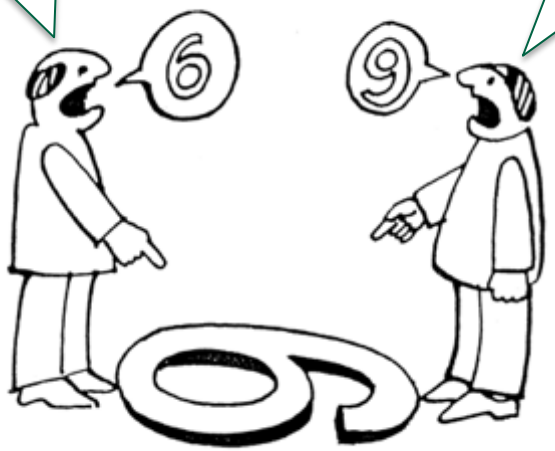
Relevance of temporary changes in C storage to bioenergy systems

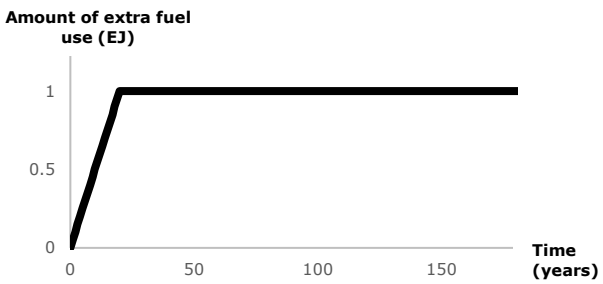
When you cut a tree and burn it for energy there will be immediate CO2 emissions that contribute to global warming. It takes many decades before a new tree has grown up and sequestered all the CO2 again.

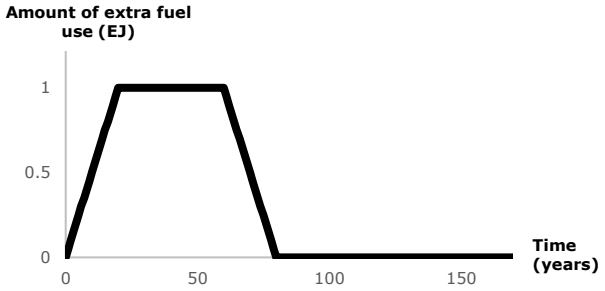
Dude…you cannot cut a tree before it has grown up! So, first the tree grows, sequesters CO2 and cools the world. Then, if you cut the tree and burn some of the wood you just return the CO2 to the atmosphere.



Göran Berndes, Chalmers university and IEA Bioenergy Task 45

Relevance of temporary changes in C storage to bioenergy systems



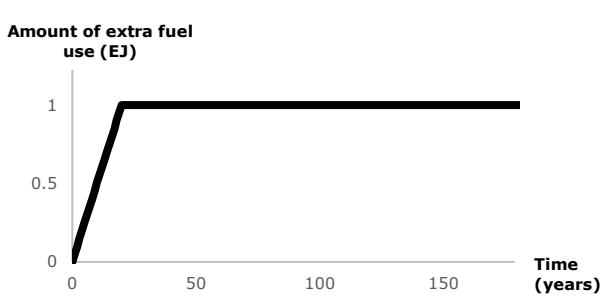


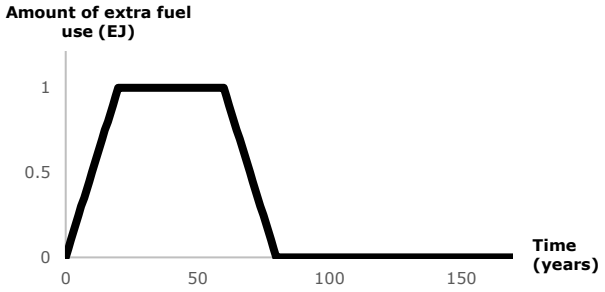
Biomass sources

Forest residues that would decompose in the forest if not used for energy

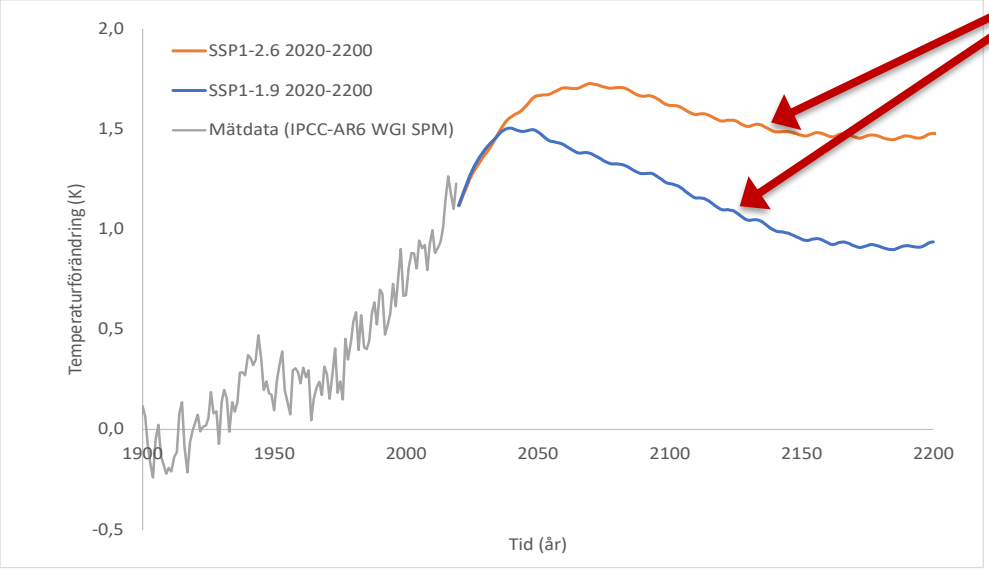
Wood that would otherwise be used to produce other products with varying residence times in society

Relevance of temporary changes in C storage to bioenergy systems



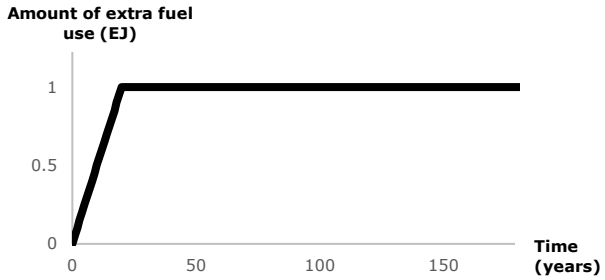


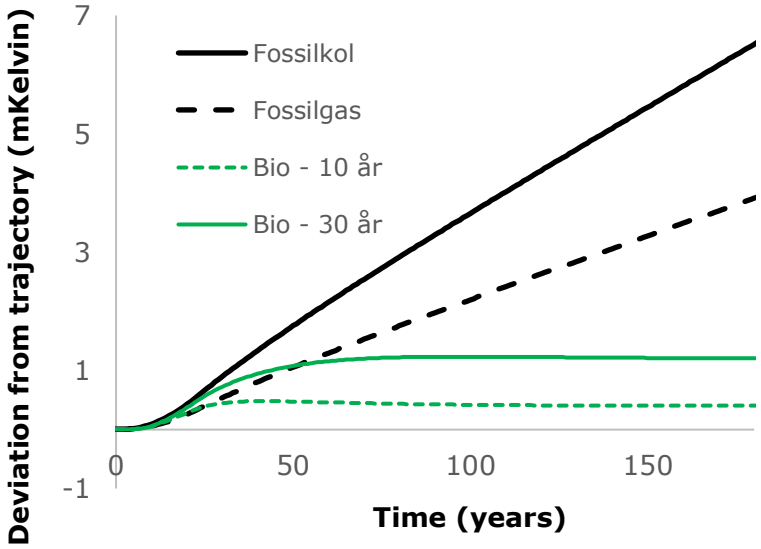
How will temperature deviate from these trajectories if we use some extra fuel?



Global average temperature change over time in the SSP1-1.9 and SSP1-2.6 scenarios in IPCC AR6

Temperature impact of using coal, fossil gas, biomass for 180 years



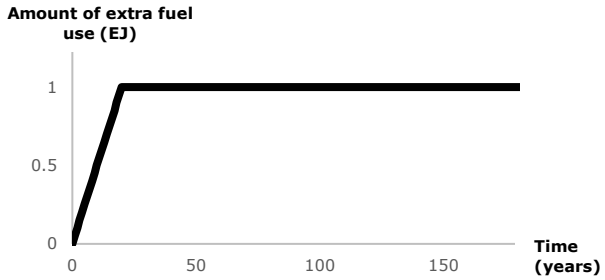


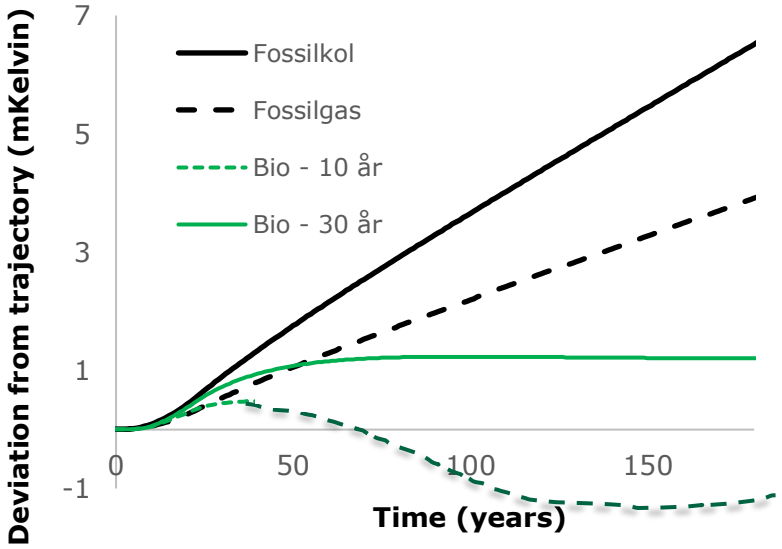
Cooling from substitution of fossil fuels

+

Warming from reduced C storage in forest and wood products pool

Temperature impact of using coal, fossil gas, biomass for 180 years



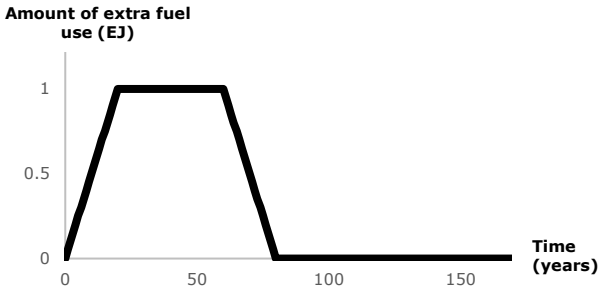


Cooling from substitution of fossil fuels

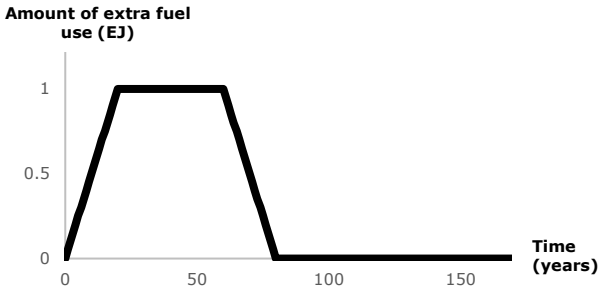
+

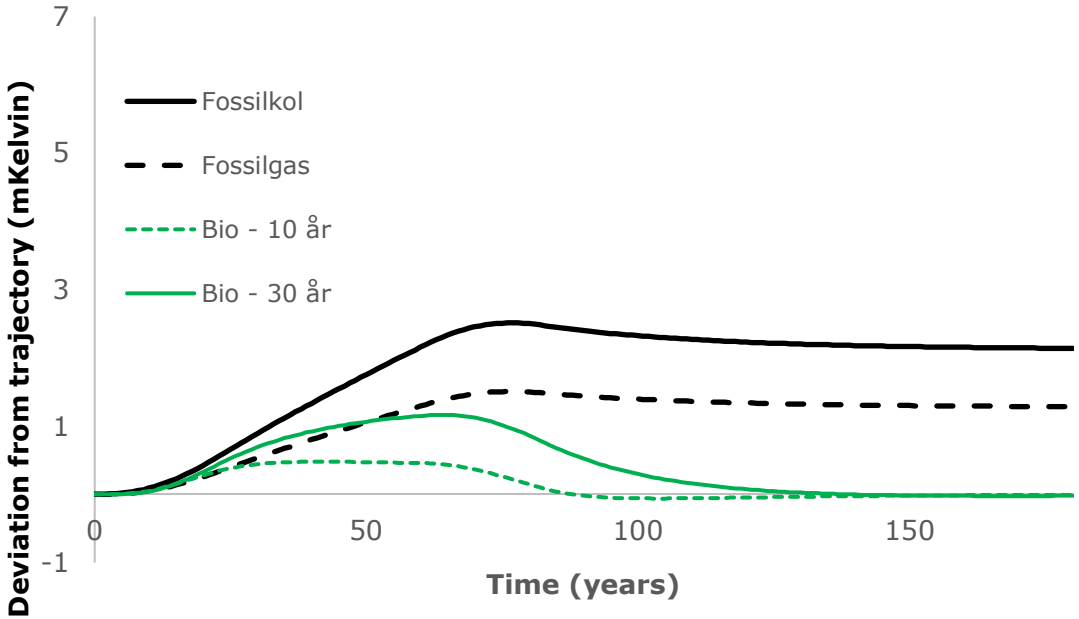
Cooling from increased C storage in forest and wood products pool

Temperature impact of using coal, fossil gas, biomass for 80 years



Temperature impact of using coal, fossil gas, biomass for 80 years





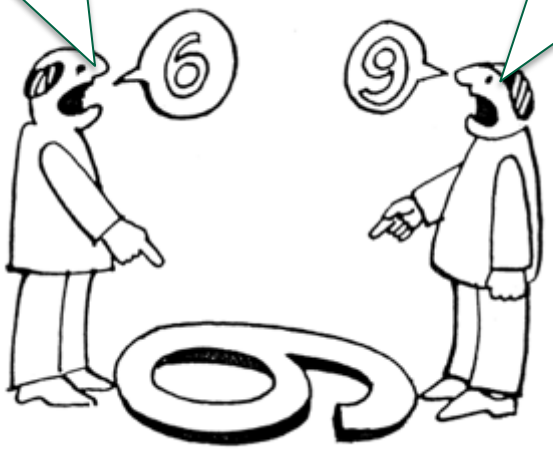
Temperature impact from fossil fuel use remains a long time after the fuel use has ended

For biomass-based fuels, the temperature impact declines towards zero after the fuel use has ended

Economics of temporary changes in C storage associated with bioenergy systems

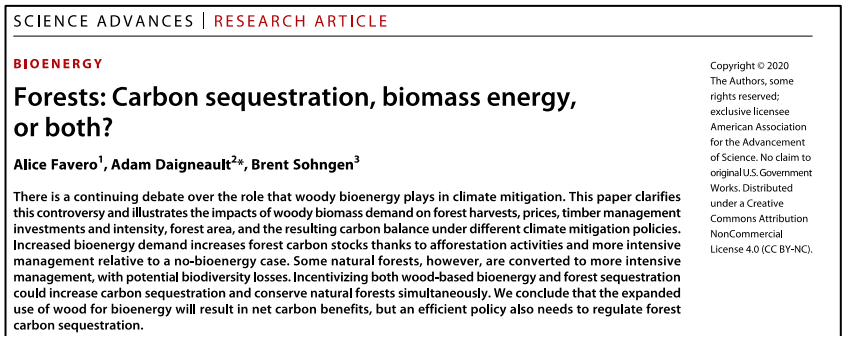
When you cut a tree and burn it for energy there will be immediate CO2 emissions that contribute to global warming. It takes many decades before a new tree has grown up and sequestered all the CO2 again.
So, you'll have to pay for the temporary storage of biogenic carbon in the atmosphere*

Dude…you cannot cut a tree before it has grown up! So, first the tree grows, sequesters CO2 and cools the world. Then, if you cut the tree and burn some of the wood you just return the CO2 to the atmosphere, so the cooling ends.
But you should definitely get paid for the cooling as long as you provide it



*https://doi.org/10.1080/14693062.2023.2276858

Economics of temporary changes in C storage associated with bioenergy systems



SCIENCE ADVANCES | RESEARCH ARTICLE

BIOENERGY

Forests: Carbon sequestration, biomass energy, or both?

Alice Favero[1], Adam Daigneault[2]*, Brent Sohngen[3]

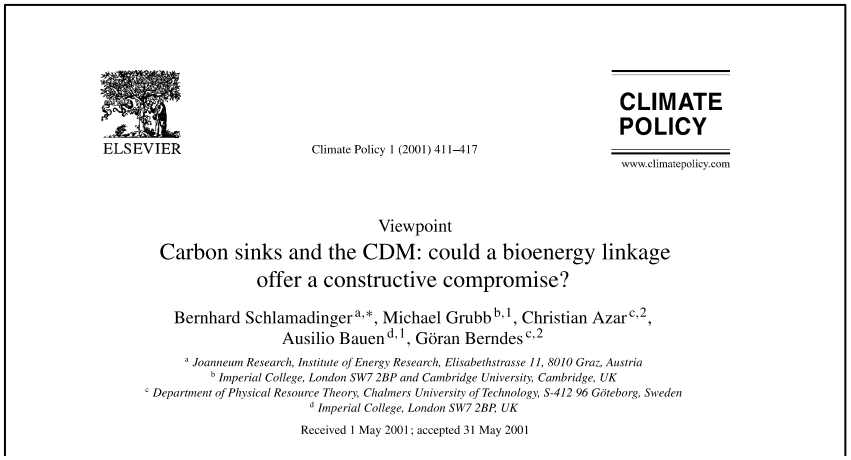
There is a continuing debate over the role that woody bioenergy plays in climate mitigation. This paper clarifies this controversy and illustrates the impacts of woody biomass demand on forest harvests, prices, timber management investments and intensity, forest area, and the resulting carbon balance under different climate mitigation policies. Increased bioenergy demand increases forest carbon stocks thanks to afforestation activities and more intensive management relative to a no-bioenergy case. Some natural forests, however, are converted to more intensive management, with potential biodiversity losses. Incentivizing both wood-based bioenergy and forest sequestration could increase carbon sequestration and conserve natural forests simultaneously. We conclude that the expanded use of wood for bioenergy will result in net carbon benefits, but an efficient policy also needs to regulate forest carbon sequestration.

"…increased bioenergy demand increases forest carbon stocks thanks to afforestation activities and more intensive management relative to a no-bioenergy case.

Some natural forests, however, are converted to more intensive management, with potential biodiversity losses.

Incentivizing both wood-based bioenergy and forest sequestration could increase carbon sequestration and conserve natural forests simultaneously."

Economics of temporary changes in C storage associated with bioenergy systems



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Climate Policy 1 (2001) 411–417

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Viewpoint

Carbon sinks and the CDM: could a bioenergy linkage offer a constructive compromise?

Bernhard Schlamadinger[a,*], Michael Grubb[b,1], Christian Azar[c,2], Ausilio Bauen[d,1], Göran Berndes[c,2]

[a] *Joanneum Research, Institute of Energy Research, Elisabethstrasse 11, 8010 Graz, Austria*
[b] *Imperial College, London SW7 2BP and Cambridge University, Cambridge, UK*
[c] *Department of Physical Resource Theory, Chalmers University of Technology, S-412 96 Göteborg, Sweden*
[d] *Imperial College, London SW7 2BP, UK*

Received 1 May 2001; accepted 31 May 2001

"…crediting the carbon sinks component of plantations could potentially provide a strong push for biomass energy.

It would also favour longer rotation periods and some types of crops over others, with annually harvested crops, such as corn, sugar cane or grasses having less incentive than short rotation forests."