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Managing BC's Forest Sector to Mitigate Climate Change: Future Options for Emission Reductions

Background Document for a public event hosted by the PICS Forest Carbon Management Project
When: Thursday May 25th, 2017, 8:30 AM to noon
Where: Vancouver SFU Harbour Centre, Room 2270, 515 West Hastings Street, Vancouver, V6B 5K3
A **live webcast** of the event starts at 8:55 AM

BACKGROUND

Climate change driven by human activities is one of the world's leading environmental threats. It is caused by increasing concentrations of carbon dioxide (CO_2) and other greenhouse gases (GHGs) in the atmosphere as a result of human activity, especially the burning of fossil fuels. Reducing GHG emissions is necessary to constrain global temperature increases.

Globally, less than half (approx. 44%) of the carbon emitted from fossil fuel burning remains in the atmosphere: forests remove around 30 percent of all fossil carbon from the atmosphere and the remaining quarter is taken up by oceans. Forests store carbon in trees, forest floor, and soils, and after wood is harvested, some of that carbon is stored in wood products. Creating longer-lived products increases the carbon retention of wood products, and delays carbon release back to the atmosphere. Changing how forests are managed can also offer additional opportunities to mitigate climate change by reducing GHG emissions, or increasing carbon removals from the atmosphere.

British Columbia (BC) has a legislated GHG emissions reduction target of 80% below 2007 levels by 2050. The province has about 55 million hectares (ha) of forest land, of which 21.7 million ha, or 40%, are included in the timber supply land base and 33.3 million ha are reserved for other functions.

From 1990 to 2014 BC's forests removed on average 20.6 $MtCO_2$ per year from the atmosphere and stored this carbon in forests and wood products manufactured from provincially harvested wood. For comparison, emissions from all other sectors in BC have been about 64 $MtCO_2e$ in 2014.

A forest is considered a "carbon source" when it emits more carbon than it removes from the atmosphere, whereas it is considered a "carbon sink" when it removes more than it emits. BC's forests and wood products were strong carbon sinks from 1990 to 2002 (53.9 $MtCO_2e$ per year). However since then the mountain pine beetle infestation, the associated temporary increases in harvesting in the early 2000s, and increased burned areas due to forest fire have converted the forest sector into a net emitter of 15.5 $MtCO_2e$ per year for the period 2003 to 2014.

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FOREST CARBON MANAGEMENT PROJECT

The Forest Carbon Management Project (FCMP) of the Pacific Institute for Climate Solutions (PICS) is funding a team of university scientists, with additional staff support from the BC government and the Canadian Forest Service of Natural Resources Canada, to investigate three broad questions:

(1) What contributions can BC's forest sector make to reducing greenhouse gas emissions?
(2) How will climate change affect BC's forests, and how could this affect the outcomes of climate change mitigation strategies in different regions of the province?
(3) What are stakeholder views and what institutional, policy and financial arrangements need to be addressed to implement climate change mitigation activities?

KEY FINDINGS FROM THE FIRST PHASE OF THE PROJECT

Mitigation options for BC forest sector:

Activities that reduce emissions or increase carbon removals compared to business-as-usual or "baseline" levels are considered climate change mitigation actions. The project examined the potential impact of a number of different forest sector management options including the following:

- Higher Utilization - extracting more wood from harvested hectares (less waste and reduced harvest area for the same volume of wood products) and increased salvage harvesting after natural disturbances
- Harvest Less - reduced harvest (therefore reduced volume of wood products)
- Bioenergy (using harvest residues) – using waste wood for new bioenergy facilities to displace fossil fuels and less slash burning
- Higher Utilization + Bioenergy
- Restricted Harvest – no harvest of tree stands older than 250 years
- More Longer-lived Products (LLP) –increasing the proportion of LLPs (e.g. panels) over short-lived products (e.g. pulp and paper), plus substituting wood products for carbon-intensive steel and concrete in buildings

While further analysis will be undertaken, the results so far show that a portfolio of regionally differentiated mitigation options, as outlined above, has the potential to contribute 35% of BC's 2050 emissions reduction target at costs well below $100 per tonne of CO_2e while generating additional socio-economic co-benefits.

So what does this mean in terms of numbers? BC's 2050 GHG emissions reduction target is 80% below the 2007 level of 65.89 $MtCO_2e$, meaning that annual emissions need to be cut by 52.7 $MtCo_2e$. This preliminary analysis suggests a mixed portfolio of mitigation actions at under $\$100/tCO_2e$ could deliver

the best carbon mitigation outcome of 18.2 $MtCO_2e$ (35% of the 2050 target). Implementing this portfolio between 2017 and 2050 would also yield more than 2000 new jobs (full time equivalent), $284M per year for GDP, and $34M per year for government tax revenue on average. The economic impact of implementing this mixed portfolio could be to up $610M per year, from 2017 to 2050.

Under such a portfolio, BC would be increasing the efficiency of harvest to create long-lasting wood products and leaving behind less waste, creating bioenergy in place of slash burning, and using more wood to substitute steel and concrete in buildings. BC has a history of pioneering the use of wood technologies, such as cross-laminated timber. The 18 story-Brock Commons building at the University of British Columbia is the world's tallest contemporary wooden mass-timber building. Mitigation activities would be designed to best fit the region to achieve multiple objectives for forest and wood use.

Environmental impacts of climate change on BC forests

Additional research supported by the FCMP shows that climate change impacts in British Columbia are already affecting forests both positively and negatively, with large differences across regions. Forest growth responds positively to warmer temperatures and higher CO_2 concentrations in the atmosphere in the moister regions of the province, where other factors such as nutrient availability are not limiting. In stark contrast, tree mortality rates have increased and growth rates decreased in areas with water limitations, including areas in the BC Interior. Therefore the design of climate change mitigation activities needs to consider the regionally differentiated forest responses to climate change. Mitigation actions in areas with declining forest health may need to differ from those in areas with enhanced forest growth.

British Columbians' views on forest sector management

Forest managers are challenged to address the many, often conflicting stakeholder interests in management and planning decisions. An evaluation of BC policies and professional guidance to 2015 concluded that they do not yet address carbon management objectives. Forest management decisions need to balance many objectives and while carbon may not be the deciding factor, its influence on future management decisions will increase as more attention is paid to mitigation objectives. Better understanding of management outcomes is therefore required.

Over the past year the FCMP has conducted four regional stakeholder workshops and a public survey of nearly 1,500 respondents from BC to explore public views on forest sector climate change mitigation. The public opinion survey, to be released in fall 2017, showed that there is strong support for activities aimed at rehabilitating forests that were affected by fire and insects. There is also support for management actions aimed at forest conservation, in particular of old-growth forests, and for actions which enhance forest management. A second round of stakeholder workshops in four regions of BC is ongoing.

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FUTURE PLANS

The next phase of the project will incorporate feedback on the initial analyses to refine assumptions and input data, improve estimates of mitigation outcomes, and assess how climate change impacts on forest growth and mortality may affect mitigation scenario results. Analyses and assessment of policy options for decision-makers, financing, and stakeholder views will also continue.

BC's forests and forest sector can make a significant, long-term contribution to reducing emissions to the atmosphere. Achieving these outcomes will require that the implementation of mitigation actions starts soon and that such activities are sustained. Improved forest management will ensure high rates of carbon removal from the atmosphere in forests that regrow after harvest or natural disturbances. It will also require use of harvested wood products to retain carbon and reduce emissions from other sectors, including the use of bioenergy to replace fossil fuels.

Implementation of mitigation actions requires investments in the forest sector. Mitigating climate change impacts through enhanced investment into BC's publicly owned forest lands will also require increased monitoring to support the reporting of management outcomes, specifically with regard to greenhouse gas emissions. This reporting can increase the public's awareness of forest management contributions to climate change mitigation and the accountability of forest managers in government, industry, First Nations and private lands.

SELECTED PROJECT PUBLICATIONS

Hember, R.A., Kurz, W.A., Coops, N.C. 2016. **Relationships between probability of tree mortality and surface water balance across North America**. Global Change Biology 23 (4): 1691-1710. Web-Link: http://onlinelibrary.wiley.com/doi/10.1111/gcb.13428/full

Hember, R. A., W. A. Kurz, Coops, N.C. 2017. **Increasing net ecosystem biomass production of Canada's boreal and temperate forests despite decline in dry climates**. Global Biogeochemical Cycles. 31: 134–158, http://onlinelibrary.wiley.com/doi/10.1002/2016GB005459/abstract

Hoberg, G., Peterson St-Laurent, G., Schittecatte, G., Dymond, C.C. 2016**. Forest carbon mitigation policy: A policy gap analysis for British Columbia**. Forest Policy and Economics 69: 73–82. http://doi.org/10.1016/j.forpol.2016.05.005

Kurz, W. A., Smyth, C.E., Lemprière, T.C. 2016. **Climate change mitigation through forest sector activities: principles, potential and priorities**. Unasylva 246 (67): 61-67. www.fao.org/3/a-i6419e.pdf

Peterson St-Laurent, G., Hoberg, G., W.A. Kurz, T. C. Lemprière, C.E. Smyth and Zhen Xu. 2017. **Evaluating options for managing British Columbia's forest sector to mitigate climate change**, PICS. http://pics.uvic.ca/forest-carbon-management-panel-event-documents

Peterson St-Laurent, G., Hagerman, S., & Hoberg, G. 2017a. **Emergence and influence of a new policy regime: The case of forest carbon offsets in British Columbia**. Land Use Policy 60: 169–180. http://doi.org/10.1016/j.landusepol.2016.10.025

Xu, Z., Smyth, C.E., Lemprière, T.C., Rampley, G.J., Kurz, W.A. 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. https://link.springer.com/article/10.1007/s11027-016-9735-7

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