

Europe needs a clear vision on circular carbon feedstock

The Clean Industrial Deal emphasises the need for transitioning away from fossil materials. For the chemical industry this represents a massive challenge as today, more than 90% of the carbon embedded in its value chains originates from virgin fossil sources. Carbon is and will remain an essential element of most chemicals and derived products by 2050. Therefore it must be managed in a way that avoids CO₂ being emitted in the atmosphere, independently from the source.

The EU needs a clear and holistic vision on how to manage the carbon that is used in the chemical sector and its wider economy, as advocated by several Member States¹. This vision should be part of the upcoming Chemical Industry Action Plan and it should:

- Include a strong innovation dimension, addressing Europe's innovation deficit e.g. on new materials and products;
- Establish a clear calculation methodology and verification system for recycled and biomass-derived content, including a mass balance chain of custody and standardised sustainability criteria;
- Consider new measures that will create additional market demand and support solid business cases, which, following a thorough impact assessment, could include additional carbon content requirements covering new sources of circular carbon in product-specific legislation like PPWR, ELVR or ESPR;
- Consider the role of chemical products and chemical companies in the EU's strategy on carbon removals;
- Maximise the availability of biomass and recycled feedstock for the chemical industry and establish a level-playing field with other sectors of the economy;
- Ensure continued public support and funding for companies that invest into circular solutions.



¹ See the <u>Joint Statement on a European Sustainable Carbon Policy Package</u> issued by the Netherlands, the Czech Republic, Ireland, France, Slovakia, Spain and Romania.

Scope of the paper

This position paper focuses on carbon-based feedstock and considers how switching to circular Carbon sources can improve the chemical industry's environmental footprint and diversify supply. Switching carbon sources is one of the solutions to reduce the GHG footprint of chemical production but not always the most cost-effective. Therefore, a comprehensive approach to carbon management also requires measures that aim at reducing the emission of carbon as CO₂ into the atmosphere, such as energy/resource efficiency, electrification or Carbon Capture and Storage. This aspect is not in the scope of this paper but is amply addressed in other Cefic positions².

In this paper, we define as "circular carbon", all carbon sources that are not derived from a virgin fossil feedstock and, which are currently present in the biosphere, atmosphere and anthroposphere. This includes biomass, waste and recycled materials, CO₂ captured from industrial processes or from the atmosphere, even if they originally come from a fossil source.

Context

As the Draghi report on *The future of European Competitiveness* rightly states, for some industries, "*the green transition objective is not to "decarbonise", but to reduce the reliance on fossil fuels as carbon feedstock*". Carbon is and will remain an essential element of most chemicals and derived products. Increased circularity will increase the resilience, not only of the chemical sector, but also of the entire economy.

For a long time, policies and the evidence supporting these policies have focused on the Final Energy Demand of industry. For the chemical industry, this final energy demand is currently estimated at 2.000 PJ³. The impact of growing demand for chemicals and the processing of circular materials will be partially mitigated by future improvements in energy efficiency and technology switching, keeping the Final Energy Demand of the sector relatively stable until 2050⁴.

However, more attention needs to be paid to non-energy uses i.e. the use of carbon-based and hydrogenbased feedstock, which is currently estimated to be between 3.000 and 5.000 PJ⁵. This demand cannot be mitigated with energy efficiency or electrification. It is expected to go up, in correlation with chemical

² <u>Cefic response to Commission consultation on Industrial Carbon Management, Cefic response to the Commission public consultation on an EU climate target for 2040, "Carbon Capture and Storage (CCS) can contribute to meeting Paris Agreement GHG emission ambition"</u>

³ EUROSTAT 2021

⁴ « <u>The Carbon Managers</u> » report by Cefic, Page 93

⁵ EUROSTAT, METIS, Cefic iC2050 database

production volumes and the increase of circular inputs (e.g. the additional amount of hydrogen needed for CCU or the amount of biomass needed to produce chemical feedstock)⁶. The net result will be an increased energy demand for the chemical sector as a whole.

The European Union is actively working towards reducing its reliance on fossil-based imports, while promoting sustainable, low-carbon alternatives. New dependencies may arise as a result of new feedstock sources being imported. The chemical industry will also need significantly increased access to renewable and low-carbon electricity (at competitive prices), in order to valorise circular feedstock sources while reducing GHG emissions. Therefore, a well-thought approach, balancing all supply sources, is required.

The new plan for Europe's sustainable prosperity and competitiveness⁷ recognises the need to create the conditions for a vibrant and competitive circular economy, within which the chemical industry can build its sustainable future. For the corresponding level of investments to materialise, European chemical companies also need a strong business case and an increased level-playing-field with other sectors and global competitors, which compete on access to circular carbon sources:

- Using biomass to produce valuable chemicals is usually associated with higher costs, compared to using fossil feedstock. Currently, it is not sufficiently supported by policy incentives. On the contrary, burning zero-rated biomass for energy production has a clear incentive under the EU ETS⁸ or under the Renewable Energy Directive. Storing biogenic carbon underground, rather than using it as feedstock, is rewarded with carbon removal certificates.
- Recycling is also not sufficiently incentivised because the cost for incineration and landfilling of carbon-containing waste is lower, although less environmentally friendly⁹.
- CO₂ emissions captured from an ETS installation and used as an alternative feedstock (CCU), is still considered as emitted and needs to be paid with ETS emission certificates.

Moreover, European chemical companies have to compete with cheap imports from other regions, which can rely on lower energy and feedstock costs.

More than ever, the EU needs a holistic and clearly-articulated vision on how to manage the carbon that is used and circulated in its economy and where to source it from. This vision, which is also advocated by several Member States¹⁰ should be part of the upcoming Chemical Industry Action Plan and it should consider the industry's future feedstock needs and where to source them. Such vision should cover the

⁶ «<u>The Carbon Managers</u> » report by Cefic, Page 97-98

⁷ https://commission.europa.eu/priorities-2024-2029/competitiveness_en

⁸ Article 38(5) of the ETS Monitoring and Reporting Regulation (MRR)

⁹ https://publications.jrc.ec.europa.eu/repository/handle/JRC132067

¹⁰ See the Joint Statement on a European Sustainable Carbon Policy Package issued by the Netherlands, the Czech Republic, Ireland, France, Slovakia, Spain and Romania.

following pillars: innovation, demand creation, a cost- and energy-efficient transformation and equitable access to circular feedstock.

What is at stake?

The Clean Industrial Deal¹¹ emphasises the need for transitioning away from fossil materials¹². For the chemical industry this represents a massive challenge as today, more than 90% of the carbon embedded in its value chains originates from virgin fossil sources. The stakes are many: reducing scope 3 CO₂ emissions, ensuring correct disposal and treatment of waste to expand the recycling capacity and reduce plastic pollution, mitigating external dependencies through diversification of supply, decoupling economic growth from resource use through circularity. In short, contributing to the Green Deal objectives while ensuring the EU's resilience and competitiveness. In order to ensure its credibility and win societal support, policies should clearly spell-out the type of environmental (whether climate-related or not), economic or societal benefits that are pursued. It should also demonstrate how the proposed measures allow to reap these benefits, based on strong evidence and scientific data.

Cefic is convinced, based on our own research¹³ and EU official sources¹⁴, that virgin fossil carbon will still represent a relevant share of the chemical industry's feedstock by 2050. Therefore carbon must be managed in a way that avoids CO_2 being emitted in the atmosphere, independently from the source.

Once the direction is clear and widely accepted, the EU should create the corresponding enabling framework.

Ensuring a leadership on circular carbon will be key to tackling Europe's innovation deficit

The issue of feedstock sourcing cannot be dissociated from the suitability for product properties: switching to new types of feedstocks and molecules often requires a high level of innovation to reach or maintain the desired product performance¹⁵. Customer and consumer benefits remain the key to success for chemical companies and any new product offering needs to provide at least the same performance as the

¹³ «The Carbon Managers » report by Cefic

¹¹ <u>https://unfccc.int/sites/default/files/resource/cma2023_L17_adv.pdf</u>

¹² Commission Communication on "the Clean Industrial Deal: A joint roadmap for competitiveness and decarbonization", Page 15: "To move away from fossil materials, it is vital to mandate the use of new raw material sources like recycled and bio-based materials to substitute, for example, virgin fossil materials in plastics"

¹⁴ Source: European Commission. (2024). Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society Impact Assessment Report Part III, Figure 51

¹⁵ Except for 'drop-in' circular feedstock' that can directly replace their fossil-based counterparts with few or no major changes.

incumbent. This is also an important competitiveness factor, where high levels of research and innovation have allowed EU chemical companies to increase product differentiation.

The EU's approach should stimulate innovation, not only on processes, but also on product chemistry. Some companies are developing nature-identical solutions and bio-polymers, which do not fit under the current general definition of plastic. Too detailed and rigid regulation reduces chemical companies' agility, stifle innovation and cement incumbent solutions. Definitions need to evolve, allowing differentiation through "chemically modified innovation" in polymers.

Last but not least, the EU market must become better at translating innovation into commercialisation. This objective can be reached with a stable and consistent regulatory framework, leaving enough flexibility for innovation and reducing companies' administrative burden, at every stage in the innovation and development process.

Chemical companies will invest in European solutions if there is a market and business case

Increasing the share of circular carbon in their products will significantly inflate production costs for chemical companies. Producing one ton of ethylene from fossil naphtha costs approximately 1,000€/ton¹⁶. By way of comparison, based on Cefic's own estimates¹⁷, the costs of alternatives could be two to six times higher.

Currently, most markets do not seem willing to absorb a green premium on their own, a market failure connected to externalities. This is why boosting demand for circular products, thereby creating a strong business case, remains a pre-requisite for unlocking private investments¹⁸. Consumer choices have not proven to be a sufficient driver for demand although ultimately, consumers will have to be a part of the solution. Additional incentives, with a monetary value, should be created to boost the integration of circular carbon into chemical products. Cefic believes that a combination of additional market pull and market push measures will therefore be needed to create viable business cases for circular products¹⁹, creating economies of scale and allowing costs to come down as the market grows. A pull from the market,

¹⁶ Source : International Energy Agency

¹⁷ Based on assumptions from Cefic's "The Carbon Managers" report, **ethylene from bio-ethanol** would cost approximately 1,800€, based on a cost of bioethanol estimated at 920€/ton. Ethylene derived from **waste pyrolysis oil** would be almost quadruple (approx. 3,700€). Ethylene from **CO2-based methanol** would cost 6,400€/ton: this includes CO₂ capture and transport (estimated on average at 300€/ton of CO₂), the cost of hydrogen (estimated at 2,600€/t of each ton of ethylene produced), the cost of CO₂ hydrogenation and the conversion of methanol to ethylene. ¹⁸ See the conclusions of the Draghi report on "The future of European competitiveness" Part B – Section 1 – Chapter 4 on Energy Intensive Industries (Page 102).

¹⁹ See Cefic detailed views on Market Pull: https://cefic.org/library-item/cefic-views-on-market-pull/

would address hurdles across the value chain, avoid the need for direct subsidies and provide a long-term market solution over time.

Implementation of existing regulation is the first crucial step, with a clear calculation methodology and verification system for recycled and biomass-derived content, incorporating a mass balance chain of custody and establishing standardised sustainability criteria. The Packaging and Packaging Waste Regulation (PPWR) and the Regulation on end-of-life vehicles (ELVR) should also secure progress for the bioeconomy and the chemical valorisation of CO₂. Cefic supports specific demand-creation measures but efforts in this regard should be additional and should not compete with recycled content targets to avoid diluting incentives for investments to scale up the recycling infrastructure.

Progressively, carbon content requirements, combined with the necessary enabling conditions, should also address new product categories, including products which are not plastic-based but, which represent 35% of the total carbon embedded in chemical products²⁰. In the longer-term, the Eco-design for Sustainable Products Regulation (ESPR) could be the adequate regulatory vehicle to tackle these additional specific product categories. Therefore, when the European Commission sets new eco-design requirements for products containing organic chemicals (e.g. textiles, furniture, tyres, etc...), we recommend that it looks at the use of circular carbon sources for the respective product categories and carries out a solid assessment regarding possible content requirements and their impact, including an analysis of the necessary framework conditions and the needs of the value chain.. In line with Cefic's position on ESPR, we believe that any ESPR requirement should apply on an "end product by end product basis", and not on intermediates, like chemicals or polymers as product groups. The mandatory disclosure of carbon footprint via the Digital Product Passport can also increase the demand for product made from circular carbon.

Furthermore, any circular carbon content requirement should also apply to imported products and be enforceable: a credible verification system must be in place to guarantee any claims related to imports. The EU should also ensure a timely implementation of equivalency clause as foreseen in PPWR, to ensure a fair level playing field.

Cefic supports a general aspiration to track and increase the share circular carbon sources in chemical and plastic products as formulated in the Commission's Communication "Sustainable Carbon Cycles". However, it is not in favour of any binding target or blending obligation for chemical or polymer producers, as it could be easily circumvented by non-EU producers.

²⁰ Source : Nova Institute

The role of chemical products as a carbon storage solution

Carbon removals will have to play a growing role as the EU strives to meet its climate-neutrality objective. Today, only a limited range of chemical products can provide permanent storage of carbon and therefore qualify as carbon removals, as per the Carbon Removals and Carbon Farming (CRCF) Regulation. However, chemical products, due to the sheer amount of carbon that they bind for varying lengths of time, can play a decisive role, as two parallel developments are foreseen to occur by 2050:

- Chemical companies will increasingly use as feedstock, carbon that has been removed from the atmosphere (biomass, biogenic CO₂ or Direct Air Capture);
- As circularity and recycling rates increase, the carbon will be retained in the "chemical products pool" for longer periods of time, delaying CO₂ end-of-life emissions and slowing down their accumulation in the atmosphere. This is especially important as landfill is phased out and incineration should be applied only as a last resort.

With the right incentives in place and a solid business case, companies would be enabled to invest into those solutions. The role of chemical products and chemical companies in the EU's strategy on carbon removals should be explicitly considered, in order to tap into this potential.

Europe should have the means for its ambitions

Setting targets does not guarantee their achievement. Any target on the share of circular carbon in feedstock or products should be complemented with a strategy that allows EU chemical companies to secure access to these alternative carbon sources, at competitive prices. Without a viable business case, there will be no successful transition.

Europe has a natural disadvantage in the supply of raw materials and inputs. The EU's vision for an open strategic autonomy should go beyond critical raw materials and englobe other crucial raw materials, aiming for a functioning industrial ecosystem ensuring cost-competitive access of circular feedstock. It should maximise the availability of alternative feedstock both produced in Europe and imported, pursuing clear sustainability criteria rather than excluding certain types of feedstocks. Free Trade Agreements as well as Clean Trade and Investment Partnerships should be continued and reinforced both on the multilateral, plurilateral and bilateral level, avoiding undue trade measures, barriers and tariffs on biomass imports. EU chemical companies need to find a marketplace and infrastructure where they can satisfy their circular feedstock demand.

Also crucial to this endeavour, landfilling and avoidable incineration should stop. As recommended in the Draghi report, industry should gain better access to waste as a source of feedstock by establishing a true Single Market of secondary raw materials and enhancing the quality of waste-derived materials. End-of-waste criteria for plastic and textile waste and captured CO₂ are urgently needed. The extension of the EU ETS to waste incineration and an early implementation of the landfill ban for municipal waste will also spur the business case for recycling.

As new markets develop, whether as a result of societal choices or regulatory targets, companies producing in Europe must be empowered to offer innovative and competitive solutions for their customers and must benefit from competitive access to energy and feedstocks. Otherwise, future market demand will be met with imports and the EU industry will lag behind, as it fails to attract investments. While projects will be mostly financed with private funds, continuous public support also plays an essential role to counterbalance higher production costs and de-risk private investments. Switching to alternative carbon sources will require adaptation to processes and consequently, capital investments. But the most important cost driver will come from sourcing alternative feedstock. Fiscal incentives or de-risking instruments, like Contracts-for-Difference may ultimately be the decisive factor, tipping the balance in favour of an investment decision.

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About Cefic

Cefic, the European Chemical Industry Council, is the forum of large, medium and small chemical companies across Europe, accounting for 1.2 million jobs and 13% of world chemicals production.

On behalf of its members, Cefic's experts share industry insights and trends, and offer views and input to the EU agenda. Cefic also provides members with services, like guidance and trainings on regulatory and technical matters, while also contributing to the advancement of scientific knowledge.