U15 Universities
ADDRESSING

U15

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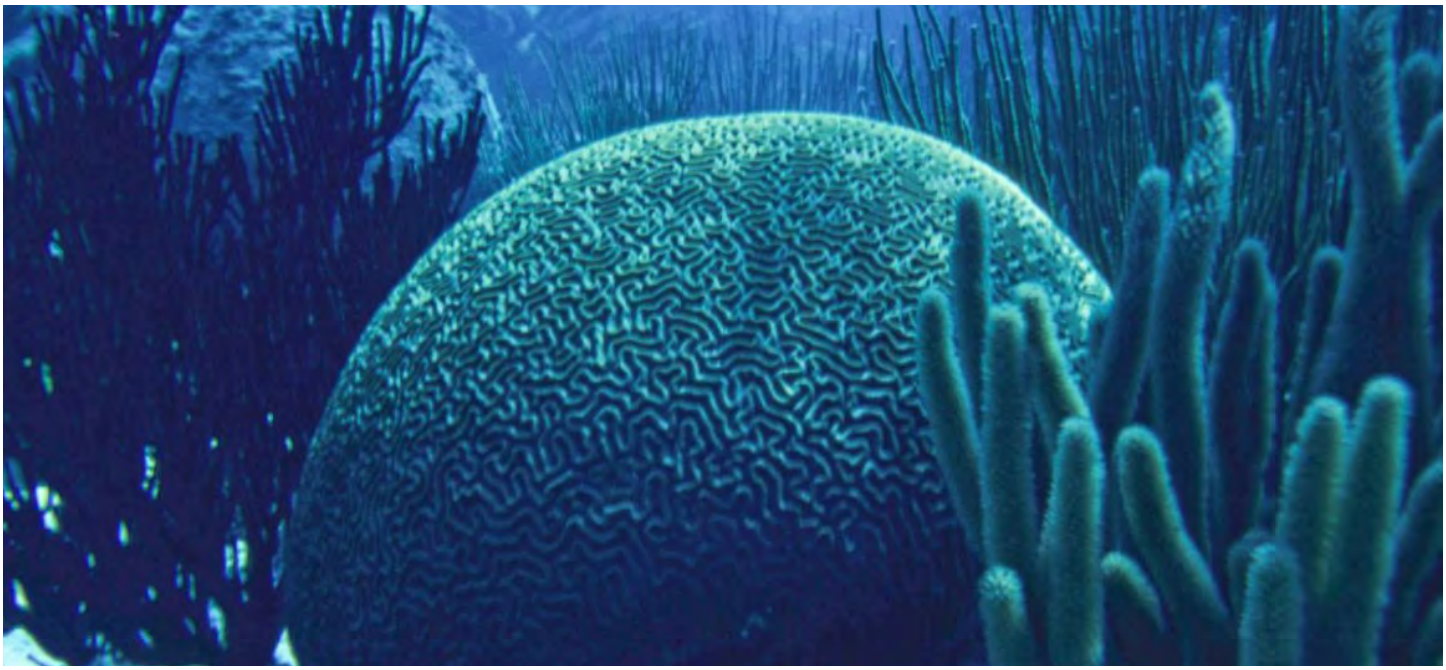
RESEARCH

Stories in this theme focus on research that either helps mitigate (e.g. greenhouse gas reduction) or adapts to the impacts of climate change. The stories are about something that has roots in fundamental research.

WHAT CORALS CAN TELL US ABOUT CLIMATE CHANGE



Scientists are studying corals, like the reef pictured here in the Cayman Islands, to better understand the effect of rising sea temperatures on these ecosystems in the past—and what it means for the future. Photo credit: Brian Jones

Scientists are using corals from the Cayman Islands to get a glimpse into Caribbean Sea temperatures over the past 500 years—critical information in predicting the effect of climate change on coral reefs. "Corals are very important for the ocean ecosystem. Upwards of 60 per cent of ocean species live in coral reefs," said Simone Booker, PhD student in the University of Alberta's Department of Earth and Atmospheric Sciences and lead author of the paper. "In this study, we've looked at how corals have responded to high sea temperatures in the past, giving us a better understanding of how the reefs that depend on them will fare in the future." Corals grow in layers, similar to tree rings, and are highly sensitive to ocean conditions. Using X-rays and computerized tomography (CT) scans, the scientists were able to identify four distinct phases of ocean temperature changes, including a drastic increase from 1932 to 2006, with a milder rise from 2006 to 2014.

"With our current global climate variability, a lot of corals are bleaching due to high sea temperatures-an indicator of poor coral health that can lead to death," explained Booker.

"There's a distinct need to understand how these rising temperatures will affect reef health in the future."

"All corals around the Cayman Islands are protected—you're not allowed to collect or touch them," said Brian Jones, professor in the Department of Earth and Atmospheric Sciences supervising Booker's research. "But in this case, a cruise ship anchor accident destroyed a patch of the reef, and we were able to work through the Cayman government to obtain these samples for study." Though the coral will take 50 to 60 years to regrow, the dead corals represent a unique opportunity for study that gives scientists a window into the seas of the past. "The oldest of the corals we studied started growing in 1474, while the majority grew from 1815 onward." said Booker. "Most climate change studies are conducted at higher latitudes than the Carribbean, so by using corals to model climate change impacts in these ecosystems, we're able to turn an unfortunate accident into yielding important scientific results." The paper, "Insights into sea surface temperatures from the Cayman Islands from corals over the last ~540 years," was published in Sedimentary Geology. (doi: 10.1016/j.sedgeo.2019.06.008)

UBC RESEARCHERS PAVING THE WAY FOR THE BIO-ECONOMY REVOLUTION

Imagine being able to 'grow' nearly everything required by society, from energy, to plastics, adhesives, and advanced biomedical materials. This is the vision that drives the research and discoveries of UBC's BioProducts Institute (BPI).

As climate change accelerates and recognition of the harm caused by plastic production and waste increases, new technologies that utilize renewable carbon as a primary source for energy, chemicals and materials present opportunities to address these challenges in groundbreaking ways. At the BPI, researchers are using state-of-the-art genomics and biotechnology to unlock the potential of materials produced in nature, extracting high-value products from agricultural and forest biomass—an abundant material sourced primarily from residual and waste products from agro-based and forest industries.

For example, forest-, plant- and marine-sourced nanostructures are being exploited for assembly into advanced functional materials. The products being developed are wide ranging and include the next generation of nutraceuticals and food products, advanced health materials, solutions for environmental remediation, systems for energy harvesting and storage that are portable and low-cost, organic nanoelectronics, and nanophotonics for security papers and diagnostics.

The sustainable utilization of biomass requires interdisciplinary strategies – an approach that is being embraced at UBC's BioProducts Institute where a team of over 50 leading researchers come from a

broad range of disciplines, including plant genetics, biocatalysis, advanced materials engineering and social science. This multi-disciplinary network distinguishes itself through its commitment to knowledge transfer with researchers, industry, government and end-users to maximize the opportunities for impact. This high level of internal and external collaboration results in researchers and practitioners combining knowledge throughout a fully integrated 'seeds to solution' bio-refining value chain, with UBC research embedded at every stage of this process. External partners have included FPInnovations, Mitacs and major BC Pulp and Paper companies.

UBC's continued commitment to leading the way in the bio-economy revolution is evident in the recruitment in 2019 of Dr. Emily D. Cranston as a UBC President's Excellence Chair in Forest Bio-Products. Dr. Cranston aims to better understand and develop valuable applications for nanocellulose, a sustainable material derived from wood pulp. The BPI's work is also bolstered by the appointment of Dr. Orlando Rojas as Canada Excellence Research Chair (CERC) in Forest Bioproducts. Arriving from Aalto University in Finland, where he has led a national cluster to advance the Finnish materials bio-economy, Dr. Rojas will lead the BPI, where he will continue his cross-disciplinary approach to understanding the fundamental principles involved in the design, manufacture and performance of biobased systems.

With its vast forest and agricultural resources, Canada is uniquely positioned to be a global leader in a bioeconomy fueled by technologies developed by UBC's BPI.

MAKING OIL AND GAS PART OF THE CLIMATE SOLUTION

UNIVERSITY OF CALGARY

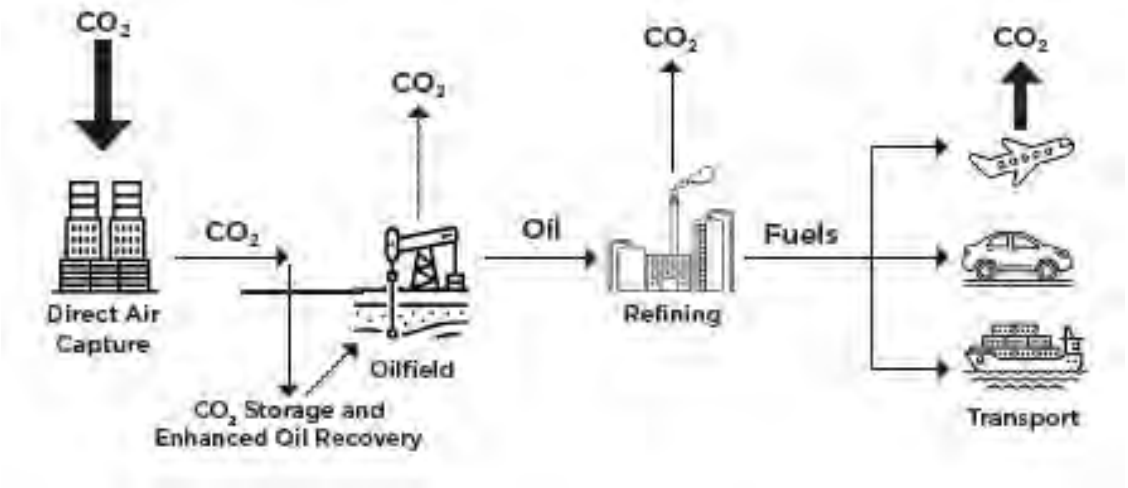
UCalgary researchers are combining and optimizing technologies to deliver negative emissions from enengy production.

Under the Paris Agreement, Canada has committed to reducing its Green House Gas (GHG emissions by 30% below 2005 levels by 2030. With new technologies being developed reularly- in addition to greater efficiency, renewable energy sources, and other mitigation strategies- technologies that remove CO_2 from the atmosphere are still desperately needed for Canada and the rest of the world, to meet those targets.

Researchers at the University of Calgary are developing a concept that they hope will be the transformative change required to not only meet Canada's targets to reduct GHGs, but surpass them: the development of negative emissions technology using direct air capture.

Removing CO_2 from the atmosphere via direct air capture, then storing that CO_2 during oil recovery, could be a strategy to offset direct and indirect emissions from fuel use.

The Concept



4.6 million
barrels of oil produced in Canada per day in 2018

16.7 billion cubic feet
of marketable gas produced in Canada per day in 2018

62 thousand+
people employed in the Canadian oil and gas industry in 2018

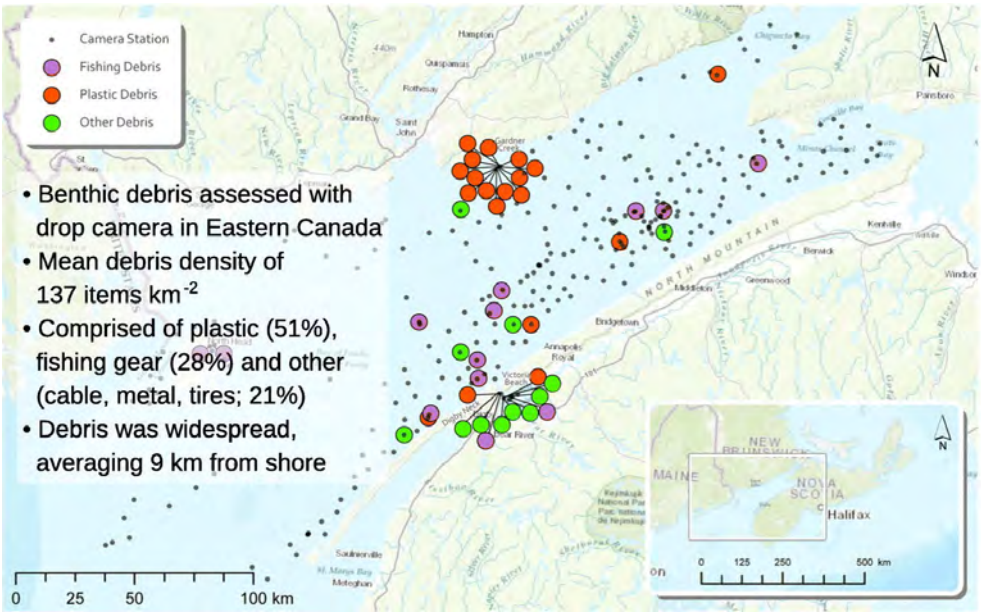
Transforming the energy-climate landscape.

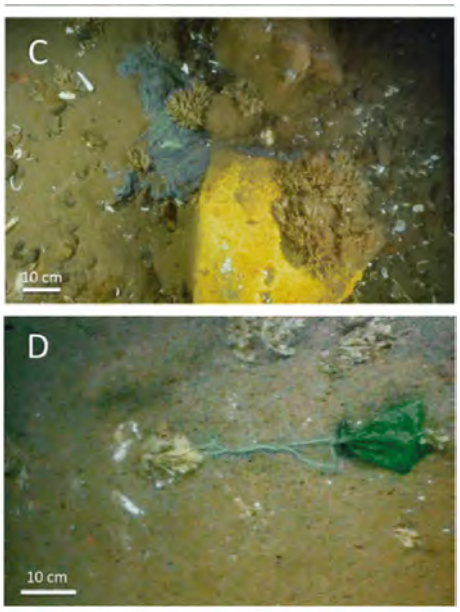
READ MORE >

ucalgary.ca/energy

TRASH IN A CANADIAN TREASURE: HOW GARBAGE LITTERS THE BOTTOM OF THE BAY OF FUNDY

DALHOUSIE UNIVERSITY





The images show a disturbing array of debris on the ocean floor: plastic shopping bags, a tire encrusted in barnacles, rubber lobster bands, garbage bags buried in sandy grit and a derelict lobster trap housing a lone moon snail. The items were all captured on video by researchers at Dalhousie who, along with the Applied Oceans Research Group at NSCC, Fisheries and Oceans Canada and the Full Bay Scallop Association, scanned the bottom of the Bay of Fundy over a three-year period.

Their work, published in the Marine Pollution Bulletin on Nov. 14, 2019, provides the first estimate of how much garbage and fishing gear litters the ocean floor in eastern Canada and it's not good.

Tony Walker, a professor in Dalhousie's School for Resource and Environmental Studies and lead author Alexa Goodman, a Dalhousie researcher in the Marine Affairs Program, found 47 items of debris from 26 camera stations.

If upscaled to cover the bay's 13,500 square kilometres, the team estimated there could be 1.8 million pieces of garbage on the floor of one of the region's most productive and lucrative fishing zones.

"It provides useful information for government and other stakeholders to develop policies and strategies to reduce sources of benthic marine pollution."

"This baseline study highlights that just because it is out of sight, benthic marine debris pollution is still evident in the Bay of Fundy, which is such a biologically significant area," Dr. Walker said.

The researchers used high-powered lights and a high-definition camera that trailed behind a fishing vessel to record footage from the seafloor. The drift transects were taken at 281 different locations in the bay in 2017, 2018 and last July.

Plastic made up the majority of debris at 51 per cent, while 28 per cent was fishing gear and 21 per cent was made up of other materials, such as cables, metal and tires.

"Seafloor debris in the Bay of Fundy is numerous and widespread," the paper states. "And plastic debris continues to fragment into secondary microplastics."

One station found 12 garbage bags in the sand, suggesting it may be a marine dumping ground.

The findings align with similar studies in other parts of the world that found plastics to be the most prolific source of marine debris.

Italian researchers scanned the seafloor off mainland Italy, finding that plastic made up almost 70 per cent of the debris, with plastic bags the most common type of litter.

MEDIA AGENCY DEDICATED TO CLIMATE ACTION

Pénélope Daignault, a professor in the Department of Information and Communication of the Faculty of Arts and Humanities, and Valériane Champagne St-Arnaud, a postdoctoral researcher, have launched an extraordinary research project. Combining social marketing and environmental psychology, the researchers looked at the relationship that Quebecers have with environment and climate change media content. More specifically, they wondered how to present information on environmental issues in the media (media framework) in order to influence readers' behaviour. They also sought to find out whether the media framework could be a solution for optimizing communication about climate change and stimulating the adoption of eco-responsible behaviour. Their research project led to the founding of Unpointcinq, a unique and innovative media organization.

Unpointcinq is the only Francophone media agency in Canada dedicated to climate action. Its objective is to change the tone of the debate on contemporary environmental issues. Its mission is to produce and publish compelling journalistic content for the general public, talking about Quebec initiatives to reduce greenhouse gases or to adapt to the new climate reality. The content prepared by Unpointcinq is regularly tested to evaluate its resonance and impact on behaviour.

The research team's work suggests that it is, for example, preferable to focus on hope and positive emotions to influence readers' environmental behaviour. Members of the public are also more interested in small actions that have concrete results than in intangible issues.

These projects can help broaden scientific knowledge about the adoption of behaviours based on climate action. The creation of the Unpointcinq media agency also attests to the diversity and interdisciplinarity of the research carried out on the fight against climate change at Université Laval.

MICROPLASTIC IN SEA ICE

Plastic pollution in the oceans has become an important societal problem, as plastics are the most common and persistent pollutants in oceans and beaches worldwide. In the common imagination, plastic waste is often associated with bottles drifting in the ocean, fishing gear washing up on beaches or plastic bags that turtles mistake for jellyfish and eat.

But those larger particles are just the tip of the iceberg. Smaller particles are also an important part of the problem. Plastic particles smaller than five millimetres are called microplastics. They may originate from deliberate design (such as cleaning agents or personal care products), breakdown of larger pieces of plastic or microfibers from textiles.

The impact of microplastics on the environment and human health is still being studied.

If people assume the Arctic environment is unaffected by what humans discard into the oceans, they are wrong. The pristine waters of the Arctic Ocean are under silent threat by those particles as they drift along with the ocean currents over long distances.

Microplastic concentrations in the Arctic are expected to increase rapidly due to increasing freshwater input and the intensification of shipping traffic and resource development activities. Given the exceptional vulnerability of Arctic marine ecosystems, there is an urgent need to assess the distribution, pathways and fate of microplastics in the Arctic.

MCGILL SUSTAINABILITY SYSTEMS INITIATIVE (MSSI) ADOPTS HOLISTIC APPROACH TO SUSTAINABILITY

Fostering a transition toward sustainability and patterns of development that promote human well-being while conserving the life support systems of the planet is one of the central challenges of the twenty-first century. Despite this being a serious issue, progress has so far been rather slow. To a large extent, this is because approaches to sustainability failed to appreciate the deep interconnectedness of human and environmental systems.

McGill recognises the importance of adopting complex, multidimensional, and cross-disciplinary thinking on the issue and launched the McGill Sustainability Systems Initiative (MSSI)- a multidisciplinary hub focused on sustainability solutions.

More specifically, the MSSI brings together experts from across McGill's faculties, providing support and seed funding for transdisciplinary teams to tackle some of the most complex and challenging issues in sustainability. Researchers from a wide variety of fields work together to develop significant, impactful and socially acceptable advances that move society towards a sustainable model of existence.

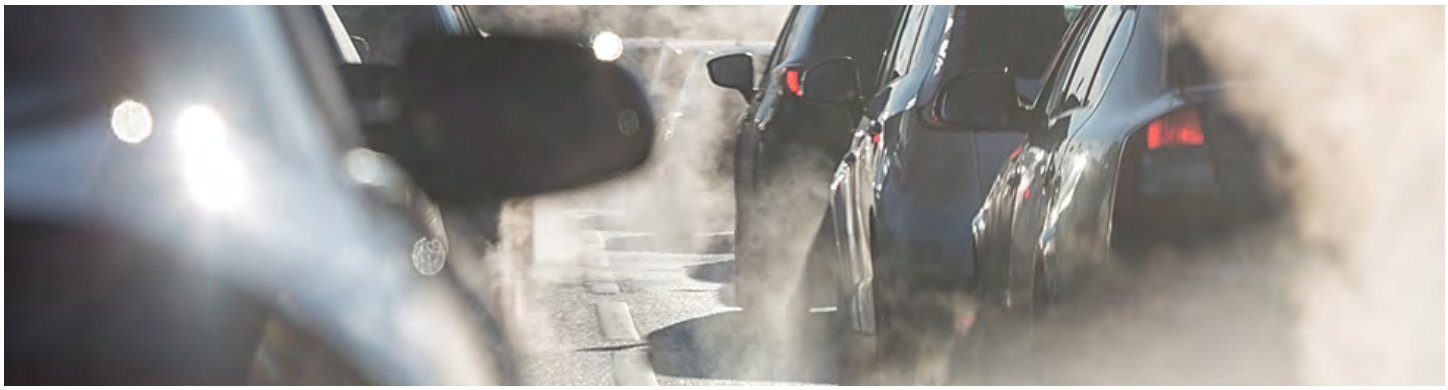
The major research of the MSSI is centered on a small number of thematic areas in which McGill has robust and demonstrated expertise and can be expected to make tangible and significant impacts. The four central research themes are: sustaining landscapes for the future, creating sustainable materials for the future, adapting urban environments for the future, and sustainability transitions.

While the MSSI brings together members from within the McGill community, external players are also integral to the transition. The MSSI puts emphasis on engaging with stakeholders, including industry, government, non-governmental organizations and civil society to collaborate in making innovative ideas come to life.

The MSSI also hosts a variety of other activities designed to build a robust and vibrant community of committed sustainability researchers and external stakeholders.

READ MORE > reporter.mcgill.ca/mcgill-sustainability-systems-initiative-ready-for-launch/

RESEARCHERS DEVELOPING TECH TO REDUCE GREENHOUSE GAS EMISSIONS



"Taking steps to reduce the impacts of greenhouse gases and air pollution on our climate and environment is a key priority in Canada," said Dr. Marc Fortin, Vice-President, Research Partnerships, Natural Sciences and Engineering Research Council of Canada.

The $2.7M in funding that Jim Cotton received through government and industry partnerships will support his leading energy system research that combines thermal and electrical energy technologies to harvest waste heat, improve energy efficiency and reduce GHG emissions. The system powers, heats and cools areas in communities with intense energy demands such as big block stores and condominium complexes.

"This technology will improve the ways in which Ontario communities manage electrical and thermal energy grids," said Cotton, Associate Director, McMaster Institute of Energy Studies and Professor, Department of Mechanical Engineering. "Communities will be able to site, design, optimize and control these more efficient systems."

The systems store waste heat in the summer and combine it with smart electrification of heating with heat pumps and thermal storage techniques. By integrating thermal and electrical energy, the amount of natural gas normally needed to heat and power buildings is reduced, which in turn, decreases GHG emissions.

"Supporting the efforts of large industries in their quest to reduce their greenhouse gas emissions is an important part of our government's Climate Change Action Plan," said Reza Moridi, Minister of Research, Innovation and Science.

Working with Carleton University and 17 energy industry partners on the project, including HCE Energy Inc., GridSmartCity, GeoSource Energy Inc., S2E Technologies Inc. and Siemens Canada Limited, Cotton and his research team will also develop predictive controls that use weather and energy market forecasts with previous performance data to optimize the system.

Ali Emadi, a Canada Excellence Research Chair in Hybrid Powertrain, is internationally recognized for his expertise in transportation electrification and smart mobility. Emadi, who received $2.5M from NSERC, OCE and industry partner Sevcon, will develop advanced motor control technologies for emerging and existing electric vehicles. Emadi and his research team will work with industry partner Sevcon to reduce emissions, improve motor testing technologies and accelerate the time-market for new electrification solutions.

READ MORE > brighterworld.mcmaster.ca/articles/researchers-developing-tech-to-reduce-greenhouse-gas-emissions/

USING ARTIFICIAL INTELLIGENCE TO VISUALIZE THE IMPACT OF CLIMATE CHANGE

Université de Montréal

An actual street-view photo (left) and a photo generated by the project (right) of the possible impact of a major flood on the same scene

Public awareness and concern about climate change often do not match the magnitude of its threat to humans and our environment. One reason for this mismatch is that it is difficult for us to mentally simulate the effects of processes as complex as climate change and to visualize the impact that our actions will have on our individual and collective future, especially if the consequences of our actions are abstract and only apparent in the long term.

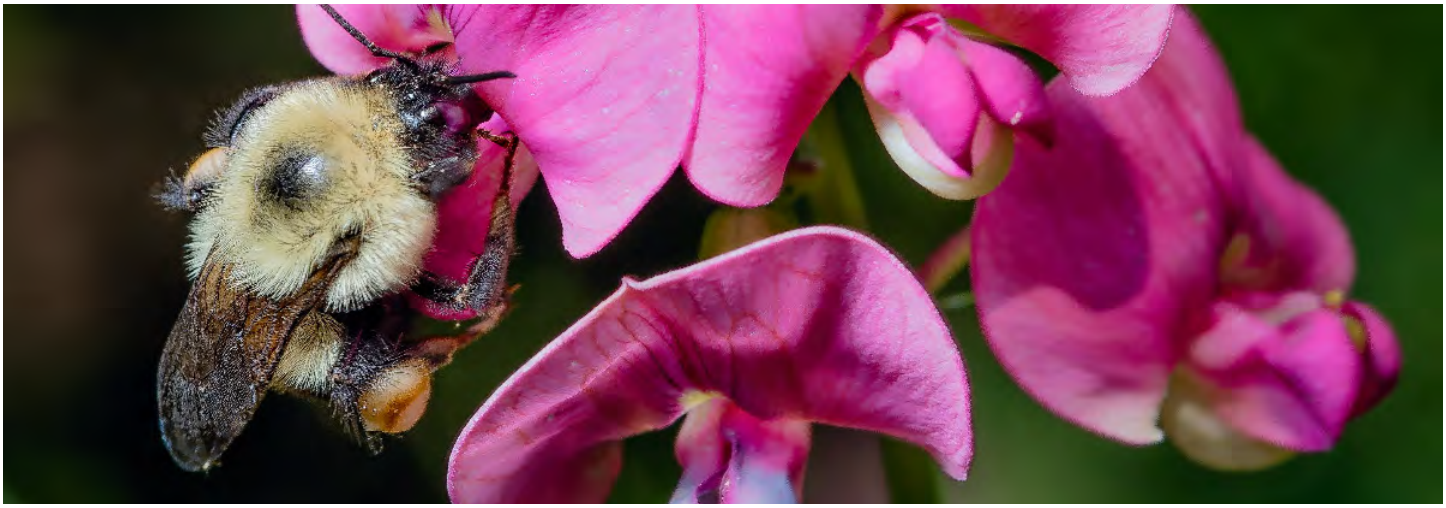
To overcome these challenges, a team of researchers at the Université de Montréal, led by Yoshua Bengio, is using artificial intelligence (AI) to develop a personalized and interactive visualization tool that helps members of the public to travel through time and imagine these consequences by visualizing the possible future impact of climate change in a personalized way.

The project includes more than 10 students, with backgrounds in AI, climate science and psychology, who are working together to create a website to create an address for seeing a visual picture of the possible future in 2050 or 2100, generated by AI techniques. The visualization will be accompanied by information available about the science behind climate change, e.g., why extreme meteorological phenomena are becoming more frequent and what types of climate change are occurring on the local and world levels. The user will also be able to activate “levers of change,” which demonstrate in a visual manner the impact of personal choices such as the use of mass transit, the reduction of air travel and changes to diet, as well as collective choices such as changes in carbon prices on the regional and national levels.

The project’s objective is to make the consequences of climate change seem more concrete and raise public awareness about the impact of the huge scope of climate change that will affect every person on Earth in the medium or long term.

Scientific publications (in English):
arxiv.org/pdf/1905.03709.pdf
arxiv.org/pdf/1910.10143.pdf

WHY BUMBLE BEES ARE GOING EXTINCT IN TIME OF "CLIMATE CHAOS"



Bombus impatiens (the Common Eastern Bumble Bee), Credit: Antoine Morin

University of Ottawa researchers develop technique to predict impact of climate change on species extinction risk

When you were young, were you the type of child who would scour open fields looking for bumble bees? Today, it is much harder for kids to spot them, since bumble bees are drastically declining in North America and in Europe.

A new study from the University of Ottawa found that in the course of a single human generation, the likelihood of a bumble bee population surviving in a given place has declined by an average of over 30%.

Peter Soroye, a PhD student in the Department of Biology at the University of Ottawa, Jeremy Kerr, professor at the University of Ottawa and head of the lab group Peter is in, along with Tim Newbold, research fellow at UCL (University College London), linked the alarming idea of ''climate chaos'' to extinctions, and showed that those extinctions began decades ago.

"We have now entered the world's sixth mass extinction event, the biggest and most rapid global biodiversity crisis since a meteor ended the age of the dinosaurs." – Peter Soroye

"We've known for a while that climate change is related to the growing extinction risk that animals are facing around the world," first author Peter Soroye explained. "In this paper, we offer an answer to the critical questions of how and why that is. We find that species extinctions across two continents are caused by hotter and more frequent extremes in temperatures."

Massive decline of the most important pollinators on Earth

"Bumble bees are the best pollinators we have in wild landscapes and the most effective pollinators for crops like tomato, squash, and berries," Peter Soroye observed. "Our results show that we face a future with many less bumble bees and much less diversity, both in the outdoors and on our plates."

The researchers discovered that bumble bees are disappearing at rates "consistent with a mass extinction."

"If declines continue at this pace, many of these species could vanish forever within a few decades," Peter Soroye warned.

The paper Climate change contributes to widespread declines among bumble bees across continents is published in ***Science.***

READ MORE > media.uottawa.ca/news/why-bumble-bees-are-going-extinct-time-climate-chaos

TREE SWALLOWS EXPOSE STATE OF OUR CLIMATE

Queen's University research examines local bird population to reveal how weather patterns are changing.

For many of us, birds are an interesting distraction or a sign of spring. For Fran Bonier and her former master's student Amelia Cox, bird populations provide vital data about the health of the world. Their new research adds to growing evidence that the climate is changing – and not for the better.

Established in 1975 by Raleigh Robertson at the Queen's University Biological Station (QUBS) north of Kingston, a box-nesting population of tree swallows has provided long-term data sets that a number of Queen's researchers have used. In her most recent study, Dr. Bonier and Cox have determined rainy springs are linked to poor nestling growth in this species.

The data shows that from 1977 to 2017, the nestlings' body mass has declined substantially and adult body mass, particularly in males, has also been declining.

"We examined 42 years of data and have determined the decline started in the late 1980s," says Cox, who took the lead on the study. "Tree swallows are avian aerial insectivores, which means they eat flying insects. These insects are inactive during cold, wet, or windy conditions which effectively reduces food availability to zero."

Looking at the long-range weather data, the researchers also determined that rainfall amounts have increased over the decades and springs are getting cooler. Dr. Bonier says these weather changes, which she attributes to climate change, are affecting more than just tree swallows.

"This isn't going to affect just one bird species; it's happening with all aerial insectivores, like bats," she says. "These populations are important to the entire food chain and their decline could lead to an insect population explosion, which could be critical in many areas."

Cox adds there are a few simple things we can do to start addressing the threats facing aerial insectivores, including providing good habitat, putting up nest boxes, leaving barn doors open for barn swallows (which are declining even faster) and leaving wetlands alone. But to get to the root of the problem, we must tackle climate change.

"I really enjoy working with huge datasets like this one and I'm hoping, with my experience, I can move on to studying other bird species," Cox says. "I'm optimistic this research can contribute to the larger conversation on climate change."

Along with examining the population dynamics of tree swallows, the Bonier Lab has a number of other research foci including the influence of urbanization on birds, the effects of warming temperatures on carrion beetles, and the ways malarial parasites affect a local population of red-winged blackbirds.

READ MORE > queensu.ca/gazette/stories/tree-swallows-expose-state-our-climate

DEVELOPING A POWER GRID FOR A SUSTAINABLE ENVIRONMENT

University of Saskatchewan

University of Saskatchewan (USask) electrical engineering professor Tony Chung and his team are helping Canada achieve a safe, reliable, and sustainable power grid that incorporates renewable energy sources.

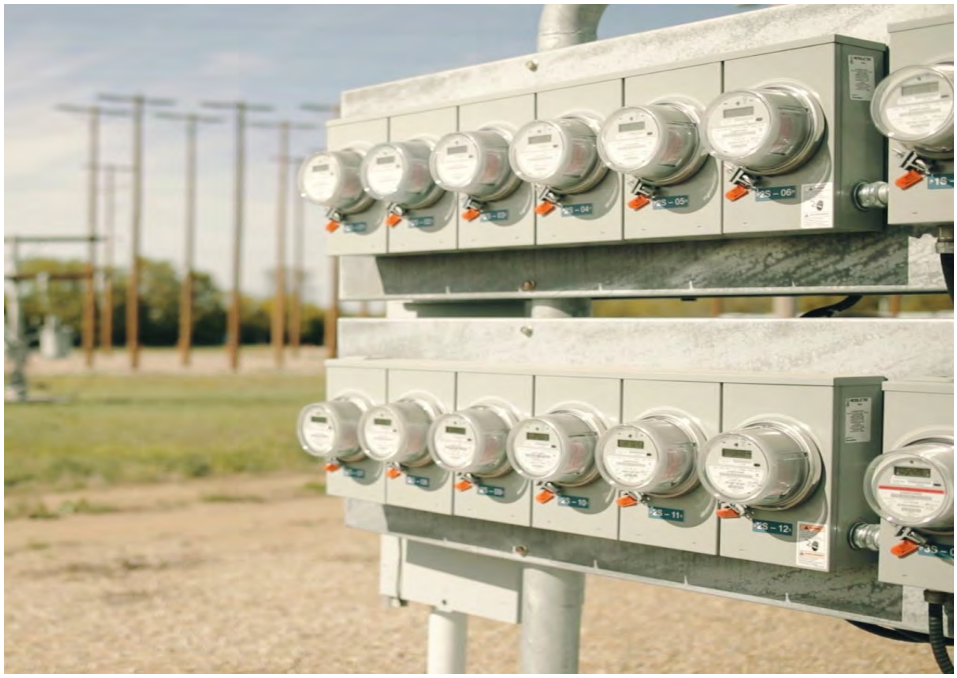
The team's research addresses operational challenges facing many utilities across North America. In particular, it supports SaskPower's ongoing work to modernize its power grid to meet the goal of up to 50-per-cent generation capacity from renewable sources by 2030.

The $2.2-million project is funded jointly by the Natural Sciences and Engineering Research Council of Canada (NSERC) and SaskPower, Saskatchewan's provincial power supplier.

"This major partnered investment in smart grid research will ensure Canada is positioned as a leader in new ways of sustainably powering our future," said USask Vice-President Research Karen Chad.

"Our students will also gain the practical skills needed to understand and operate energy grids of the future, enabling them to gain employment and become leaders in this growing field in Canada and beyond."

SaskPower intends to add renewable electricity options such as wind and solar as part of its strategy to significantly reduce emissions—40 per cent below 2005 levels by 2030.



(Photo: Credit SaskPower)

"This research will be critical to helping the utility better understand the best way to integrate those options into the existing power grids and plan for the future," said Tim Eckel, Vice-President of Asset Management, Planning and Sustainability at SaskPower.

The key to the project is to modernize the system with smart grid technology, said Chung, a Fellow of the Institute of Electrical and Electronics Engineers and an internationally recognized expert in smart grid technology and renewable energy.

Modern smart grids include a broad array of emerging technologies on sensing, communication, automation, and intelligence that improve the reliability of existing power grids, enable greater use of renewable energy, and prevent large-scale system blackouts.

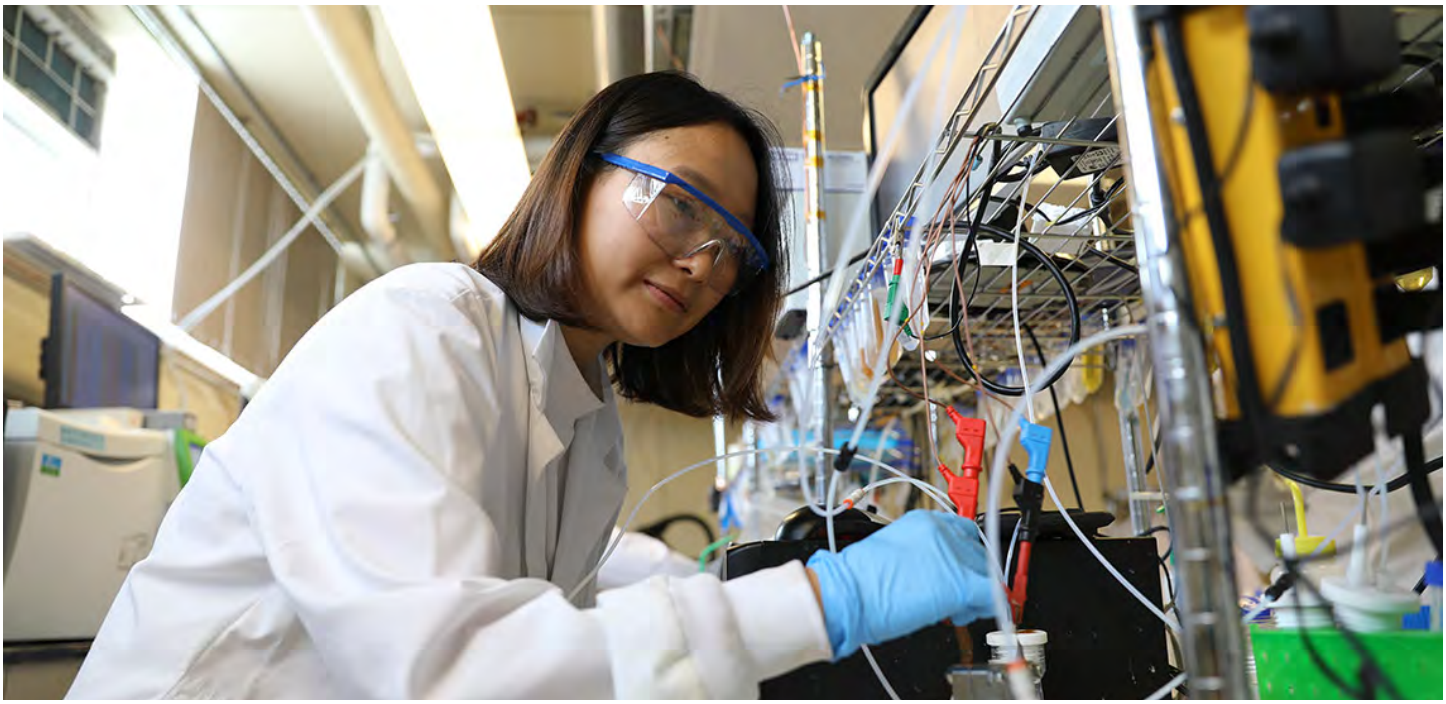
The research includes renewable energy forecasting and real-time monitoring of the grid. Evaluating these technologies and developing new ones to determine options for incorporating them into Saskatchewan's power grid is a key goal. The results will be shared with SaskPower and other electric utilities.

Chung's team has already developed advanced dynamic thermal line rating techniques (to increase the power transfer capability of transmission lines connected to wind farms), accurate models to incorporate compressed air energy storage systems, and a wind power prediction module that SaskPower has successfully tested.

In addition, high-quality personnel trained through this project have joined SaskPower to transfer their research from the university to the company.

CO_2 CAPTURING AND RECYCLING

UNIVERSITY OF TORONTO



A research team from the University of Toronto has developed a new electrochemical path to transform CO_2 into valuable products. The technology could significantly improve the economics of capturing and recycling carbon directly from the air.

Direct-air carbon capture is an emerging technology used to produce fuels or plastics from carbon that is already in the atmosphere, rather than from fossil fuels. Some companies, such as Canada's Carbon Engineering, capture and recycle CO_2 by forcing air through an alkaline liquid solution to create a substance called carbonate. In order to then produce CO_2 gas that can be readily turned into a wide variety of products, the carbonate is converted into a solid salt and heated to temperatures above 900C. The energy required for this heating drives up the cost of the resulting products.

The U of T team's alternative method applies a new electrolyzer design to drive a chemical reaction that converts carbonate directly back into CO_2 gas, skipping the intermediate heating step entirely and driving down costs. The CO_2 gas mixture that is produced, known as syngas, is a common chemical feedstock for the well-established Fischer-Tropsch process.

While many types of electrolyzers have been used to convert CO_2 into chemical building blocks, none of them can deal effectively with carbonate. This is the first known process that can go all the way from carbonate to syngas in a single step.

"Today, it is technically possible to capture CO2 from air and, through a number of steps, convert it to commercial products," says University Professor Ted Sargent

The U of T team's proof-of-concept study demonstrates a viable path for direct-air carbon capture and utilization, a key step towards closing the carbon loop. Now, more work will be needed to scale up the process to the levels needed for industrial application.

READ MORE > utoronto.ca/news/out-thin-air-u-t-researchers-shorten-path-capturing-and-recycling-co2-new-process

EVERYTHING IS GOING TO CHANGE

(TREKKING THE ENDS OF THE EARTH TO SET A TIMETABLE FOR OUR CLIMATE EMERGENCY)

For eight days straight, researcher Christine Dow and her team dragged a sled-mounted radar system roughly 85 kilometres across the frozen Antarctic. The hard-earned data they collected has Dow convinced the Antarctic Ice Sheet is destabilizing faster than anyone thought.

"It's scary," says the Scotland-born Canada Research Chair in Glacier Hydrology and Ice Dynamics at the University of Waterloo. "The West Antarctic was predicted to take 1,000 years to collapse. Now, we're talking a few hundred years."

Understanding the danger posed by melting polar regions takes a combination of physics knowledge, computational chops and a heavy dose of imagination. Dow does the work not everyone is prepared to do. She travels to the coldest places on earth collecting raw data and modelling that information to understand how the subglacial hydrological and ice-ocean systems evolve as a result of climate change.

The familiar shape of the Antarctic we've seen on maps since childhood betrays the landmass beneath.

"The landmass is in the middle of the Antarctic. Massive ice shelves cling to its edge holding back the ice on land. If those shelves go, that land ice accelerates into the ocean," Dow says.

Her radar sled uncovers information deep below the ice to paint a picture of how warming ocean water is eroding that anchor ice and cleaving ice shelves at an accelerated rate, which significantly raises sea levels.

"Because we've only recently had the computing power to run these kinds of models, and we're still making these new discoveries about ice shelves, the more we find out, the more unstable the whole system seems to be," Dow says. "Is this going to collapse in the next 200 years? It might."

This threat of collapse has attracted climate researchers from around the world to the West Antarctic Ice Sheet. The area is experiencing an uncanny confluence of climate-related changes. "The data we're gathering isn't about whether it's collapsing, it's how fast," Dow adds.

READ MORE > uwaterloo.ca/stories/global-impact/everything-going-change

NORTHERN TORNADOES PROJECT LAUNCHES MOST COMPREHENSIVE ANALYSIS EVER IN CANADA

A unique, Western University-led project to discover and decode tornadoes in remote Northern Ontario has spun into a nationwide mission to identify every Canadian tornado in 2019.

The Northern Tornadoes Project identified nine tornadoes in 2017, which had previously gone undetected and provided enhanced information for nine others. In 2018, the research team's aim expanded to finding every tornado in Ontario and improve analysis from coast to coast. The result: 12 previously undetected tornadoes while improving data for another 10.

"The goal for 2019 is to capture every tornado nationally with the intent of finding, assessing, storing data and learning from each significant event," says Western Engineering professor and Acting Dean Gregory Kopp. "It's a big goal and it's a big country but we're confident we can meet our target."

The Northern Tornadoes Project is the most comprehensive analysis of these natural disasters ever undertaken in Canada.

Data collection and analysis takes place with the latest radar and satellite technology and extremely high-resolution aerial surveys with a level of detail that can identify individual trees uprooted and their direction of fall, as well as where grasslands have been scarred. The Western Engineering-led team uses satellite, surveillance planes, drones and on-the-ground observation to capture the events and their extent.

"This level of analysis combined with an improved database can help us understand severe and extreme weather, improve early detection, mitigate against damage to people and property, and model future implications for climate change," says Kopp, who serves as lead researcher for the Northern Tornadoes Project.

The research is a collaboration between Western Engineering and the Meteorological Research Division of Environment and Climate Change Canada (ECCC).

Results of the first two years of the Northern Tornadoes Project are described in a newly published conference paper, with Kopp and ECCC scientist David Sills as primary authors.

Approximately 60 tornadoes are identified and verified in Canada each year. Statistical modelling by ECCC using tornado, lightning, and population data suggests the actual number is almost four times that number, closer to 230 per year.

Many of these tornadoes occur in areas where forest density and remote locale make traditional ground surveys impossible, or in grasslands where damage footprints are more difficult to detect. This project helps fill gaps in tornado climatology and helps improve understanding of tornado occurrence and risk.

TEACHING & LEARNING

Stories in this theme focus on some unique educational opportunities available to students. These could be experiential learning (WIL/Service learning) or some innovative program.

YOUTH VOICE THEIR DESIRE FOR CHANGE

Youth hope the future holds change and a focus on climate strategies.

"When I first started reading about climate change and how big a problem it is, it shook me really hard…I cried because I wanted to do so much, but then I'm only one person. And I felt so helpless because I felt like I couldn't do anything."

A high school student from Accra, Ghana shared their feelings about climate change. They were one of 99 students from 13 countries who collaborated on a Cities and Climate Change project facilitated by the Centre for Global Education in winter 2018. The students used online tools to exchange ideas in addressing climate change. From this group, 14 students were selected by their schools to travel to Edmonton to collaborate on a position paper and present it at the Cities & Climate Change Science Conference. The Bennett Centre hosted the students, ages 14 to 17, while they worked on the paper. The resulting "International Youth White Paper on Climate Change: Education and Cities" was an opportunity for the youth to voice their fears, hopes and visions for the future. The paper introduces key findings and calls to action that include equity and inclusion, education and updated curriculum, infrastructure, project-based learning, social media and communication. While the international students worked on the paper, Faculty of ALES students followed the experiences and emotions of the youth involved, the impact the project had on them, and implications of the findings for climate-change politics and education. Sixteen senior undergrad students in RSOC 410 — research methods and policy applications in applied environmental sociology — had an opportunity to interface with the youth. The class, led by Debra Davidson, a professor in the Department of Resource Economics and Environmental Sociology, created an 80-page report, "International Youth Participation in the IPCC Cities and Climate Change Conference," that can guide future efforts of youth, educators and policymakers. "This project represents a rare initiative that brought together youth from around the world to develop a message that was presented to the highest international scientific body focused on climate change, the IPCC," said Davidson. The students' work has led to further research in climate change education and youth engagement with climate change. Davidson, Karsgaard and the team presented at two education conferences and are working to publish results from the study. They also distributed the report at the United Nations Climate Change Conference COP24, to various policy makers and all the participant schools.

UBC EMPOWERING NEXT GENERATION OF CLIMATE LEADERS WITH TRANSFORMATIVE LEARNING OPPORTUNITIES

UBC is consistently recognized as a global climate leader through excellence in sustainability-focused teaching, learning and student engagement. Across campus, faculty and students are exploring climate change solutions through hundreds of courses, programs and research projects. UBC's ambitious goal is for all students to have access to sustainability learning alongside their chosen degree program, in addition to innovative applied learning and co-curricular opportunities. With a range of initiatives fostering knowledge, skills and partnership, UBC seeks to empower students to serve as agents of change, community leaders and responsible global citizens.

The Sustainability Scholars Program, for example, provides paid internships that match graduate students with on- and off-campus partners to work on applied research projects that advance sustainability. Students gain hands-on experience by applying their skills to real-world problems that advance the sustainability goals of partner organizations. The program collaborates with government, business and community organizations to complete projects on a range of topics such as emissions reduction, sustainable transportation, green buildings, biodiversity and climate change.

Recently, six program scholars worked with municipalities across Metro Vancouver on a series of projects to reduce carbon emissions through sustainable transportation solutions, including a lifecycle cost analysis of electrifying municipal fleet vehicles. Last year, the Sustainability Scholars program produced 51 projects working with 12 external partners, as well as 16 projects with units across UBC's Vancouver campus.

The Social Ecological Economic Development Studies (SEEDS) Sustainability Program is another experiential learning initiative that goes outside traditional classroom settings to provide hands-on, real-world learning. Through SEEDS, students partner with faculty, staff and community organizations to lead research projects advancing sustainability ideas, policies and practices. The program sparks collaborations across disciplines and organizations, and tests new sustainability solutions using UBC's Campus as a Living Lab. Students gain course credit for their work, along with valuable professional experience, while researchers and community organizations enhance their capacity to address pressing environmental challenges.

Since the program began, over 1,100 projects have been completed on a broad range of social, ecological and economic sustainability issues. For example, a campus tree inventory project brought together forestry and botany students to study campus tree populations and support the development of an Urban Forest Management Plan. SEEDS was Western Canada's first academic operational program to tackle sustainability issues and it is the largest, most comprehensive program in North America. It has received international recognition, and its model has been replicated across universities in North America and Europe.

CERTIFICATE IN SUSTAINABILITY STUDIES CO-FOUNDER CREATES EXPERIENTIAL LEARNING OPPORTUNITIES FROM THE LOCAL TO THE GLOBAL

Sarah Skett, research associate in UCalgary's Sustainability Studies Program, is an expert at finding and creating experiential learning and research opportunities for her students. Not many know, but she was responsible for co-developing UCalgary's Certificate in Sustainability Studies program, which saw its second cohort of students graduate in spring 2019.

"Right now, our priority is to scale the Sustainability Studies program," says Skett. "We have a huge demand for the certificate from stu-dents, as well as an interest for more courses that engage sustainability challenges and help us find actionable solutions. We also want to continue to work with faculties across campus to embed sustainability throughout their curriculum and research.

"We all have an impact with our consumption and behaviours, and with that comes the responsibility to understand and take action. And we learn by engaging in these challenges through real-world applications."

One key component of the Certificate in Sustainability Studies is the experiential research opportunities provided to students. Skett has been liaising with The City of Calgary to give students the opportunity to conduct research on food systems that will be used to devel-op a food charter in Calgary. Once complete, the food charter will work to ensure all Calgarians have access to healthy and affordable food.

In addition, students are also working with The City to develop a risk assessment tool for urban agriculture. This tool will help ensure food production methods such as vertical, indoor and spin farming not only follow regulations, but are also sustainable and support those engaged in this work.

One of Skett's next initiatives for the program is a field school in Uganda, which she will lead in May 2020. This interdisciplinary field school Ubuntu & The Sustainable Development Goals: Learning From Uganda will use the UN Sustainable Development Goals (SDGs) as a guide to help students explore the daily challenges faced by Ugandans from the local to the global. Students will be immersed in community projects that support sustainable community development through gender empowerment, increased food production, eco-tourism and youth engagement. There are also other courses and field schools under development.

READ MORE >

Learn more about the Certificate in Sustainability Studies:
ucalgary.ca/news/can-hands-learning-kick-start-your-students-future-careers

NOVA SCOTIA STARTUP A GAME CHANGER FOR CLEAN ENERGY

DALHOUSIE UNIVERSITY

Dal grad and Rayleigh Solar Tech co-founder Sam March.
(Danny Abriel photo)

The “it” material that is significantly advancing solar power also happens to be the inspiration for an exciting startup that calls Halifax home.

Led by longtime friends, Sam March and Dane George, Rayleigh Solar Tech aims to commercialize perovskite solar cells. Perovskite is a solution deposited at low temperatures, is easy to make and works really well. With an efficiency that has skyrocketed to over 23 per cent, the technology has gained traction in the research community in the past five years and will be cheaper than any existing solar cell technology.

“There is usually a trade-off for solar cells,” says March. “If they are cheap to make, they don’t work very well, but perovskite is a cheap AND efficient solar cell material.”

The idea for Rayleigh Solar Tech came to March when he was studying perovskite in the Ultrafast Quantum Control Group in Dal’s Physics Department, which is led by Kimberly Hall. The group focuses on using ultrafast lasers to study how light interacts with perovskite materials.

At the time, March was reading as many research papers as possible to keep up with a global surge in perovskite interest and it became clear that these solar cells were poised to be a disruptive technology. They are easy to integrate into various thin-film solar applications and can be coated on the exterior of any window. That makes them a nice option for global markets to offset having to burn fossil fuels for energy needs.

For a relatively new company, there have already been several highlights for Rayleigh Solar Tech. One was the opportunity to participate in the Creative Destruction Lab (CDL) Atlantic program.

“It was all because of the CDL Atlantic Site Lead Jeff Larsen,” says March. “He heard about our project and strong-armed us to join the program. It was the best decision we never made!”

CDL Atlantic, which is hosted at Dalhousie, is a seed-stage program for massively scalable, science and engineering-based companies, which has expanded nationally.

“The Creative Destruction Lab plays an important role in connecting successful business mentors with the talent, science and technology emerging from universities that can scale up to make a global impact,” says Jeff Larsen, executive director, innovation and entrepreneurship.

“Sam March is a great example of how this can work, where a PhD student who might never have commercialized his research and started a company now has incorporated, investment and mentorship to try and bring next generation solar to market.”

UNIC2020 - INTERNATIONAL STUDENT SUMMIT ON CLIMATE

UNIVERSITÉ LAVAL

From July 6 to 9, 2020, Université Laval will host UniC2020, the International Student Summit on Climate, which will welcome some 300 students from higher education institutions on six continents. The holding of a student summit on climate of such a scope is a first in Canada, and possibly internationally as well.

Université Laval hopes to bring together young people with various backgrounds so they can share their various climate action leadership skills. This event is in line with the United Nations' sustainable development goals and will prepare the students participating to mobilize at other international climate meetings. It is planned to hold UniC2020 every two years to increase the scope and awareness of this unique gathering.

The Summit will be conducted under the aegis of the Hydro-Québec Institute of Environment, Development and Society (EDS) of Université Laval, a hub of sustainable development knowledge which includes over 100 professors and some 330 undergraduate and graduate students. Many climate-change-related issues will be addressed. The decarbonization of society's activities and the transition to a low-carbon economy; organizational and behavioural changes; human migrations and conflicts related to climate change; sustainable health, biodiversity and food safety; public policy and citizen action; and extreme environmental disturbances are only a few examples. Moreover, Indigenous and Inuit students from the North will be invited so they can share their vision of climate issues that reflects their reality, as well as their approach to the specific aspects of the northern context.

Further to the Summit, an international student network for the climate will be created in order to set up an evolving community of sharing best practices. This network will be led by the Institut EDS to maintain the dialogues begun and support young university students in the identified areas of collaboration. Moreover, the network of partners solicited to ensure the success of UniC2020 will extend to nearly 500 higher education institutions and organizations around the world.

The Government of Quebec, the Government of Canada and Québec City are three major partners of UniC2020. It is a unique opportunity for Université Laval and its government partners to position themselves worldwide as mobilized and committed players in the climate action field.

READ MORE > ulaval.ca/calendrier-ulaval/congres-et-colloque/unic2020-sommet-international-etudiant-pour-le-climat

LEARNING FROM THE LAND

The Land and Water program helps participants learn about Indigenous people's enduring relationships to place and land, explore their role in protecting land and water, and meet other young people committed to climate action. The program brings together R. B. Russell Vocational High School students with a post-secondary team to engage in Indigenous land-based programming. The post-secondary team is comprised of University of Manitoba students and other youth.

The program is co-facilitated by post-secondary team members, elders, guests and a U of M program coordinator. The post-secondary team will help facilitate creative programming at monthly lunch and learns at R. B. Russell (November to May), monthly full-day field trips from March to June, plus an overnight camping trip in the spring. Examples of past programming include a trip to Shoal Lake 40 First Nation, and an Elder-led tour of the Bannock Point site in the Whiteshell.

During fall term reading week (November 12-15), the post-secondary team will take part in a four-day land-based experience, free of charge. This is Indigenous Land, which consists of a mix of urban and rural land-based education, will provide opportunities to re-story Winnipeg as Indigenous land, re-root our relationships to land and each other, put Indigenous values like reciprocity into action, and develop a land ethic that includes urban spaces.

This program is free of charge and open to all students. Indigenous students are strongly encouraged to apply. R. B. Russell's student population is almost entirely Indigenous, and CSL acknowledges how important it is for the post-secondary team to share a cultural frame of reference with the R. B. Russell youth. CSL also recognizes that Indigenous students need access and opportunities to take part in Indigenous land-based programming.

READ MORE > umanitoba.ca/student/community-service-learning/mentoring.html

MCGILL CELEBRATES 10TH ANNIVERSARY OF SUSTAINABILITY PROJECTS FUND

In 2019, the Sustainability Projects Fund celebrated a milestone anniversary: 10 years! What was started as an initiative approved by a landslide student vote has since grown to become the largest fund of its kind in Canada, valued at $980,000 a year!

The Sustainability Projects Fund's (SPF) mandate is to build a culture of sustainability on McGill campuses through the development and seed-funding of interdisciplinary projects. It creates opportunities for the McGill community to actively engage in sustainability initiatives on campus, and encourages individuals by empowering them to be change agents in their own studying and work environment. This is just one initiative among many in McGill's plan to incorporate opportunities in sustainability in education, extra-curricular activities, and orientation events.

The first SPF-funded project, launched shortly after the Fund itself in 2010, had a simple ask. For $330, the Apartment Gardens project would "give individuals on the downtown McGill campus an opportunity to have a small home garden, right in their window or on their balcony" by inviting members of the community to pick up leafy vegetable seedlings at the McGill Farmer's Market for free.

A few years later, the Greening Indoor McGill team carried forward with a similar idea, and worked to "promote the use of indoor plants

to improve air quality and promote a healthy aesthetic through the greening of indoor environments for McGill faculty, staff, and students."

In the ten years since its inception, the SPF has supported more than 215 projects covering a variety of fields, and has allocated total funding which reached over $8 million.

The SPF is celebrating this milestone by launching a new funding stream focused on enabling large-scale, transformative projects that have the goal of making McGill's campuses a greener, more sustainable, healthier place to work, study, and live.

Named the Big Wave, this funding stream supports projects requiring between $100,000 and $400,000. While the SPF has supported large-scale projects in the past, such as the Gault Nature Reserve Community Access project, the Big Wave stream will now allow project teams to receive funding for the planning and design of their projects.

The idea, the SPF Governance Council determined, is that for projects to truly transform McGill's campuses, they need to be conceived with long-term sustainability, and our future, in mind. We can't wait to see what the SPF will achieve in the next ten years!

READ MORE > reporter.mcgill.ca/the-sustainability-projects-fund-looks-toward-another-decade-of-creating-a-sustainable-campus/

RISING TO THE CHALLENGE: NEW MCMASTER GRAND CHALLENGES SCHOLARS PROGRAM LAUNCHED

Young people who will tackle tomorrow's thorny global problems will need both superlative technical skills and a range of problem-solving skills.

That's the philosophy behind the newly launched McMaster Grand Challenges Scholars Program, an initiative aiming to enhance graduates' ability to drive real, sustainable change in the face of 21st century challenges.

The Grand Challenges program builds on the strengths of MacChangers, a co-curricular program led by the Faculty of Engineering and the MacPherson Institute, which brings together teams of students from across campus to seek local solutions to challenging societal issues.

"We know that the world is changing at a rapid rate and so we need to prepare students to be agile thinkers and strong communicators who are capable of shaping the future, rather than just chasing it," Puri says. "We want to ensure that every student graduating from McMaster Engineering is a resilient, calculated risk-taker who can impact the world."

It's just the latest way McMaster Engineering is transforming the student experience and amplifying experiential learning, says Ishwar K. Puri, Dean of Engineering.

Following a framework developed by the US National Academy of Engineering, the Grand Challenges Scholars Program is offered at more than 60 American universities, including MIT, Duke, Georgia Tech, Virginia, Maryland, Ohio State and the University of Southern California.

McMaster is the first Canadian university to be accepted into the program, joining eight other non-U.S. schools, including Australian National University, City University of Hong Kong, and the National University of Singapore.

While the American version of the program focuses students on very specific goals, the McMaster version encourages students to look for problems that address the UN Sustainable Development goals., which range from eradicating poverty to climate action to improving water quality and good health and well-being.

To complete the program and earn a digital credential, students will have to demonstrate skill in the five competency areas of research, multiculturalism, business and innovation, multidisciplinary work, and social consciousness.

They can draw on learning gained through coursework, extracurricular and co-curricular activities, exchange programs, volunteer opportunities, and work experiences to demonstrate their mastery of the competencies.

READ MORE > dailynews.mcmaster.ca/articles/rising-to-the-challenge-new-mcmaster-grand-challenges-scholars-program-launched/

HORIZON COURSE: RISKS AND CHALLENGES IN THE 21ST CENTURY

Université de Montréal

Université de Montréal's Faculty of Arts and Science has offered the "Horizon Course: Risks and Challenges of the 21st Century" since September 2019. This three-credit course is open to all undergraduate students at the university and its affiliated schools.

Inspired by UNESCO's sustainable development principles, the course covers various themes. The theme selected for 2019–2020 was "Planet Earth 1.5°C: How Can We Limit Global Warming in a Context of Indifference and Scepticism

About Science?"

Through an innovative teaching approach based on team projects and interdisciplinary collaboration, students can learn by identifying solutions to this important societal issue. Each team is made up of students from different fields of study and is asked to define the problem, as well as to propose possible solutions and a relevant action plan.

Throughout the course, students are also provided with methodological, conceptual and philosophical tools to address or fight scepticism about climate change predictions. Consequently, students are also initiated in investigation methods and complex problem-solving approaches. The teacher then becomes a facilitator. The training also allows the development of project management,

communication, problem-solving and social innovation skills.

At the end of the course, the students are asked to prepare a report describing their approach, which may be a website, a media format, a video or an artistic or creative project, and present it in various contexts. For this first iteration of the course, the students carried out a wide variety of projects ranging from an urban farming course at the high school level and a video promoting an overhaul of the carbon tax to the creation of a student bursary intended to support sustainable development projects.

The two professors of the Horizon course this year are the recipients of a Louis Gagnon HORizon fellowship. The objective of this fellowship is to support training in educational technology, and the use of interdisciplinary thinking to solve complex societal problems. The two professors of the Horizon course are also supported by the Université de Montréal's centre for university teaching for the implementation of the course.

READ MORE > fas.umontreal.ca/etudes/baccalaureats-majeures-mineures/cours-horizon/#c129451

THE INSTITUTE OF THE ENVIRONMENT



Transforming to an environmentally sustainable way of life is one of the greatest challenges facing our planet. This will require substantial changes in all sectors of society, including our institutions and their governance, our economic and social policies, and the way we use knowledge and technology to address environmental issues.

The Institute of the Environment (IE) is the University's hub for environmental sustainability-related research, teaching and other activities. The cross-cutting nature of environmental problems means that there is a critical need for innovative, interdisciplinary approaches to teaching and research. Our institute is well positioned to bring together different academic fields and stakeholders, all playing a vital role in understanding environmental problems and developing solutions.

We have built a national profile in the area of environment and economy through our research and policy network, The Smart Prosperity Institute (SPI). SPI brings together business, policy and academic leaders to allow innovative ideas to inform policy development.

We are also home to the collaborative specialization in environmental sustainability and the graduate program in environmental sustainability.

Our programs prepares graduates to navigate key environmental sustainability issues through a real-world approach to education, bringing practice into the classroom and learning into the community.

The master's is designed to address a growing need for sustainability professionals who can shape decisions by understanding problems and the interconnected processes through which they persist, professionals able to translate integrated, systems-based thinking into tangible action.

UC3 FORUM - INNOVATING AND PARTNERING FOR CLIMATE ACTION IMPACT

Ideas about sustainability and climate change permeated Mitchell Hall on Thursday, Oct. 3 as Queen's University hosted the Queen's UC3 Forum. The event brought together experts and community members for a daylong discussion of climate change and the university's role in protecting the environment. The forum is part of Queen's membership in the University Climate Change Coalition (UC3).

The UC3 is a group of leading North American research institutions united in a collaborative effort to accelerate local action against climate change. Together, UC3 members leverage their institutional strengths to foster cross-sector partnerships and knowledge sharing aimed at reducing greenhouse gas emissions and nurturing community resilience.

"Climate change is one of the greatest challenges our society will face and requires us to work with our community and academic partners to find creative solutions," says Principal Deane. "Events like the UC3 Forum are integral to helping us foster connections and provide opportunities to share knowledge and resources, inspiring us to build a better future together."

The day kicked off with welcoming remarks from Principal and Vice-Chancellor Patrick Deane, Mayor of Kingston Bryan Paterson, and Mark Green, Vice Dean (Graduate Studies and Recruitment) in the Faculty of Engineering and Applied Science, who spoke in his capacity as a member of the Mohawk community. This series of opening remarks set the tone for the event, as the forum would go on to bring together a variety of perspectives from both Queen's and the broader community.

Throughout the day, speakers engaged with audience participants in lively discussions about sustainability during Q&A sessions.

READ MORE > secondnature.org/initiative/uc3-coalition/

ENVIRONMENTAL LAW COURSE EXAMINES UNIVERSITY'S OWN EMISSIONS POLICIES

Students from Environmental Law 444 course visiting the University of Saskatchewan Heating Plant (photo submitted)

Four years after the adoption of the Paris Agreement, global greenhouse-gas emissions continue to rise, and disruptive climatic changes continue to mount. Of all the political and technical barriers to achieving deep decarbonization and sustainability, the most significant obstacle may be our mindset: Do we truly believe not only that we must transform our society, but also that we can? Climate-change researchers are just beginning to understand the power of envisioning more hopeful and positive pathways toward resilience and sustainability.

Professor of environmental law, Jason MacLean, learned this lesson, not from a scholarly article, but from his own students. At first, Prof. MacLean's course focused on the gravity of the impacts of climate change but, through reading course evaluations from students, he realized that he neglected to discuss the groundswell of innovative and inspiring research on promising solutions, particularly at local levels of policy and governance. It was clear that the students got the message – climate change is an existential challenge – but they were also looking for solutions.

In response, Prof. MacLean radically redesigned his course on environmental law. Instead of delivering the course in a series of depressing lectures about environmental law's endemic failure to ameliorate ever-worsening conditions, he posed a single question to the class: What would it take to turn the aspirations of the Paris Agreement into reality here at the University of Saskatchewan? What are the obstacles? More importantly, what are the opportunities?

Each class began by discussing cutting-edge Earth-system science and governance research, and then proceeded to break into research groups to work on identifying innovative solutions to eliminating the University's emissions. One group focused on co-locating energy and food production by installing solar panels on the University's agricultural plots, another group researched ways of reimagining academic conferences to reduce air travel, and still another concentrated on reducing waste and turning the University into a circular economy.

As the University is situated on the lands and waters of Treaty 6 territory and the Homeland of the Métis the course also incorporated traditional teachings. In particular, Indigenous cultural advisors shared principles of sustainability that had allowed Indigenous peoples to successfully steward our local environment for thousands of years.

As the University embarks on establishing a new and innovative action plan to achieve sustainability through decarbonization, its leaders can learn from the students of Environmental Law 444, who discovered firsthand the power of envisioning solutions and learning by doing.

CAMPUS AS A LIVING LAB - ACADEMIC WOOD TOWER

U of T students are getting hands-on experience in the design and implementation of sustainability projects through the Campus as a Living Lab (CLL) program. The CLL approach brings together faculty members, students, staff, and, where appropriate, external partners to collaborate on developing sustainability projects that combine operational and academic activities. These projects will contribute to the operational sustainability goals of the University, and also provide an opportunity for research and experiential learning.

In 2018, U of T identified six projects to act as living labs —one new project and one retrofit project on each of the University's three campuses. At the University's downtown Toronto campus, students will get involved in the design and implementation of the Academic Wood Tower — a 14-storey tower that is expected to be the tallest mass timber and concrete hybrid building in North America. U of T's new tower will be built with cross-laminated timber — a method that allows producers to create larger, stronger wood pieces — and follows a growing international trend towards tall timber structures, which have been lauded for their low carbon footprint, fire safety and faster construction time.

The project is currently in the design phase and the plan is to involve students in building a Virtual Design and Construction Model for the Tower. As the project enters the construction phase, a study of process as a living lab project will become possible. This study would give students the chance to use

participation-observation techniques to learn how actual project decisions are made and how constraints are navigated. In the process, students will help generate new ideas to inform future sustainability projects.

READ MORE > utoronto.ca/news/u-t-build-academic-wood-tower-downtown-toronto-campus

WHY CLIMATE CHANGE MEANS INDONESIAN STUDENTS ARE COMING TO CANADA

Tsunamis, which take lives and destroy property, pose challenges for insurance companies too
(Dasril Roszandi/AFP/Getty Images)

The University of Waterloo made its name as a Canadian pioneer in co-op education, which enables students to earn while they learn, often in jobs related to their studies.

Now the southwestern Ontario school, which accounts for almost one-third of study-and-paid-work placements in Canada, has started exporting its model to countries overseas.

Among them is Indonesia, a southeast Asian island nation increasingly vulnerable to climate change and facing a dire shortage of actuaries to advise pension funds and insurance companies on the financial risks of catastrophic events. Over the past four years, Waterloo has helped Indonesian private and state universities establish new actuarial science programs that include options for paid student placements with employers.

"Co-op is a foreign concept in Indonesia," says Maydison Ginting, head of the department of business mathematics at Universitas Prasetiya Mulya (UPM), a private business and technology university in Jakarta that adopted Waterloo's model in 2016. "A lot of graduates in Indonesia complain they can't find a job [after earning their degree], and industries complain they can't find graduates who are ready to enter the workforce. The best way to link them is with a co-op program."

Ginting's university is one of 12 Indonesian institutions participating in the Risk Management, Economic Sustainability and Actuarial Science in Indonesia (READI) project, a five-year program established in 2015 by the Canadian government to support Indonesia's efforts to boost its supply of actuaries and formalize co-op in higher education. A spokeswoman for the Department of Global Affairs, which accepted an unsolicited proposal from Waterloo to deliver a project to establish Indonesia as a regional centre of actuarial excellence, acknowledged the university's reputation "as an international leader in co-op education," along with its expertise in actuarial science. A shortage of actuaries, the spokeswoman added, "presents a risk to economic stability and growth for Indonesia, which is crucial to ensure poverty reduction."

READ MORE > macleans.ca/education/why-climate-change-means-indonesian-students-are-coming-to-canada/

DIMITROV: UNLOCKING FREEDOM THAT ENGAGES STUDENTS

Radoslav Dimitrov participates in climate change negotiations at the United Nations (UN), and uses his real-life experience to conduct realistic simulations where students follow the diplomatic protocol of the UN and the standard operating procedures through which international negotiations unfold.

"They get into the shoes of these diplomats and policy-makers. They get very passionate, very excited," Dimitrov said. "The simulations run for a long time, maybe two to three weeks, and by the time we're done, students learn very difficult and technical material about, say climate change, that would be difficult to teach just through lecturing."

These classroom negotiation simulations, pits student against student as they portray diplomats negotiating international treaties on a variety of issues, from climate change to the Iranian nuclear energy program. It has been a particularly effective tool for teaching, with students internalizing their roles to the point they become so engaged it becomes personal.

YouTube youtu.be/7vWzOWr0xXk

READ MORE news.westernu.ca/2019/04/dimitrov-unlocking-freedom-engages-students/

LEADERSHIP & PARTNERSHIP

Stories in this theme focus on the role the university is playing in their communities, nationally and internationally, including indigenous communities. The stories demonstrate the university being a positive force for action on climate change mitigation and/or adaptation at a local, regional, national or international level. They include things like capacity building initiatives, community outreach, participation in international coalitions, etc.

TRADITIONAL INDIGENOUS KNOWLEDGE SUPPORTS FLOOD MITIGATION RESEARCH IN JAMES BAY REGION

New research from University of Alberta human geographers taps into rich, traditional Indigenous knowledge to better understand spring flooding in the Kashechewan First Nation, located in the southwestern James Bay region of northern Ontario. Results from the study show that the timing and extent of spring flooding in the region is exacerbated by climate change and human-induced changes that have affected spring ice breakup and ice jams. "These human-induced ecological changes have contributed to and created the increased risk of flooding for the community of Kashechewan," explained Arshad Khalafzai, PhD student in the Department of Earth and Atmospheric Sciences studying under the supervision of Professor Tara McGee. "The First Nation also identified a number of factors it feels have been exacerbated by climate change, including spring flows of the river, increased temperature, unpredictable weather, breakup ice jams events, and issues with safe access to the winter ice road." The research methods used for this study, which included in-depth interviews and participatory mapping, may also prove useful for ongoing flood monitoring and disaster risk reduction activities in this region of southwestern James Bay—as well as elsewhere among Canadian Indigenous communities. A local research assistant was a member of the research team and assisted throughout the data collection process. Their involvement may help to build capacity for the Kashechewan community to conduct similar research in the future. "Traditional knowledge is contextualized as a body of cumulative knowledge, evolving over time, passed on through generations, and associated with a specific place for a long period of time" said Khalafzai. "Collaboration between Indigenous traditional knowledge holders and the scientific research community can help to promote innovative and effective adaptation action, and relevant traditional knowledge can inform cost-effective and sustainable disaster risk reduction."

UAlberta research and traditional Indigenous knowledge are improving understanding spring flooding in the Kashechewan First Nation. Photo credit: Arshad Khalafzai

READ MORE >

The paper, "Flooding in the James Bay region of Northern Ontario, Canada: Learning from traditional knowledge of Kashechewan First Nation," was published in the International Journal of Disaster Risk Reduction (doi: 10.1016/j.ijdrr.2019.101100).
https://www.sciencedirect.com/science/article/pii/S2212420918306988

UBC LEADS GLOBAL CLIMATE ACTION BY INTEGRATING LEARNING, RESEARCH AND OPERATIONS

UBC is consistently recognized as a global leader in climate action thanks to a unique, integrated approach that aligns learning, research and operations to deliver meaningful action on climate change. In 2019, UBC was ranked #1 in the world for taking urgent action to combat climate change by Times Higher Education (THE) and first in Canada for making cities inclusive, safe, resilient and sustainable.

"These rankings not only reflect how UBC has worked to dramatically reduce its own climate impact for more than 20 years, but also the importance of engaging in partnerships and collaborations with NGOs and provincial and federal government to develop broader sustainability approaches and solutions. We are proud of all of our researchers, students and staff who have been involved in this work," said Vice-President, Research and Innovation Gail Murphy.

THE's University Impact Rankings, in which UBC ranks third overall amongst 500 participating institutions across 75 countries and six continents, aims to measure universities' social and economic contributions through their success in delivering on the United Nations' Sustainable Development Goals.

UBC has a long history of leading climate-change action. In 2007, UBC was the first Canadian university to meet greenhouse gas (GHG) emission reduction targets set by the Kyoto Protocol. Since then, UBC further reduced its GHG emissions by 38% and is on track to reduce emissions by 67% below 2007 levels by 2021.

The university's Campus as a Living Laboratory model weaves sustainability throughout the 80,000-strong community and provides a one-of-a-kind test bed for clean energy solutions at a municipal scale. One living lab project, the Bioenergy Research & Demonstration Facility, converts wood waste to energy and displaces around 8,500 tons of GHG emissions annually.

The complexities of climate change inspire a multifaceted research approach at UBC. Research teams are making vital contributions to preserve our abundant wildlife and our natural environment on land and in the water by transforming our understanding of how plant and animal species adapt to climate change. Others are developing clean energy technologies and materials, advancing carbon emissions monitoring, examining human behaviour change and studying the policies and regulations required for Canada's transition to a low-carbon economy.

Beyond the classroom and laboratories, UBC students demonstrate climate leadership through initiatives such as SEEDS (Social Ecological Economic Development Studies) and the Sustainability Scholars program. These initiatives partner students at all levels with staff, faculty and community partners to develop climate-friendly solutions to issues on- and off-campus.

On the world stage, UBC leads new partnerships across the post-secondary sector. In 2019, UBC hosted the University Climate Change Coalition (UC3) summit, which brought together leaders of major North American research universities to discuss the role of universities in combatting climate change and foster increased collaboration across sectors. Climate change was also a major focus of UBC's participation in the inaugural meeting of the U7 Alliance in Paris, which comprises universities from around the world that come together to collaboratively address pressing global challenges.

PARTNER WITH UCALGARY TO MAKE A GLOBAL IMPACT ON CLIMATE CHANGE

UCalgary is committed to collaborations that strengthen our society and the economy. **Our goal is to provide a new option for CO2 removal that is scalable, netnegative emissions, and rapidly deployable.** We believe that an optimized integration of direct air capture coupled with CO2 enhanced oil recovery provides that option for Canada, and for the world.

We are looking for support to:

- Set meaningful research targets through technoeconomic and life cycle assessment
- Develop efficient, scalable and cost-effective direct air capture tailored to enhanced oil recovery integration-
- Identify CO_2 enhanced oil recovery approaches that allow utilization to be tuned to maximize profits
- Assess policy gaps, barriers, and impacts of uncertainty

The Team

Dr. Steven Bryant, Canada Excellence Research Chair in Materials Engineering for Unconventional Oil Reservoirs (steven.bryant@ucalgary.ca)

Dr. Sean McCoy, Principal Investigator, Global Research Initiative; Assistant Professor, Department of Chemical and Petroleum Engineering (sean.mccoy@ucalgary.ca)

Dr. Joule Bergerson, Principal Investigator, Global Research Initiative; Canada Research Chair; Associate Professor, Department of Chemical and Petroleum Engineering (jbergers@ucalgary.ca)

Dr. Don Lawton, Professor, Department of Geoscience; Director, Containment and Monitoring Institute (don@cmcghg.com)

READ MORE > **ucalgary.ca/energy**

GETTING IN TOUCH: DAL STUDENT INVITES YOU TO TEXT A TREE

What would a tree say if it could talk?

Resource and Environmental Management student Julietta Sorensen Kass offered Halifax residents and visitors alike a chance to find out last summer with a public engagement project called Text-A-Tree at the Halifax Public Gardens.

The project invited people to send text messages to the trees they meet in the gardens. Participants then received a reply text from a volunteer with information about the cultural significance and biology of the tree.

"We're calling on trees in an old-style way using modern media," said Julietta. "People would think writing a letter to a tree is beautiful and sacred." She wanted to see if people will be able to forge a similar connection over text message or social media.

The idea came to Julietta at an urban forestry conference where she heard about a project in Melbourne, Australia. Email addresses created to track maintenance issues for individual trees were flooded with letters from citizens who wanted to connect with the trees emotionally: thanking them for providing oxygen and shade, asking how they are doing, paying them compliments.

"I was telling a friend about it and the words just fell out of my mouth: what if you could text a tree?"

She brought the idea to Professor Peter Duinker in the School for Resource and Environmental Studies, to see if he would supervise the project. He helped her incorporate it into her Master's of Resource and Environmental Management (MREM) internship, working on Halifax Regional Municipality's Urban Forest Master Plan.

Julietta thinks that people have started to think of themselves as separate from nature as more of our population is concentrated in cities, and it's changed how we relate to trees. "Trees aren't going anywhere but our culture is evolving. We want to find a way for people to socially relate to trees."

Participants will receive a short survey at the end of the project. Julietta hopes that the research will inform conservation and biodiversity initiatives. "Planting trees in cities is going to be a huge way forward for addressing climate change, and that's not free," she says. "We need to find out what people value about trees in cities."

CARBON OFFSET PROGRAM AND VALUE-ADDED PARTNERSHIPS

Université Laval provides its community with a voluntary greenhouse gas (GHG) emissions offset program. It is therefore possible for staff and students to measure the GHG emissions of their personal and professional travel by car or plane and to offset them by purchasing carbon credits. Since the program was implemented in 2012, 7,600 members of the university community have offset the equivalent of over 4,800 tonnes of CO2 related to their own activities and travel. This offset has resulted in the planting of over 73,000 trees in Quebec and the rest of the world!

Université Laval has decided to contact carbon credits organizations with which it can create significant partnerships in order to add value to climate action. By developing international cooperation and knowledge transfer, the university's rollout of its carbon offset program builds strong ties with organizations that provide leadership in their respective communities in the fight against climate change.

Open to the world, Université Laval has been a partner, since 2019, of the Cameroonian non-governmental organization (NGO), called ABIOGeT (***Action pour la biodiversité et la gestion des terroirs)***, which works for the sustainable management of natural resources in the Sudan–Sahel region. The NGO carries out reforestation projects that contribute to the university's voluntary GHG offset program. ABIOGeT also works to raise awareness and train rural communities on sustainable farm and forestry practices. A team of researchers from Université Laval's Faculty of Forestry, Geography and Geomatics was formed to provide technical and administrative support for ABIOGeT in the rollout of its activities.

Carbon credits are also contracted from Irokko, a young Quebec enterprise in the voluntary carbon market sector set up by Saliou Diallo, a Université Laval graduate. Irokko's activities rely on strong partnerships, notably with the Fédération des coopératives forestières du Québec to ensure the quality of its reforestation projects in Quebec and Peru.

WA NI SKA TAN

Wa Ni Ska Tan: An Alliance of Hydro-Impacted Communities emerged out of three meetings and two tours of hydro-affected communities in northern Manitoba. The Alliance is shaped by the priorities of hydro-impacted Indigenous communities. Principles underlying Wa Ni Ska Tan centre on transparency, accountability, cross-cultural sensitivity, mutual respect, and consensus in decision-making.

The overall goal of Wa Ni Ska Tan (Cree word for 'Wake Up' or 'Rise Up') is to explore both the positive and negative implications of hydropower for nearby environments and Indigenous communities in Manitoba and other affected regions across Canada, and to further explore how and to what degree this research alliance might enable healing as well as meaningful and desirable social and environmental change.

The research focuses on the implications of and community responses to hydropower, in particular to those related to cross-regional and cumulative impacts. In this respect, we emphasize hydropower projects across Manitoba and similar projects located in British Columbia, Alberta, Saskatchewan, Quebec and Labrador. We also work to support community projects in hydro-impacted communities.

The research themes, core activities, and key outcomes of Wa Ni Ska Tan emerged from small group discussions at two gatherings, held in Thompson, December 2014, and Opaskwayak Cree Nation, June 2015. These are as follows:

Wa Ni Ska Tan: An Alliance of Hydro-Impacted Communities emerged out of the priorities voiced by hydro-impacted Indigenous communities. The Alliance consists of representatives from 24 Cree (Ininew/ Inniniwak), Anishinaabe, and Métis nations; 22 researchers; 14 social justice and environmental NGOs; 9 universities from Canada and the US; and multiple levels of government.

READ MORE > hydroimpacted.ca/

MCGILL JOINS UNIVERSITY GLOBAL COALITION

Last Fall, McGill University joined the University Global Coalition (UGC) as a founding member. The news was announced on Sunday, Septempter 22, 2019 at a reception in New York City which was attended by former UN Secretary General Ban Ki Moon and several higher education leaders, including McGill's Principal, Suzanne Fortier. McGill and University of Waterloo are the UGC's only two Canadian members.

The UGC describes itself as "a collaborative platform of globally engaged universities and higher education associations working in partnership with the United Nations and other stakeholders to create a more sustainable future for all."

The UGC aims to advance the UN's Sustainable Development Goals. Adopted unanimously by world leaders in September 2015, the goals are a global agreement about the world's most pressing issues, and what targets should be met by 2030. UGC receives support from the Rockefeller Foundation.

"It is a privilege for McGill University to join the University Global Coalition," said Principal Fortier. "Sustainability is a priority for McGill, both in the knowledge that we create and share through our academic mission, and in how we operate day to day. We share with our peer institutions a special obligation to guide society in its global sustainability efforts—and the University Global Coalition will be an important platform for us to achieve that."

The UGC is committed to advancing six objectives:

- Increasing students' understanding of the most pressing challenges facing the world today, as articulated in the UN's Sustainable Development Goals, and inspiring students to play an active role in driving change and finding new solutions
- Developing the global competence and leadership skills students need to effectively collaborate across cultural and national boundaries and across disciplines and sectors in creating a more sustainable future
- Engaging in actionable research, knowledge sharing, and innovation in collaboration with local and international organizations in pursuit of novel approaches to achieving the Sustainable Development Goals
- Engaging with private and public actors in leading, guiding and supporting local, national and global responses to the Sustainable Development Goals
- Recognizing the impact that each member's own operations have on important sustainable development issues, and acting responsibly to address them and serve as an example to others.
- Communicating publicly the group's progress and being accountable for outcomes.

UGC member institutions will work together and in partnership with the United Nations Institute for Training.

YouTube youtube.com/watch?time_continue=13&v=0XTBYMfZyrM&feature=emb_logo

GLOBAL WATER FUTURES FUNDS MORE WATER-QUALITY RESEARCH AT SIX NATIONS

Global Water Futures is funding a new research collaboration between McMaster researchers and traditional knowledge holders on Six Nations of the Grand River that focuses on addressing water-related issues of training, wellness and resilience and governance.

Called Ohneganos — Indigenous Ecological Knowledge, Training and Co-creation of Mixed Method Tools, the project is led by Dawn Martin-Hill, the Paul R. MacPherson Chair in Indigenous Studies.

Martin-Hill's team includes Beverly Jacobs from the University of Windsor, and Lori Davis Hill, director of Six Nations Health Services, as well as Christine Wekerle, associate professor of pediatrics and mental health team leader at McMaster. They and other academic and community partners will work in three teams to address specific areas of interest identified in consultations with Six Nations.

The training team will bridge and combine traditional ecological knowledge and western science when it comes to accredited water management training, and will create bilingual resources to improve communities' capacity to manage water-related challenges.

The wellness team will work to address the impact of water crises on mental health, especially among youth.

"We also plan to conduct a survey to explore water anxieties and stressors on young mothers," Martin-Hill says, adding that more than half of the home births at Six Nations are in homes without running water.

The Ohneganos project, led by Dawn Martin-Hill, is a collaboration between McMaster researchers and community partners at Six Nations of the Grand River.

The governance team will work with community partners to train youth and the community members in water governance and rights in accordance with Indigenous laws.

"All three teams will focus on issues of addressing stewardship over time; crafting bilingual, relevant resources; and fostering resilience," Martin Hill says. "We want to develop an enduring legacy of Indigenous knowledge harmonization with western science through the co-creation of sustainable water management pathways for the community."

The projects will produce a bilingual science text for school curriculum; turtle sensors tracking and a mobile application; Two row paddle digital river stories; and an ecosystem inventorying medicines.

Ohneganos and five other three-year projects are sharing $1.63-million in funding, in addition to 33 GWF projects that address Indigenous community water issues.

While the overall goal of the GWF research program is to better prepare for and predict climate change threats and sustainably manage freshwater resources in Canada and cold regions worldwide, these particular projects address unique challenges.

READ MORE > brighterworld.mcmaster.ca/articles/global-water-futures-funds-more-water-quality-research-at-six-nations/

FISH, FISH AND MORE (SUSTAINABLE) FISH

Université de Montréal has received the Marine Stewardship Council"s certification for its supply of fish from responsible fishing.

"Out of 2.5 tonnes of fish served annually via our Local Local food services, 1.5 tonnes come from responsible fishing," said Stéphane Béranger, UdeM's sustainable development coordinator. "Fish from aquaculture are not recognized by this certification. We are working on a separate approval for those."

In Quebec, the council has accredited only two universities (UdeM and McGill) and 33 other purveyors (restaurants, shops and factories).

The independent audit and certification was welcomed with enthusiasm Nov. 14 by those bodies at UdeM that manage the supply: the Sustainable Development Unit and UdeM Food Services (which oversees Local Local).

"The process was initiated two years ago and required major changes in how we do things, especially in terms of warehouse logistics at Local Local," said Béranger. "We also had to train employees and draft new clauses in our calls for tender."

To receive the MSC's stamp of approval, a fishery must be independently assessed for the impact of its activities on fish stocks and marine ecosystems. The fishery's distributor must also be approved. Throughout the supply chain, from ocean to plate, MSC-certified fish and seafood are separated from those that are not. They are clearly labelled so that they can be traced back to the certified sustainable fishery.

Organizations that want to obtain MSC certification must source from approved suppliers who ensure that the fishery is sustainable. This means that fishing respects "the seabed, does not deplete resources, minimizes by-catch and allows fishermen to live with dignity," according to the MSC.

Certified organizations must also meet strict standards. For example, Local Local must keep all invoices and delivery notes for MSC products for at least three years. In addition, the storage and preparation of MSC products must always be kept separate to ensure traceability. The same applies on the seller side. Fortunately, Local Local only serves one type of fish at a time for hot meals.

Pascal Prouteau, director of UdeM's Residences, Hotels and Restaurants division, and Aurélie Feuerstein, its chief executive, applauded the new certification.

"They lent themselves to the practice change exercise and quickly put in place measures to help employees take part in the accreditation process and thus offer a variety of more responsible products to customers," said Béranger.

"More than ever, students are asking for food that meets sustainable development criteria – and sustainable fishing is an essential element of that."

POSITIVE ENERGY: CHARTING CANADA'S ENERGY FUTURE IN AN ERA OF CLIMATE CHANGE

uOttawa

As an energy producer and consumer with a large resource base, Canada is facing tough challenges in mapping out its energy future. Current debates about energy and climate change are often divisive and polarized, as shown in recent protests over pipeline projects that paralyzed rail lines across the country.

Leveraging its strength in public policy research, the University of Ottawa is uniquely positioned to provide thought leadership on how public authorities can effectively address energy and climate issues. It has recently launched its second Positive Energy project, under the leadership of Monica Gattinger, professor of political studies and director of the University's Institute for Science, Society and Policy.

Canada's Energy Future in an Age of Climate Change is a three-year project that provides a neutral forum to bring together leading Canadian and international researchers, industry players, government officials, Indigenous leaders, municipalities and non-governmental organizations to identify how Canada can build and maintain public confidence in government authorities making decisions about energy.

It will build on the success of the first Positive Energy project, launched in 2015, which spearheaded an influential engagement and research program to strengthen public trust in energy decision-making.

"Debates on energy and climate have become polarized and partisan. This erodes public confidence and prevents meaningful progress on energy and climate objectives. Positive Energy's latest project provides a neutral forum and solution-focused research to help build and maintain public confidence in those navigating the country's energy future."

– Monica Gattinger, Chair, Positive Energy and Director of the Institute for Science, Society and Policy

This latest project will help all those involved to prevent and address problems by identifying key weaknesses in the decision-making systems for energy and climate and by recommending concrete solutions. It will tackle tough questions, including how to address polarization; identifying the respective roles and responsibilities between federal, provincial and territorial governments and regulators, Indigenous governments, municipal governments and the courts; and models of and limits to consensus-building.

It will also show how crucial the global context is to the development of Canada's energy and climate policies, while exploring how our country might provide leadership in this field on an international scale.

READ MORE > uottawa.ca/positive-energy/

INSTITUTE FOR SUSTAINABLE FINANCE LAUNCHED

The Institute for Sustainable Finance is a multi-disciplinary network of research and professional development that brings together academia, the private sector, and government to shape Canada's innovations in sustainable finance.

Launched on Tuesday, Nov. 19, the institute is working at the intersection of sustainability and finance with a mandate to align mainstream financial markets with Canada's transition to a prosperous sustainable economy. In support of this mandate the institute is taking a leading role in creating capacity for research and education, as recommended in the Canadian Expert Panel on Sustainable Finance report for 2019, while also providing a viable platform for collaboration between government, academia, and industry.

In its 2019 report the Expert Panel calls for an authoritative and supportive network of leading financial professionals and related services providers, as well as clear and reliable climate information for capital markets. The Institute for Sustainable Finance will help accelerate Canada's finance innovation, and by fostering advanced education, professional training, research and partnerships, it will help elevate Canada to a leadership position within this emerging field within global finance.

As part of its mandate, the ISF established the Canadian Sustainable Finance Network (CSFN), an independent formal research and educational alliance of more than fifty researchers from 21 academic institutions across the county.

"The Institute for Sustainable Finance aims to create the most credible and robust body of sustainable finance knowledge in the country," says institute executive director, Sean Cleary, BMO Professor of Finance and Founding Director of the Master of Finance program at Smith School of Business at Queen's University. "Establishing the CSFN as a critical resource for Canadian leaders is one way we can help guide the massive transition to a sustainable economy."

The Institute for Sustainable Finance is based at Smith School of Business, Queen's University, and is supported by the Ivey Foundation, the McConnell Foundation and the McCall MacBain Foundation.

INTERNATIONAL PARTNERSHIPS TO COMBAT CLIMATE CHANGE AND ADVANCE WATER SECURITY

Photo: Mark Ferguson

The University of Saskatchewan's Global Institute for Water Security (GIWS) and a top Indian research institution—the Indian Institute of Science (IISc) in Bengaluru—have signed an over-arching agreement to partner for five years on joint research, training and academic exchanges related to water security, climate science and policy issues. A key global need is to better understand glacier decline, snowmelt and groundwater movement—research that is critical to sustainable water supplies and builds upon research strengths both in the Canadian Rockies and the Himalayan regions.

USask is ranked No. 1 in Canada for water resources research (2019 Academic Ranking of World Universities). IISc, located in Bengaluru in southern India, is ranked No. 1 in India for post-graduate research (master's, PhD and post-doctoral level). Both institutes have a strong national and global network of scientists, policy makers, business leaders and practitioners with whom they collaborate.

University of Saskatchewan (USask) President Peter Stoicheff and IISc In-Charge Registrar Indumati Srinivasan signed the memorandum of understanding (MOU) that is expected to lead to additional collaboration agreements and implementation plans.

Under the agreement, the two institutes plan to provide access to their respective research facilities, and pursue bi-lateral and/or global funding opportunities. They agree to share research expertise and hydrological models, both at the local and global scale, to predict water futures as affected by both climate change and humans.

Both institutions will build on their strengths, including hydrology of high-mountain regions. For instance, USask offers an intensive 10-day graduate course in the Canadian Rockies on the physical principles of hydrology. USask also offers a short course on The Future Professoriate, for graduate students and post-doctoral fellows, which examines how to create a research brand for a successful research career.

U7+ ALLIANCE

The University of Toronto is helping to build an international coalition to address climate change through its engagement with G7 leaders and involvement in an action-oriented network of universities committed to collectively tackling major global challenges.

U of T — represented by President Meric Gertler — was one of 47 universities that met in Paris in advance of the 2019 G7 Summit. The group of universities, from 18 countries, belong to the U7+ Alliance, which was established by France as a way to dig deeper into the issues to be discussed by world leaders at the G7 Summit in Biarritz.

At the U7+ meeting, the group reached an agreement on how post-secondary institutions can play a leadership role in addressing urgent global issues and unanimously adopted six commitments that tackle five major challenges: the key role of universities in a global world, climate change and energy transition, inequality in societies, technological transformations, and community engagement and impact. Equally important, the U7+ leaders drafted a series of "action items" related to each principle.

The University of Toronto played an instrumental role in drafting the principle that speaks to climate change. U of T also championed tangible actions that several universities have chosen to implement, including commitments to improve energy efficiency, reduce their green house gas emissions, and provide all their students with access to courses related to climate and sustainability.

After the U7+ meeting, university leaders presented their work to French President Emmanuel Macron at a dinner reception that took place at the Élysée Palace. At the event, President Gertler briefed Macron on the U7+ Alliance's commitment to addressing climate change.

READ MORE >

utoronto.ca/news/obligation-fill-vacuum-u-t-president-meric-gertler-leads-climate-change-discussion-paris-summit

ENSURING FISH ARE SAFE TO EAT IN THE CANADIAN NORTH

UNIVERSITY OF WATERLOO

Waterloo researcher works alongside Indigenous communities to combine traditional knowledge with western science

In 2011, Heidi Swanson's phone rang. An unfamiliar voice said, "Hi, Heidi? This is George. I heard you work on fish mercury and that you are good at working with communities."

Eight years later, Swanson and George, who turned out to be George Low, coordinator for the Dehcho Aboriginal Aquatic Resources and Oceans Management program in the Northwest Territories, are planning their seventh field season together.

In the Canadian north, subsistence food fishes such as the lake trout are integral to Indigenous communities, both in terms of food security and culture. However, balancing the health risks and benefits of eating these fish remains a complex problem because northerners are wary of both perceived and real risks of mercury contamination of their lakes and rivers.

Swanson, a professor and researcher in the Department of Biology, has been using a community-centred research approach that is proving invaluable by creating lasting solutions. Northern Indigenous communities are involved in all stages of her research. Together, they ask questions, sample lakes and rivers, analyze results and implement solutions informed by both science and traditional knowledge.

"We fish together, hunt together and cook and live together," Swanson says. "They teach us about what their traditional foods and land means to them, and we teach them some transferable skills in environmental sampling and community-based monitoring."

Every two years, Swanson and her colleagues share their results with the communities, where the public is invited to attend and discuss the best ways to act upon key findings.

Indigenous peoples in Canada are often faced with unique challenges in terms of their access to safe water and the traditional foods they source from it. As global warming affects the north more acutely than other regions of the globe, it places additional strain on aquatic ecosystems. The issue of water as a human right for Indigenous peoples in Canada will be explored in depth at the University of Waterloo on World Water Day on March 22 as five notable Indigenous women will speak as panelists at the Water Institute's annual World Water Day.

READ MORE >

uwaterloo.ca/stories/ensuring-fish-are-safe-eat-canadian-north
uwaterloo.ca/world-water-day/

LEADING THE CHARGE ON CLIMATE CHANGE

"Listening to and appreciating the diverse views of young people will help us turn the vision of a more peaceful and prosperous planet into a reality."
Rt. Hon. Justin Trudeau, Prime Minister of Canada and Minister of Youth

Western's second-year integrated engineering student Elijah Dietrich joined the Prime Minister's Youth Council (PMYC) in June 2018, serving alongside 20 other young Canadian leaders aged 16-24. Initiated in 2016, and choosing its members from a pool of over 16,000 applicants, the PMYC advises the prime minister and the Government of Canada on policies and programs that are important to young Canadians.

The Youth Council members are provided with engagement opportunities to take action on the issues that are important to them, including employment, mental health, innovation, environment, and climate change.

Dietrich's passion lies in environmental stewardship. He founded his high school's Environmental Action Committee and has conducted multiple research trips to study climate change in Churchill, Manitoba, and in the Arctic Sea.

In December 2018, an opportunity arose for Dietrich to join the Canadian Youth Delegation to attend the annual United Nations Climate Change Conference (COP24), held in Katowice, Poland. He was one of two PMYC members to take on the once-in-a-lifetime opportunity and attend COP24, representing the interests of young Canadians in the development of international environmental policy.

"I believe that youth are in a perfect position to mitigate climate change and its devastating effects through technological entrepreneurship," said Dietrich. "Attending COP24 proved to be an incredible opportunity to learn what needs to be done to mitigate the climate crisis directly from the scientists studying it, and to make it clear to decision-makers that stronger action is urgently needed."

Over the course of the conference, Dietrich attended and reported on the progress of negotiations pertaining

to Article 6 of the Paris Agreement, which covers market mechanisms and private sector engagement.

Outside the negotiations, Dietrich spoke on a panel of commentators, where he called on youth who live in fossil fuel-dependent economies, such as Alberta, Venezuela, and Poland, to lead the charge on initiating and framing a just transition to a decarbonized economy.

"It should be up to youth in these areas to lead the charge on framing what a just transition looks like and how it can be effectively executed," said Dietrich. "At the end of the day, today's youth will be the people who bear the brunt of climate change and its related transitions."

Dietrich's two-week experience at COP24 allowed him to make connections with politicians, advisors, scientists, researchers, and other youth from Canada and around the world. Making these connections, both globally and locally, have helped Dietrich to discover his niche.

READ MORE > https://www.eng.uwo.ca/media/news/2019/leading-the-charge-on-climate-change.html

OPERATIONS

Stories in this theme focus on how the university is changing how it does business to reduce its environmental (especially GHG) footprint. Stories may include retrofitting or constructing buildings, procurement, or improved use of transit, etc.

FROM ALGORITHMS TO ENERGY: HOW UALBERTA IS INNOVATING SOLAR TECHNOLOGY

What do algorithms and sunshine have in common? Together they can create green energy as part of the University of Alberta's newest sustainability partnership on solar photovoltaic mapping. Solar photovoltaic arrays, more commonly known as solar PV panels, are a green energy alternative that converts sunlight into electricity without creating greenhouse gas emissions. Though they're often installed in sunny, high up places, like rooftops or balconies, solar panels can't simply be installed anywhere the sun shines—the proper locations need to be chosen. With the support of University of Alberta's Energy Management and Sustainable Operations (EMSO), Dr. Mustafa Gül, Associate Professor of Engineering at the University of Alberta and his team created a computer algorithm to map out potential locations for solar panels across campus. Using simple rooftop photos, the team's research model can estimate the best locations for the panels as well as how many can be installed on any given building. Dr. Gül, who shared his excitement about the project, said he is looking forward to helping the University of Alberta achieve their sustainability goals as well as laying the groundwork for other universities to benefit from solar PV mapping. "The technology we are developing can be applied to other campuses, communities, and even cities in the future," said Dr. Gül. As we continue to expand our sustainability practices, solar mapping technology will help us make better decisions about how and where to use solar panels and how to integrate solar technology within our energy systems. But this is just one example of the many partnerships on campus focused on sustainability. Since the creation of the Energy Management Program in 1975, the University of Alberta has completed numerous energy conservation projects, saving over $390 million in utility costs and avoiding over 2.8 million tonnes of greenhouse gas emissions. That's equivalent to the emissions from about 7,200 Canadian households each year, for 40 years. Knowing sustainability work is never done, the University of Alberta continues to pave the road green by partnering with researchers, discovering innovative ways to reduce greenhouse gas emissions, energy consumption, and our environmental footprint.

"The technology we are developing can be applied to other campuses, communities, and even cities in the future," said Dr. Gül.

UBC ACHIEVING AMBITIOUS EMISSIONS REDUCTION WITH CAMPUS AS A LIVING LABORATORY FOR SUSTAINABILITY

As a community of over 80,000 students, faculty, staff, and residents—with a vast network of university-owned utilities and infrastructure—UBC is uniquely positioned to enhance operational sustainability by acting as a test bed for innovative climate solutions. Using Campus as a Living Laboratory, UBC brings together operations teams, researchers, students and industry partners to experiment with new ideas, implement them on campus and demonstrate their potential.

These Living Lab projects showcase the real-world impact of emerging sustainability solutions and have enabled UBC to meet aggressive greenhouse gas emissions (GHG) reductions targets. Despite an increase in both building space and student enrolment, UBC has achieved a 34 per cent reduction in emissions from a 2007 baseline and is now on track to reduce emissions by 67 per cent by 2021.

But the impact extends beyond UBC. Living Lab projects are attracting global interest, and UBC is working with partners across Canada and around the world to promote the adoption of these new technologies and drive real-world change.

The BioEnergy Research and Demonstration Facility (BRDF) is one of UBC's flagship Living Lab projects. A first in North America, the system processes renewable biomass to generate thermal energy for heating campus buildings. The facility has reduced UBC's reliance on fossil fuels by providing a quarter of campus heating needs and eliminates 14 per cent of campus GHG emissions.

UBC Bioenergy Research & Demonstration Facility. Photo Credit: Don Erhardt

The BRDF initiative began as a partnership between UBC Operations, researchers, students, governments, and a number of industry partners including the BC Hydro, Nexterra Energy Corporation, GE Power and Water, Canada Wood Council, BC Bioenergy Network and FPInnovations. Government of Canada investments, in partnership with the Government of British Columbia, were instrumental in making this innovative project a reality, with funding support from Natural Resources Canada and Western Economic Diversification Canada. After the BRDF concept was proven successful at UBC, Nexterra went on to develop similar facilities in the UK and additional bioenergy facilities are being explored locally in Canada.

Work is currently underway on an expansion of the BRDF, which will nearly double the heat production capacity of the facility and eliminate an additional 14,500 tonnes of GHG emissions annually. The expansion is being made possible by Environment and Climate Change Canada's investment of $7.6 million through the Low-Carbon Economy Fund.

The BRDF has engaged students, researchers, faculty and staff on all levels to learn about UBC's energy systems and further their studies. More than 1,000 people tour the biomass facility each year to learn about the technology, the building and how this unique facility supports campus life.

CANADA GREEN BUILDING COUNCIL'S (CAGBC) NEW ZERO CARBON BUILDING STANDARD

The University of Calgary is one of 16 participants, and one of only three post-secondary institutions across Canada, to take part in a two-year pilot program to help finalize the Canada Green Building Council's (CaGBC) new Zero Carbon Building Standard.

Pilot program participants aid in the development of tools, resources and education to drive change in the green building industry. The Zero Carbon Building Standard links greenhouse gas emissions with green building performance in Canada.

A zero carbon building is a highly energy-efficient building that produces onsite, or procures carbon-free renewable energy to offset the annual carbon emissions created by building operations and the day-to-day activities of the occupants of the building.

"This opportunity allows the University of Calgary to play a leadership role in sustainable building design in Canada with the redevelopment of the MacKimmie Complex as one of the first projects striving for certification with CaGBC's new Zero Carbon Building standard," says Joanne Perdue, chief sustainability officer. "Participation in the pilot program also aligns with our Institutional Sustainability Strategy and the goals outlined in the Framework for Sustainability in Administration and Operations of aspiring to attain net carbon neutrality and becoming one of the most energy-efficient campuses in Canada."

MacKimmie Complex and Professional Faculties Building Redevelopment: One of the most energy efficient post-secondary buildings in Canada

The timing was perfect for the university to apply for consideration for the pilot program earlier this year. "Right from the start of the MacKimmie Complex redevelopment we set out to design an energy-efficient building," says Boris Dragicevic, associate vice president, Facilities Development. "Our participation in this pilot program offers us the opportunity to learn from our peers how this might be made possible within an Alberta context with an eye to fiscal responsibility, while still delivering the space and program that supports the needs of our campus."

The MacKimmie Complex Redevelopment Project will also be a showcase for the University of Calgary Campus as a Learning Laboratory (CLL) initiative. Students and faculty will have the opportunity to connect research with design, construction and operational challenges related to achieving zero carbon through experiential learning and applied research project on sustainability in the built environment. Research projects could range from life cycle assessments, research on energy efficiency and renewable energy strategies and technologies, to data visualization of building performance metrics and development of apps to help influence how occupants contribute to reducing building energy use.

"The most exciting part of participating in the pilot program," says Perdue, "is that we will be renewing the MacKimmie Complex for the next 50 years through a focus on clean tech innovation, while providing important research and experiential learning opportunities."

READ MORE >

ucalgary.ca/news/ucalgarys-mackimmie-complex-help-drive-canadian-green-building-standard
ucalgary.ca/news/mackimmie-tower-ucalgarys-first-net-zero-carbon-building-opens-its-doors

SUSTAINABILITY SUCCESSES

DALHOUSIE UNIVERSITY

More than a decade into its mandate, Dalhousie's Office of Sustainability is a more integral part of the university than ever, engaging in everything from planning and policies to building, retrofits, and day-to-day operations.

Here are two of the major successes the office, university and external partners have made in recent years.

IDEA Building

Opening of the IDEA Project

As Dalhousie undertook the most sweeping transformation of its downtown Sexton Campus in decades as part of the IDEA Project, it did so with sustainability top of mind. Officially opened in fall 2018, the renewed campus is now a beacon of sustainability at the university.

Major renovations to a number of existing buildings, outdoor improvements, and the construction of two new buildings — the Emera IDEA Building and the Richard Murray Design Building — were all undertaken with a commitment to green-focus practices in areas of renewable energy (solar and geothermal infrastructure), waste, water (rainwater cistern), natural and urban environments, living buildings (green roof) and transportation.

Outside the Emera IDEA Building, an active-transportation (or "green") corridor cuts across the campus from Spring Garden Road to Morris Street creating a link to other active-transportation infrastructure. It includes dedicated space and markings for pedestrians and cyclists, permeable pavers, and native vegetation.

Both LEED candidate buildings were constructed targeting a Gold certification, with a stretch goal targeting Platinum. If the latter is achieved, it will be a first for Dalhousie.

A (bio)massive achievement

Dal's Agricultural Campus has its sights set on being completely carbon neutral — a goal highlighted at the opening of

the new Biomass Energy Plant, which celebrated its grand opening in the fall of 2018.

The renewed plant and district energy system, a $26.5-million project that began operation in summer of 2018, burns biomass fuel in a thermal oil heater. This heat moves a new 1 MW turbine to create electricity — an organic rankine cycle (ORC) system that's the first of its kind on a North American university campus. It's technology that places Dal on the leading edge of sustainable technology and renewable energy practices.

"We have taken a 30-year-old traditional heating plant and renewed it to be a cutting-edge biomass system that meets our campus heating needs and creates electricity that we then sell back to Nova Scotia Power," explained David Gray, Faculty of Agriculture dean and campus principal, at Tuesday's event.

The project also saw the entire Ag Campus steam distribution system replaced with a district hot water system — 2.6 km of piping. The waste heat from the electricity generated is used to heat the campus. The result is a system that, overall, is 30 per cent more energy efficient.

YouTube youtube.com/watch?v=o8EgQbuLfjw

ACHIEVING AND MAINTAINING CARBON NEUTRALITY

Credit photo: Julie Moffet

Université Laval is the only Quebec university to have achieved carbon neutrality and the first Canadian university to have done so without being legally obliged to do so. The accomplishment of this audacious objective was a key factor in Université Laval winning many prizes and distinctions in sustainable development. It was awarded, in 2016, the gold level of the STARS certification, by the Association for the Advancement of Sustainability in Higher Education. This recognition is all the more important because the university ranks first in Canada and second in the world among the 800 or so universities registered. This achievement also led Université Laval to receive the prestigious International Green Gown Award in 2016. In Canada, Université Laval also distinguished itself in 2019 by winning the SDG Leadership Award presented by Global Compact Network Canada. In particular, the award highlighted the university's achievements related to its ambitious climate change goals.

Since 2015, Université Laval has maintained its carbon neutrality through consistent efforts to improve the campus's energy efficiency. For example, the pipes initially designed to cool buildings are now used to transfer heat from one pavilion to another by means of 24 heat pumps. The implementation of this system reduces GHGs by approximately 3,500 tonnes a year. In addition, an automated system containing close to 60,000 control points remotely manages the heating, ventilation, air conditioning, filtration, thermal wheels, heat pumps and laboratory fume hoods located in various buildings on campus. Université Laval was also the first university in Quebec to replace 8% of its annual natural gas consumption with renewable natural gas. Through its partnership with Énergir, this substitution makes it possible to reduce the university's emissions by the equivalent of 1,888 tonnes of CO2 annually.

To offset its GHG emissions which cannot be reduced, Université Laval relies, among other things, on the Montmorency Forest carbon sink, which is its teaching and research forest and the largest carbon sink in the world (nearly 400 square km), as well as on the management of part of the forest area owned by the Séminaire de Québec. The team responsible for forest activities there follows best practices in sustainable forestry management and conducts research on forest carbon management. Rigorous methodology makes it possible to measure the quantities of carbon sequestered in this way. For example, for the year 2017–2018, the university's activities generated the equivalent of 26,466 tonnes of CO2. The Montmorency Forest sink was able to capture the equivalent of nearly 1,400 tonnes of CO2. The remaining 12,000 tonnes were mostly sequestered on the Séminaire de Québec's property or through other carbon offset projects supported by Université Laval in Quebec and internationally.

SUSTAINABILITY STRATEGY 2019-2023

UM was an early leader in the move to reduce its resource usage and environmental footprint, releasing a Sustainability Strategy in 2016 and the most recent update in 2019.

The new Sustainability Strategy 2019-2023 provides a roadmap for the University of Manitoba's continuous improvement toward ecological, social and economic aspects of sustainability. The plan outlines the actions to be taken over the next five years toward pressing issues such as climate action, resource conservation and pollution prevention; ecological systems; Indigenous achievement and resurgence; wellness and accessibility; innovation and governance; teaching and learning; and community connection and engagement.

A key component to the new strategy is to build upon the existing Sustainable Development Goals (SDGs) outlined by the United Nations. Through partnerships with the Office of Sustainability, staff, students and communities can foster new learning and research opportunities while finding solutions that integrate ecological renewal, social resilience and economic prosperity, on campus and beyond.

"The goals and commitments defined in this strategy will foster new learning and research opportunities, deliver social and environmental benefits to our community and contribute to the sustainable financial management of the University. The University of Manitoba is committed to continuing

our path to a more sustainable future and this strategy is another step in a more sustainability direction," stated Andrew Konowalchuk, Associate Vice-President (Administration).

Since the previous strategy was introduced, a variety of new and exciting initiatives have been introduced at the University, such as:

- implementing a restoration and enhancement plan for the University's riparian zones to control invasive species and riverbank stabilization
- continuing to track sustainability progress through STARS to maintain the University's current Gold status, and pursue opportunities to achieve Platinum rating
- creating and implementing an organic waste management program to reduce the amount of waste being sent to the landfill
- creating a bike share program
- continued collaboration between administrative units and Indigenous leaders, faculty, staff and Elders to implement the Indigenous Planning and Design Principles, documenting lessons learned from each project while continuing to refine the process
- creating a climate action plan that includes targets for emission reductions, resilience and adaptation, and considering the financial benefits of planning

These are only a few examples of the University's ongoing commitment to sustainability. Visit our new strategy webpage for more information

READ MORE > umanitoba.ca/campus/sustainability/strategy/index.html

MCGILL COMMITS TO CARBON NEUTRALITY BY 2040

McGill is committed to safeguarding our planet for future generations to come and implementing more sustainable practises for every day operations. Released in November 2017, the Vision 2020 Climate & Sustainability Action Plan (2017-2020) is designed to expand and enhance the University's commitment to sustainability. The Action Plan also outlines a number of initiatives to lower McGill's own carbon footprint, and is the result of an extensive consultation process that engaged over 500 McGill community members.

To set the University on the right path, two long-term targets were set to guide the Action Plan: achieve carbon neutrality by 2040 and attain a Platinum sustainability rating by 2030.

McGill's own plan for carbon neutrality includes strategies for campus energy systems, air travel, and commuting policies, among other emissions sources. Achieving carbon neutrality by 2040 means that McGill will eliminate its greenhouse gas emissions – currently 54,060 tonnes – through significant carbon reduction and, to a lesser extent, carbon sequestration and carbon offsets. This amounts to the equivalent of taking 11,576 cars off the road.

"We knew that if we were going to address climate change on campus, we needed to think beyond 2020. That is why we set these long-term targets," says Sustainability Director, Francois Miller. "Addressing a challenge like this – arguably the defining challenge of a generation – requires us to go towards a more longstanding vision of change."

The Action Plan outlines twenty-two short-term actions across five areas (Research, Education, Connectivity, Operations, and Governance & Administration), many of which will move the University closer to achieving this goal by 2030. McGill also entered a new and exciting chapter this January by starting the consultation process leading to the Next Climate and Sustainability Strategy.

Actions under operations include addressing emissions from McGill's fleet of vehicles, optimizing the environmental performance of campus buildings and developing a waste reduction and diversion plan.

READ MORE > reporter.mcgill.ca/climate-ad-sustainability-action-plan-commits-mcgill-to-carbon-neutrality-by-2040/

THEY'LL DESIGN PARADISE AND UNPAVE A PARKING LOT

McMaster University

Parking Lot M is getting a lot greener.

A group of artists, professors, students and others plan to reclaim and redesign a part of McMaster's west campus and wetlands, while still creating space for the university's logistical needs, like parking and outbuildings.

Designing Paradise, which begins this month, is the latest in a series of initiatives that has looked at reimagining the west campus from an environmentally sustainable perspective.

2013's Mapping Paradise was the beginning: a movement by professors and a number of community partners, including Randy Kay of Restore Cootes, to reclaim part of parking lot M for a marshland research facility. That phase of the project had studio art students working with visiting professor Gregg Schlanger to come up with ideas for restoring the wetland – eventually known as MACMarsh – culminating in a public exhibition.

Paradise Revisited, a six-month project begun in 2017, sought to re-acquaint the surrounding community with McMaster's rich landscape – including MACMarsh and the surrounding area – through field trips, panel discussions, art exhibits and other activities.

Eventually, a 30-metre buffer was established around the lot, reducing the amount of toxic runoff into nearby Coldwater Creek.

Designing Paradise is the latest in a series of moves to remediate and redesign McMaster's west campus.

Throughout those projects, McMaster professors, including Mike Waddington and Susan Dudley in the Faculty of Science, have been conducting research: fish counts, hydrology models and other work to determine the health of the natural environment and its significance to the larger ecosystem around Cootes Paradise and beyond.

"Coldwater Creek is one of two cold-water creeks left running into Lake Ontario," explains Daniel Coleman, a McMaster English professor and the author of Yardwork, which recounts the complicated natural and human history of his backyard, which backs onto the west campus.

"This cool water is necessary to maintaining the temperature of Cootes Paradise for spawning – and now that Cootes is warming, the health of these creeks is more important than ever."

YouTube dailynews.mcmaster.ca/articles/theyll-unpave-a-parking-lot-and-put-up-paradise/

READ MORE > dailynews.mcmaster.ca/articles/theyll-unpave-a-parking-lot-and-put-up-paradise/

A UNIVERSITY OF MONTREAL INNOVATION

Université de Montréal

During the construction of the MIL campus pavilions, *Projets éphémères* [temporary projects] were started on the work site. Thus, from April to October, an unused portion of the site was used for educational, cultural and rallying activities for residents from neighbouring communities.

The *Projets éphémères* started in 2013 through the support of many partners. Currently, an area of 12,000 m2 is used to host approximately 30 partners. Gardens, bee hive, tree nursery, container village, belvedere lookout, conference hall and sculptures are reminders of the richness of projects that take place there. Urban agriculture plays an important role and a number of activities take place there on the themes of ecological transition, the nourishing city and urban planning with a constant concern for improving the quality of life of residents living near the construction site. Many cultural, social, community and scientific activities are still part of the program, including a sugar shack, an urban agriculture summer school, a rich outdoor film program, the *Nuit des perséides* [meteor showers] and talks on many topics.

Some beneficial impacts

1. The site is a place of learning and education for residents of all ages who are seeing the city transform under their eyes through the adoption of sustainable development practices;
2. The site makes it possible to hold events related to subjects taught at the University of Montreal;
3. The greening of paved surfaces contributes to reducing heat islands;
4. Better surface water retention avoids having them flow too quickly in the pipes;
5. Concrete links are created with local organizations that participate in the neighbourhood's beautification and life;
6. Air quality is improved as a result of the capture of air pollutants by plants;
7. First prize winner in 2016 at the City of Montreal's environment and sustainable development gala;
8. A different place, which is unique and much envied!

UOTTAWA: A LEADER IN SUSTAINABLE CAMPUS OPERATIONS

The University of Ottawa is a leader among universities globally in our sustainability practices and our adoption of responsible investment policies and procedures.

Our campus sustainability measures date to 1974, when we first started tracking our energy consumption. More recently, we have vowed to reduce our carbon footprint by at least 30% by 2030. aligning with Canada's national climate commitment. Since 1992-93, the University's floor space has grown by 62.7% and its population has nearly doubled; however, our energy consumption is the same as it was three decades ago thanks to sector-leading efficiency measures. As our systems become more efficient, our GHG emissions are actually dropping.

We have set a target to reduce energy consumption by 2% annually. Since 2005, our EcoProsperity initiative has invested over $18M in a series of projects that reduce a building's energy consumption by 24% or more. These deep energy retrofits play a pivotal role in reducing uOttawa's GHG emissions and include measures such as: replacement of outdated systems with efficient technology, and heat recovery systems which harvest waste heat. We even go so far as to harness the body heat produced by the people who work and study in our facilities.

As a concrete example, the 1972 Morriset library underwent extensive energy retrofits in 2013 and is now partially heated by the users themselves. The return on the $2M investment has been a 33% reduction in electricity consumption, with a financial payback period of 4.4 years. We recently completed our 9th and 10th building retrofits, reducing their CO2 emissions by 2,263 tonnes a year, the equivalent of removing 686 vehicles from the road.

In 2019 uOttawa was the highest ranked Canadian institution in sustainable transportation on the Sustainable Campus Index (SCI). This international ranking recognizes our efforts to encourage ride-sharing, biking, walking and public transit, and an employee bike fleet. Over 87% of our community uses sustainable transportation methods to commute to campus. We are moving toward a car-free campus core, which will reduce exposure air pollution and help create a clean air community.

uOttawa was the first Canadian university (and the second university globally) to sign the Montreal Carbon Pledge in November 2015.

Our new strategic plan, Transformation 2030, includes sustainability as a strategic pillar, including sustainable infrastructure growth. The accompanying Strategic Areas of Research identify creating a sustainable environment as a research priority.

In 2016, uOttawa's Board of Governors adopted *Addressing Global Warming: The uOttawa Response* that outlines how we will continue to take a leadership role on climate change. Initiatives focus on responsible investment, finding ground-breaking solutions on climate change through our research and teaching and continuing to reduce our campus' carbon footprint. One of the initiatives is to gradually shift uOttawa's fossil-fuel related investments towards investments in enterprises, especially in Canada, involved in creating and selling technologies of the future, including renewable energy and other clean technology solutions. A report on overall climate change actions is presented to the Board annually.

SOUL FOOD

Queen's Soul Food is a student run organization which delivers the unconsumed food from Queen's University campus cafeterias to local Kingston shelters every night. The organization was founded in 2007 and has now expanded to bring the unused food from both Leonard Hall and Ban Righ Hall cafeterias to four local shelters as well as the Kingston Street Truck Mission in the winter.

Soul Food is a great way to get involved with the Queen's community and with the Kingston community as a whole. The aim is to raise awareness not only of the help that can be provided to the local shelters, but also to bring awareness and raise questions about personal food consumption. Soul Food's initiatives create an effective way to gain first-hand exposure to the difference that more thoughtful food consumption can create.

Food that is not collected by Soul Food is also shared with Loving Spoonful Kingston to support their food reclamation program. These food items are distributed to a variety of agencies within the community, providing quality and fresh meals for those who are in need.

CAMPUS COMPOSTING SHINING EXAMPLE OF SUSTAINABILITY-IN-ACTION

The University of Saskatchewan (USask) is the first University in Canada to install a food waste dehydrator that is able to divert up to 650 pounds of food waste from the landfill every day by creating a semi-composted material that is being put to use elsewhere on campus.

The composting initiative has involved changing habits in the dining hall kitchen with staff using compost bins, which now outnumber garbage bins. Culinary Services Assistant Director and Executive Chef James McFarland states that "It's a group effort and it takes everyone's regular attention to ensure it's successful. Having access to this dehydrator and understanding the benefits has been a great learning experience and the staff have been great in supporting this."

Photo Cutline: U of S Grounds Manager Gift Marufu (left) and Culinary Services Assistant Director James McFarland put the new dehydrator to use for the first time at Marquis Hall

Although USask already has a vibrant composting program on campus, where leaves, grass clippings and materials from greenhouses are collected and are producing about 2000 yards of compost annually, the dehydrator adds to this by taking campus food waste and transforming it into a nutrient-rich material that's great for plant growth. This composted material is then distributed to community gardens and the flower beds located on campus. This compost is also used instead of conventional fertilizers in areas such as the soccer fields operated by the University.

A more compact version of the machine was initially installed at USask in early 2017 as part of the demo phase, where staff worked to smooth out any initial issues. A larger, more powerful version was brought to campus soon after. While there has been some work implementing the machine, from configuring electrical and plumbing, to training staff on how to use the equipment it's been an investment that's paid off in a number of ways.

By diverting over 4,000 pounds of food waste from landfill every week, there are associated costs with garbage pick-up that USask no longer needs to pay. USask is also self-sufficient now for all campus-wide compost needs as all materials are now developed in house. The compost has even found its way to the rooftop gardens located on campus. MacFarland says that the partnership with the rooftop gardens are a significant highlight as they show the "full circle of sustainability" as the food grown at the gardens has found its way back to campus kitchens.

And with word of the project getting out, there has been plenty of positive feedback as well as interest from other areas of campus including student groups making the future bright for this USask initiative.

LOW CARBON ACTION PLAN AND GEOTHERMAL EXCHANGE PROJECT

The proposed King's College Circle Geothermal Project is predicted to yield annual greenhouse gas (GHG) reductions of 15,000 tonnes of carbon dioxide equivalent by the year 2024 (photo by Muhanad Sidek)

The University of Toronto has unveiled an ambitious Low-Carbon Action Plan that will propel it towards its goal of cutting greenhouse gas emissions by 37 per cent from 1990 levels by the year 2030 and put it on a path to becoming a "net-zero" institution.

From energy-efficient buildings and carbon-capture schemes to forest management strategies and collaborations to test green technologies, the five-year plan aims to bring U of T 80 per cent closer to its 2030 target by the year 2024.

One new sustainability project proposed under U of T's Low Carbon Action Plan aims to make the earth beneath the expansive lawn at the heart of the St. George campus the site of a geo-exchange system. Boreholes would be drilled deep into the ground to allow for storage of surplus heat, generated by mechanical systems in the summer, for use in the cold winter months.

In effect, the system would use the Earth as a thermal battery for the storage of so-called reject heat, which is typically discarded into the atmosphere. The resulting geothermal field is projected to service the heating needs of several buildings, including the Terrence Donnelly Centre for Cellular and Biomolecular Research and the Leslie L. Dan Pharmacy Building. These buildings are currently heated by natural gas, a high-carbon fuel, and will be renovated to fully attain the benefits of the geoexchange energy.

The King's College Circle Geothermal Project will be the largest known geoexchange project of its kind in urban Canada and is predicted to yield annual greenhouse gas (GHG) reductions of 15,000 tonnes of carbon dioxide equivalent by the year 2024, making it the single biggest contributor to U of T's annual emission-reduction target.

READ MORE > utoronto.ca/news/u-t-s-proposed-geoexchange-project-front-campus-one-urban-canada-s-largest

CLIMATE AND ENERGY ACTION PLAN

UNIVERSITY OF WATERLOO

Overview
Waterloo is in the process of developing the first ever Climate and Energy Action Plan (CEAP) for the campus. The University has acknowledged that it has a role to play in addressing the pressing global challenge of climate change, which will impact communities locally and around the world.

Waterloo already mobilizes world-renowned teaching and research related to the development of a sustainable, low-carbon future, including interdisciplinary research institutes, innovative curriculum, and cross-sector partnerships.

The Climate and Energy Action Plan will develop a roadmap for how the University can address climate change by reducing emissions generated through campus operations. Although this roadmap will stretch to 2050, it will integrate an ongoing monitoring and regular review process that splits specific actions into more manageable increments.

The planning process is being led by the Climate and Energy Working Group of the President's Advisory Committee on Environmental Sustainability. For more information, contact sustainability@uwaterloo.ca.

Purpose
The CEAP will form Waterloo's institutional response to the challenge of climate change. It seeks to reduce emissions, optimize operational costs, and improve energy efficiency.

To keep Waterloo's action aligned with a science-based approach, the Climate and Energy Action Plan will seek to achieve carbon neutrality by 2050.

This will support commitments and requirements that the University has made, including:

- to fulfil objectives of the Environmental Sustainability Strategy
- to fulfil the joint commitment made through the Council of Ontario Universities to develop a roadmap to a low-carbon campus, and
- to support and advance beyond legislative compliance
- In addition, the action plan would support the following benefits to the University community:
- Supporting improvements to the indoor quality and comfort of teaching and learning facilities
- Improving outdoor air quality
- Supporting community action to reduce emissions, locally through globally
- Identifying and managing long-term risk exposure
- Managing long-term utility cost exposure
- Optimize investment into facilities renewal
- Enabling further teaching, learning, and research opportunities using the campus as a living laboratory for social change

READ MORE >

uwaterloo.ca/sustainability/projects-and-initiatives/energy-and-climate-change/climate-and-energy-action-plan

STRAW POLL: WESTERN CHOOSES PAPER OVER PLASTIC

Western is taking steps in September towards becoming a campus free of plastic straws, even as Starbucks works to eliminate single-use plastic straws from all its locations by 2020.

The push to eliminate plastic straws is an environmentally conscious move for food service providers, an industry that generates significant waste, said Craig Clifford, Residence Operations Manager and Procurement Manager within Hospitality Services.

At Western, plans are underway to introduce paper straws in time for the start of the next academic term.

"We've been considering this for well over a year; we've been doing our research and many companies are moving to a straw-less, paper straw or biodegradable-straw alternative. And that is what we are looking at," Clifford said.

Starbucks this week became the largest food-and-beverage company to announce a ban on plastic drinking straws. In June, McDonald's and A&W restaurants announced they would also test alternatives to plastic straws across their franchises.

While Western's Hospitality Services does house chain franchises that may need more time to catch up, residences and non-franchised food eateries at Western will offer a paper alternative to the plastic straw, Clifford noted. Three different sizes will be available to accommodate the campus community, with a regular-sized drink straw, a wider option for smoothie-based beverages and a large straw that would be suitable for drinks such as bubble tea. Plastic straws will be available upon request.

"Food services is a big producer of waste. We've been looking at what we can do to minimize our footprint on campus, whether it be waste diversion, recycling or local purchasing – straws are fairly new to (these efforts). We are working closely with our marketing team on some education for students and the Western community, and we will continue to work with our franchise partners. Most of them have something in the works that may or may not be ready for September," Clifford noted.

"It will be a shock to everybody when they come back in September and wonder, 'Hey where are the straws' or 'Where is my plastic straw?' We will have this paper alternative; it will be a welcome initiative and choice for people because I think everybody is wanting to do the right thing. You just have to make it easy for them."

READ MORE > news.westernu.ca/2018/07/straw-poll-western-chooses-paper-plastic/

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