



COLLABORATION IS AT THE CORE OF COSIA



cosia[®]
CANADA'S OIL SANDS
INNOVATION ALLIANCE



Our Priority Areas

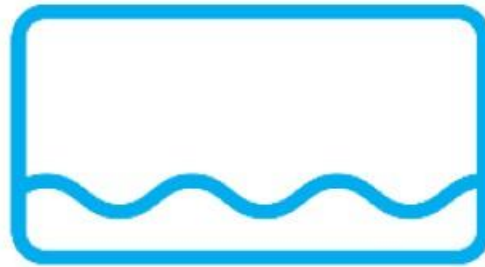


We've identified four priority areas where innovation can have the biggest impact:



Greenhouse Gases

Produce oil with lower **greenhouse gas** emissions than other sources of oil.



Water

Be world leaders in **water** management, producing Canadian energy with no adverse impact on water.



Land

Be world leaders in **land** management, restoring the land and preserving biodiversity of plants and animals.



Tailings

Transform **tailings** from waste into a resource that speeds land and water reclamation.



CLRA | ACRSD

ALBERTA CHAPTER

2022 AGM & CONFERENCE

"Celebrating the profession;
collaboration education, and engagement"

Cambridge Red Deer Hotel & Conference Centre
May 3 - 5, 2022



COLLABORATION



OUR MEMBERS



Teck

DID YOU KNOW

Our members represent 90%
of Canada's oil sands production?



WHAT PROGRESS HAVE WE MADE

\$1.8B

TECHNOLOGY
DEVELOPMENT
COSTS

1,143

CONTRIBUTED
TECHNOLOGIES

233

ACTIVE
PROJECTS

\$531M

COST OF ACTIVE
PROJECTS

*Cumulative from 2012-2021



**Our goal is to help Canada become
a global leader in clean
technologies for oil production.**

COLLABORATION – What does it take?



Successful collaboration takes trust, leadership, and a willingness to take risk.

- Most scenarios on global energy consumption forecast a continued demand for fossil fuels for decades to come.
- That's why COSIA's work is so important. COSIA members are developing and implementing technologies that demonstrate it is possible to address climate-related risks, while also meeting global energy demand and supporting economic development.
- **An unprecedented level of collaboration is required to meet Canada's climate commitments.**



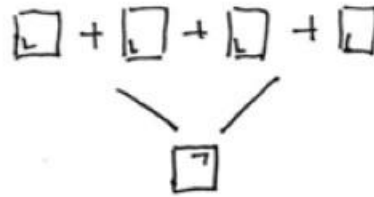
COLLABORATION – What does it take?



- Intentional
- Cultural
- Not Easy
- Rewarding

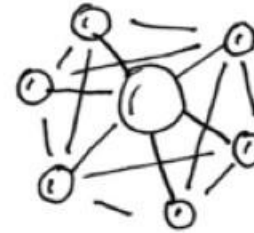
COOPERATIVE V. COLLABORATIVE

By John Spencer @spencerideas



COOPERATION

- Mutual respect
- Transparency
- Shared goals
- Independent and dependent
- Loose network
- Short-term
- Sharing of ideas as a group
- Engagement



COLLABORATION

- Mutual trust
- Vulnerability
- Shared vision and values
- Constant state of interdependence
- Tight culture
- Long-term
- Generation of new ideas as a group
- Empowerment

Collaboration Components



- **Leadership**
 - CEO Accountable
- **Line of Sight**
 - Reporting
- **Leverage**
 - The place to share and drive environmental innovation
- **Linkages**
 - Ideas and Research into practice



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Unique Innovation Model



COSIA is an alliance of oil sands producers focused on accelerating the pace of improvement in environmental performance in Canada's oil sands.

- COSIA brings together leading thinkers from around the world.
- It's about sharing expertise, resources, technologies and even intellectual property to go farther, faster in environmental performance.
- It's called open collaboration and it's a unique made-in-Canada way of advancing game-changing technology solutions.

COSIA - Under the Hood



- Governing Body
- Priority Areas
- Steering Committees
- Planning Framework
- Working Groups
- Joint Industry Projects & EPA Led Studies



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WATER

EXAMPLES OF OUR CURRENT WORK:

- Mine Water Management Workshop
- Water Technology Development Centre
- High Temperature Membranes
- Pit Lake Mesocosm Facility



Water Technology Development Centre (WTDC)

- \$140-million world-class, dedicated water technology test facility for the in situ sector, which started up in 2019, at Suncor's Firebag in situ production site.
- Allows operators to test more technologies and speed development and commercialization of new water treatment innovations.
- Facility has live process streams from the Firebag facility enabling testing of technology for the entire suite of in situ unit operations.
- Technologies discovered and developed here could have broad application in other sectors and globally.



Pit Lake Mesocosm Facility



- High-end aquatic mesocosm facility that operates as an outdoor research lab.
- Models aquatic systems to test ways to reduce toxicity of tailings water.
- Uses native plants and microorganisms to remove contaminants efficiently.
- Complemented with advanced analytical chemistry lab on site.

GREENHOUSE GASES

We are committed to a low carbon future by exploring and advancing technologies such as:

- Carbon Capture, Utilization and Storage (CCUS)
- Molten Carbonate Fuel Cells
- Natural Gas Decarbonization
- Energy Efficient Design
- Fugitive Emissions Measurement and Management
- Reinventing the extraction process
- New mining technologies
- H2nanO SolarPass



Carbon Capture Utilization and Storage (CCUS)



- **CCUS is one of today's most promising technologies to significantly reduce global CO₂ emissions from large industrial sources.**
- The oil sands industry has been a pioneer on this front and is leading technology development.
- Canadian Natural has advanced several initiatives and now has the fifth largest CCUS capacity in the world.
- Since 2015, the company's Quest facility has captured and safely stored **6 million tonnes of CO₂** underground – at a lower cost than anticipated.





**XPRIZE
CARBON**

nrg | **cosia**

NRG COSIA Carbon XPrize

Learn more at
transformingthefuture.ca

Watch the [video](#)



New Mining Technologies



COSIA members are evaluating a number of innovative technologies for giant haul trucks to find ways to significantly reduce vehicle emissions.

They are collaborating with the Canada Mining Innovation Council and haul truck providers to jointly progress the most promising technologies.

Electrification and trolley assist

- Replaces the mechanical drive and diesel motor with an electrical drive and battery.
- The truck hooks on and off an overhead electrical line, taking power only when it needs to.

Other technologies being assessed include modified truck design and alternate fuels.



TAILINGS

EXAMPLES OF OUR CURRENT WORK:

- Filter Press
- PASS



Speeding Up Reclamation

Filter Press

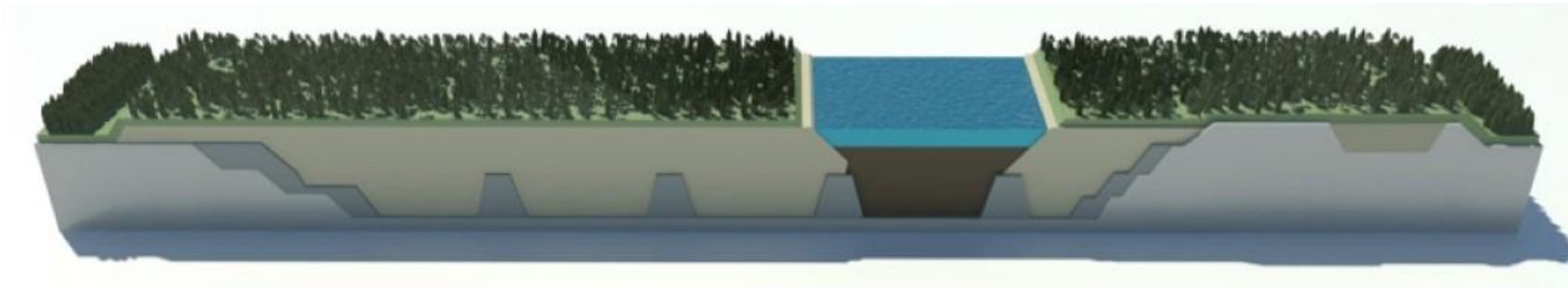
- Better ways to turn tailings from a waste to a resource.
- Filter press used in other industries, now tested in oil sands.
- Removes up to 75% of water from tailings.
- Leaves behind dense soil 'cakes' suitable for land reclamation.
- It cuts the time required to get a suitable reclamation material from years to a couple of hours.



Speeding Up Reclamation

Permanent Aquatic Storage Structure (PASS)

- Accelerated method to dewater and treat fluid fine tailings.
- The PASS structure leads to the creation of a lake shortly after the end of mine life.
- Use of coagulants/flocculants to improve the quality of the water taken out of the treated tailings.
- Multi-year, multi-stage project with participation from the Universities of Alberta, Saskatchewan and Waterloo.



OIL SANDS MONITORING PROGRAM



Sound decisions based on scientific data.

- A national initiative to improve understanding of the long-term cumulative effects of oil sands development.
 - Air data – monitoring to measure the types and levels of emissions in the air and on the landscape.
 - Water data – monitoring to quantify and assess oil sands impacts on the Athabasca River system.
 - Wildlife data – assessing the level and potential oil sands impacts on wildlife species.
 - Biodiversity and disturbance data – studying the relationship between disturbed habitat and wildlife diversity.
- A huge database of knowledge is freely available to researchers anywhere in the world.

LAND

Within the Land EPA, the COSIA members have signed a Joint Venture Agreement (JVA), with contractual requirements to identify, develop, conduct and then contribute environmental research & technology.

This unique collaboration enables sharing & learning for the purposes of accelerating environmental performance improvement in Canada's oil sands.





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EDUCATION & ENGAGEMENT



Land Environmental Priority Area

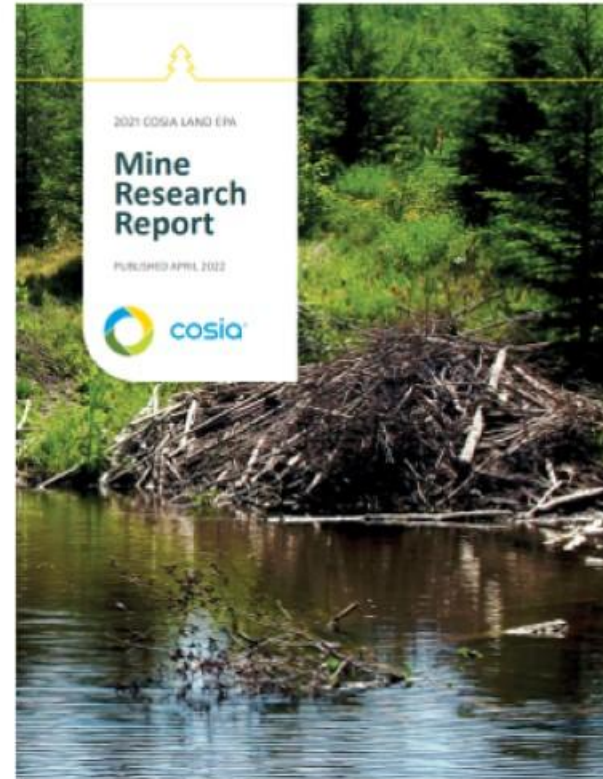


The Land Environmental Priority Area aspires to be world leaders in land management, restoring the land and preserving biodiversity of plants and animals.

- The Land EPA has contributed 484 technologies and currently has 69 active projects.
- Research Reports highlight mine and in situ research.

The Land EPA work falls into 3 main themes:

- Biodiversity
- Uplands, Soil, and Vegetation
- Wetlands



Land Environmental Priority Area



360° VIRTUAL TOURS AND SILVICULTURE TOOLKIT:
Reclaiming Land the Best Possible Way



Land Environmental Priority Area



Land Environmental Priority Area



Compensation Lakes

- Creating compensation lakes for fish from the ground up.
- Replacing fish habitat removed for oil sands mining.
- Goal to create a self-sustaining body of water and thriving ecosystem.
- Demonstrates successful land and water reclamation after disturbance.
- Virtual Reality Tour: www.360tours.cosia.ca



Boreal Ecosystem Recovery and Assessment (BERA Project)

- UofC, UofA, UofW, COSIA, AI-Pac
- NRCan, ABMI
- <http://beraproject.org/>



Faster Forests

- Novel ways to grow forests and reclaim land faster.
- Salvaged surface soil from operations and site to trial reclamation technologies.

Land EPA Research and Collaboration



Oil Sands Vegetation Cooperative (OSVC)

- Collaborative harvesting and banking of native boreal forest seed for use in revegetation and research.
- Addresses revegetation needs through coordination between industry companies and external service providers.
- Annual harvests over 10 years have resulted in a reliable supply of over 50 boreal species.

Boreal Wetland Reclamation Assessment Program(BWRAP)

- NSERC COSIA Industrial Research Chair in Oil Sands Wetland Reclamation.
- Research focus on evaluating the success of wetland reclamation efforts in the oil sands.
- <http://www.bwrap.org/>



Land Environmental Priority Area



- Foundational Supporter
 - Boreal Caribou
 - Land Management
 - Wetland Knowledge



Canadian
Conservation
and Land
Management

Land Environmental Priority Area



OIL SANDS ANNUAL LAND RECLAMATION TRACKING

Oil sands companies have been reporting land disturbance and reclamation activities to the Alberta Energy Regulator for many years. In 2009, the definitions were updated and the oil sands mine companies began using consistent definitions, ensuring that any given piece of land is only tracked in one category at a time. The new definitions were subsequently applied to the reporting for the in situ oil sands companies, ensuring greater consistency across the two oil sands sectors.

Land cannot be categorized as permanently reclaimed until revegetation has occurred, which is reflective of authorized plans. Land that is certified is returned to the Crown, confirmed to have met the expectations of equivalent land capability.

[VIEW DATA →](#)

- <https://cosia.ca/initiatives/land>

Land Environmental Priority Area



COSIA Members' Mining Operations: Reclamation and Disturbance Data, as Reported Annually From 2009- 2020

Status of Land (Reported in Hectares) as Defined by Alberta Environment and Parks (AEP 2007)¹

Year	EPEA Approved Footprint	Mine Site Footprint	Plant Site Footprint	Total Active Footprint	² Cleared	³ Disturbed (Used for Mine or Plant Purposes)	⁴ Ready for Reclamation (No Longer Used for Mine or Plant Purposes)	Soils Placed (Terrestrial & Wetlands & Aquatics)	⁵ Permanent Reclamation (Terrestrial)	⁵ Permanent Reclamation (Wetlands & Aquatics)	⁶ Temporary Reclamation (Terrestrial)	⁷ Certified
2009 ^b	134,155	63,373	4,045	67,418	18,550	41,261	913	1,093	3,503	1,237	863	104
2010 ^b	135,157	67,924	3,527	71,451	17,047	46,773	394	1,534	3,652	1,271	780	104
2011 ^b	136,647	72,598	3,566	76,164	17,050	51,334	250	1,513	3,548	1,229	1,241	104
2012 ^b	145,299	80,309	4,083	84,395	20,435	55,902	372	1,447	3,827	1,215	1,227	104
2013 ^b	144,437	85,178	4,209	89,488	19,265	61,832	181	1,543	4,178	1,269	1,244	104
2014 ^b	144,437	88,948	4,419	90,416	18,931	65,402	86	1,527	4,630	1,271	1,307	104
2015	142,807	89,541	4,503	94,095	18,065	66,559	294	1,305	4,892	1,272	1,632	104
2016	142,807	90,113	5,189	95,301	17,712	67,590	376	1,450	5,063	1,275	1,896	104
2017 ^a	142,099	94,133	4,735	98,920	18,571	70,248	234	1,070	5,498	1,276	2,022	104
2018 ^a	143,675	96,662	4,498	101,155	18,713	71,638	124	1,347	5,929	1,291	2,120	104
2019	149,122	100,042	4,502	102,924	18,763	72,541	158	1,358	6,619	1,291	2,196	104
2020	152,559	103,121	2,421	105,542	19,572	73,859	141	1,128	7,439	1,292	2,110	104

^a2017 and 2018 numbers were corrected in 2020 to remove footprint from Total because this had been erroneously included in the footprint for Canadian Natural Horizon South

^b2009-2014 numbers were adjusted in 2021 to correct a transcription error

¹Alberta Environment and Parks (2007) categorizes and defines the Status of Land as follows: ²Cleared = Cleared of Trees; ³Disturbed = soils disturbed (i.e., used for mine or plant purposes); ⁴Ready for Reclamation = no longer used for mine of plant purposes; ⁵Permanent Reclamation = Reclaimed to Terrestrial, Wetlands or Aquatics habitat; ⁶Temporary Reclamation= erosion control or vegetation has occurred where future disturbance is expected to occur; ⁷Certified = Certified Reclaimed by GOA. Full Definitions are available at:

<http://osip.alberta.ca/library/Dataset/Details/29>

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**Canada's Oil Sands Innovation
Alliance (COSIA)**



**Canada's Oil Sands Innovation
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The End