PICS
PACIFIC INSTITUTE
FOR CLIMATE SOLUTIONS

SPECIAL 10TH ANNIVERSARY EDITION

Annual Report 2017-2018

University of Victoria

UBC THE UNIVERSITY OF BRITISH COLUMBIA

SFU SIMON FRASER UNIVERSITY ENGAGING THE WORLD

UNBC UNIVERSITY OF NORTHERN BRITISH COLUMBIA

PICS is hosted by the University of Victoria in collaboration with the University of British Columbia, Simon Fraser University and the University of Northern British Columbia.

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All Hands on Deck

In 2018, the Pacific Institute for Climate Solutions (PICS) passed an historic milestone, marking 10 years of pioneering research on climate change mitigation and adaptation solutions.

The creation of PICS reflects a drive and a belief in British Columbia that we can make a difference and that we have the talent to carve a path toward a low-carbon economy. I am proud to see that sentiment today is stronger than ever, reflected in the next generation of climate solutions leaders arising from our research partnerships and in the capacity we have helped build in this province.

In 2008, PICS was the first-of-its-kind climate research collaboration between its host, the University of Victoria, and Simon Fraser University, the University of British Columbia, and the University of Northern British Columbia. Our goal then remains paramount today: to develop innovative, evidence-based climate solutions knowledge that is actively used by decision makers within BC, yet scalable beyond.

PICS researchers have published more than 200 papers and reports, deepening our understanding of the complex challenges a changing climate brings to our economy, communities, and ecosystems. Through publications, conferences, and meetings, our work has helped inform public policies and private-sector investment decisions on carbon economics, vehicle electrification, forest carbon management, net-zero energy buildings, climate resilient communities, and much more.

It is now time to build on this success. With the latest assessment from Environment and Climate Change Canada showing that this nation is warming at twice the rate of the global average, the need for solutions has never been greater.

Now, as we start our second decade, we are extending the reach and impact of our research and engagement programs (see page 18). Our new Strategic Plan (2017-2022) brings a more in-depth, collaborative approach than ever before. We will not only connect academic researchers with "solution seekers" from government, industry, our communities, and NGOs within Canada and overseas, but will also ensure these research teams carry projects from vision to implementation, working together every step of the way so results are timely and put to use.

This special "Anniversary Edition" Annual Report is something of a time machine. Not only does it point the way forward, it profiles the diversity of our institute's work over the past two years, and the past decade. And if it looks and feels a little different, that's because it marks the debut of our fresh new visual identity and brand.

I am very proud of the climate solutions research capacity we have built in this province and am excited to launch into our next chapter. From our talented student interns to our scientists and project leads, I know all will continue to accelerate climate solutions in British Columbia, across Canada, and potentially, around the world.

Dr. Sybil Seitzinger
Executive Director

A Decade
Advancing Solutions

In 2018, the Pacific Institute for Climate Solutions (PICS) marked its first decade of building BC's capacity to deliver cutting-edge climate-solutions research.

The University of Victoria hosts and leads PICS in collaboration with BC's three other research-intensive universities: Simon Fraser University, the University of British Columbia, and the University of Northern British Columbia.

The four institutions are the pillars of what has grown to be a research network that engages key stakeholders, advances climate solutions, and informs policy leadership.

Calculating our Contribution

Over the course of the past decade, the institute has supported solutions-focused research projects across the four PICS universities. More than 140 post-graduate students and 24 post-doctoral fellowships have received funding. Research results include 120+ journal articles, 32 white papers with policy recommendations, 37 specialist reports, and 43 briefing notes for policymakers. Nearly 100 PICS interns have assisted government, industry, and community organizations' climate-related work. PICS has hosted or supported hundreds of lectures, workshops, and technical briefings for policymakers and industry, as well as climate outreach events for the public.

Phase 1
Building The Foundation

Startup: The Province of British Columbia establishes PICS with a major endowment.

PICS launches first round of Fellowships worth $800,000 for 39 graduate-students and postdocs.

The IPCC publishes Michael Mann's "Hockey Stick" graph, correlating industrialization with rising CO_2 levels. (PICS hosts public talk with Mann in 2012.)

2008

2009

2010

2011

PICS releases eight academic white papers; topics include cap-and-trade carbon pricing, adaptation, and alternative energy technologies.

PICS launches the *News Scan*, a weekly climate news summary.

Focused outreach underway to academia, industry, government, and the public via briefing notes, white papers, and lectures.

Climate scientist Dr. Tom Pedersen assumes PICS leadership.

Copenhagen COP15 climate talks end in disappointment.

PICS launches internship program.

PICS invests $1.8 million in 27 new research projects under five new themes: Low Carbon Emissions Economy; Social Mobilization; Sustainable Communities; Resilient Ecosystems; Carbon Management in BC Forests

Phase 2

Upping The Ambition, Broadening Our Reach

Phase 3

Taking Stock And Expanding Strategic Influence

British Columbia legislates new targets for 2030 and 2040, releases *CleanBC* plan.

PICS releases final module of *PICS Climate Insights 101* animated short courses. The series attracts hundreds of thousands of viewers in 170+ countries.

PICS unveils its new *Strategic Plan 2017-2022* with a strengthened partnerships approach.

Canada signs the *Paris Agreement* at COP21.

The federal government releases *The Pan-Canadian Framework on Clean Growth and Climate Change*, the nation's first national climate strategy.

PICS initiates a national and international review process for all new research proposals.

Atmospheric carbon dioxide concentration reaches 400 ppm.

2013

2014

2015

2016

2017

2018

PICS first strategic research plan launches the "Big Five" projects which target BC's biggest GHG sources ($1.5 M to each).

- The 2060 Project: Western Canadian Grid Integration
- Forest Carbon Management
- Natural Gas: Maximizing Social Benefits
- Transportation Futures
- Energy Efficiency in the Built Environment

Dr. Sybil Seitzinger, Executive Director of the International Geosphere-Biosphere Programme, assumes PICS leadership; Dr. Tom Pedersen returns to UVic's School of Earth and Ocean Science.

British Columbia releases its *Climate Leadership Plan*. A PICS-commissioned analysis concludes it will bring BC only one-third of the way towards its 2050 target.

A PICS/Pembina report crunches the GHG numbers on proposed LNG developments.

PICS launches new $1M Theme Partnership research program to forge legacy partnerships on highly complex issues, and build international climate solutions leadership in BC.

PICS *News Scan* relaunches as *The Climate Examiner*, offering more in-depth analysis.

PICS releases research reports on wave energy, thermal imaging for home retrofits, and tackling climate change in BC forests.

PICS launches new Opportunity Projects Program to pursue high-impact, short-term research opportunities in key areas of emerging importance.

Increasing Knowledge, Engagement, and Impact in 2017 & 2018

Notable accomplishments across the past two years.

By the Numbers

9,158
Total live audience at workshops, seminars, and lectures that PICS primarily sponsored

39
Faculty members who received research funding support from PICS

75
Graduate students and post-doctoral fellows

24
Journal articles publishing PICS-funded research

19
Companies, government ministries, or organizations employing PICS interns

6
Specialist reports and white papers

PICS Expenditures

The PICS endowment is managed by the University of Victoria Foundation and has continued to perform well over the past two years. PICS total annual expenditures were approximately $3.2 million in each of FY2017 and FY2018. The majority of our investment continued to be in our major research projects and graduate student support. We show distribution of PICS expenditures as a percentage of the total.

2017: 58% · 17% · 16% · 9%

2018: 57% · 17% · 16% · 10%
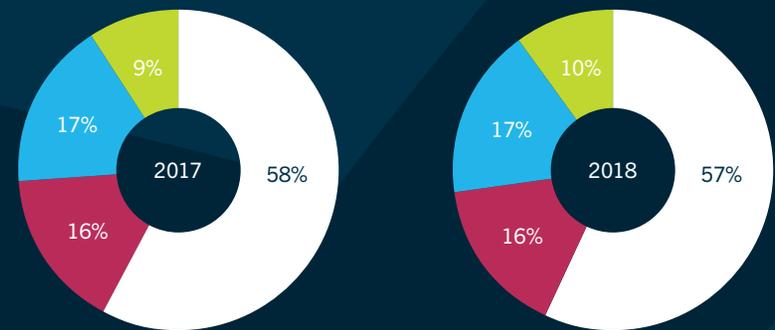
- ● Research
- ● Administration
- ● Communications
- ● Intercampus Coordination

Engagement and Outreach

April 2017

Increasing Energy Literacy: PICS and the Institute for Integrated Energy Systems at the University of Victoria (IESVic) make a media splash with the Wave Energy Primer for BC.

Engaging Citizens: PICS co-hosts a fully-subscribed interactive live videoconference on clean growth and climate action with BC's major political parties before a provincial election.

May 2017

Convening Experts; Informing Public Policy: PICS convenes forestry experts from industry, academia, and provincial/federal governments to learn about the PICS Forest Carbon Management Project research results. Its findings inform the province's CleanBC and Wood First policies.

June 2017

Hosting Dialogue: PICS leads debate on clean tech breakthroughs and mitigation opportunities with "Canada's Climate Change Moonshot" public forum.

Engaging Industry: PICS' Dr. Sybil Seitzinger addresses Canada Green Building Council annual conference on mitigation and adaptation options for the built environment.

August 2017

Informing Public Policy: A new PICS-Pembina Institute report highlights opportunities for electrifying two planned BC LNG plants.

October 2017

Informing Public Policy: British Columbia's Minister of the Environment appoints Dr. Sybil Seitzinger to British Columbia's Climate Solutions and Clean Growth Advisory Council.

Convening Experts: PICS informs industry and policymakers of climate impacts on food production by co-hosting Northern Agriculture and Climate Change Research Forum.

April 2018

Informing Public Policy: Associate Director Dr. Ged McLean joins the board of the BC Bioenergy Network, helping to shape the province's bioenergy climate strategy under CleanBC.

September 2018

Convening Experts; Informing Public Policy: PICS educates the public and decision makers on carbon-pricing mechanisms via "Lessons from California and BC" forum.

Informing Public Policy: Dr. Seitzinger chairs climate adaptation task force for the United Nations Global Climate Observing System.

Informing Public Policy: Dr. Seitzinger joins the International Advisory Board of Pathways to Sustainability initiative at Utrecht University, Netherlands.

October 2018

Increasing Energy Literacy: PICS hosts well-attended public panel discussion on "Bioenergy: Challenges and Opportunities," helping BC meet its legislated GHG reduction targets.

Engaging Students: PICS launches a new PICS Student Engagement Program at its Annual Fellows forum.

November 2018

Convening Experts: PICS convenes government and industry forest experts for a two-day workshop focused on reducing emissions from slash burning—a CleanBC priority.

Moving the Dial

PICS researchers work in a broad array of disciplines, ranging from materials science to the social sciences. Here are just a sample. Meet seven PICS-supported researchers who helped inform and inspire public- and private-sector climate solutions leadership in 2017 and 2018.

Renewables Require Real Estate

UVic | Kevin Palmer-Wilson

Love them or hate them, wind and solar farms are a divisive issue. They provide clean energy but also change landscapes. And the sooner we begin grappling with the broader social-acceptance challenges of a large-scale shift to zero-carbon electricity, the sooner we can get on with making that transition happen.

PICS 2060 Project PhD student **Kevin Palmer-Wilson** realized that one way to do that would be to quantify the land-use impacts of zero-emissions power generation technologies. So in 2018, he and the team at UVic's Institute for Integrated Energy Systems modeled the terra firma requirements associated with a shift to zero- or low-emissions electricity in Alberta. The team chose that province's grid because it reasonably approximates the mix of fossil and renewable sources—coal, gas, biomass, wind, and a trickle of hydro—found in many areas of the world.

Conclusion? Reducing Alberta's electricity emissions 90 per cent below today's levels would increase the area of the province impacted by electricity production by as much as 10 times that of today. In the extreme scenario, decarbonizing the province's grid would require dedicating a stretch of prairie slightly larger than Prince Edward Island to wind turbines.

There are scant few generation options that are both light on the land and gentle on the climate—carbon capture and storage is a potential solution, and even nuclear. But those aren't exactly an easy sell, either. In any event, says Palmer-Wilson, "the amount of infrastructure that needs to be built is huge. Should policymakers decide to heavily invest in renewables, then we need to start communicating both their climate benefits and their accompanying implications to the public."

Palmer-Wilson, Kevin & Donald, James & Robertson, Bryson & Lyseng, Benjamin & Keller, Victor & Fowler, McKenzie & Wade, Cameron & Scholtysik, Sven & Wild, Peter & Rowe, Andrew. (2019) Impact of land requirements on electricity system decarbonisation pathways. Energy Policy. 129. 193-205.

Trucking with Terawatts

UBC | Hoda Talebian

Hoda Talebian never meant to spook anyone. But in mid 2017, the UBC mechanical engineering PhD student, Vanier scholar, and PICS Transportation Futures team member asked herself a question. How could electrification of road freight trucking, source of 10 per cent of the province's emissions, help the province meet its mid-century emissions reduction target? After running the numbers, she had her first inkling: In order for our truck fleets to meet the requirements of British Columbia's interim emission reductions targets, as of 2025 every truck sold would need to be powered by batteries or fuel cells.

Though quite ambitious, that might be doable, she thought. Then she calculated the quantity of electricity that all those all-electric rigs would require and shared her findings with Walter Mérida, her supervisor. "He was impressed by the scale," Talebian recalls. "Actually, both of us were."

In British Columbia, the 1.1-GW Site C large-hydro dam, now under construction near the city of Fort St. John, has for years been the focus of intense and often emotionally charged debates on the costs and impacts of power

generation. Talebian's research had just revealed that by 2040, a truck fleet powered by battery-electric or fuel-cell trucks would require the equivalent output of between 2.5 and 6.5 Site C projects. "We will need a lot more wind and solar," she says.

It was a stunning finding. As a result, when Energy Policy published her team's research in April 2018, she briefly found herself fielding questions from reporters. Now, post-spotlight, she's studying how government, utilities, and industry might most effectively plan and deploy hydrogen infrastructure. Because while policymakers are likely now mulling over the battery truck-charging challenge, electricity-intensive fuel-cell rigs will likely be in the transportation solutions mix, too.

Talebian, Hoda & Herrera, Omar & Tran, Martino & Mérida, Walter. (2018). Electrification of road freight transport: Policy implications in British Columbia. Energy Policy. 115. 109-118.
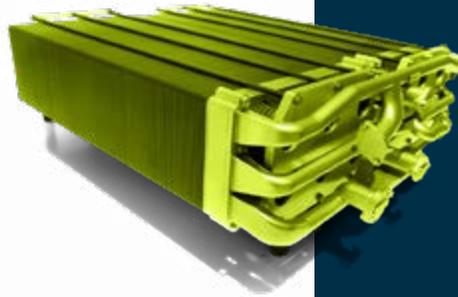
In Alberta, Heavy Haulers Need Backup

UVic | Victor Keller

UVic doctorate mechanical engineering graduate **Victor Keller** has a message for elected officials in jurisdictions that still have a bunch of coal and natural gas on the grid: Electric and fuel-cell trucks are cool, but incentivizing them with the current energy mix would make little difference. "We must green the heavy duty transportation system," he says. "But if you have a high carbon intensity in your electricity, doing that on its own will lead to a very small benefit." How small? Without additional policy such as a carbon price, electrification of heavy-haul trucking in Alberta would only reduce emissions three per cent. The journal *Energy* recently published Keller's research, which examined electrification of the heavy duty sector in Alberta with battery electric and fuel-cell vehicles. He's currently finishing up a similar piece, also part of the PICS 2060 project, that considers electrification of all road transportation sectors in British Columbia.

Keller, Victor & Lyseng, Benjamin & Wade, Cameron & Scholtysik, Sven & Fowler, McKenzie & Donald, James & Palmer-Wilson, Kevin & Robertson, Bryson & Wild, Peter & Rowe, Andrew. (2019). Electricity system and emission impact of direct and indirect electrification of heavy-duty transportation. Energy. 172. 10.1016.

The Best Bus Routes for Batteries

UVic | Anaissia Franca

Battery Electric Bus #7 departs the depot at 6:05 am and travels its route for three hours before taking on a dozen 108-kilogram rugby players and climbing a four-kilometre 25 per cent grade. When will it need recharging?

For her Master's thesis, UVic mechanical engineering student and Transportation Futures researcher **Anaissia Franca** wrote some code to find out. Her tool tracked the current that flows in and out of a bus battery—and much more, moment to moment—as a coach makes its way across town.

Franca wanted to get a precise handle on a given battery's lifespan. But the Canadian Urban Transit Research & Innovation Consortium (CUTRIC) knew the tool could do more. After all, if a transit agency could predict the energy a battery electric bus would need for a given route, then it could plan charging time, costs, and GHG benefits over a whole system.

"Transit agencies want to understand which bus routes to electrify first and how long the batteries can last between charges," says Franca. "Our tool informs their system planning and emissions savings, so they can begin strategically electrifying their fleets." Franca now works full time with CUTRIC in Montreal as a research strategy manager, leading a team focused on continually improving the tool, which authorities from Vancouver to Halifax have been putting to work.

Franca, Anaissia, "Electricity consumption and battery lifespan estimation for transit electric buses: drivetrain simulations and electrochemical modelling," M.A.Sc. Thesis, University of Victoria, March 2018.

The Bike Lane is Just the Beginning

SFU | Mark Jaccard and Rose Murphy

Sustainability planners dream of the day that car commuters finally abandon their vehicles and embrace public transit en masse. (Victory!) But **Rose Murphy**, a PICS postdoc at Simon Fraser University and member of the PICS Built Environment Project, has seen this future via CIMS-Urban, the model she co-developed with researcher Brett Zuehlke and others in Professor Mark Jaccard's research lab. And it's, well… problematic.

"Suddenly you have less congestion," she says. "And those emptier-looking roads start looking tempting again to the people on the bus. And a number of them start driving again." CIMS-Urban accounts for such human foibles and combines them with spatial data, such as the locations of rapid transit lines, to forecast a given community's energy consumption and emissions.

In 2017, the team released a PICS-supported report that used the model to identify the policies and actions that would be needed to deliver on Vancouver's 100 per cent renewable energy target. An additional technical journal article is forthcoming. But here's a spoiler: The city won't get there

without a suite of policies that only senior governments can deliver.

"A growing percentage of cars are not burning gasoline, and a larger number of buildings are turning to BC's relatively clean electricity, instead of natural gas, for heat—but much more needs to be done," says Jaccard. "We need to work smartly and focus on what absolutely must happen, in addition to the other things we do to make cities more livable." As cities are starting to figure out, the bike lane is just the beginning.

Evaluation of Actions and Policies to Reduce Urban GHG Emissions Using Multiple Criteria: A Contribution Towards Energy Efficiency in British Columbia's Built Environment. (August 2016) Rose Murphy, Kaitlin Boyd and Mark Jaccard.

Solving Forestry's Gnarly Carbon Calculus

UBC | Robert Hember

The forest-climate connection is simple, isn't it? When trees grow, they gradually absorb carbon dioxide; when they die, they slowly release it.

But forest-carbon accounting—the gritty, technical work of calculating how forests and forest products subtract, store, and contribute greenhouse gas emissions to and from the atmosphere? That is wickedly complex stuff.

Just ask **Robert Hember**. The PICS postdoctoral fellow worked on the PICS Forest Carbon Management project, under the leadership of Dr. Werner Kurz (see: "Woodsy Solutions"). His team's research has helped the provincial government get a better fix on how environmental changes such as hotter, drier summers and decreasing nitrogen deposition impact forest productivity and health.

There's still room for improvement. While BC has invested more than $100M in forest-health data collection, its underlying models still assume that trees are growing and dying at rates that haven't changed over the last century. (Actually, they *have* changed.)

Six published papers later, Hember's team has enriched the science of estimating the role of environmental impacts on forest productivity.

"Much public attention and research focuses on visible impacts, such as wildfires and insect outbreaks," says Hember, who now works for the province as a forest carbon modeling professional. "But anyone concerned about the state of our forests, and the role they play in addressing climate change, needs to equally consider the trends that unfold over decades in the vast expanses of the province that are not being disturbed by severe wildfire."

Hember, R. A., Kurz, W. A. and Coops, N. C. (2017), Relationships between individual-tree mortality and water-balance variables indicate positive trends in water stress-induced tree mortality across North America. Global Change Biology, 23: 1691-1710.

Woodsy Solutions

UBC + UVic + Natural Resources Canada
Werner Kurz

British Columbia's CleanBC climate strategy directs industry to produce hundreds of millions of litres of renewable gasoline and diesel by 2030, procure 15 per cent of domestic natural gas supply from renewable sources, and increase the proportion of harvested wood used in long-lived products that store carbon, such as buildings.

Werner Kurz, a senior researcher with Natural Resources Canada, leads a team that is helping policymakers understand how the forestry sector can help deliver on those objectives, among others. He heads up the Forest Carbon Management Project, a PICS collaboration including scientists from UBC, British Columbia's Ministry of Forests, Lands, Natural Resource Operations, and Rural Development, and the Canadian Forest Service. The team can now simulate forest-carbon dynamics, and GHG emissions and removals, down to the hectare level—across almost all of British Columbia. It's using the data to model forest climate-mitigation opportunities as far out as 2070.

"Increasingly, the policy community is understanding the role of the land sector in contributing to GHG removals, but also the risk of increased emissions from climate-change-induced wildfires," says Kurz. "Our team's work is informing that discussion."

Xu, Z., C.E. Smyth, T.C. Lemprière, G.J. Rampley and W.A. Kurz. 2017. Climate change mitigation strategies in the forest sector: biophysical impacts and economic implications in British Columbia, Canada. Mitigation and Adaptation Strategies for Global Change.
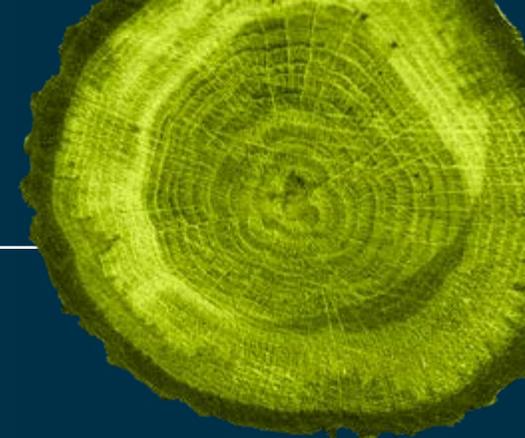
Using AI to Grapple with Changing Sea Levels

UBC | Jackie Yip

"I'm really interested in flooding," admits **Jackie Yip**, who, to be clear, isn't talking about burst pipes.

Last fall, the UBC PICS Fellow defended her PhD with UBC's Institute for Resources, Environment, and Sustainability on a new approach to account for the uncertainty bedeviling sea-level rise projections and local-level societal impacts. Scientists know that melting ice caps will impact coastal cities sometime this century, but are less certain on when it will happen, and how much. Add in local X-factors such as changes in land use, topography, population density, and the distribution of businesses and services, and the picture gets fuzzy in a hurry.

"There is a wide range of projections on how much the oceans will rise," says Yip. "So we're trying to change the way we think about planning for the future." The usual long-term planning approach takes the so-called "best" prediction and identifies the cheapest and highest benefit option. Yip instead used Self Organizing Maps, a machine-learning algorithm, to help the City of Vancouver understand how sea-level rise impacts could unfold across a wide range of futures, and ultimately help find adaptation options more tolerant to changing projections of sea level. Yip modelled 14 potential flood impacts including direct impacts (e.g., building damage) and indirect impacts (e.g., sewage backup and disruptions to businesses, hospitals, and transportation systems). She modeled the spatial distribution of these impacts both within and beyond the area directly inundated.

"This machine-learning algorithm allows the impacts to be shown as spatial maps that are understandable by different stakeholders, so it can be a great platform to support collaboration," she says. Yip has since joined an engineering firm, focusing on municipal sea-level rise adaptation planning, and recently accepted a position as a coastal risk scientist with Natural Resources Canada.

Zheng Ki (Jackie) Yip (2018) "Spatially explicit robust impact patterns: a new approach to account for uncertainties of long-term sea-level rise impacts at the local level." PhD Thesis. The University of British Columbia. Vancouver. August 2018.

© Paul Souders, Calving Iceberg, Disko Bay, Greenland

Way Over Our Heads

UNBC | Nazrul Islam

Methane is brutal. The greenhouse gas possesses more than 40 times the heat-trapping power of garden-variety carbon dioxide. And, unfortunately, Western Canadian energy producers send a great deal of it into the sky as they drill for, process, and distribute natural gas.

To quantify this pollution, British Columbia, Alberta, and Saskatchewan regulators all rely on some combination of industry-supplied data and their own output-based calculations. Four years ago, UNBC doctoral student **Nazrul Islam** initiated a research project using a top-down approach to verify—independent of industry reporting—the emissions quantified in provincial greenhouse gas inventories.

The PICS UNBC Fellow studied data from the Greenhouse Gases Observing Satellite, or GOSat, a Japanese craft launched in 2009. After screening out non-oil-and-gas methane sources, such as cattle feedlots, Islam was able to compare precise measurements with official accounts going back years. His preliminary results echoed the findings of other independent researchers: emissions estimates based on GOSat since 2009 suggest that provinces have underestimated most of their annual carbon counts. Islam hopes his findings will inspire regulators to review their methodologies, and perhaps consider space-based monitoring as a compliance mechanism.

"If governments are to keep their promises to the global community, they will need accurate measurements of industry emissions," he says. "Without accurate measurements it just doesn't happen."

Islam, S.N., Jackson, P.L., & McLinden, C.A. (2018, December). Satellite-based Methane Emission Estimates of Western Canada Using Simple Mass Balance Method and Quantifies Oil and Gas Sector Contribution. In *AGU Fall Meeting Abstracts.*

© Japan Aerospace Exploration Agency (JAXA)
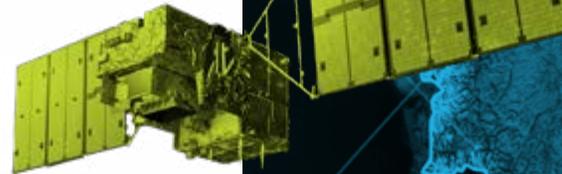
The People Who Make it Possible

Meet the team keeping the institute on a steady course both at headquarters and in our PICS universities—developing new initiatives, establishing new connections, and amplifying important findings as they emerge.

Four PICS Program Managers coordinate the research and engagement work at each of the British Columbia universities represented in PICS, and act as key contacts for their respective communities.

The Home Team

Dr. Sybil Seitzinger
Executive Director

With an eye on impact, Sybil has led the charge in upping the ambition and breadth of PICS' strategic partnerships since she arrived in 2015. Proud of PICS' legacy and its potential, Sybil has a personal desire to see adaptation planning elevated within Canada. She is delivering a balanced and innovative research portfolio.

Dr. Ged McLean
Associate Director

Ged joined PICS in November 2017 and has been a driving force in bringing the new collaborative research program from conception to reality. True to his engineering background—bioenergy and mitigation solutions are his passion—Ged has influenced PICS, which is now investigating potentially ground-breaking projects for reducing greenhouse gas emissions.

Robyn Meyer
Senior Communications Officer

Robyn is fresh back from parental leave and passionate about supporting climate solutions so vital for this generation and the next. Climate change is the leading story of our time, and the ability to inspire action and engagement through the creative sharing of innovative research across multiple platforms is her key motivation.

Nancy Chan
Executive Assistant

Nancy keeps PICS running behind the scenes, ensuring staff and the institute's multiple stakeholders remain connected through organizing face-to-face and online meetings, workshops, and events. She also manages finances and keeps the lights on. Nancy's is the first friendly face you will see when visiting PICS HQ.

In 2017 and 2018, four key PICS home team members either retired, transferred to other departments at the University of Victoria, or pursued their own projects. We thank them for their service.

- **Megan Jameson**, administration officer, retired after 29 years at UVic.
- **Stephanie Inman**, communication assistant and event coordinator, transferred.
- **Jennifer Kwan**, senior communications officer (temporary), transferred.
- **Leigh Phillips**, science writer and author, left to write his next book.

Field Agents

Nastenka Calle Delgado
Simon Fraser University

Engagement Highlight: In 2018, Nastenka launched the PICS Student Engagement Program, which offers peer learning opportunities to PICS scholars across all four of our partner universities. The kickoff included a science communication workshop to help researchers more effectively share their work.

Kristy Faccer
University of Victoria

Engagement Highlight: As a brand-new hire, Kristy had only just begun her work with the UVic community when we produced this report. But given that her PhD dissertation explores the many ways that collaboration between "unexpected allies" can inform climate action, we expect good things ahead.

Sara Muir Owen
University of British Columbia

Engagement Highlight: In 2018, Sara worked with student leaders to help organize and host the university's first Climate Change Town Hall. Its success spawned the UBC Climate Hub, which now supports climate research and action across the university and wider community.

Michelle Connolly
University of Northern British Columbia

Engagement Highlight: This past year, PICS partnered with UNBC Office of Research and the BC Agricultural Climate Adaptation Research Network to host a Northern Agriculture and Climate Change Research Forum. Delegates learned about new initiatives to help northern producers adapt to climate change and develop thriving agri-businesses.

A Well-Connected Research Constellation

The PICS network aims to deepen collaborations with solution seekers through direct involvement in co-design and co-delivery throughout research projects, while also directly influencing an even broader community of decision makers with discoveries and innovations as they emerge.

Our teams' discoveries inform and advance climate change mitigation and adaptation.

PICS partnerships connecting solution seekers and leading researchers.

Communities

Governments: Local, Provincial, Federal

NGOs: Provincial, National, International

Business and Industry

First Nations

Intergovernmental collaborations

PICS

UBC

SFU

UNBC
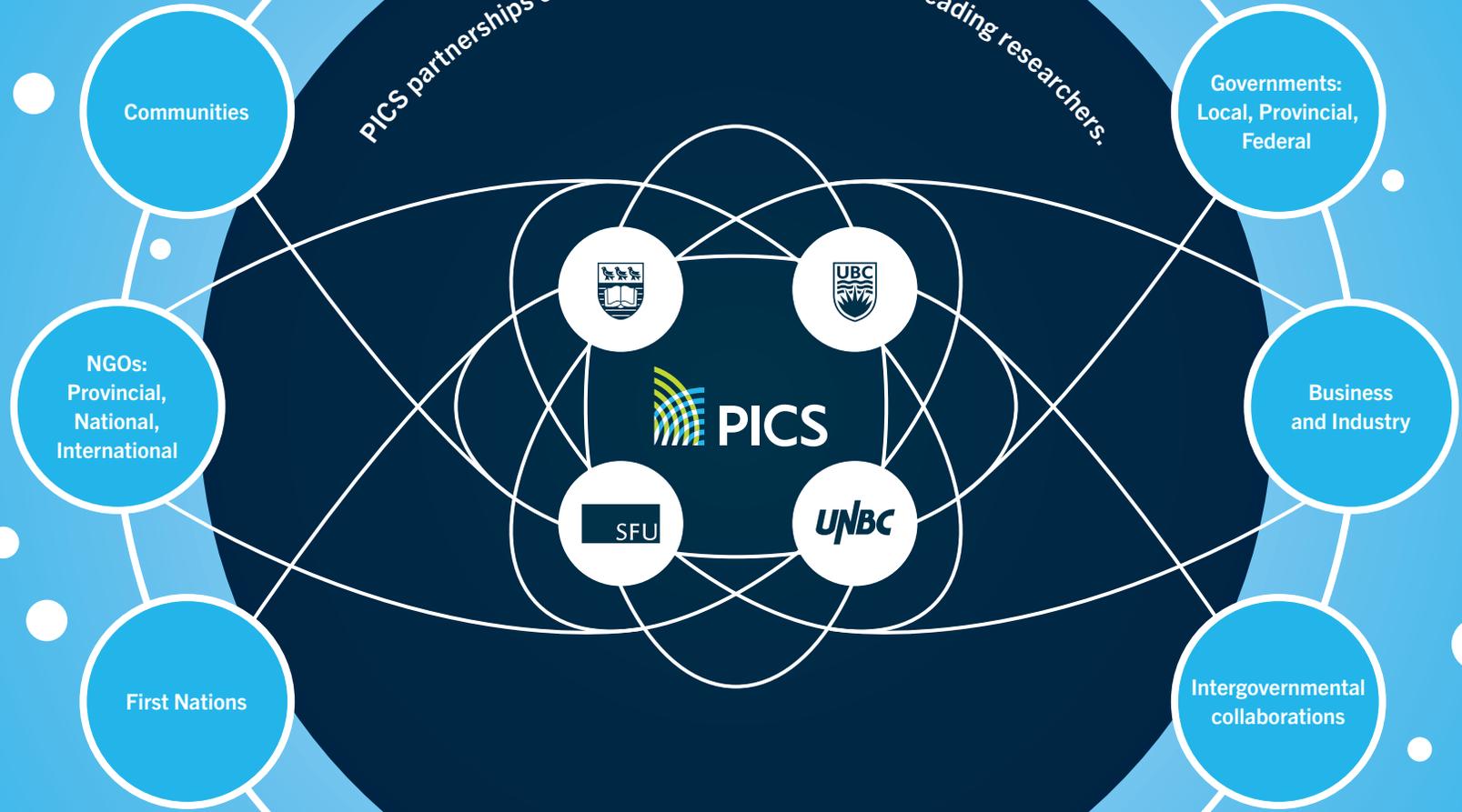
A Timely Recalibration

During the first half of 2017 at PICS headquarters we were putting a lot of sticky notes up on the walls. In an extended consultation with our researchers, solution seekers, and other stakeholders, we considered strengths, assessed our impact, and identified outstanding opportunities to go further.

The end result: **The PICS Strategic Plan 2017-2022**. Since then, with our new strategic plan as a springboard to action, we have been redesigning our research programs and developing a more effective approach to communication and engagement, while also taking steps to enhance the organizational structure and capacity throughout PICS. Alongside all this, in 2018 we developed a refreshed visual identity—first showcased in this annual report.

For design inspiration, the branding team looked to our two core constituencies: our four-university collaborative foundation and the solution seekers, the ultimate end-users of PICS' findings. Our logo represents all the interdisciplinary partnerships, discoveries, and solutions that emerge when these two groups—represented as concentric circles—work together.

Our new research strategy doubles down on collaboration and impact. The solution seekers—decision makers within government, industry, and our communities—will not only use and benefit from our research, but help design it in the first place. PICS will assume a much more central role in communication and engagement, right from the beginning of projects. In short, our new approach will robustly engage with the full spectrum of stakeholders. And should technology, economics, and/or policy take a sharp and unexpected turn, we'll be ready to jump in and assist.

RESEARCH PARTNERS

SOLUTION SEEKERS

Turning Ideas into Action

Solution seekers become solution makers, from question to collaboration and idea to implementation.

PICS is expanding on its commitment to research excellence under a new collaborative research model that connects solution seekers with academic researchers in dynamic new partnerships. Decision makers within government, industry, NGOs, First Nations, and communities must address a wide range of complex challenges—from meeting ambitious emissions-reduction targets to preparing cities for more frequent extreme weather events. We connect those solution seekers to our powerhouse network of knowledge, experience and innovation, bringing the right partners together to co-design, co-develop, and

co-deliver practical solutions that can inform local, national, and potentially global strategy.

We have introduced two new programs that embody this enhanced research direction. Both stipulate that all projects must include research faculty members and students from at least one of the four PICS universities—UVic, SFU, UBC, and UNBC—and solution seekers. We're also encouraging International collaborations where needed expertise does not exist in BC.

Opportunity Projects Program

Maximum: $60,000 per year for each project, up to three years duration

Frequency: Number of projects flexible within a maximum annual $600,000 budget

How does a young researcher get started in climate solutions? How does a new idea, never before tested, get off the ground?

The Opportunity Projects Program aims to advance new entrants and unleash emerging leaders with innovative ideas and approaches. Solutions can emerge from unexpected places, in forms not yet imagined. We anticipate that targeted and relatively short-term projects under this program will encourage researchers to take bold, but calculated, risks in pursuit of high-impact results. When coupled with solution-seeking partners who are eager to implement the tools of change, we believe this program will yield great results.

Theme Partnership Program

Maximum: $250,000 per year for each project, up to a four year duration

Frequency: One award to be issued approximately every 12 to 18 months

We're in it for the long haul. That's why we designed our new Theme Partnership Program to support research into particularly complex—and critically important—climate mitigation and adaptation challenges. Again, we want to build international leadership here in BC.

Approved partnerships consisting of local solution seekers and leading academic researchers will establish teams of excellence in their respective fields of study. From the most preliminary whiteboard sketches to the final polished deliverables, these team members will together deliver tangible and actionable solutions—while also creating a legacy of climate solutions leadership in our province.

Looking Ahead

We look forward to sharing the preliminary results of our new program this time next year. In the meantime, here's a taste of good things to come.

Researcher in Residence

Our first Researcher in Residence will work to maximize the impact of PICS' climate solutions research in the built environment. The researcher will be based at the University of Victoria, and act as the institute's primary liaison to our solution seekers.

Engagement Everywhere

The institute's four Field Agents are planning a suite of events, workshops, and other symposia in support of the new PICS strategy. Subscribe to our updates at pics.uvic.ca to learn about events and opportunities near you.

Research Investments

In 2019, PICS will award the first recipient in the institute's Theme Partnership Program, and three to five Opportunity Projects. PICS will also fund 10 internships throughout the province in the private and public sector.

Pan-Canadian Collaboration

PICS will be a partner in an exciting new institute, the Pan-Canadian Expert Collaboration, that will bring together 15 organizations to develop advice and analysis spanning climate change mitigation, adaptation, and clean growth, and share them with Canadians and their governments.

Roll Call

**The following individuals led PICS projects in 2017 and 2018,
either as researchers or as supervisors of masters or PhD students.**

Diana Allen
Department of Earth Sciences, SFU

Jonn Axsen
School of Resource and Environmental Management, SFU

Natalie Ban
School of Environmental Studies, UVic

Julia Baum
Department of Biology, UVic

Xiaotao (Tony) Bi
Department of Chemical and Biological Engineering, UBC

Stephanie Chang
School of Community and Regional Planning, UBC

Raymond Cole
Institute for Resources, Environment and Sustainability, UBC

Nicholas Coops
Department of Forestry Resources Management, UBC

Curran Crawford
Institute for Integrated Energy Systems, UVic

Ned Djilali
Institute for Integrated Energy Systems, UVic

David Duff
Centre for Business Law, UBC

Lawrence Frank
School of Community and Regional Planning, UBC

Verena Griess
Department of Forest Resources Management, UBC

Mark Groulx
School of Environmental Planning, UNBC

Kathryn Harrison
Department of Political Science, UBC

Kasun Hewage
School of Engineering, UBC Okanagan

George Hoberg
School of Public Policy and Global Affairs, UBC

Mark Jaccard
School of Resource and Environmental Management, SFU

Peter Jackson
Environmental Science, UNBC

Werner Kurz
Pacific Forestry Centre, Natural Resources Canada

Elicia Maine
Beedie School of Business, SFU

Ronald Kellett
School of Architecture and Landscape Architecture, UBC

Paul McFarlane
Department of Wood Science, UBC

Walter Mérida
Clean Energy Research Centre, UBC

AnnaLisa Meyboom
School of Architecture and Landscape Architecture, UBC

David Michelson
Department of Electrical and Computer Engineering, UBC

Mehrdad Moallem
School of Mechatronic Systems Engineering, SFU

Nancy Olewiler
School of Public Policy, SFU

Andrew Rowe
Institute for Integrated Energy Systems, UVic

Adam Rysanek
School of Architecture and Landscape Architecture, UBC

Maged Senbel
School of Community and Regional Planning, UBC

Kara Shaw
School of Environmental Studies, UVic

Sheryl Staub-French
Department of Civil Engineering, UBC

James Tansey
Sauder School of Business, UBC

Martino Tran
School of Community and Regional Planning, UBC

Tongli Wang
Centre for Forest Conservation Genetics, UBC

John Welch
Resource and Environmental Management, SFU

Peter Wild
Institute for Integrated Energy Systems, UVic

Kirsten Zickfeld
Department of Geography, SFU