

Towards an accurate accounting for carbon from biomass in the Product Environmental Footprint (PEF)

Bio-based products are products wholly or partly derived from renewable materials of biological origin (i.e. from plants, crops, trees, algae and biological waste). These products are used in a wide range of applications, such as energy, textile, plastics, chemicals, pharmaceuticals, hygiene, food and many more. Ideally, bio-based products are circular by nature, since they are made of renewable resources, are designed to be re-used, re- and up-cycled several times, and at the end, for biodegradable ones, returned to nature through biodegradation or composting.

To fully reflect these assets, we need a comprehensive and meaningful method to account for the footprint of biogenic carbon and allocate it to the actors along the bioeconomy value chains.

Biogenic carbon in the current PEF rules

In the currently proposed methodology of the Product Environmental Footprint rules addressing biogenic carbon, there is no recognition granted to the producers of biomass-derived products of the fact that CO₂ was removed during photosynthesis and plant growth, compared to fossil ones.

In a cradle-to-grave approach, CO₂ biogenic uptake and emissions from disposal are balanced. Therefore, in such an approach, biomass-derived products will not receive any CO₂ burden when they are disposed of, while fossil products will receive a CO₂ burden in case of incineration.

However, in a cradle-to-gate life-cycle analysis using PEF methodology, biomass-derived products will not receive any credit for the fact that CO₂ was removed from the atmosphere during photosynthesis and plant growth. Whereas in Life Cycle Assessment (LCA) (ISO 14067, EN 15804 and other LCA standards^a) biogenic CO₂ uptake in biomass-derived products shall be addressed.

When the use of the product cannot be singled out - like platform chemicals which are used for a range of different other products or intermediates -, the manufacturers need to supply a cradle-to-gate LCA. Accordingly, there will be no CO₂ removal credit for bio-based raw materials calculated

^a ISO 22526-1, ISO 22526-2, ISO 22526-3, EN 16760

at the gate of the product. It will look like there is hardly any benefit from producing biomass-derived products if any at all, compared to fossil based.

The same “accounting” problem appears when biomass feedstock is blended with fossil feedstock, like in mass balance scenarios. There will hardly be any difference in greenhouse gas footprints as long as a cradle-to-gate assessment is used for life-cycle inventories and for full LCA where other forms of end-of life approaches than incineration are applied. Additionally with the current approach, the use of the products in long-lasting applications, investment goods and others are not considered as an actual removal of CO₂ from the atmosphere with the linked positive effects to mitigate climate change.

The figures (fig. 1 and 2) below illustrate this method used for an imaginary product made of both fossil- (grey) and bio-based (green) feedstock. For simplicity, we assume exactly the same CO₂ footprint in production and logistics for these two feedstocks, as well as the same manufacturing processes and the same final uses. The only difference is in the CO₂ emissions at end of life, where bio-based feedstock emissions are zero and fossil-based ones are substantial (= 100 in this scale). We easily see that there is no difference for cradle-to-gate LCA or for everlasting or recycled products that never will release CO₂. This is counter-intuitive since we all know that CO₂ was fixed during growth of the biomass and has not yet been released again until end of life.

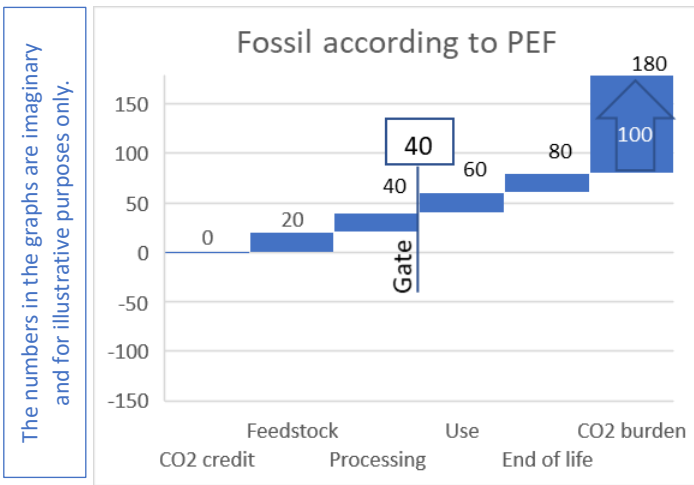


Fig 1. Cradle-to-grave carbon footprint - fossil feedstock (with incineration)

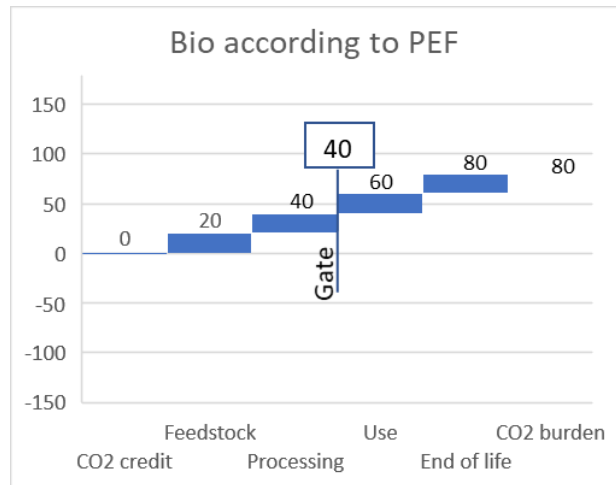


Fig 2. Cradle-to-grave carbon footprint - biobased feedstock (with incineration)

Our proposal for biogenic carbon in a comprehensive and meaningful PEF supporting the European Green Deal

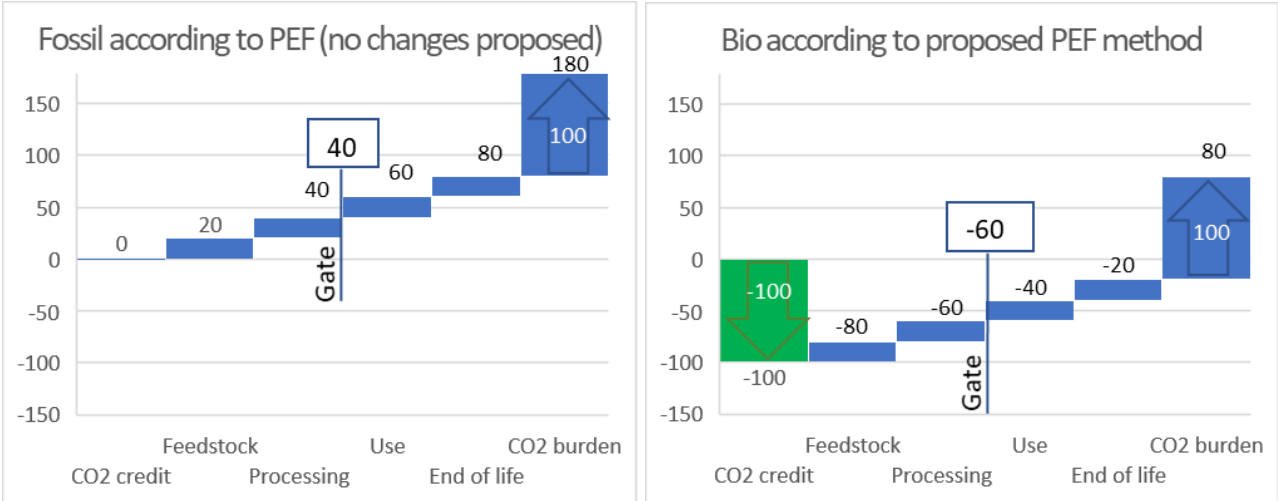
In our views, the current PEF methodology is not incentivising the use of bio-based materials. A much more meaningful way, applied in LCA and environmental footprint which is not in use in PEF today would be based on allocating CO₂ removals credits to biomass when produced AND giving CO₂ penalty to all CO₂ (bio-based and fossil) when it is actually released back to the atmosphere.

In this case, the emissions and removals are shown alongside the time periods that are in the scope of the calculations. With this approach, the data can be shown in a transparent and meaningful way. In addition, this procedure follows the standard ISO 14067 which is the commonly applied standard. Furthermore, this will be much more in line with people’s perception and much easier to communicate. It shows the positive contributions of materials to the reduction of GHG emissions on the level of purchasing decisions and helps to promote the marketing of products with overall lower carbon footprints. It also allows for informed discussions on the different stages of the life cycle.

With this proposed approach, all released CO₂ at end of life is counted as emissions regardless whether biogenic or fossil-based. Thereby, there is no further need to keep track of the origin of the carbon in the product and one avoids any double counting of CO₂ credits, hence reducing any error. Even incineration of biomass, like energy production from pellets, will have to count their CO₂ emissions. This will thus promote also the recycling of partly and fully bio-based products, Carbon capture and utilisation (CCU), Carbon capture and storage (CCS) and long-term storage of carbon, which is in line with the objectives of the Sustainable Carbon Cycles initiative^b.

The figures 3 and 4 illustrate such an alternative and more meaningful accounting method, based on the same imaginary product produced from fossil- (grey) and bio-based (green) feedstock. Again, for simplicity, we anticipate exactly the same CO₂ footprint in production and logistics of these two feedstocks, as well as the exact same manufacturing processes and the same final uses. The only difference is in the CO₂ emission at the cradle, where bio-based is negative (due to uptake of CO₂) and fossil-based is zero. With this method there is the same total carbon footprint at end of life as with method 1, but the difference also shows up at any stage during processing and use.

The numbers in the graphs are imaginary and for illustrative purposes only.



^b COM(2021) 800 final

Our recommendation

We are convinced that the use of the proposed alternative methodology to account for the carbon dioxide impact of biomass-derived products within the Product Environmental Footprint will be more intuitive and transparent, is ISO and CEN compliant, and will show the actual difference in CO₂ footprint between biomass-derived and fossil products at any stage of the life cycle, irrespective of the selected system boundaries and end-of-life scenarios linked to the functional unit of an LCA. In addition, it will avoid the challenges of double counting of CO₂ credits, since all “end-of-life” CO₂ emissions will have to be counted as contributing to climate change, whether biogenic or fossil-based. It will support the use of bio-based materials, product recycling, long term storage of carbon, CCU and CCS, in line with the Green Deal objectives. This will enable customers and consumers to make an informed purchasing decision, based on the demonstrated and transparent climate benefits of bio-based solutions.

We recommend adapting the current Product Environmental Footprint accordingly, especially in the context of the Sustainable Products and the Green Claims and Consumer Empowerment initiatives.

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About Cefic

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