



SPRING 2014

Adaptation and the great Calgary flood of June 2013: One year on

PICS Executive Director Tom Pedersen

Images of raging creeks and overflowing rivers are not unusual on the television news. Floods happen, and the media dutifully report them. And unless it's our basement that's filling with water, we Canadians tend to be blasé about such reports. But the visuals broadcast from Calgary on June 20, 2013, were different. They struck hard. A hockey icon—the Saddledome—was at their very centre: the first ten rows of seats were shown drowned by fetid brown water that filled the entire lower bowl of the arena.

Meteorologically speaking, the 'worst flood in Calgary's history' resulted from a high-pressure system parked across the northern half of Alberta that directed moisture laden air from the east onto the slopes of the Rockies west of the city. Canmore, due west of Calgary, saw 220 mm of rain in just 36 hours, while the weather station at High River to the south recorded 335 mm of rain—over one foot—in less than 48 hours. Once the ground was saturated, the precipitation ran as sheet flow into the upper reaches of the Bow, Elbow and Highwood rivers. Worse, at slightly higher elevations in the front ranges, the rain fell on a heavy snow pack, the melting of which added even more water to overloaded river channels.

The surge of water that coursed through the cities of Canmore, Calgary and High River—some ten times the volume normal for the time of year—resulted in over \$5 billion in direct losses. About one-third of that was covered by insurance, rendering the 2013 floods the costliest disaster in Canadian history in terms of insured damages.

So where are we a year later? The Saddledome has been back in operation since last September, after the investment of 650,000 person-hours of labour. An Expert Flood-Management Panel appointed by the City of Calgary continues to work on mitigation strategies, one of which is a proposal to construct a \$500M nine-metre diameter tunnel under the city to send future floodwaters to the Bow River downstream of the city's core.

Meanwhile, Canmore has been fast-tracking \$14M worth of remediation and mitigation initiatives. The channel of Cougar Creek, a steep watercourse that raged through the north side of the town in June 2013, ripping some creekside homes from their foundations, is being rebuilt by lining it with 45,000 m² of reinforced concrete mattresses (see photographs). Crews worked 24/7 shifts to complete the work prior to the start of this year's freshet, fearful lest history repeat itself. That worry has now become reality. As I write on June 18, 2014, rivers in southwestern Alberta



Flood mitigation on Cougar Creek: laying articulated concrete mattresses. Photo courtesy of Carolyn Dunn, CBC.

are again flooding, thanks to two days of unrelenting intense rainfall. Floodwaters are now coursing through Claresholm, 132 km south of Calgary, filling basements and forcing widespread evacuations, and Lethbridge and Medicine Hat to the south and east are under flood and evacuation warnings.

There is a lesson for us all in the social and fiscal devastation wrought by the Alberta floods, last year and again now: extreme precipitation events have serious consequences. The frequency of such events is growing over much of the northern hemisphere as human-induced global warming drives up the concentration of water vapour in the atmosphere. We must adapt to this new reality, as hockey fans who attend games in the Saddledome now know.

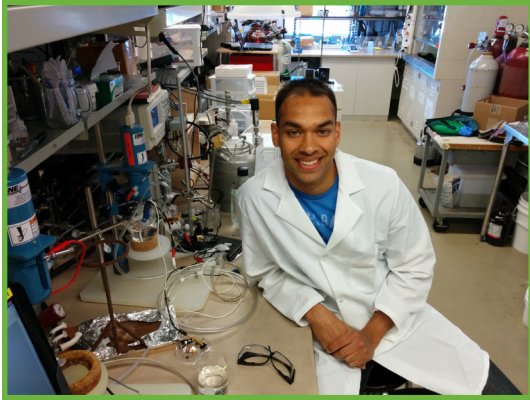
That message—that adaptation to global warming is not optional—forms the central theme of the next PICS online short course that we will release this summer. And the imperative to adapt brings with it another truth: failing to take steps to reduce greenhouse gas emissions and slow global warming will be costly. In fact, it already is.



Cougar Creek channel lined with articulated concrete mattresses.

PICS supports research to clean up oil & gas industry waste

"As we transit from fossil fuels, if there is a way to do things cleaner, we should." Saad Dara



PICS Fellow Saad Dara, part of the CCEMC winning UBC team

PICS Fellowship holder Saad Dara is part of the UBC team that has been awarded \$500,000 from the [Climate Change and Emissions Management Corporation \(CCEMC\)](#) for developing technology that converts on-site waste materials from oil and gas production into high-value chemicals and desalinated water, for reuse by that industry. The project led by former PICS program committee member, Prof. David Wilkinson, was one of 24 finalists chosen this spring from over 344 international submissions to the CCEMC Grand Challenge: Innovative Carbon Uses.

The technology combines in an electrochemical cell waste carbon dioxide (CO₂) and the salts present in industrial wastewater. This mineralizes the CO₂, creating high-value chemicals such as acids and carbonate salts. In the process the wastewater is desalinated, and can be reused by industry, rather than disposed of.

Saad, who moved with his family to Canada from his Pakistan-Kuwait home base in 2005, said it's exciting to be part of a project with such environmental and economic potential benefits. Speaking at the PICS Fellows Forum in April he said that flaring during gas extraction, for example, could be a feedstock of CO₂ for this electrolysis process, rather than having it vent to the atmosphere. "The overall result would be a smaller carbon footprint and

an economical alternative to conventional desalination techniques."

Saad said the goal is to make the technology transportable and simple to operate on site. A pilot scale electrochemical cell will be ready for demonstration within two years, with a goal of commercialization by 2018. Wide-scale adoption of the technology in Alberta's oil and gas industry, for example, would reportedly remove some 3.5 megatonnes of CO₂ emissions while conserving up to 170 million barrels of water each year. Round two of the CCEMC Grand Challenge in September 2015 will see five winners receive \$3 million. An overall winner will be awarded \$10 million in 2018 to establish a business that annually reduces Alberta's greenhouse gases by at least one megatonne.

PICS Fellows 2014

Developing climate-friendly refrigerators, saving lives during extreme weather events and making carbon pollution cost accounting more accurate – these are just some of the projects being undertaken by the intake of 11 new PICS graduate fellows. The fellowship holders for 2014 have received either \$12,000 or \$18,000 a year for

their Masters or PhD research respectively. PICS executive director Tom Pedersen says the projects are focused on practical outcomes that will help BC at a policy, personal and planning level take the right steps toward mitigating and adapting to climate change. The new fellows participated in the annual PICS fellowship symposium held in Vancouver in April, where researchers exchanged ideas and information on their projects. Full details are available on the [PICS website](#).



PICS Fellows at the symposium held in Vancouver, April 2014

Global energy futures according to Shell

"If we want things to stay as they are, things will have to change." Shell Canada policy advisor J.P. Jepp used the words of Italian writer Giuseppe Tomasi di Lampedusa on June 18 at UVic when summing up [his presentation](#) at a public PICS-hosted lecture on his company's predicted global energy forecasts. While the author was referring to Sicilian war and revolution in his book *The Leopard*, members of the audience hoping to hear similar tales about a pending renewable energy revolution would have been disappointed.

The two scenarios presented in the Shell Global [New](#)



J.P. Jepp from Shell Canada talks global energy futures

[Lens Scenarios](#) show that world energy supply from renewable sources such as solar will grow, but fossil fuels will continue to dominate to at least 2060 - especially among non-OECD countries. J.P. Jepp says that although the scientific community has benchmarked a two-degree increase in global temperature as the threshold beyond which serious climate impacts will occur,

Shell forecasts that humanity will surpass this line-in-the-sand—and by a significant margin. Although investment is being made by Shell and other companies in technologies such as carbon capture and storage (CCS), and new abatement opportunities are being constantly examined, these measures are not being employed to the levels needed to offset the anticipated growth in GHG emissions.

A stalemate of sorts has emerged; J.P. Jepp explained that companies have a duty to deliver return on investment to shareholders and under current conditions the greatest return is most often from fossil fuels, not renewables. Programs such as potential Shell Global wind farm projects and solar initiatives were shelved for this reason, with competitors such as [Chevron](#) following suit this year. “Companies don’t want to be disadvantaged relative to competitors but we are ready to play our part if government leads with policy,” he said. Shell supports putting a price on carbon, in particular a cap and trade system, and is signatory to the [Trillion Tonne Communiqué](#) calling for proactive policies to cap carbon emissions.

New internships announced

This summer 12 new PICS internship holders will be joining the BC workforce in a range of organisations undertaking climate solutions-related projects. This popular annual program supports the hiring of students from the PICS partner universities on a four-month contract, with PICS providing baseline support of \$10,000 per intern and the employers providing top-ups. Issues being tackled by this year’s intake include developing regional flood management strategies for the Fraser Basin, adapting agriculture to climate change at a regional and farm level, the adoption of green building standards into the Building Code, and the role of urban forests in community resilience to climate change. Profiled below are two of the 12 new interns. More interns will be profiled in the summer newsletter.

Ministry of Agriculture – Kayleigh Donahue, UVic

Unraveling the implications of climate change for BC agriculture will be the focus of work being conducted by PICS intern and UVic economics masters student Kayleigh Donahue, who is working as a Climate Change Analyst for the BC Ministry of Agriculture this summer. Kayleigh’s internship work includes: conducting a jurisdictional scan and literature review on climate change and agriculture, and reporting on methods of assessing and presenting impacts such as crop losses and insurance; analyzing ministry crop insurance and AgriStability records from the last 20 years; developing “planning scenarios” for BC agriculture that incorporate key climate stressors (droughts, floods, extreme weather, sea level rise, and pest outbreaks), and then estimating their economic

implications; and assessing the economic benefits of adaptation such as reducing risk and vulnerability. This work will build on regional climate projections in the [Risk and Opportunity Assessments](#) commissioned by the BC Agriculture Council (and supported by PICS and the Pacific Climate Impacts Consortium).

Comox Valley Project Watershed Society – Russell Prentice, UBC

Providing a community-based solution to climate change adaptation through improving shoreline resilience is the focus of work being carried out by UBC Bachelor of Science student, Russell Prentice during his PICS internship with the Comox Valley Project Watershed Society (PW). Founded in 1993, the non-profit PW assesses carbon levels in estuaries, with the goal of developing a verifiable protocol for offsetting carbon emissions by conserving ocean vegetation (Blue Carbon offsets). The proposed restoration of intertidal and sub tidal eelgrass, complemented with shoreline salt marsh restoration, will contribute to estuarine carbon sinks as well as provide some protection from sea level rise due to climate change and storm surges. Russell’s tasks include maintaining and operating a small boat, preparing eelgrass for planting and shuttling divers to planting sites. He has also assisted in a survey of inter-tidal sites that will later be restored using the GPS coordinates from the survey.



Putting food on the table - Kayleigh Donahue’s internship looks at BC’s agricultural future



PICS intern Russell Prentice measuring the carbon content of sediments with Royal Roads Graduate student Angela Spooner.

SFU launches new Zero Waste initiative

Simon Fraser University's (SFU's) new [Zero Waste Initiative](#) aims to reduce waste, divert it from the landfill, and ensure its sustainable use. This goal forms an important part of [SFU's Sustainability Strategic Plan](#), which PICS SFU Program Coordinator Nastenka Calle is helping to implement. SFU's goal is to divert 70 per cent of waste from the landfill by 2015 by recycling and composting. The program has introduced standardized four-stream Zero Waste Stations across all three SFU campuses, and includes the collection of food scraps and compostables. Food scraps and compostables are taken to [Harvest Power's Richmond Energy Garden and Composting Facility](#) and [Enviro-Smart's Organics Facility in Ladner](#), which create compost, soil products and biogas (via anaerobic processes), which is then used to fuel generators and create renewable electricity. Education and engagement are central to the program, with local musician Dan Moxon featuring in the [SFU Zero Waste video](#), student educators engaging people at bins, and events on all three campuses. May saw the relaunch of the program (that began in January) for the summer semester, with updated signage reflecting feedback from the community, a fun 'Separation anxiety' campaign, and 'zelfie' (zero waste selfie) competition.

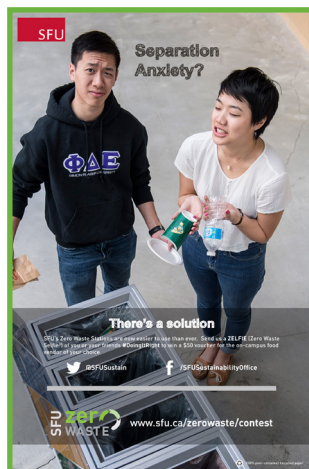
Dome greenhouse at UNBC

The UNBC student club, Students for a Green University (SGU) and the Northern Undergraduate Student Society (NUGSS), is in the process of building a geodesic dome greenhouse on campus. The greenhouse will enable students to grow food locally for an extended period of time throughout the year. By doing so, UNBC students will be helping to



Lending a hand (and a paw) to build UNBC's Dome Greenhouse

close the loop on organic waste production by using the dome's compost to grow produce for the university's student run pub. PICS sponsored this project to help students seek solutions to the food challenges of a colder northern climate, and to get an eye into the future growing conditions in Prince George, due to climate change.



Send a Zelfie (Zero Waste selfie) of yourself recycling at SFU and you could win a \$50 voucher.

Once the concrete form was poured the framing of the greenhouse went up in two days. The construction should be completed by early July in time to test how far into the fall the dome will extend optimal growing conditions. Pictured (from left to right) are PICS Program Committee Member Dr. Art Fredeen; PICS UNBC Program Coordinator Kyle Aben; Greenhouse Manager Deanna

Rach; UNBC Energy Manager Amanda Drew; UNBC Sustainability Manager Kyrke Gaudreau; Mike Watson NUGSS Sustainability Representative; Minetta Norrie, and Dave Pow PG PIRG Garden Coordinators. Canine assistance was provided by (L to R) Lola, Alice and Donny.

Coming up in the fall

Stay tuned! This coming September, PICS will host a panel session on the 5th IPCC report on Impact, Adaptation and Vulnerability as part of the PICS UBC SFU Lecture series. Our panelists, Stewart Cohen, Environment Canada and Deborah Harford, SFU, will highlight the major outcomes and recommendations of the report and

explore adaptation opportunities in BC as a planned response to climate change.

Also keep an eye out for pending updates on PICS' five major research projects on LNG, grid integration, transport policy, carbon in BC forests and energy efficiency in the built environment. And our new online short course on adaptation will be released this summer.

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