

CANADA'S WOOD PELLETS

MEETING CLIMATE CHANGE GOALS

The Role of Wood Pellets

For decades, wood waste from manufacturing was burned in beehive burners. Unwanted logs, branches, and tops from harvesting were either left on site, creating a fire hazard and potential insect infestation, or burned in piles, releasing CO₂ and fine particulate without generating any economic or energy benefit.

Today, an increasing amount of that waste is being turned into wood pellets in Canada. Those pellets are used around the world to produce clean energy and to displace fossil fuels – supporting efforts to meet important global climate change targets.

Biomass, particularly wood pellets, is part of the climate change solution as we transition away from fossil fuels. The energy industry is increasingly using wood pellets to replace fossil fuels to substantially lower GHG emissions. For example, at Drax Power Station in the UK, even after accounting for fossil fuel emissions

along the supply chain during harvesting, manufacturing and transportation, wood pellets lower GHG emissions by more than 80 percent compared to coal.¹

Power producers are not the only ones supporting energy from biomass. The United Nations Intergovernmental Panel on Climate Change (IPCC), the world's leading authority on climate change, has recognized the significant GHG mitigation potential of biomass – as much as 80 to 90 percent – provided that it is developed sustainably and used efficiently.²

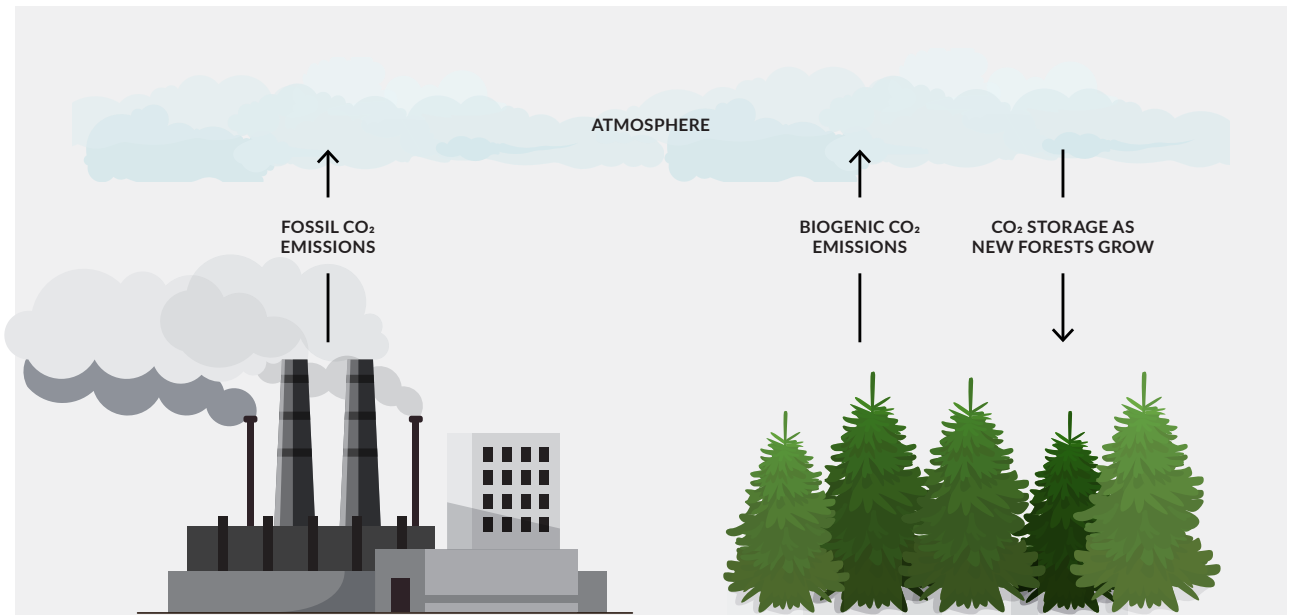
The need for sustainability is a strong argument for Canadian wood pellets. Canadian wood pellets are produced entirely from the residuals of sustainably managed forests. Those forests are highly regulated to ensure that Canada's forests will not be depleted over time and the regulations are enforced by governments and backed by independent certification.

CO₂: FOSSIL FUELS VERSUS BIOMASS

While both fossil fuels such as coal and biological materials like wood pellets emit carbon dioxide (CO₂), it's ultimately the source of the CO₂ that determines the impact it will have on the atmosphere. Coal is a very efficient fuel, in that it provides more energy per kilogram than biomass, but it is not a renewable fuel. Coal is mined from carbon sinks that took millions of years to form, so when it is burned to produce energy it increases the total amount of CO₂ and other potent GHGs in the atmosphere. Energy made from woody biomass

comes from burning carbon drawn out of the atmosphere by trees within the last 150 years; much of the carbon from those trees is being held in long-lived forest products and, in most jurisdictions in Canada, harvested areas are reforested and newly-planted trees start drawing in CO₂ from the atmosphere within a year of harvesting. Those factors make woody biomass a renewable energy source and an important alternative in the transition away from fossil fuels (see Figure 1).

Figure 1 Biogenic Versus Fossil CO₂ Emissions



MORE TO CO₂ AND PELLETS:

Carbon dioxide is not the only GHG, nor the most potent one. The chart below, based on IPCC data, shows some naturally occurring gases, such as methane, have a much higher global warming potential than carbon dioxide.

GREENHOUSE GAS	GREENHOUSE WARMING POTENTIAL OVER 100-YEAR TIME HORIZON
Carbon dioxide (CO ₂)	1
Methane (CH ₄)	28
Nitrous oxide (N ₂ O)	265

“Ash content” – the material left behind after combustion – is another important consideration. Ash content is carefully monitored in the wood pellet sector and must meet strict customer requirements. The ash content of coal can be as high as 30 percent whereas industrial wood pellets have an ash content of less than three percent meaning wood pellets leave behind less waste after combustion.

SUSTAINABLE FOREST MANAGEMENT AND CARBON STORAGE

Like wood pellet customers, other consumers of forest products want to ensure those products come from sustainable sources. Canada's forest sector depends on sustainably managed forests to make lumber, panel products like plywood and oriented strand board, and pulp and paper products like tissue, cardboard, and printing paper. Only 0.2 percent of Canada's forests are harvested annually³ and overall Canada's forests are growing faster than they are being harvested.

It is a fundamental requirement of sustainable forestry that the carbon stock in forests remains stable or increases over time. Forest professionals manage whole forests by dividing them into hundreds of individual forest stands or sections. As one plot is being harvested, another is being

planted, another is being thinned, while in yet another, crews are removing competing brush to allow the trees to grow faster. While this is happening, the stands are being managed for other important values such as biodiversity, recreation, and cultural heritage. Since only a small fraction of the total forest is harvested each year, growth in the hundreds of adjacent stands adds up to at least the same, but most often more than the amount harvested. Newly planted stands sequester only small amounts of carbon, but will store more and more carbon over time until they reach maturity. At maturity, both growth and carbon sequestration slow until finally the trees are harvested and the cycle begins again. This concept is important in understanding forest carbon accounting (see Figure 2).

Figure 2 Carbon Flow in a Canadian Forest: a representation of a collection of forest patches across a landscape with arrows showing the direction and rate of CO₂ flow depending on the age and condition of each patch.



When a single forest stand is harvested, about half of the carbon ends up being stored in long-lived forest products. In North America, 2x4 lumber is used to build 90 percent of North American houses, which last for many decades. Paper products (which are recycled up to seven times) also store carbon. Canada's approach to sustainable forestry ensures its forests as a whole act as a carbon sink. New engineered wood products are allowing wood to store carbon in even longer-lived structures, including high-rises. Figure 3 illustrates this carbon cycle in a typical sustainably managed Canadian forest where timber is used to make lumber, pulp and paper products, and wood pellets.

Despite the growing demand for clean energy, only a small amount of biomass makes its way into wood pellets. Canadian wood pellets are produced entirely from the residuals of sustainably managed forests. Taken as a whole, these residuals account for about 4 percent of the annual harvest in Canada.

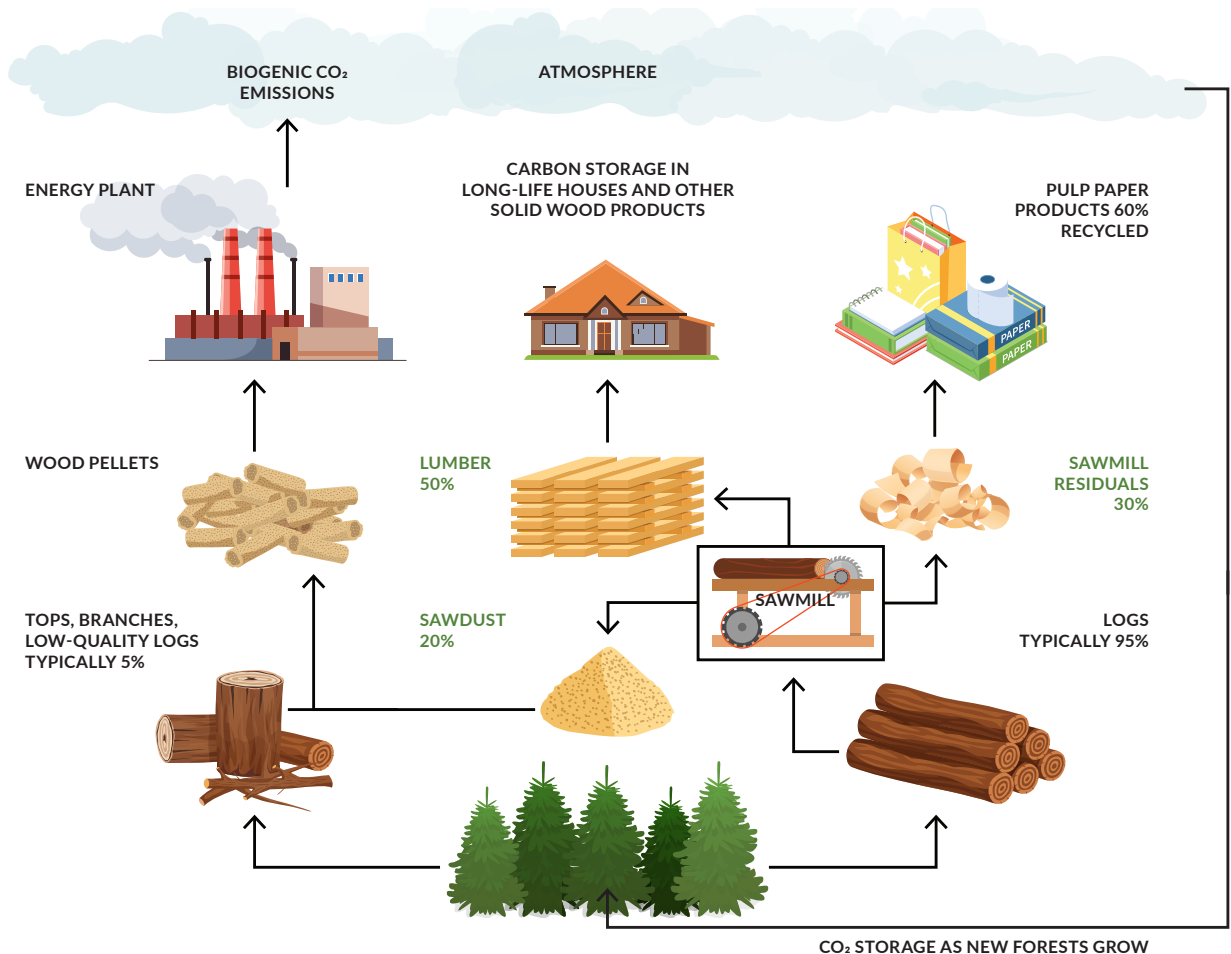
WHY PELLETS?

Wood pellet manufacturers receive raw material in the form of sawdust, chips, and low-quality logs with up to 50 percent moisture content.

Wood pellet manufacturing consists of removing moisture from incoming wood fibre, grinding the fibre into dust, and compressing the dust into the shape of a pellet. Heat causes lignin—that naturally occurs in wood—to act as a glue to hold the compressed particles together. The result is a dry, highly compressed product that can be transported efficiently for very long distances.

With electric power plants, pellets are handled the same as coal. Pellets are ground back to dust, the dust is combined with air, and the resulting mixture is fed continuously to a flame which creates steam to generate electricity.

Figure 3 The carbon cycle in a sustainably managed Canadian forest





Natural Resources Canada, in its 2020 annual report, *The State of Canada's Forests*, confirmed that Canada's forests managed for timber production are consistently a net carbon sink.

Unfortunately, in recent years, global warming has accelerated the number of natural forest fires, especially in remote, northern and unmanaged forests. The annual forest area burned is 15 times larger than annual harvesting and has caused excessive CO₂ emissions. The wood pellet sector has an important role to play in reducing wildfire risk by salvaging a portion of the burnt timber as raw material and replanting some of the more accessible burnt areas, turning them back into carbon sinks.

While wood pellets are already part of the climate solution, the future holds even more promise. Emerging technology such as carbon capture and storage (CCS) promises to use wood pellets to achieve negative GHG emissions that are mixed with a solvent and then, instead of being released to the atmosphere, are sent through a pipeline to deep underground air pockets where they are permanently stored.⁴ Large-scale CCS technology is just starting to be commercialized. There are currently two commercial scale coal power stations using CCS: SaskPower's Boundary Dam project and Petra Nova's project in Texas. Drax Power is working on CCS technology for biomass, and when ready, it will actually enable negative emissions from wood pellets; that is to say, it will essentially suck GHGs out of the atmosphere.

The increasing demand for sustainable wood pellets generates two wins: reducing GHG emissions abroad and ensuring all parts of the tree are used to generate maximum economic benefit domestically. Sustainable Canadian biomass and the wood pellets made from it are an excellent option for energy producers looking to lower their GHG emissions.

Canadian wood pellet producers understand the needs of their customers and demand sustainable biomass from their suppliers even as they help their suppliers reduce waste. Both objectives support the goals of governments seeking better utilization of natural resources and more jobs from the natural resource sector. It's a natural win for everyone.

1 Drax. Forest Scope. <https://forestslope.info>

2 Chum, H., A. Faaij, J. Moreira, G. Berndes, P. Dhamija, H. Dong, B. Gabrielle, A. Goss Eng, W. Lucht, M. Mapako, O. Masera Cerutti, T. McIntyre, T. Minowa, K. Pingoud. (2011). Bioenergy. In IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer, C. von Stechow (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. <https://www.ipcc.ch/site/assets/uploads/2018/03/Chapter-2-Bioenergy-1.pdf>

3 Based on analysis of: Natural Resources Canada, Canadian Forest Service. (2020). State of Canada's Forests 2019 Annual Report. <https://cfs.nrcan.gc.ca/pubwarehouse/pdfs/40084.pdf>

4 Kelsal, G. (2020, April 4). CCUS Status, Barriers and Potential. IEACC Webinars. <https://www.iea-coal.org/webinars/>