



CANADA'S
Oil Sands



The Future of Canada's Oil Sands Industry is Changing –

And we are excited about it. Like the entrepreneurs who established our industry and helped fuel our world over the past 100 years, we share Canadian values and have built our industry focused on solutions and continuous improvement.

We are going to be using oil for a long time to come – both in Canada and around the world. Canada has a tremendous resource base combined with a stable political environment and skilled people that make it the ideal place to develop our natural resources responsibly.

Just as we are committed to growing our businesses, we are equally committed to continuing to improve our environmental performance. We collaborate on our biggest environmental challenges, and develop technologies that lessen our impact on climate, air, land and water, and provide benefits for our country.

We know that our innovation and technological advances will help Canada achieve its global environmental commitments and move towards a cleaner energy future. We know it, because we are working on tomorrow's energy, today.

So, when it comes to helping the globe meet the need for increasing demands for energy – all forms of energy – we believe the world needs more Canada.

CONTENTS

CANADA'S ENERGY FUTURE	1
ENERGY	2
USES	6
THE RESOURCE	10
TRANSPORTATION	16
ECONOMY	23
ENVIRONMENT	32
THE FACTS	54
FIND OUT MORE	55

ENERGY

The oil sands are a vital energy source for Canada and the world.

OUR ENERGY FUTURE

The world relies on an energy mix that includes oil, coal, natural gas, hydro, nuclear and renewables. All forms of energy production must increase to meet growing global demand. Canada is uniquely positioned to provide an abundance of safe, secure energy.

161 BILLION BARRELS

Canada has 168 billion barrels of oil that can be recovered economically with today's technology. Of Canada's 167 billion barrels of oil, 161 billion barrels are located in the oil sands.

Source: AER 2021 and CAPP



Canada has the third-largest oil reserves in the world.

TECHNOLOGY

New technology and innovation are critical to developing the oil sands and improving environmental performance.

INVESTMENT

The majority (81%) of world oil reserves are owned or controlled by national governments. Only 19% of total world oil reserves are accessible for private sector investment, 52% of which are found in Canada's oil sands.

Source: CAPP, 2020

ENERGY Energy Demand

GLOBAL NEEDS

Global consumption of energy is expected to increase 27%* by 2040 as economies in both developed and emerging countries continue to grow and standards of living improve.

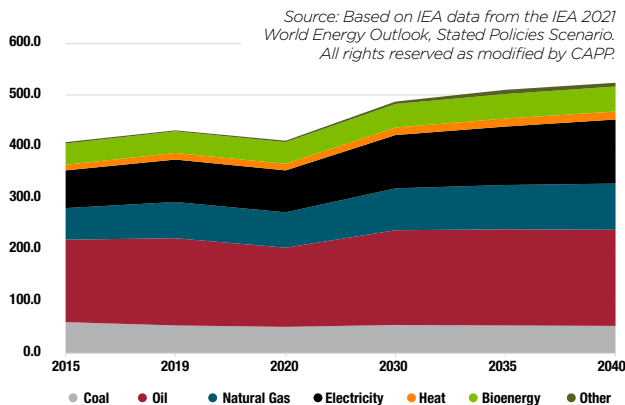
Source: IEA, 2021 World Energy Outlook, Stated Policies Scenario.

UNCONVENTIONAL

All sources of energy, developed responsibly, will be needed to meet growth in global demand. With conventional oil supply declining, the need for unconventional resources, such as oil sands, is increasing.

GLOBAL PRIMARY ENERGY CONSUMPTION

EJ - EXOJOULES



ENERGY Energy Supply

SECURITY OF SUPPLY

Supplying energy to Canada and beyond generates economic benefits across the country. For global customers, importing energy from Canada makes sense. Canada is politically stable, reliable and environmental standards are high.

FUELLING CANADA

Oil sands production provides secure and reliable supply, reducing reliance on foreign imports and providing economic growth in both Canada and the U.S.

PRODUCTION

Over the last 35 years, Canadian crude oil production has increased by 2.6 million barrels per day mainly due to the growth in supply from the oil sands.

CANADIAN OIL PRODUCTION

BARRELS PER DAY

	1985	2020
Crude Oil (incl. oil sands)	1.5 million	4.04 million
Oil Sands	0.2 million	2.84 million

In 2020 about 70% of Canada's crude oil production was from the oil sands.

Source: CAPP, 2021

USES

Oil is an important part of daily life in Canada, providing energy for transportation, residential and industrial uses.

USES Energy Use

Canadians consume a lot of energy. We need it to stay warm, do our work and get from place to place.

Oil derived from the oil sands is sent to refineries across North America to make gasoline, diesel, aviation fuel and other consumer products.

FUELS

GASOLINE

Gasoline is the fuel designed for spark-ignition internal combustion engines. It is commonly used in automobiles.

AVIATION FUELS

Aviation fuels are specialized petroleum-based fuels used to power various types of aircraft.

DIESEL

Diesel is a fuel designed for engines commonly used in trucks, buses, locomotives, and farm and heavy equipment. It contains more energy and power density than gasoline.

USES

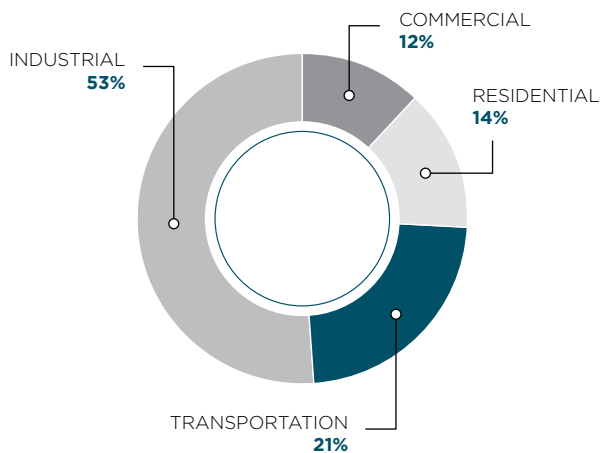
Energy Use

CANADIAN CONSUMPTION

Transportation accounts for 21% of the total energy that Canadians consume – second only in consumption to Canada's industrial sector. That translates to 62 billion litres of gasoline and diesel pumped into fuel tanks across the country on a daily basis just for mobility, without which our modern lifestyle would be impossible.

ENERGY DEMAND BY SECTOR, 2020

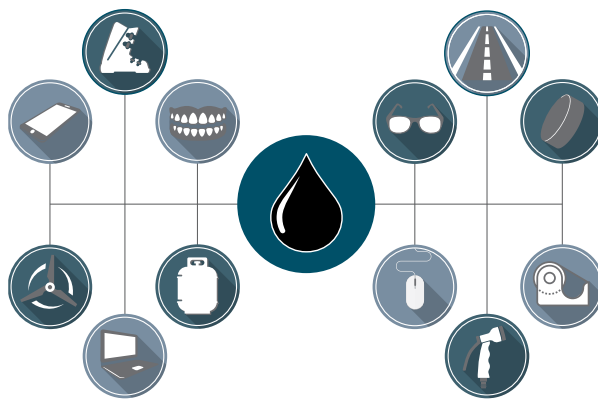
Source: CER, 2021



*May not add due to rounding.

PRODUCTS

Thousands of everyday products get their start from oil. Raw materials used to create items including ink, crayons, dishwashing liquids, deodorant, eyeglasses, cosmetics, tires, ammonia, telephones and heart valves are derived from feedstocks from crude oil.



THE RESOURCE

Canada has the third largest oil reserves in the world: 96% of these reserves are located in the oil sands.

OIL SANDS

Oil sands are a natural mixture of sand, water and bitumen.

BITUMEN

Bitumen is oil that is too heavy or thick to flow on its own. It must be diluted, heated, or otherwise treated to be transported. Some bitumen is found within 70 metres (200 ft) from the surface but the majority is deeper underground.

LOCATION

Canada's oil sands are found in three deposits - the Athabasca, Peace River and Cold Lake deposits in Alberta and Saskatchewan. The oil sands are at the surface near Fort McMurray but deeper underground in other areas.



THE RESOURCE

Recovering the Oil

Oil sands are recovered using two main methods: drilling (in situ) and mining. The method used depends on how deep the reserves are deposited.

IN SITU METHOD

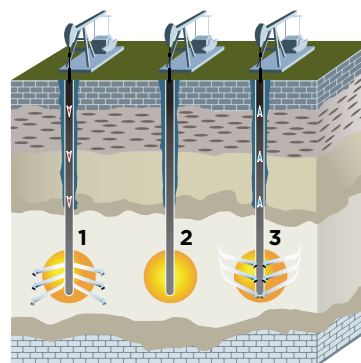
Of all oil sands reserves, 80% are too deep to be mined. These reserves are recovered in place, or “in situ,” by drilling wells. Drilling is planned to minimize land disturbance and in situ extraction does not require tailings ponds.

Advanced technology is used to inject steam, combustion or other sources of heat into the reservoir to warm the bitumen so it can be pumped to the surface through recovery wells.

80% OF OIL SANDS COULD BE RECOVERED THROUGH DRILLING.

20% of oil sands could be recovered through mining.

CYCLIC STEAM STIMULATION DRILLING (IN SITU) METHOD



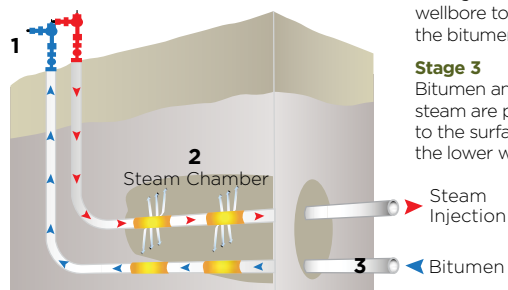
Stage 1
Steam injected into the reservoir

Stage 2
Steam soaks into the reservoir and heats the bitumen

Stage 3
Heated bitumen and condensed steam pumped to the surface

STEAM ASSISTED GRAVITY DRAINAGE DRILLING (IN SITU) METHOD

Surface Wellhead



Stage 1
Two parallel, horizontal wells are drilled, one above the other into the reservoir.

Stage 2
Steam is injected through the upper wellbore to liquefy the bitumen

Stage 3
Bitumen and condensed steam are pumped to the surface through the lower wellbore

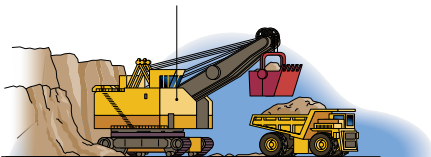
THE RESOURCE

Recovering the Oil

MINING METHOD

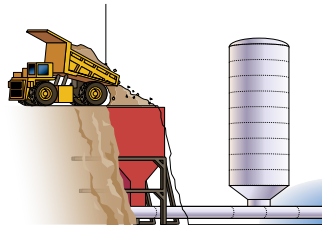
STAGE 1:

Large shovels scoop the oil sands into trucks.



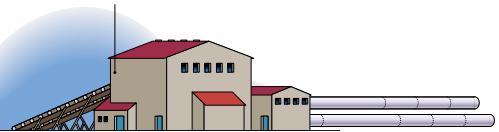
STAGE 2:

Crushers break down clumps of material to enable transportation to the plant for extraction.



STAGE 3:

Bitumen is extracted from the oil sands using separation processes.



Of the oil sands reserves, 20% are close enough to the surface to be mined using large shovels and trucks.

WATCH IT:

View our animation describing the oil sands mining process.



UPGRADING AND REFINING

Once recovered, bitumen from the oil sands can be upgraded from heavy to light oil and sent to refineries in Canada and the U.S. to be converted into petroleum products such as gasoline, diesel and jet fuel.

1.3 MILLION

In 2020, about 1.3 million barrels per day or 42% of the total bitumen produced in Canada was sent to be upgraded in Canada.

Source: AER, 2021

TRANSPORTATION

Canadian crude oil producers continue to build new markets for their expanding production.

TRANSPORTATION Markets

Today essentially all of Canada's oil exports go to one customer — the U.S. Access to multiple customers beyond the U.S. is crucial to strengthen Canada's energy future.

DIVERSIFICATION

Without better access to tidewater and domestic markets Canada receives fewer economic benefits from oil sands development.



The West Coast is a critical outlet for Canadian oil to reach customers in Asian markets. Exporting Canadian oil creates significant economic benefits including jobs for Canadians across the country.

Eastern Canada currently imports almost 40% of the crude oil it processes from foreign suppliers such as the U.S., Saudi Arabia, the Russian Federation and Nigeria. This cost almost \$10 billion in 2020.

TRANSPORTATION

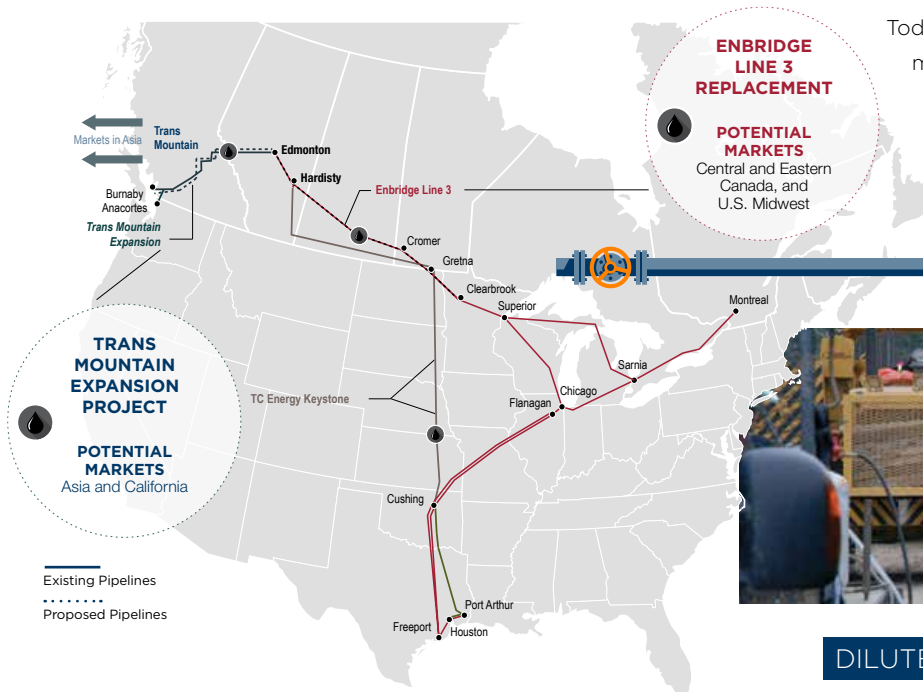
Pipelines

Bitumen and oil are transported three ways; pipeline, marine transport and rail car.

Canada needs more pipelines in all directions to move our growing oil supply to more customers.

Today, Canada has limited pipeline infrastructure to move oil from Western Canada to Eastern Canada and beyond to global customers.

A number of pipeline projects are proposed to connect the growing supply with growing markets in India, China, and to continue supporting the U.S.



Source: CAPR, 2018

DILUTED

To flow, the bitumen — which was separated from the sand at the source — is diluted with condensate or lighter oil to form dilbit. Once mixed with a diluent, the dilbit does not separate but is a new mixture.

TRANSPORTATION

Marine Transport

SAFE FOR 80 YEARS

Oil tankers have been moving safely and regularly along Canada's West Coast since the 1930s.

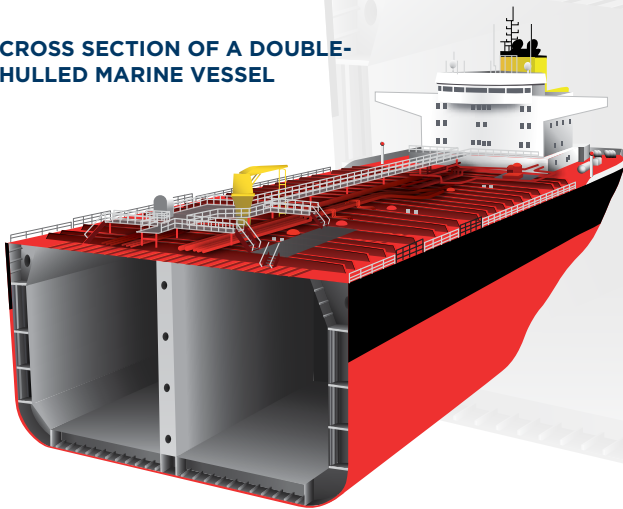
Source: Transport Canada, 2016

DOUBLE-HULLED

Large single-hulled oil tankers were prohibited in 2010 and can no longer operate in Canadian waters. Double-hulled means the bottom and sides of a vessel have two complete layers of water-tight hull surface.

Source: Transport Canada, 2016

CROSS SECTION OF A DOUBLE-HULLED MARINE VESSEL



550 MILLION BARRELS

Each year, about 550 million barrels of oil are safely transported along Canada's East and West Coasts via tanker.

Source: Transport Canada, 2021

OIL TRANSPORTED BY WATER

6 millions of tonnes (MT) on Pacific Coast, 67 MT on Gulf of St Lawrence, 24 MT on Great Lakes and St Lawrence Seaway and 192 MT on Atlantic Coast.

Source: Clear Seas, 2021

HIGH STANDARDS

All oil tankers using Port Metro Vancouver are subject to the same international agreements, rules and strict national and port authority standards.

Source: Clear Seas, 2017

CLOSER TO ASIA

Asian markets are an 8-day to an 11-day sail from proposed West Coast terminals, two days closer than most of our international competitors.

TRANSPORTATION

Rail Transport

Without new pipelines, every new barrel of oil will need to move by rail. In 2021, an average of approximately 148,000 barrels per day of western Canadian crude oil were moved by rail.

Source: CER, 2021

Rail loading capacity in Western Canada is currently about 1,000,000 barrels per day.

Source: CAPP, 2019



Canada's oil sands industry provides economic benefits across Canada.

ECONOMY

ECONOMY

Economic Contribution

\$1.0 TRILLION

Oil sands development is expected to contribute over \$1.0 trillion to the Canadian economy from 2019 - 2029

Source: CERI, 2019

\$17 BILLION

Over the next 10 years the oil sands industry is expected to pay an estimated 17 billion in provincial and federal taxes - including royalties. Governments use this economic contribution to help pay for things Canadians value and want such as healthcare, education and public infrastructure.

Source: CERI, 2019

\$17 BILLION IN ROYALTIES AND TAXES COULD SUPPORT



NEW



SCHOOLS



HOSPITALS



ROADS

ECONOMY

Jobs

In addition to paying significant royalties and taxes, the oil sands industry is a major employer and creates jobs across Canada.

166,000 JOBS

In 2020, the oil sands supported and created almost 166,000 direct and indirect jobs across Canada.

Source: Prism Economics and CAPP 2021



The goods, materials and services used to construct and operate oil sands projects, mines and upgraders come from across North America. Many of the components — tires, trucks, gauges, valves, pumps, etc. — are produced in B.C., Ontario and Quebec.

JOB CREATION

For every direct job created in northern Alberta by the oil sands industry, 2.5 indirect jobs will be created across Canada.

Source: CERI, 2017

ECONOMY

Canadian Benefits

NUMBER OF COMPANIES THAT HAVE DIRECT BUSINESS WITH THE OIL SANDS — PROVINCES OUTSIDE ALBERTA

Source: CAPP, 2020

3

“We developed specialty gloves for the oil sands. The company is an example of B.C. people making a difference.”

Martin and Michele Moore
Watson Gloves
Vancouver, B.C.

513

“The oil sands are tremendous for Ontario. We’ve been selling equipment to the oil sands for a decade now. It’s bringing business and new job opportunities to us.”

Don Berggren, President
Berg Chilling Systems Inc.
Toronto, Ontario

55

“The economic impact of supplying goods and services to the oil sands on our region is phenomenal. The oil sands are good for Prevost, good for Quebec and all of Canada.”

Gaétan Bolduc, President and CEO
Prevost Coach Manufacturer
Sainte-Claire, Quebec

23

167

1302

585

2

19

38

2,200 DIRECT SUPPLIERS

In 2019, more than 2,300 companies from across Canada had direct business (goods and/or services) with the oil sands.

Source: CAPP member data aggregated by CAPP, 2020



ECONOMY

Canadian Benefits



B.C.

\$1.4 BILLION

\$1.4 billion was spent by oil sands producers on procurement in British Columbia between 2017 – 2019.

Source: CAPP, 2020



ONTARIO

\$6.5 BILLION

About \$6.5 billion was spent by oil sands producers on procurement in Ontario between 2017 – 2019.

Source: CAPP, 2020



QUEBEC

\$1.8 BILLION

About \$1.8 billion was spent by oil sands producers on goods and services in Quebec between 2017 – 2019.

Source: CAPP, 2020

ECONOMY

Indigenous Communities

Canada's oil sands industry continues to build positive and mutually beneficial relationships with Indigenous communities where we work.

CONSULTATION

Industry works with potentially affected Indigenous groups to seek ways to mitigate potential impacts of oil sands development. Indigenous groups, through consultation and engagement in regulatory processes, and through Canada's legal system, are afforded multiple levels of due process.

COMMUNITY

In 2017 – 2019, total funding for community investment in the oil sands was \$85.2 million, which includes contributions such as sponsorship for community activities, in-kind investments and contributions to community infrastructure.

Source: CAPP, 2020

275 COMPANIES

In 2019, 275 Indigenous companies from across Alberta had direct business (goods and/or services) valued at \$2.36 billion with oil sands operators.

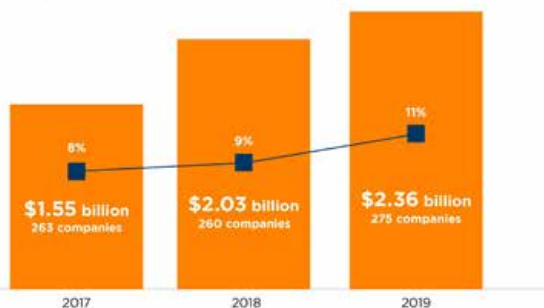
Source: CAPP, 2020

ECONOMY Indigenous Communities

OIL SANDS INDIGENOUS SUPPLY CHAIN

■ Total Procurement Spend (Indigenous Companies)

■ Indigenous Procurement as a % of Total Oil Sands Spending



TYPES OF INDIGENOUS BUSINESSES BY SPEND



Source: CAPP, 2021

INDUSTRY In Action



THE FORT MCKAY GROUP OF COMPANIES LP

The Fort McKay Group of Companies LP (FMGOC), which works extensively with oil sands operations through its six divisions, brings in more than \$150 million in revenue annually. FMGOC is completely owned and controlled by the Fort McKay First Nation.

Source: Fort McKay Group of Companies

IMPERIAL: ENGAGING INDIGENOUS BUSINESSES

Finding solutions to engage, create and sustain opportunities for the Indigenous business community is a fundamental goal at Imperial. At the company's existing operations, it has local and Indigenous suppliers providing a wide variety of services including charter aviation, janitorial, construction, security, road maintenance, scaffolding, environmental services and well servicing.

The company also offers local and Indigenous suppliers information and training on its procurement process and requirements and offers in-depth debriefs to unsuccessful local and Indigenous vendors to help them succeed in the future.

Since 2009, Imperial has spent in excess of \$1.5 billion with Indigenous suppliers, spending \$329 million with more than 100 different Indigenous suppliers in 2015 alone.

ENVIRONMENT

Canada's oil sands producers are committed to developing solutions for a cleaner energy future.

ENVIRONMENT

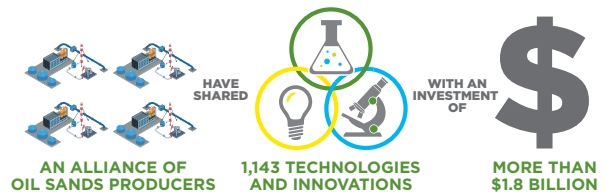
ACCELERATING PERFORMANCE

As Canada's oil sands industry works to help meet global energy demand, we are also accelerating environmental performance.

CANADA'S OIL SANDS INNOVATION ALLIANCE (COSIA)

COSIA is an alliance of oil sands producers focused on accelerating the pace of environmental performance in Canada's oil sands through collaborative action and innovation.

COSIA brings together thought leaders from industry, government and academia to improve measurement, accountability and environmental performance in four priority areas; tailings, water, land and greenhouse gases.



COSIA's member companies have shared 1,143 distinct technologies and innovations with an investment of more than \$1.8 billion to develop.

www.cosia.ca



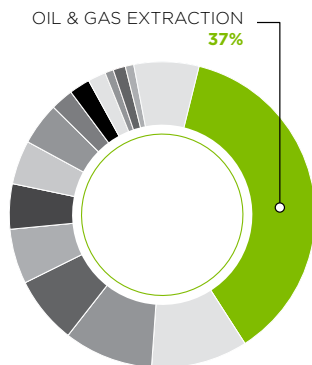
ENVIRONMENT Protection Spending

\$3.6 BILLION

Canadian businesses reported spending \$9.7 billion on environmental protection in 2018. \$3.6 billion was spent by the oil and natural gas industry. 42 per cent of the 3.6 billion dollars was spent on capital investment projects; investments designed to improve long-term pollution prevention, abatement and control.

Source: Statistics Canada, 2018

ENVIRONMENTAL SPENDING BY INDUSTRY



● Oil & Gas Extraction	37%	● Wood Product Manufacturing	2%
● Primary Metals	10%	● Other Manufacturing Industries	2%
● Mining	9%	● Pipeline Transportation	2%
● Electric Power	7%	● Natural Gas Distribution	1%
● Paper Manufacturing	6%	● Transportation Equipment	1%
● Chemical Manufacturing	5%	● Logging	1%
● Petroleum & Coal Products	5%	● Other Manufacturing	7%
● Food Manufacturing	5%		

INDUSTRY In Action



THE ALGAE PROJECT

Oil sands companies are investigating using algae (microscopic plants) to reduce greenhouse gas emissions while producing valuable products. An assessment for a pilot-scale biorefinery was initiated in 2013 by Canadian Natural Resources Limited (Canadian Natural), the National Research Council of Canada (NRC) and Pond Technologies, a Canadian algae technology company. Building upon these learnings, the NRC, Pond Technologies, and St Marys Cement began testing this technology in 2016 at a pilot-scale biorefinery, located at St Marys Cement Plant in Ontario.

The pilot project captures carbon dioxide from the cement plant operations by placing this gas into a large photobioreactor (tank) with algae and LED lights to promote photosynthesis. The mature algae can be pressed to release bio-oil that can be used for biofuels and biomaterials— and, at an oil sands operation, blended into heavy oil or synthetic crude oil. The leftover algal biomass may be used to feed livestock or as a soil amendment for land reclamation.

ENVIRONMENT

Regulating and Monitoring

Reliable, long-term environmental monitoring based on sound science is in everybody's best interest. Oil sands operators must adhere to stringent regulations. Approvals from numerous regulatory agencies are required at every phase, from construction and operation to decommissioning and reclamation.

Existing monitoring systems gather valuable data for independent scientific review and inform new monitoring needs as industry grows.

OSM PROGRAM

OIL SANDS MONITORING PROGRAM

Launched in 2012, the OSM Program is jointly managed by the Alberta and Canadian governments, in partnership with Indigenous communities in the oil sands region and industry. It seeks to understand the cumulative environmental effects of oil sands development in the region.

WBEA

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION

WBEA operates intensive and integrated air and land monitoring and reporting programs in the oil sands. Its ambient air network is the most extensive in Alberta.

WBEA reports continuous ambient air quality data, in real time, directly to their website.

ENVIRONMENT

Regulating and Monitoring

LARP

THE LOWER ATHABASCA REGIONAL PLAN

In place since 2012, LARP is a plan to achieve a long-term vision for growth and development in the oil sands area in alignment with provincial social, economic and environmental objectives. It uses a cumulative environmental management framework to inform oil sands development, inclusive of air and water limits to safeguard community and environmental health. LARP also increased the amount of conservation in the region to more than two million hectares.

The total conserved land through LARP is three times the size of Banff National Park.



ENVIRONMENT

Air

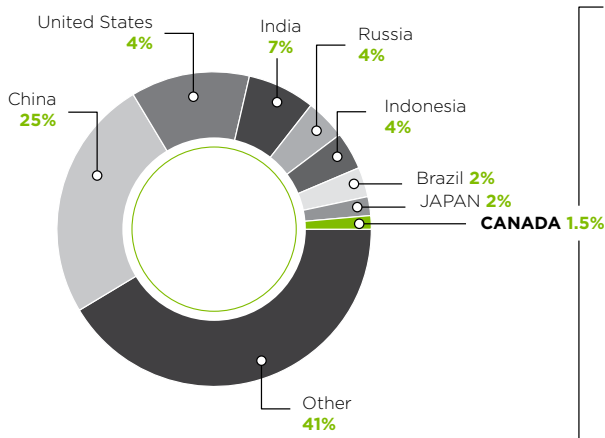


GHG EMISSIONS

Oil sands account for 11% of Canada's GHG emissions or about 0.17% of global GHG emissions.

Carbon dioxide (CO₂) is a GHG. CO₂ is emitted into the air by burning fossil fuels for electricity generation, industrial uses, transportation and for heat in homes and buildings.

GLOBAL EMISSIONS, 2018



Canada, with less than 1% of the world's population, produces less than 1.5% of global CO₂ equivalent emissions.

ENVIRONMENT

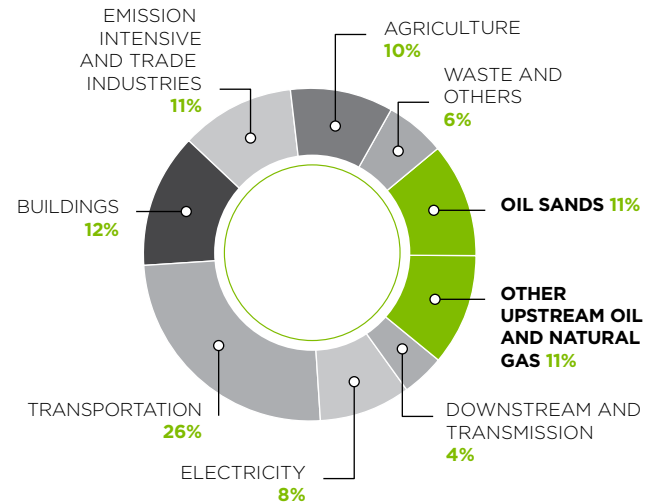
Air

WELLS-TO-WHEELS

Measuring GHG emissions from the start of oil production (wells) through to combustion (wheels) is called a wells-to-wheels or life cycle analysis.

CANADIAN EMISSIONS, 2019

Source: Environment and Climate Change Canada, 2020 & World Resources Institute, 2016



ENVIRONMENT

Air Quality



24 | 7 | 365

The Wood Buffalo Environmental Association (WBEA) monitors the air in the oil sands region in and around Fort McMurray 24 hours a day, 365 days a year. WBEA's air quality monitoring network is one of the most extensive in North America.

Air monitoring information is available in real time at:

wbea.org

MANAGED

An Air Quality Management Framework was developed as part of the Lower Athabasca Regional Plan (LARP). The framework includes ambient air quality triggers and limits. Triggers are intended to give advance notice of less favourable trends, while limits are established as the upper boundaries that must not be crossed. A management response is required if quality triggers or limits are exceeded.

Air quality in Fort McMurray is better than many North American cities - including Toronto, Edmonton and Seattle - benchmarked by the Clean Air Strategic Alliance (CASA).

INDUSTRY

In Action



COSIA IN SPACE

COSIA is literally going out of this world to achieve its vision of accelerating the pace of environmental performance in Canada's oil sands. Through COSIA, oil sands operators will investigate the use of satellite technology to measure greenhouse gas (GHG) emissions from tailings ponds and mine faces.

Imperial Oil is leading the joint industry project with Canadian Natural, Shell and Suncor to work with GHGSat (a global emissions monitoring company based in Quebec) to investigate the use of satellite technology to provide more accurate and frequent measurements of GHG emissions.

The satellite named "Claire" launched on June 22, 2016 and is orbiting above Alberta's oil sands mining operations once every two weeks and conduct concentration measurements and transmit them back to Earth.

www.cosia.ca

ENVIRONMENT Water



Canada's oil sands industry recycles water and continues to look for ways to reduce fresh water use including use of saline (brackish) groundwater and other alternative water sources that are not able to be consumed.

0.18 BARRELS

In 2020, drilling (in situ) production required an average of 0.18 barrels of fresh water for every barrel of oil equivalent produced.

Source: AER, 2021

2.91 BARRELS

In 2021, oil sands mining required an average of 2.91 barrels of fresh water for every barrel of oil equivalent produced.

Source: AER, 2021

295 MILLION M³

Oil sands fresh water use in 2020 was about 295 million m³. That is 0.20% of all the fresh water available in Alberta.

Source: AER, 2021

ENVIRONMENT Water Use



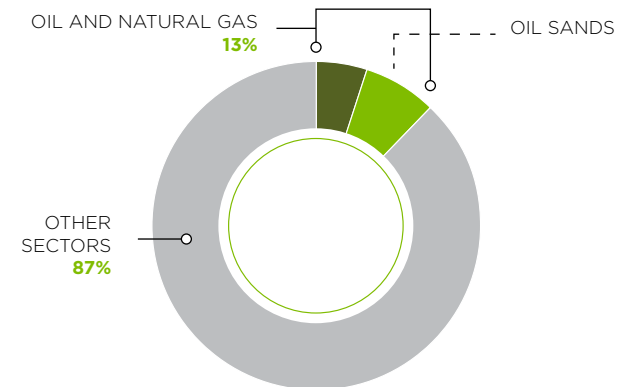
REGULATED

The Alberta Energy Regulator oversees the industry's use of water. Industry water users must apply to divert fresh water from its original source. The amount of water allocated is based on sustaining Alberta's groundwater and surface water supplies.

Each sector applies for water licences and the government allocates water based on these applications. In 2020, the oil and natural gas industry represented almost 13% of total provincial water allocations. Of this, approximately 75% was for oil sands development. But not all of that water was actually used. The oil and natural gas industry used about 26% of its total water allocation in 2020.

ALBERTA WATER ALLOCATIONS, 2021

Source: AER, 2019



ENVIRONMENT

Water Use and Availability



ATHABASCA RIVER

The Lower Athabasca River was the source of 43% of the fresh water used for oil sands mining in 2020. The remaining 57% came from surface runoff or shallow groundwater sources.

Source: AER, 2021

LESS THAN 3%

In 2020, 121 million m³ of water was withdrawn from the Lower Athabasca River for oil sands mining.

Source: AER, 2021

MANAGED

The Surface Water Quantity Management Framework for the Lower Athabasca River establishes weekly management triggers and water withdrawal limits. Triggers and limits reflect seasonal variability and become more restrictive in times of low flow. A series of adaptive management triggers direct when a management response is required.

The government of Alberta issues an annual report on the status of surface water quantity in the Lower Athabasca region.

WATER SUPPLY

Northern Alberta, where oil sands operations occur, has more than 86% of Alberta's water supply.

Source: Alberta Environment and Parks, 2015

ENVIRONMENT

Water Quality



CO-MANAGED

The Governments of Canada and Alberta execute a comprehensive environmental co-managing program in the oil sands region, including water monitoring for surface ground water quality, quantity and aquatic ecosystem health.



MANAGED

A Surface Water Quality Management Framework was developed as part of the Lower Athabasca Regional Plan (LARP). The framework includes ambient surface water quality triggers and limits. Triggers are intended to give advance notice of less favourable trends, while limits are established as the upper boundaries that must not be crossed. A management response is required if quality triggers or limits are exceeded.

ENVIRONMENT

Tailings Ponds



TAILINGS

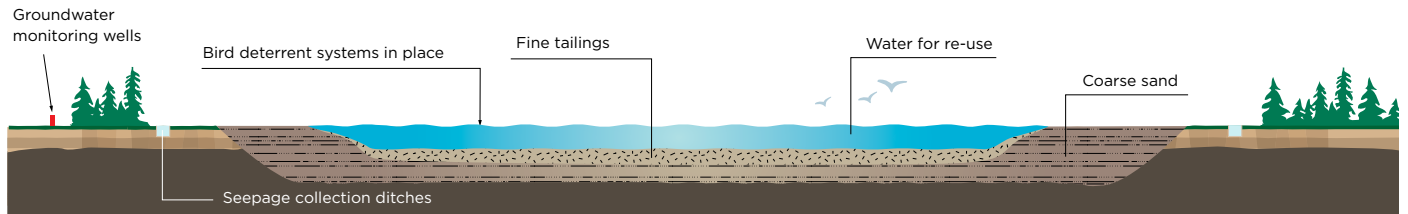
Tailings are a mixture of water, sand, clay and residual bitumen, and are the by-product of the treatment process used to separate the oil from the sand and clay in oil sands mining. Tailings are stored in large engineered dam and dyke systems called tailings ponds, designed to settle out the solid particles from the water.

WATER RECYCLING

Water is continuously recycled from the tailings ponds back into the extraction process, reducing new withdrawals of fresh water from the Athabasca River and other sources.

FLUID TAILINGS

Although the tailings sand separates and settles quickly from the water, smaller mineral particles including clays and silts remain in suspension and form fluid tailings. These fluid tailings are treated using new and existing technologies to enable reclamation.



RECLAMATION

To ensure fluid tailings volumes are managed appropriately, the Government of Alberta released the Tailings Management Framework which will ensure fluid tailings are in a ready-to-reclaim state within 10 years of the end-of-mine life.

From 2012 to 2019, COSIA members invested \$826 million to develop 228 tailings technologies with the goal of accelerating land and water reclamation.

Source: COSIA, 2021

WATER QUALITY

All tailings ponds are constructed with containment dykes and groundwater monitoring facilities to capture run-off and minimize seepage.

BIRDS

There is potential for residual bitumen to be found on the surface of tailings ponds, posing a threat to birds and waterfowl that land on ponds. Several mechanisms are in place to deter birds from the tailings ponds, including propane cannons and radar/laser-activated acoustic deterrent systems, such as those used at airports.

INDUSTRY In Action



RIFLE TUBE TECHNOLOGY

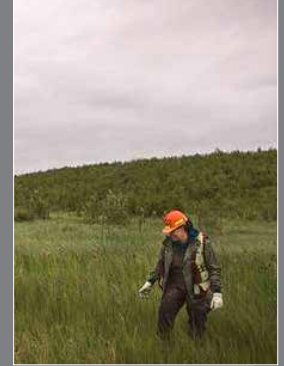
Through COSIA, oil sands companies are looking at ways to increase energy efficiency while reducing boiler blowdown and water use in SAGD operations.

Rifle Tube Technology involves using a “rifled” or “ribbed” tube instead of the smooth tubes currently used in boilers and heat exchangers that produce steam for SAGD. The internal ribbing of rifle tubes introduce centrifugal force in the tubes helping to turn water into steam more uniformly, which means less energy, fewer emissions, and less water use.

Devon Energy completed a 10-month demonstration pilot at their Jackfish in situ facility and efforts are now focused on fully de-risking the technology.

www.cosia.ca

INDUSTRY In Action



SANDHILL FEN

In 2008, Syncrude Canada Ltd. launched an ambitious project: design a peat-forming, groundwater-fed wetland and incorporate it into land reclaimed from its oil sands mining operation in northern Alberta.

Syncrude developed the project as a research watershed that covers 52 hectares of sand-capped soft tailings in its former East Mine. Construction was completed in 2012 and progress is closely monitored. Today, the Sandhill Fen Watershed supports peat-forming vegetation and is home to over 100 plant and moss species. In addition, wildlife, such as rodents, bats, frogs and birds now inhabit the watershed.

The project has received recognition for environmental excellence from both the Alberta Emerald Foundation and the Mining Association of Canada.

ENVIRONMENT

Land



LAND IMPACTS

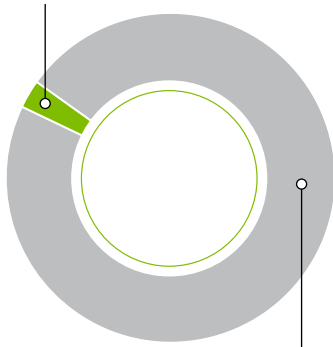
Alberta's oil sands lie under 142,000 km² of land. Only about 3%, or 4,800 km², of that land is located above bitumen that can be recovered by the mining method of extracting oil sands.

The remaining reserves that underlie 97% of the oil sands surface area are recoverable by drilling (in situ) methods which require very little surface land disturbance.

OIL SANDS LAND USE

Source: AEP

3% OF THE OIL SANDS SURFACE AREA COULD BE MINED



97% OF THE OIL SANDS SURFACE AREA COVERS RESERVES THAT ARE TOO DEEP TO BE MINED

Canada's oil sands industry is committed to reducing its footprint, reclaiming all land affected by operations and maintaining biodiversity.

RECLAIMED MINING FOOTPRINT

Since the first commercial mineable oil sands operations began in 1967 approximately 1,055 km² land has been cleared and disturbed for mining operations and 88 km² (8%) has been reclaimed.

Source: COSIA, 2020

0.04%

0.04% of Canada's boreal forest has been disturbed by oil sands mining operations over the past 50 years.

Source: Alberta Environment and Parks

RECLAIMED IN SITU FOOTPRINT

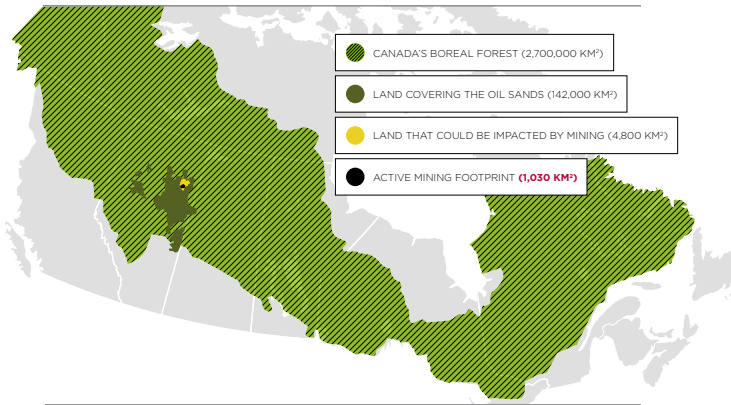
Since in-situ oil sands operations began in the late 1960s, approximately 101 km² of land has been cleared and disturbed and 10 km² (10%) has been reclaimed by COSIA member companies, representing approximately 82% of CSS and SAGD production in Alberta.

Source: COSIA 2020, AER ST-53 2019

PROTECTED LAND

Teck Resources, Imperial and Cenovus Energy's collaboration with Mikisew Cree First Nation and the Government of Alberta, led to the conservation of over 1,600 km² of land in the Kitaskino Nuwenēné Wildland Park. Together with several surrounding parks, these form the world's largest protected area of boreal forest of over 67,000 km²

ENVIRONMENT Land Reclamation



HOW BIG IS 1,030 KM²?

Area (KM ²)	City Proper	Greater Metropolitan
Calgary, AB	848	5,107
Hamilton, ON	1,117	1,371
Saskatoon, SK	228	5,890

LEGAL REQUIREMENTS

Alberta law requires all lands disturbed by oil sands operations be reclaimed. All companies are required to develop and update regularly, a conservation and reclamation plan that spans the life of the project. Reclamation resources, such as topsoil and subsoil, are required to be salvaged and stored for later use on sites undergoing reclamation.

ENVIRONMENT Land Reclamation

PROCESS

Reclamation is progressed throughout the life of an oil sands operations, as areas are no longer needed for operations. The reclamation process involves landform creation (for mines), contouring, topsoil and subsoil replacement, seed collection, revegetation and monitoring. Many oil sands companies engage with Indigenous communities to seek their input into reclamation that is planned and undertaken.

CERTIFICATION

A reclamation certificate is applied for when the reclaimed land can be deemed self-sustaining. Reclaimed land is returned to the Crown for public use. To date, roughly 1 km² of mineable oil sand footprint and 0.4 km² of in-situ oil sands footprint has been certified.

Oil Sands Vegetation Cooperative

The COSIA Oil Sands Vegetation Cooperative (OSVC) is a collaborative effort of all COSIA member companies to harvest and bank seeds from a variety of species characteristic of the boreal forest to be used in reclamation. Since 2009, seed from 43 species of trees, shrubs and plants from various boreal habitats have been registered, banked and stored by the Alberta Tree Improvement and Seed Centre in an underground bunker held at -18°C.

Source: COSIA

THE FACTS

Research indicates that Canadians want a balanced discussion about energy, the economy and the environment. This pocket book is designed to give you fast, easy access to oil sands facts that will help you get in on the discussion.

Facts are sourced from credible third parties or are developed using CAPP data that is checked against other data sources, including government reports.

DIG DEEPER

We couldn't cover it all in this little book! So we have provided links to various sources at the end of the book. Go ahead, dig deeper.

MORE FACTS?

Are you curious about facts that aren't covered here? Send your questions to publications@capp.ca. We will respond.

To order printed copies of *Canada's Oil Sands*, email publications@capp.ca.

UPDATES

The facts provided in this book are current as of February 2022.

A regularly updated version is available online at: www.canadasoilsands.ca.

Discover the oil sands with social media:

 @OilGasCanada  OilGasCanada  @OilGasCanada

FIND OUT MORE About the Oil Sands Industry

ALBERTA CHAMBER OF RESOURCES
acr-alberta.com

ALBERTA ENERGY
energy.alberta.ca

ALBERTA ENERGY REGULATOR
aer.ca

ALBERTA ENVIRONMENT AND NATURAL RESOURCES
alberta.ca/environment-natural-resources.aspx

ALBERTA ENVIRONMENT AND PARKS
environmentalmonitoring.alberta.ca/activity/oil-sands-monitoring

CANADA'S OIL SANDS INNOVATION ALLIANCE
cosia.ca

CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS (CAPP)
capp.ca and canadasoilsands.ca

CANADIAN ENERGY RESEARCH INSTITUTE (CERI)
ceri.ca

CANADIAN ENERGY REGULATOR (CER)
cer-rec.gc.ca

CANADIAN FUELS ASSOCIATION
canadianfuels.ca

FIND OUT MORE

About the Oil Sands Industry

CLEAN AIR STRATEGIC ALLIANCE (CASA)

casahome.org

ENVIRONMENT CANADA CLIMATE CHANGE

<https://www.canada.ca/en/environment-climate-change/services/oil-sands-monitoring/documents-reports.html>

IHS MARKIT

cera.com

INTERNATIONAL ENERGY AGENCY (IEA)

iea.org

OIL SANDS COMMUNITY ALLIANCE

oscaalberta.ca

THE ROYAL SOCIETY OF CANADA

rsc.ca

TRANSPORT CANADA

tc.gc.ca

U.S. ENERGY INFORMATION ADMINISTRATION (EIA)

eia.gov

WOOD BUFFALO ENVIRONMENTAL ASSOCIATION (WBEA)

wbea.org

THE CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS

capp.ca

The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP's member companies produce about 80 per cent of Canada's natural gas and crude oil. CAPP's associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP's members and associate members are an important part of a \$116-billion-a-year national industry that provides essential energy products.

CAPP's mission, on behalf of the Canadian upstream oil and natural gas industry, is to advocate for and enable economic competitiveness and safe, environmentally and socially responsible performance. Competitiveness, in North America and globally, is necessary so as to attract the capital necessary to grow production and expand markets to deliver value to the Canadian public and to our investors. Public confidence, from governments, Indigenous Peoples, the public, stakeholders and the communities in which we operate, will be determined by our collective performance and the effectiveness of our communications and outreach.



CANADA'S OIL & NATURAL GAS PRODUCERS

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