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## How forests can help us meet GHG reduction targets

Guest Editorial by Werner Kurz, senior research scientist, Natural Resources Canada

Globally forests remove about one quarter of anthropogenic carbon dioxide (CO<sub>2</sub>) emissions and store the carbon in wood and other organic matter, thus helping reduce the rate of increase in atmospheric greenhouse gas (GHG) concentrations that are driving global warming. Canada's 348 million hectares of forests are contributing to this global sink, but could the forest sector's contribution be enhanced through management or will it be diminished through the impacts of climate change?

In British Columbia (BC), investigations are underway into the potential of its 55 million hectares of forest to help meet GHG emission reduction targets. The net carbon balance of BC's forests is affected by two large and opposing fluxes: about 1100 Megatons CO<sub>2</sub> are removed from the atmosphere annually by BC forests to produce organic matter (Net Primary Production), and about 92% of this is released back to the atmosphere through decomposition. Interannual variation in climate and long-term trends in atmospheric CO<sub>2</sub> concentration affect both of these large fluxes and the net impact remains uncertain. Forest management, through harvest, silviculture and fire suppression affects the forest net carbon balance and offers the promise that carbon uptake across BC's forests could be enhanced.

The carbon contained in BC's average annual wood harvest is equivalent to about 66 Mt CO<sub>2</sub> – about the same as BC's emissions to the atmosphere from all other sectors. All carbon contained in BC timber has been removed from the atmosphere in prior decades and centuries. Using harvested wood as a carbon storage medium that can substitute for emissions-intensive materials such as concrete, steel and plastics contributes to reducing global GHG emissions. A recently published [national study](#) by the Canadian Forest Service demonstrated that application to British Columbia of the best examined forest management and wood-use strategies, including increased use of wood as a building material, could reduce emissions in BC and elsewhere by 26 MtCO<sub>2</sub>e per year from 2040 to 2050 relative to a business-as-usual baseline. For comparison, this amount is roughly equivalent to 40% of BC's emissions in 2007.

Although preliminary, these results highlight the importance of better understanding the potential contribution of BC's forest sector to climate change mitigation. Toward this end PICS has launched a

new five-year research project with in-kind contributions from the federal and provincial governments. The new study, described in more detail in the next article, involves

experts from BC's four leading research universities, governments and other stakeholders.

Designing mitigation options in BC's forest sector is complicated because climate change is already affecting forests. In the summer of 2014, media attention has focussed on the over 300,000 hectares of forests that burned in the province. The fires released millions of tons of carbon dioxide, adding to the atmospheric carbon concentration. But while significant, the area burned comprises less than 1% of BC's forest area. To determine the net carbon balance of BC's forests the contribution of the other 99% of forests also need to be quantified. And while warming temperatures increase the risks of forest fires, higher temperatures and atmospheric CO<sub>2</sub> concentrations have also increased growth rates, at least for some species and some regions of BC's forests. Thus forest management mitigation strategies need to be designed with the anticipation that BC's forests responses to climate change will range from increased mortality in some regions to higher growth rates in others. Forecasting regionally differentiated forest responses and adapting mitigation strategies to these changes will be a major challenge for the new research project.

Once climate-effective mitigation strategies are identified, mechanisms to implement and finance such strategies also need to be developed. Stakeholder engagement in all stages of this new project will be critical to achieving PICS' goal of developing climate change solutions. Exploring and evaluating policies, institutional and financing options will contribute to the understanding of which identified strategies may be acceptable to the people of British Columbia. The anticipated outcomes of the project will help BC's forest sector contribute to meeting GHG emission reduction targets.



Werner Kurz, leader of the PICS Forest Carbon Management Project, checks out some long-term carbon storage (i.e. the Kinsol Trestle, on Vancouver Island)

## The forest carbon management project

*"How the forest is regenerated and with what species of trees, how timber is harvested, and... using wood for building rather than "carbon intensive" materials such as steel, concrete and plastics all have an impact on the province's carbon footprint and our ability to meet greenhouse gas reduction targets." Werner Kurz, Vancouver Sun, July 22, 2014.*

Perhaps unsurprisingly, the [July announcement](#) of a major new PICS research project to help the British Columbia forestry sector better prepare for, and help slow climate change, generated considerable interest in the province where one in five jobs is related to forests.

The five-year, \$1.5-million Forest Carbon Management Project headed by this edition's guest editor Werner Kurz, a senior research scientist with Natural Resources Canada, brings together climate, forestry, and socio-economic policy experts from academia, government, industry, and First Nations. Their goal? To design a roadmap to help managers safeguard forests in the face of climate change, while maximizing the potential of our forests to capture and store carbon – both in the living forest and soil-based carbon sinks, and in timber products such as furniture and buildings. The project will test how various approaches to harvesting, silviculture, site preparation and stand reestablishment activities can alter GHG balances. It will also identify opportunities to substitute timber products for carbon-intensive products.

PICS executive director Tom Pedersen says the devastation wrought by mountain pine beetle has been BC's wake-up call to the impacts of climate change. "BC must design management policies that will work under a range of climate change scenarios. For example, how will a particular tree species in a region respond to two or three degrees of warming, and more generally where will climate change enhance or reduce forest growth?" Results from the first phase of the five-year project, are expected by March 2016.

## Energy efficient buildings workshop

A core group of BC's leading researchers, policy makers, industry representatives and professional practitioners from architecture, engineering, planning and computer science joined forces on June 10 to talk about how the province can best design, build, retrofit and operate buildings to exceed international benchmarks for energy efficiency. The workshop

was organized by a seven-member committee comprising UBC and SFU researchers and led by Tom Pedersen, PICS executive director, and Ray Cole, director of the Center for Interactive Research on Sustainability (CIRS) alongside Sara Muir-Owen, PICS-UBC site coordinator. The one-day session held at UBC included over 30 participants and was facilitated by Carbon Talks' Shauna Sylvester and Betsy Agar. The workshop served as an important first step towards assisting PICS in developing key research questions for its building energy research program. The resulting dialogue report [Increasing Energy in BC's Built Environment](#) highlights research challenges and priorities.

## Agricultural trade appears unaffected by BC carbon tax

British Columbia's carbon tax does not appear to have had a measurable impact on international agricultural trade, despite concerns it would greatly reduce the BC industry's competitiveness, according to a new PICS white paper [released this summer](#). The report – [The Effect of British Columbia's Carbon Tax on Agricultural Trade](#) written by Nicholas Rivers

from the University of Ottawa and Brandon Schaufele from Western University, was the first of its kind to use real data, rather than simulation models, to assess the tax's impact on the sector for the first three years following its introduction in 2008.

The authors said the results may be surprising to some, given industry claims that the tax was devastating agricultural producers, which no doubt contributed to carbon tax

exemptions for agriculture being implemented in BC from 2012. The report offers three potential explanations: First, the tax had little effect because fossil fuels represent only a small proportion (on average four per cent) of agricultural production costs. Second, because agriculture is less carbon intensive than some other highly traded sectors (e.g. manufacturing), its comparative advantage may increase due to the limited impact of the tax. And third, the incremental rises in the carbon tax may have changed behavior, by stimulating process innovations or greater energy efficiency on BC farms. The report recommends further research using microdata at the individual farm level, over a longer time period, to obtain more precise results of on-farm impacts. Media coverage included The Economist, the Huffington Post, Vancouver Sun, Business in Vancouver, the Vancouver Observer, Phys.org science news service, Radio New Zealand, CFX 1070, Tax News, and the CBC.



PICS program co-ordinator Kyle Aben discusses PICS' carbon forestry project with CKPG News

## PICS research in the community

As part of an ongoing newsletter series, PICS profiles the work of our fellows and interns. Below are three university students who have been busy this summer assisting with BC adaptation and mitigation efforts:

UBC School of Community and Regional Planning (SCARP) Masters student and PICS intern **Rebecca Chaster** has been



PICS intern Rebecca Chaster from UBC helping Surrey "go green"

assisting with implementing the City of Surrey's recently approved Community Climate Action Strategy that addresses both mitigation and adaptation measures. Rebecca's work will help refine which building sectors have the greatest greenhouse gas emissions and energy reduction potential, and also help advance Surrey's draft energy efficiency pilot project that provides bonuses for reducing emissions across the city. On the adaptation front, she will assist with priority projects on sea level rise and flood protection, as well as on community education and engagement on climate change. This internship will help advance climate solutions in the second largest city in British Columbia where rapid growth poses both challenges and opportunities for climate action.

Recent extreme weather events in Canada and around the world provide insight to the impacts local governments can expect from climatic change, especially impacts on aging municipal infrastructure. This is an issue being grappled with at all levels of government but especially municipalities, which bear responsibility for most of the infrastructure at risk. Planning for



PICS intern Lisa Danielson from SFU is researching the economics of adaptation

such events has become a core local government function. Yet despite the growing costs associated with climate change, the economics of adaptation in Canada is at a nascent stage, with very little if any attention given to the potential of economic instruments as a means to incent or finance adaptation measures. SFU public policy masters student and PICS intern **Lisa Danielson** is working with the Adaptation to Climate Change (ACT) team to identify finance tools available in Canada to either directly finance infrastructure adaptation or catalyze adaptation measures. Collaborators include the City of Vancouver and the Cowichan Valley Regional District.

Like many British Columbians, PICS fellow **Robert Tsin** took a lot of walks this summer around Vancouver and the Lower Mainland. But unlike the typical BC'er Tsin was armed with two thermometers, a GPS and GoPro camera to take measurements on the hottest days along 20 planned routes in Vancouver, Burnaby, New Westminster and Richmond. The data will be used to build a snapshot of summer-time urban heat in the region, Tsin said. "We're analyzing what variables are correlated with higher or lower temperatures, which can help with urban planning and mitigation," he said. The data will be a valuable on-the-ground measure; organizations such as the BC Centres for Disease Control could use the data to contribute to their research on public health responses to heat waves, and the data can also help validate remote sensing measurements from other experiments.



Finding the hot spots - PICS fellow Robert Tsin with his urban heat measuring equipment

## Are our brains wired to ignore climate change?

"What a delightful spinach tart" - a quote that PICS guest

speaker George Marshall used to illustrate how people avoid talking about climate change, in this case during a dinner party when a guest steered an uncomfortable conversation about personal responsibility for global warming back to safer territory.

During his lectures at UVic and UBC on September 9 and 10, George Marshall, co-founder of the UK charity the [Climate Outreach Information Network \(COIN\)](#), outlined theories covered in his [new book](#) over the "socially constructed silence" that prevents us from discussing climate change, despite its enormous threat.

Drawing on the research of Nobel laureate and psychologist Daniel Kahneman among others, plus his own research talking with climate scientists, Tea Party activists, conservative evangelicals and environmentalists,



George Marshall gave two PICS talks as part of his North American book tour

Marshall explained that the nature of climate change makes it difficult to mobilise against – it's perceived as in the distant future, it's uncertain and it requires sacrifices now for future gains. It's also problematic because we are all responsible, yet acting without intent. And having

scientific proof of the impact of our actions makes no difference – “we are inside the elephant in the room”, he says. “Environmentalists and scientists alike continue to assume that climate change denial can be overcome with more reports and data. They are wrong,” Marshall says. “More than any other issue climate change requires a sense of shared humanity... and must be understood as an appeal to peoples’ values and identities.”

More than 300 people watched the lectures either in person or via the live webcast which is now housed on the [UBC](#) and [PICS website archives](#). George Marshall's new book, Don't Even Think About It: Why Our Brains Are Wired To Ignore Climate Change, examines the psychology of climate change denial. Through COIN he also provides academic, government and campaign training in climate change communications and public engagement, and is a lead advisor to the Welsh Government. Check out his [blog](#).

### Awards for PICS leaders

**Dr. Art Fredeen** has this year been recognised as the Service Award winner in the UNBC's University Achievement Awards that acknowledge outstanding faculty in four areas: Professional Practice, Mentorship or Stewardship; Research; Service; and Teaching. In addition to Dr. Fredeen's efforts as a PICS Program Committee Member he also serves on the UNBC Green University Planning Committee and the Natural Resources and Environmental Studies Institute (NRESi) and can always be found volunteering for



Service recognised: UNBC Service Award winner Dr. Art Fredeen helps build a geodesic dome greenhouse on campus

events such as Bike-to-Work week and Green Day celebrations. Dr. Fredeen's own research interests include the measurement of forest carbon stocks and storage as well as CO<sub>2</sub> fluxes into and out of forests and he has been working on the PICS Carbon Management in BC Forests theme since its inception. For all the work done for PICS and at UNBC we congratulate Dr. Fredeen on his well-deserved Service Award.

PICS would also like to congratulate Program Committee member **Dr. Curran Crawford** and his team of the University of Victoria plus-in electric vehicle (PEV) smart grid project who this summer were awarded a \$600,800 grant from the federal government under Canada's ecoENERGY Innovation Initiative (ecoEI). The project, which PICS is also supporting, will help generate a better understanding of intermittent renewable electricity sources such as wind, tidal, wave and solar, and the storage potential in electric vehicle batteries. Crawford's project is multidisciplinary. A UVic psychology team will examine how people think about electric vehicles and use them, a UBC architecture and design team will examine design of charging stations, and an SFU survey will gather data about how existing EV users use electric cars, while a team at BCIT will test out Dr. Crawford's models. For more details on the project and how it fits into the federal government's overall ecoEI investment click [here](#).

### PICS events coming up in fall. ....

Join **Science World** on the weekend of September 27 & 28 to celebrate the everyday science that takes

place in our community! Stop by the PICS booth and explore hands on demonstrations on renewable energy and learn about PICS new free online course on BC Regional Climate Impacts and Adaptation.

PICS UBC-SFU will continue co-hosting **free public lectures** in downtown Vancouver including presentations on Embedding sustainability into corporate culture on October 14, and on From communities of interest to communities of practice on November 20. Visit the [PICS event calendar](#) for details on upcoming lectures.

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