Clean Energy Development Fund
Carbon Emissions from Advanced Wood Heating in Vermont

Introduction

The Clean Energy Development Fund fully supports the use of locally sourced wood fuels for heating as a primary strategy to meet our greenhouse gas (GHG) and renewable energy goals.[1] Vermont's forests provide a multitude of ecological, intrinsic, and economic values and are a vital component of the working landscape. When wood fuels are sourced locally from well-managed forests and used to directly replace fossil fuels in high-efficiency applications like space heating, they can be an excellent long-term carbon emission reduction strategy for Vermont. Yet, several recent reports and news articles have called into question the climate benefits of various types of biomass energy—especially shipping pellets from the Southeastern US to Europe for co-firing with coal to produce electricity. As a result, many Vermonters have lingering questions about the renewability of forests and the carbon emission mitigation benefits of using wood for fuel. This summary bulletin addresses these questions.

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Is wood a "renewable" resource? Forests in the Northeastern US naturally generate without any replanting after a timber harvest. While wood sourced from land-clearing for development is not renewable, wood sourced from well-managed forests is. In Vermont, we harvest approximately half the amount of wood as is regrown each year. If we continue to harvest less wood than we grow each year, wood products and fuels are a "renewable" resource.

What about deforestation?
While Vermont was nearly 80% deforested in the mid-1800s for expanding fields for livestock, today Vermont is nearly 80% forested. The amount of forestland area in Vermont has been very stable over the past 50 years – with only minute changes due to land-clearing for agriculture and development. Forest management, periodic harvesting of timber and fuel, and viable local markets for low-grade wood help keep forests as forests and lessens the economic pressure on private landowners to clear forests for development purposes.

How are forests in Vermont managed? A large majority of Vermont's forests are privately owned and actively managed. Over 80% of harvesting in Vermont is overseen by a professional forester and harvested in accordance with a management plan. Forest management or silviculture is the practice of altering current forest conditions to achieve a desired future forest condition. Objectives like improved wildlife habitat, ecological functions, timber value, and carbon storage are the drivers in most forest management decisions. While clear-cutting wide swaths of forests and conversion of forestland for development are commonly held images when many people think of logging, they are uncommon practices in Vermont where forests are managed to remain as functioning forests.

What are the impacts of harvesting on forest growth & health? Timber harvesting can adversely impact various forest functions, but management practices can mitigate these impacts and maximize desired benefits. Cutting trees can improve forest health and stimulate growth. This may seem counter intuitive, but removing select trees from crowded forests, opens the canopy -- providing more sunlight and resources to the trees left uncut. Recent studies of the impacts of logging indicate responsible forest management and harvesting techniques are being widely practiced in Vermont.[2]

Are we over-harvesting our forests? The answer is, no. In fact, data from the past six decades indicate Vermont's forests have annually grown over two times more wood than was harvested for timber, pulp, and fuel.[3] As a result, Vermont's forests are, on average, growing older -- with increasing acres of older forests with larger trees and fewer acres of young forests stocked with smaller trees.

A recent study prepared for the Vermont Department of Forests concluded Vermont's forests can yield twice as much wood fuel annually as is currently harvested while at the same time increasing forest stocking and carbon storage.[4] Annual pulpwood harvest levels have declined 70% over the past two decades—creating more opportunities to use this low-grade wood for fuel.

What about climate change and the carbon emission from burning wood? For many decades, land use change (deforestation) was the primary source of human-caused global CO_2 emissions. However, since the 1950s, fossil fuel use has increased dramatically, and global rates of land use change have reduced significantly. See Figure 1 below.

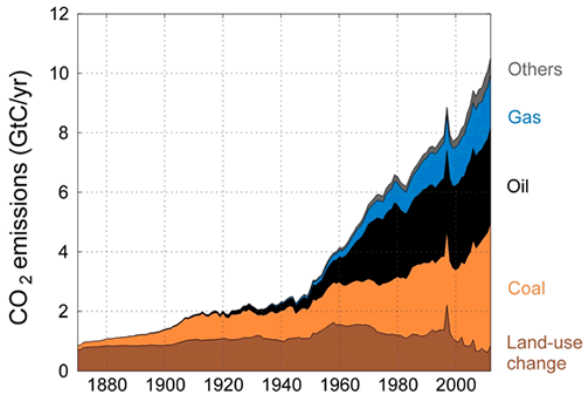

***Figure 1**- Global carbon emissions by source. Source: Global Carbon Project*[5]

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By contrast, forests are both a carbon sink and source – they continually absorb and emit carbon over time. As part of the natural carbon cycle, "biogenic" carbon is continually cycled between forests and the earth's atmosphere. Forests have been absorbing and emitting carbon with no net increase to atmospheric CO_2 levels for thousands of years. Using wood fuel from well-managed forests simply mimics the natural carbon cycle. See Figure 2.

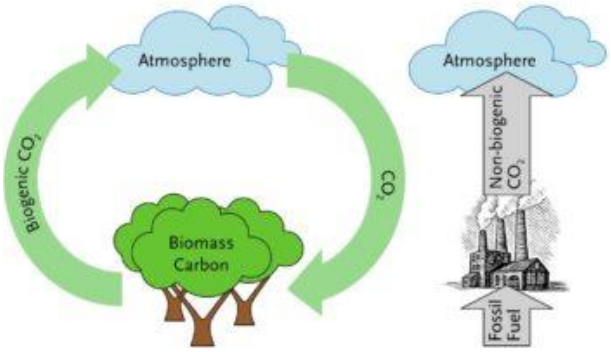

Figure 2 *– Biogenic carbon cycle and the one-way path of geologic carbon into the atmosphere.*

While harvesting a live, growing tree and using it for fuel, immediately emits carbon and shortens the amount of time before the stored carbon in wood is released back to the atmosphere when the tree dies and decomposes, wood fuel harvested as part of sustainable management causes no long-term net increase in CO_2 levels in the atmosphere.

Does using wood as a substitute for fossil fuels achieve net reductions of CO_2 over time? Yes. Burning fossil fuels extracts geologic carbon stored below the surface of the earth for millions of years and directly emits additional CO_2 into the atmosphere.

Although wood fuels emit slightly higher amounts of total carbon dioxide per unit of energy than fossil fuels, burning wood releases carbon dioxide that was already absorbed from the atmosphere by the trees as they grew. As a result, no long-term increases in atmospheric carbon dioxide levels occur and equal amounts of carbon are recaptured with the re-growth of the well-managed forest. However, there are some fossil fuel CO_2 "upstream" emissions from the logging, processing, and transportation of the wood fuels that are accounted for, but they are relatively few. When wood fuels are used to replace fossil fuels, numerous recent studies have concluded there are significant reductions of long-term GHG emissions compared to burning fossil fuels.[6,7]

While the carbon emission benefits of replacing fossil fuels with wood are less when viewed in the short-term, there is an abundance of evidence that strategies that offer long-term emission reductions are vital. The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change and is widely respected as a source of objective GHG emission information. The IPCC's fourth assessment report summarized the wood fuel CO_2 emission issue succinctly:

"In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fiber, or energy from the forest, will generate the largest sustained [carbon emission] mitigation benefit."[8]

Conclusion

Vermont's forests provide a multitude of essential functions – cleaning air and water, wildlife habitat, biodiversity, carbon storage, and can also sustainably produce timber, fiber, and fuel. Vermont's forests are well-managed and continue to grow more wood than is harvested. While some forms of biomass energy have questionable carbon benefits, local wood heat is different. When wood fuels are sourced locally from well-managed forests and used to directly replace fossil fuels in high-efficiency applications like space heating, it is an excellent long-term carbon emission reduction strategy for Vermont.

Vermonters continue to use tens of millions of gallons of heating oil and propane each year to heat our homes and buildings. Conservation, efficiency, and switching to sources of renewable energy like wood heating are all essential strategies needed to address the scale of the problem.

References
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