



# Reducing Greenhouse Gas Emissions Thanks to Bioenergy

The use of forest bioenergy to replace fossil fuels in heat and electricity generation has the potential to reduce greenhouse gas (GHG) emissions. Under sustainable forest management practices, forests can provide renewable feedstock for bioenergy as the CO<sub>2</sub> released during wood combustion is later recaptured by photosynthesis as the forest regrows.

## Starting off in debt

For the same amount of energy produced, biomass releases more CO<sub>2</sub> into the atmosphere. Therefore, for a variable period of time, cumulative atmospheric CO<sub>2</sub> emissions are higher when converting bioenergy than when using fossil fuels. This period is often referred to as the "carbon debt." However, once this period is over and the carbon debt has been paid back, benefits in terms of GHG released into the atmosphere are achieved.

## Is the future green?

Canadian Forest Service researchers have developed a user-friendly tool that evaluates GHG mitigation potential and carbon debt payback time. Users create their own bioenergy deployment scenario by selecting different options regarding the supply chain and forest dynamics. First, they determine the biomass source used, i.e., harvest residues, live trees or salvaged trees (following a fire or an epidemic). Then, they choose the transformation their biomass will undergo (chips or pellets) and where it will be used (export or local market). Finally, the tool takes into account the form of energy conversion (heat or electricity) and the type of fossil fuel (coal, oil or natural gas) replaced by bioenergy.



Photo: NRCan



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## What about the next century?

The tool's results are presented in two ways: the number of years required to pay back the carbon debt and the amount of GHG emissions avoided after payback. These results are presented in a graph covering a 100-year period, starting at year 0, i.e., when bioenergy from a

sustainably managed forest is first being produced and used. They can provide guidance on how to optimize forest bioenergy use in order to mitigate GHG emissions.

## To access the calculator:

<https://apps-scf-cfs.nrcan.gc.ca/calc/en/bioenergy-calculator>

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