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Forest Biomass for energy – science, markets and policies

(Policy issues from a climate perspective) [1]

The carbon cycle

Nature-based solutions to limit global warming are to increase forest carbon sinks by letting trees grow, and to delay the return to the atmosphere of carbon in harvested trees e.g. by using durable wood products. Newly planted trees typically take several decades to absorb as much carbon as is emitted when they are harvested and burned for energy (carbon grow-back time). Trees are therefore not "carbon neutral" over periods that are shorter than their lifetimes (many decades, depending on species and forest management).

Policy: stop assuming carbon neutrality for trees. Plan for carbon grow-back times of many decades.

Cascading

Wood from harvested trees can be used in a cascade of applications to maximise its economic and environmental added value. When trees are harvested, their wood should be used first for durable long-life applications, such as construction timber, furniture or boards, and then re-used and recycled before being used as a feedstock for bioenergy. Such a cascade can keep the carbon from harvested trees out of the atmosphere for many decades.

Policy: require cascading to delay the return of carbon from harvested trees into the atmosphere.

Labelling bioenergy as renewable and carbon neutral

More than 3 decades ago, forest bioenergy was labelled as renewable on the basis of "carbon neutrality" (the assumption that emissions on combustion are reabsorbed by forest regrowth). At that time, the urgency of reducing atmospheric levels of carbon dioxide was much less than today, and other renewables (solar and wind energy) had much higher costs. In contrast, the Paris agreement to limit global warming to 1.5 ^{o}C and the recent IPCC report highlight the urgent need to reduce CO_2 emissions - by 2030 (< 10 years).

The long grow-back time of forest bioenergy means that it cannot reduce net CO_2 emissions by 2030 because harvested trees grow back too slowly. Indeed, because burning wood produces significantly more CO_2 per unit of energy delivered than burning coal and double that of gas, the initial impact on climate is negative, and will thus work against 2030 targets if the bioenergy feedstocks have a grow-back time of longer than 10 years. Just the biomass supply chain emissions from harvesting, pellet making, transportation, and storage are higher than those from installing solar or wind farms.

Taking additional wood from forests for bioenergy conflicts with current priorities of enhancing carbon stock and reducing biodiversity loss in forests, because forestry residues provide a source of nutrients, while large scale harvesting of trees for bioenergy reduces biodiversity.

Policy: As bioenergy from whole trees cannot help to deliver a 55% reduction in GHG emissions by 2030 (EU objective cited in RED), it should not be defined as renewable in RED or Taxonomy.

Wood Pellet and forest biomass imports

Wood pellets are promoted for bioenergy applications because they can be easily transported and stored. They are imported into the EU and traded between Member States for use in power generation and for domestic, industrial and district heating. However, if their carbon emissions are officially recorded, it is only in LULUCF records of the exporting country. This allows importing countries and businesses to report zero carbon emissions from combustion and to falsely claim GHG emission reductions when converting from fossil fuels to wood burning.

Due to its long grow-back time, roundwood from whole trees should not be made into pellets for bioenergy. Instead, following cascading principles, pellets can be made from forest industry wastes with no

[1] Based on work by EASAC since 2016 - see *https://easac.eu/programmes/environment/publications/*

higher value uses (e.g. chipboard), or forest wastes that are not needed for biodiversity or the soil. As it is difficult to determine whether a pellet has come from wastes or from roundwood, and fraud risks are high, independent certification of the origins of biomass pellets is very important.

Policy: Sources (roundwood or waste) of pellets must be independently certified, and LULUCF emission records of traded pellets must be transferred from the exporting to the importing country.

Bioenergy modelling (Integrated Assessment Models - IAMs)
Many models envisage substantial increases in woody biomass use by 2030 and 2050, but are normally run using existing or planned policy scenarios, and may assume that all biomass is carbon neutral. Such models may wrongly prioritise bioenergy use. For a science-based approach, zero CO_2 emission assumptions for bioenergy combustion should be replaced by time dependent CO_2 emissions, and sensitivity analyses should be performed with different carbon grow-back times to identify which biomass feedstocks could help to deliver future GHG emission reductions.

Policy: refine model algorithms to avoid predicting misleading bioenergy demands in future scenarios

Bioenergy with carbon capture and storage (BECCS)
BECCS is promoted as a means of taking carbon out of the atmosphere, whilst also delivering bioenergy. However, the process uses energy for CO_2 capture and emits CO_2 at every stage of the supply chain (harvesting, transport, storage, combustion, and CO_2 storage). To minimise supply chain emissions is therefore critical, for example by using locally produced wastes. Counter-intuitively, if CCS facilities are available, to burn fossil fuels and store their emissions would in most cases be cheaper and release less carbon into the atmosphere over the next 10 to 20 years than to use BECCS. It would also leave forests free to grow and continue working as carbon sinks.

Risks associated with the large-scale use of BECCS include: biodiversity loss, displacement of local communities, disruption by biomass transportation, increased demand for water and fertiliser, soil carbon loss, air pollution from combustion, and long term leakage from underground CO_2 storage.

Policy: Further develop CCS, and use only wastes in BECCS demonstration plants (at least until 2030).

Bioenergy in the EU
Renewable energy, of which 60% is bioenergy, contributes just over 20% of EU energy consumption.

Fit for 55 legislative proposals together with the EU's biodiversity, forest and energy strategies address many challenging policy issues associated with the use of forest biomass in EU markets. However, they may not stop businesses seeking to avoid stranded assets by converting existing heating or power generating plants from coal to wood burning and then falsely claiming emission reductions and the use of renewable energy, while avoiding ETS costs. The proposals do not stop Member States subsidising such conversions until at least 2026.

Use of forest bioenergy in EU markets is being accelerated by three main economic drivers:
1. Renewable energy subsidies (ca. €10 billion / year in EU27 + UK)
2. Zero costs under the ETS (bioenergy is excluded)
3. Avoiding stranded assets (re-use of coal plants when coal is phased out)

Policy: Options to strengthen the Fit for 55 proposals relating to the use of forest bioenergy include:
1. *Enforce cascading, and labelling of biomass pellets - type of feedstock (roundwood or wastes)*
2. *Stop classifying forest biomass, especially from whole trees, as renewable in RED and Taxonomy*
3. *Stop subsidies for burning forest biomass that takes longer than 10 years to grow back*
4. *Include CO_2 emissions from forest bioenergy in ETS unless the biomass is proven to come from forest or forest industry wastes, or to come from previously used wood (cascade principle)*
5. *Ensure transparency for forest biomass imports - transfer ownership of LULUCF carbon emissions for each shipment from exporting to importing country when trade takes place*
6. *Avoid misleading bioenergy demand projections by replacing zero CO_2 emission assumptions with time-dependent CO_2 emission algorithms for bioenergy combustion in IA models.*