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MITIGATION STRATEGIES FOR THE FOREST SECTOR AND THEIR EFFECTIVENESS IN BC

This May 2017 blog is written by Marina Melanidis from the PICS Forest Carbon Management Project, a multi-year collaborative effort created by the Pacific Institute for Climate Solutions, involving scientists from Natural Resources Canada (NRCan), the University of British Columbia (UBC) and other agencies.

The forest sector could potentially play an important role in mitigating human-caused climate change due to the forests' natural ability to sequester (absorb) atmospheric carbon [1]. Whether forests sequester more carbon than they release can be influenced by management strategies for forests and harvested wood products. With British Columbia's forest sector removing an average of 62.8 Mt of CO_2 from the atmosphere per year over the last 25 years, the province has a substantial potential to achieve increased mitigation benefits by implementing effective management strategies [2]. Applying regional-specific mitigation strategies to B.C.'s forests could contribute to the province's greenhouse gas (GHG) reduction target of 80% below 2007 levels by 2050 [3].

Forest management activities that reduce GHG emissions or enhance GHG removals compared to business-as-usual, or "baseline", levels have high climate change mitigation potential [4].The mitigation potential of a specific strategy is defined as the reduction of GHG emissions or the enhancement of GHG removals resulting from a change in management activity, relative to a baseline defined by the forest management activities that would occur in the absence of an implemented mitigation strategy [4]. Several mitigation strategies can be applied in the forest sector, each with differing mitigation potentials depending on location, forest type, proximity to manufacturing facilities, and the energy demand of the local community. Five potential mitigation options for B.C.'s forest sector include *higher utilization*, *harvesting less*, *collecting harvest residues for bioenergy*, *restricting harvest*, and *producing more long-lived wood products* (LLPs).

HIGHER UTILIZATION

A higher utilization strategy aims to increase the efficiency of harvesting practices. This includes increasing the amount of wood removed and used from each hectare harvested, reducing the amount of harvest residues left on site to decay or be burnt, and increasing salvage harvesting (collecting trees killed by natural disturbance that would otherwise decay or become fuel for forest fires) [6]. A higher utilization strategy that is effective at increasing harvest efficiency results in a decrease in the total area needed to meet harvest targets, which in turn reduces the area of forests required for harvest each year.

For B.C.'s forests, a higher utilization strategy provides the greatest average mitigation potential of the five strategies listed here and provides the greatest benefit for the majority of B.C.'s forests [2]. Most of the mitigation benefits however, are achieved several years after the strategy is first implemented, with benefits increasing over the long term as less residues are left on site to decay and more carbon is sequestered by unharvested stands.

HARVEST LESS

This strategy involves reducing total harvest volumes, resulting in fewer trees being cut to manufacture into wood products. This strategy has great benefits in the short term as emissions associated with harvesting are avoided and more carbon is able to accumulate and be stored in the forest. However, in the long term it becomes less effective at mitigating climate change [4]. The benefits of harvesting less are ultimately offset by several factors, including the decrease in forest carbon uptake and the increased risk of natural disturbance that occurs as trees age,, and more significantly, by an increase in the utilization of emission-intensive materials, such as structural steel, that the forgone wood products would have replaced [2].

It is assumed that B.C.'s demand for products such as new buildings won't change if harvest volumes decrease. This means that there are less wood products available to satisfy demand and more products will have to be produced using high-emitting alternatives, such as cement or steel, to fulfill that demand. As these alternatives result in an increased release of GHGs compared to wood products, an increase in their production would negatively impact mitigation in the long-term.

COLLECT HARVEST RESIDUES FOR BIOENERGY

Collecting residues left over from harvest, such as branches, tree tops and other wood currently left on site, and using the residues for local bioenergy production is a third climate change mitigation option for B.C.'s forest sector. The aim of this strategy is to reduce slash burning treatments, a practice where harvest residues are burnt on site to reduce wildfire risks and increase the planting area, and to use bioenergy as a substitute for fossil fuels [5].

The mitigation potential of this strategy varies greatly from region to region due to differences in the energy sources that would be substituted, the demand for energy, the availability of harvest residues, transportation distances, and the technical efficiency of the bioenergy conversion [2]. The greatest mitigation benefits are possible when bioenergy is used to produce heat, or combined heat and power, in lieu of high-emitting fossil fuels like coal [7]. In B.C., when an effective bioenergy strategy is applied, it provides the second highest mitigation potential of the five strategies described herein [2].

RESTRICTED HARVEST

A restricted harvest mitigation strategy involves limiting forest stands available for harvest to those less than 250 years old. The baseline harvest volumes would still be maintained, if possible, but only those stands younger than 250 years would be harvested.

In B.C., a restricted harvest strategy can only achieve mitigation benefits in the north and central coast, where the proportion of 250 year old stands is much greater than elsewhere in the province. In these locations, restricting harvest to young stands can make it difficult to maintain harvest volume levels since younger stands would have lower merchantable volumes than old stands, resulting in lower overall harvest levels and increased carbon sequestration [2]. In fact, most logging in this region is already prohibited under the Great Bear Rainforest Land Use Objective Order, a forest management agreement that addresses First Nations cultural heritage resources, ecosystem integrity, biodiversity, and wildlife, among other factors [8]. In other regions of B.C., this strategy would result in greater areas of forest being harvested relative to the baseline in order to maintain harvest volumes [2]. To further assess the mitigation potential of this strategy, additional analyses and model runs based on the region and current harvest practices and policies would be required.

PRODUCING MORE LONG-LIVED WOOD PRODUCTS (LLP)

The aim of this strategy is to shift the commodity mix of harvested wood products away from short-lived products such as pulp and paper and towards products that are longer-lived, such as panels. This strategy doesn't change the total volume of wood that is harvested; rather, it involves using more of the harvested wood to create LLPs, resulting in a decrease in the amount of short-lived products and the associated emissions [2]. The mitigation benefits of this strategy lie within the ability of LLPs to store carbon for longer periods of time, and the ability of LLPs to substitute for more emission-intensive products, such as concrete and steel in buildings [8, 9].

As this strategy doesn't affect harvest levels, it can be combined with any of the other four strategies to increase the overall mitigation benefits. It has a high cumulative mitigation potential, especially when assessed with a global perspective, as much of B.C.'s harvested wood is exported and used abroad [2]. In B.C., an increase in LLPs provides the greatest mitigation potential when combined with either a higher utilization strategy or a bioenergy strategy [2]

OTHER FACTORS TO CONSIDER

While the above five strategies are certainly potential options for B.C., they are by no means the only strategies that could be effective. Avoiding deforestation and increasing afforestation, for example, are also well discussed mitigation options. And while this blog focuses on the biophysical impacts of mitigation activities, there are several other factors to consider when implementing new forest management policies as climate change mitigation is not the sole service that B.C.'s forests provide. The economic costs and the socio-economic impacts of mitigation strategies must be carefully considered, as are values pertaining to cultural and spiritual significance, wildlife habitat and biodiversity conservation, and recreation and tourism benefits, among others.

In addition, the time-frame of a mitigation strategy will impact its effectiveness, as will the location where the strategy is implemented. There are trade-offs between aiming for mitigation in the short-term versus the long-term, and often maximizing one will result in a reduction in the other [4]. Moreover, a strategy that may be effective for one region in B.C. may not be effective in another, largely due to differences in forest types and other factors such as the transportation distance to the nearest manufacturing facilities. To more accurately assess the impacts a strategy will have, it is therefore necessary to determine the time-frame of the goals the strategy is aiming to achieve and the effect of the location on a strategy's effectiveness.

All in all, there is a great potential to achieve climate change mitigation benefits through changing forest management and/or the use of wood products within B.C's forest sector, especially if strategies are selected at the region level. One study has shown that B.C.'s forest sector could contribute 35% of the province's emission reduction target in 2050 if a successful combination of mitigation strategies is implemented by 2017 [2]. If action is taken soon, the long-term benefits of these mitigation strategies can be achieved.

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