

Large differences in the climate impact of biofuels

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When biomass is combusted the carbon that once was bound in the growing tree is released into the atmosphere. For this reason, bioenergy is often considered carbon dioxide neutral. Research at the University of Gothenburg, Sweden, however, shows that this is a simplification. The use of bioenergy may affect ecosystem carbon stocks, and it can take anything from 2 to 100 years for different biofuels to achieve carbon dioxide neutrality.

"Using a tree as [biofuel](#) creates a [carbon dioxide](#) debt that must be "paid back" before the fuel can be considered to be carbon dioxide neutral. Energy forest is fully neutralised after 3-5 years, while other trees grow so slowly that it can take up to 100 years before they achieve carbon dioxide neutrality" says Lars Zetterberg of the Department of [Earth Sciences](#) at the University of Gothenburg.

The use of [bioenergy](#) affects ecosystem [carbon stocks](#) over time in either a positive or negative way. Biofuels where the combustion related emissions are compensated rapidly have a lower [climate impact](#) than fuels for which it takes a long time for the emissions to be compensated. Despite this, the difference in climate impacts between slow and rapid biofuels is rarely highlighted in political contexts. Emissions from bioenergy are, for example, not included in countries' commitments under the [Kyoto Protocol](#).

In his PhD thesis, Lars Zetterberg analyses how different types of biofuels affects the ecosystem carbon stock over time, and the

consequent climate impact. The results show that biofuels where the combustion related emissions are compensated rapidly have a lower climate impact than fuels for which it takes a long time for the emissions to be compensated. Results from this study can help decision makers to understand the climate impacts from different bioenergy types in order to prioritize between different bioenergy alternatives.

"The [time perspective](#) over which the analysis is done is crucial for the result. Over a 100 year perspective the use of stumps for energy has a significantly lower climate impact than coal, but over a 20 year time perspective, stumps have a higher climate impact than natural gas. Using logging residues in the form of branches and tops for energy reduces carbon dioxide emissions in both the short term and the long term."

If environmental legislation, for instance the EU renewables directive, requires that climate benefits of biofuels are calculated over a 20 year period, biofuels that need longer time to reach carbon neutrality may be regarded as not renewable..

"If we want to do reduce global carbon emissions quickly, we should prioritize fuels that are beneficial on a short time scale, for instance 20 years In addition, over a longer time scale it will be beneficial to replace coal with stumps, even if we will not see a result until after 20 years."

In the thesis, Lars Zetterberg also addresses how the EU Emissions Trading System should be designed in order to incentivize the use of carbon dioxide efficient fuels.

Provided by University of Gothenburg

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