Joint Statement:

The -1/+1 approach in carbon accounting for LCA – an important puzzle piece on the way to a circular economy and defossilisation

The exact methodology for carbon accounting in LCA has a huge effect on how products are judged and how their impact on the environment is viewed by consumers and partners in the value chain. It is therefore important to evaluate the different options and potential impacts for methodological choices and we fully support the efforts of JRC and the PEF TAB to scrutinise all options and make a well calibrated decision.

One of the central questions – whether biogenic carbon should be accounted for with a -1/+1 or with a 0/0 approach – has far-reaching consequences. Currently, PEF includes the 0/0 approach. At first glance, it is the simpler solution for calculating the carbon footprint, but -1/+1 offers several significant benefits and **is crucial for a transformation towards a circular economy and defossilisation in Europe**.

As stated in the Communication on Sustainable Carbon Cycles and by the initiative led by the Dutch government for a policy package on sustainable carbon for chemical industries, we need more chemical and material industries to transition away from fossil carbon as a feedstock. The alternative for these carbon-dependent sectors is to use renewable, sustainable carbon sources. Available carbon sources are biomass, captured carbon (CCU) and recycled materials. Allowing companies to use the -1/+1 approach according to the PEF guidelines is crucial for this transition. It allows them to highlight their products' superior carbon footprint, even in a cradle-to-gate assessment, due to recognition of the carbon uptake from the atmosphere.

The 0/0 approach stems from the energy sector. Fuels are a very simple product from a methodological point of view because it is obvious that they are incinerated at the end of life and the carbon is emitted to the atmosphere. Their cradle-to-grave system boundaries are easy to model as the full life cycle is known. In comparison, the challenge with all other products and materials is anticipating the exact use and the end of life. Companies producing intermediate products usually do not know their products' exact fate. In fact, immediate burning as in the case of fuels is the least wanted option for a product – may it be fossil or biogenic.

Two findings can be drawn from this observation. First, cradle-to-gate system boundaries are key for many industry players as they need to inform subsequent value chain actors about the performance of their products to be included in later assessments. As the 0/0 approach shows benefits of the bio-based materials only in the EoL (emissions are accounted as not contributing to climate change), biogenic products cannot show the benefits in many reporting formats. Second, and this is even more important from a systemic point of view, the 0/0 accounting approach does not offer any incentive for keeping the carbon embedded in products in the loop. The carbon that stays in the technosphere through recycling, CCU or CCS is accounted for in the same way as incineration, compromising cascading use and circular economy principles.

It is a key advantage of the -1/+1 approach that it allows for more transparency along the flows of carbon in a product's life cycle. By including emissions as well as uptakes, it is in line with the "polluter pays" principle, which is one of the guiding principles of the EU's environmental policy. Further, the -1/+1 approach follows the actual physical flow of carbon at all stages of evaluation. If emissions are not shown at all, as it is the case with the 0/0 approach, there are no incentives to avoid emissions either – which means there are also fewer incentives to transition towards a circular economy and avoid incineration at a product's end of life. **The -1/+1 approach helps to properly assess life cycles including recycling and CCU, which makes it extremely valuable and supportive of a multitude of high-level EU policy priorities.**

In this context it is fitting that the -1/+1 approach is already well established in the overwhelming majority of LCA standards. The PEF would be well advised to aim for coherence with these other standards. **It should be mentioned that in the other standards it is prescribed that the uptake of biogenic carbon should also be declared separately, and not just be included as a negative factor in the carbon footprint result.** Often, this is not done properly by LCA practitioners and industry, which is a shortcoming. **Fossil GHG emissions and removals shall be included in the CFP or the partial CFP**

and documented separately as a net result. Biogenic GHG emissions and removals shall be included in the CFP or the partial CFP and should each be expressed separately.

Table 1: Overview of provisions on biogenic carbon in different LCA standards (Kähler et al. 2024 (forthcoming))

ISO 14040 /-44	ISO 14067	PEF	EPD (ISO 14025 &15804)	GHG Protocol* (Product level)	Pathfinder	TfS	JRC's plastics LCA method	RED III (only for energy)
-	- 1/+1	EF method (0/0)	- 1/+1	allows - 1/+1 & 0/0	- 1/+1	- 1/+1	see PEF	0/0

***GHG Protocol on corporate level (relevant for SBTi's) is still based on the 0/0 approach, while the GHG Protocol on a product level allows both options (-1/+1 and 0/0).**

The -1/+1 approach offers a few pitfalls, which we acknowledge.

Even though a cradle-to-grave assessment is preferable from a strict LCA perspective, cradle-to-gate assessments are already standard practice in several industry contexts – also by the fossil industry. It is extremely difficult for a chemical producer that needs to report its products' carbon footprints to partners in the value chain (and soon also to policy makers due to the CSRD obligations) to evaluate all impacts after the products leave the gate. In most cases, chemicals are used in a multitude of applications and the final impact can vary greatly. For the reporting realities, the cradle-to-gate assessment is a necessity and the 0/0 approach creates a significant barrier at the value chains interfaces, and therefore a barrier to defossilisation.

In cradle-to-gate assessments (and potentially due to miscalculations regarding carbon uptake), the -1/+1 approach can led to net-negative carbon footprints of a certain product. This is a sensitive issue as it can wrongly imply that a product removes carbon from the atmosphere permanently and needs to be balanced by clear rules on how to communicate such results. It is conceivable that such results cannot lead to product claims but must only be communicated to B2B partners along the value chain. Reporting that 'emissions from manufacture are less than the carbon sequestered at the gate' as opposed to claiming a net negative result can for example help avoid miscommunications. It must also be clear that carbon uptake in a product is not equivalent to permanent carbon storage / carbon removals. At the same time, it is physically true that at the gate, the net effect can be a negative GHG emission. Reporting that 'emissions from manufacture are less than the carbon sequestered at the gate' as opposed to claiming a net negative result can help avoid miscommunication.

In the case of landfilling as end-of-life option, it is also possible that the -1/+1 approach leads to a net-negative carbon footprint even in cradle-to-grave assessments since landfilling of plastics is inert up to 100 years and does not cause any EOL emissions. This aspect of the methodology has multiple downfalls, since there is high uncertainty on how plastics behave in landfill and since landfilling is the least preferred option of the waste hierarchy. Choosing this end-of-life option in an LCA needs to be well justified in our mind. We would argue that landfill burdens should be accounted for in a transparent way and be treated in the same way for all products The signatories of this paper do not propagate landfilling as end-of-life option.

The separate declaration of the carbon element, as prescribed the other standards as well, should be standard so that the results of the -1/+1 calculation are understandable and can be interpreted by stakeholders. It is a complex topic, and more guidance is needed, but we consider the -1/+1 approach the more appropriate option to account for biogenic carbon in a way that supports alternative feedstocks and keeping the carbon in the loop while increasing transparency – fully in line with the mentioned policy goals.

SIGNATORIES: