- 5) **Economics:** BC has the potential to reach net-negative carbon emission scenarios but certainty in carbon pricing and offset markets is required to weigh investments in CCUS systems against alternative GHG-reduction pathways.

How might we coordinate our knowledge, discovery, and decision making to inform the national CCUS strategy, and prioritize innovation that will enable wide-scale CCUS deployment in BC?

Join us to advance CCUS Systems Modelling and Deployment in B.C.

BC's CCUS stakeholder ecosystem will be sustained through concrete projects that rely on shared information and interactive relationships. Engagement in these collaborative initiatives will serve to support a coordinated effort between governments, academia, industrial sectors and community stakeholders towards CCUS deployment in the region.

Tangible indicators for the growth of the ecosystem can be measured through increased engagement in annual workshops, increased granularity and confidence in the modeling, and securing additional funding sources for solution seekers to deploy pilot or demonstration projects.

Please consider supporting one or more of the initiatives outlined here;

1. Optimization of the national CCUS modelling framework (NCMF) for BC's context:

Project Lead:	Dr. Robin Hughes @ CanmetENERGY Research Centre , Natural Resources Canada
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Objectives:	<ul style="list-style-type: none"> • Develop a rigorous technical and economic basis for policy and program development within Provincial and Federal governments for CCUS • Provide industry with an open source, customizable, set of modelling tools for evaluating CCUS technologies and projects • Make the high-quality data required for CCUS modelling readily accessible • Facilitate the coordinated planning of large scale, integrated infrastructure for CCUS with key stakeholders from industry, academia and government
Call to Action:	Seeking participation from industry and transportation providers to share data sets to further develop and validate the national CCUS modelling framework so that it reflects BC's unique context.
Contact:	robin.hughes@NRCan-RNCan.gc.ca

2. Development of a collaborative CCUS systems research and demonstration project to validate the NCMF and assess industrial CCUS hub viability:

Project Lead:	Dr. Naoko Ellis @ Clean Energy Research Centre , University of British Columbia
Objectives:	<ul style="list-style-type: none"> • Develop partner-relevant scenarios and business models based on; <ul style="list-style-type: none"> ○ Technoeconomic and life cycle assessments using transparent accounting in carbon removal efficiencies ○ Spatial resource pattern studies to understand the interactive relationships among regional industrial activities ○ CO2 transportation modeling and logistics optimization algorithms using high quality geographic and economic data • Generate performance data from CO2 capture systems to be analyzed and integrated to advance the AI model for cost and performance predictions • Examine CCUS systems within current and future climate policy, including carbon pricing and key regulations, using a technologically explicit and behaviorally realistic energy-economy model. • Conduct environmental literacy campaigns focused on the benefits of CCUS to support public acceptance.
Call to Action:	Seeking a regional set of multi-sectoral partners to collaborate on the design, modelling, and optimization of an industrial CCUS hub in BC.
Contact:	naoko.ellis@ubc.ca – Professor & Research Theme Lead kyra.laverdiere@ubc.ca – Research Partnerships

3. Development of a geological carbon sequestration atlas for BC:

Project Lead:	Richard Truman @ Geoscience BC
Objectives:	<ul style="list-style-type: none"> • Phase 1: Assess carbon storage targets in Northeast B.C.'s Western Canadian Sedimentary Basin - as a first step – <i>project starting April 2022</i>



	<ul style="list-style-type: none"> Phase 2: Build research consortia to develop BC geological CCS atlas: <ul style="list-style-type: none"> Identify and assess carbon storage targets in other sedimentary basins in BC Scope potential opportunities for further carbon mineralization research
Call to Action:	Seeking new industry, Indigenous government, community, Indigenous and research consortia partners and Geoscience BC members. Development of; providing input, sharing resources, and staying up to date on research initiatives and outcomes.
Contact:	truman@geosciencebc.com

4. Completing the feasibility study on sequestering CO2 beneath the Earth's ocean floor & building toward a demonstration plan

Project Lead:	Curran Crawford @ Solid Carbon , University of Victoria
Objectives:	<ul style="list-style-type: none"> Systems-engineering of floating offshore platforms that house Direct Air Capture technology, injection equipment and alternative systems powered by renewable energy and are globally scalable Design and development of a carbon mineralisation demonstration plan Research on the social, regulatory and investor acceptance of Solid Carbon
Call to Action:	Seeking partners and funders to enable a field demonstration at the Cascadia basin off Canada's west coast. This is the best studied ocean basalt site on the planet and has been monitored in real-time by Ocean Networks Canada since 2009. This demonstration will prove that the ocean basalt is a safe and permanent removal situation, as the injected CO2 will mineralize into rock over a short time.
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Staying connected with workshop participants.

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