POSITION PAPER

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Restoring sustainable carbon cycles

As the European chemical industry, we have the ambition to become climate-neutral by 2050. We are currently looking into the "HOW" and the elements needed for achieving this objective. Cefic welcomes the European Commission's initiative on restoring sustainable carbon cycles, which we see as an important step towards an effective carbon management policy and which will guide our thinking towards 2050. We aim to go as far as possible in reducing our own carbon footprint by maintaining high levels of resource efficiency and circularity, by introducing alternative processes enabling the use of circular and alternative feedstock and low-carbon energy including low-carbon heat and steam supply as well as by capturing and storing CO_2. However, when it comes to the role that carbon plays within industry, the chemical sector has its own specificity: carbon is and will remain at the very heart of many of our processes and it is an essential element of many chemicals, like it is for most products society is using. Having access to alternative sources of carbon, notably from waste, CO_2/CO captured from industrial processes and bio-based resources is therefore an absolute necessity. In the longer-term, as residual emissions become hard or even impossible to abate, balancing options will also be needed to reach our climate-neutrality objective.

A new approach to carbon management

Cefic supports the objective to establish sustainable and climate-resilient carbon cycles, thereby minimising additional emissions. The Commission's Communication recognizes the essential role that carbon plays in our life, societies and economies, while aiming to ensure that this resource is managed in a sustainable manner, without leakage to the environment in the form of waste or CO_2. Establishing sustainable and climate-resilient carbon cycles is, in our view, a more efficient approach to climate mitigation than an approach that is essentially geared towards "decarbonisation", which may result in the wrong diagnosis and thus will lead to suboptimal solutions. In fact, carbon is an essential element in organic compounds: it is not possible to reduce the carbon density of our products and we will remain strongly reliant on carbon as a source of feedstock.

The objectives of the Communication are in line with the vision put forward by Cefic in its Mid-Century Vision report titled 'Molecule Managers'. The European Chemical Industry is already contributing for years to the objectives identified in the Communication.

The EU27 chemical industry has already significantly reduced its carbon intensity through increased energy efficiency, with specific energy consumption[1] going down by 47% since 1990. Next, the industry is aiming for higher resource efficiency in general, limiting waste during production and using waste and side streams as circular feedstock, by intelligently connecting production plants and technologies. The fraction of waste generated in the industry which is recovered increased from 39% in 2007 to 48% in 2018.[2] Product design

[1] Specific energy consumption index, which is calculated as (energy consumption index/consumption index) (1990=100). See Cefic's 2022 Facts & Figures

[2] Recovered waste intensity index is calculated by dividing the total (hazardous and non-hazardous waste) recovered waste index by the production index, source: E-PRTR and Cefic analysis.

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and product reuse can also decrease the use of resources to the necessary minimum supporting SDG #12 on responsible production and consumption. At the same time, carbon is and remains an indispensable element for organic chemistry, which is about three quarters of the production volume of the European Chemical Industry.

Conscious of consumers' desire for sustainable products, the chemical industry is increasingly looking at the ways to reduce its own carbon footprint, particularly by sourcing its carbon feedstock from alternative sources and by increasing circularity in order to keep the carbon in the loop. The share of bio-based chemicals has increased to 15% over the last decade[2] and the EU chemical industry is set to scale-up their sustainable production and use. Chemical recycling is another way to intensify carbon circularity. This emerging route is starting to make contributions[3]. Our member companies are working towards investments in scale-up and full integration of chemical recycling in the production of chemicals including plastics. European chemical companies are also developing a broad portfolio of advanced technologies for efficient utilisation of CO_2 from various sources (and CO from industrial waste gases) for the production of chemicals and polymers with a lower carbon footprint. Ensuring greater circularity of resources (including those that are originally fossil-based) to reduce emissions at the products' end of use and switching to biogenic carbon and CO_2, all have the potentials to significantly reduce our impact on climate.

Certain sources of GHG emissions emitted by our plants will remain extremely costly or even impossible to abate – at least by 2050, and therefore need to be removed/compensated elsewhere in the chemical industry or the economy, necessitating exploiting cross-sectoral synergies, industrial symbiosis and long-term carbon storage solutions. For instance, some installations' emission abatement potentials will be strongly limited by their geographical location (e.g. lacking infrastructure). Deploying carbon removal solutions inside the chemical sector can also help other sectors of the economy, in particular industrial installations, to deal with their own emissions. Chemical products are a major reservoir of carbon. They can help keeping carbon in the loop through a variety of circular solutions.

The industrial sustainable carbon challenge

An aspirational target of 20% to increase the share of sustainable non-fossil carbon sources in chemical and plastic products can be an important signal for our sector but it can only materialise if access to raw material is improved and is competitive for the industry, and if waste collection and sorting for all sources is improved to enable innovative recycling solutions.

This 20% objective by 2030 also needs to be further examined regarding:

- the type, cost-competitivity, accessibility and sustainability of feedstock to be considered for the attainment of the objective. In Cefic's view, this target should cover all sustainable circular feedstock including bio-based, mechanically and chemically recycled and CO_2-capture based materials;
- the methodology for calculating the share of "non-fossil" carbon: is the target aiming at the feedstock consumed or at the final product? And at which disaggregate level?

[2] According to BIC/Nova institut statistics, the share of the chemical turnover coming from bio-based chemicals has increased from 7.5 to 15% over 10 years

[3] Cefic Chemical Recycling Virtual Exhibition: https://cefic.org/policy-matters/innovation/chemical-recycling/

Cefic recommendations

- Develop a comprehensive and supportive policy framework to help overcome existing challenges and incentivise increased market recognition, while safeguarding industry's international competitiveness: industry requires a clear set of measures that would make alternative/circular feedstock and products competitive;
- Enlarge the concept of "non-fossil carbon sources" to include all sources of sustainable circular carbon even if coming from fossil sources originally;
- Establish a clear and harmonised system for claiming circular sustainable raw material content in all material end-use segments, including a chain of custody (such as mass balance) certification system;
- The 20% aspirational target by 2030 on sustainable carbon sources should be backed with a detailed strategy outlining the measures taken to secure access of the chemical industry to sustainable biomass and waste at fair economic and technical conditions for all market players while fully respecting the planet's boundaries;

Transforming industrial value chains

The EU's and Member States policy and regulatory framework should further evolve to enable the chemical sector's contribution to new carbon management options. Concretely:

- **CO_2 emission avoidance resulting from the utilisation of captured CO_2 as alternative carbon feedstock for the production of chemicals should be recognized in the ETS**

Cefic welcomes the proposal from the Commission to establish that *"an obligation to surrender allowances shall not arise in respect of emissions of greenhouse gases which are considered to have been captured and utilised to become permanently chemically bound in a product so that they do not enter the atmosphere under normal use"* in the framework of the revision of the EU Emission Trading System. Such principle should be based on an appropriate methodology when leading to a revision of the Monitoring and Reporting Implementing Regulation.

- **The EU's strategy should take into account the role of (chemical) products as a carbon storage and sequestration option**

The chemical sector is uniquely positioned as an important contributor to restoring sustainable carbon cycles. Chemical products are a massive reservoir of carbon that can fix the carbon for 10-40 years[4] in a single pass and will be fixed for a multiple of this time when the recycling will become fully material. Today, based on our estimations, the volume of carbon embedded in chemical products is comparable to total emissions of the industry for the production of those. Today, most of this carbon ends up in the atmosphere when products are incinerated at the end of their use[5]. An ambitious circular economy strategy including efficient waste management and recycling policies, securing access to biobased feedstock and supportive measures for the utilization of captured CO_2 as feedstock are therefore a pre-requisite for achieving sustainable and climate-resilient carbon cycles by keeping carbon "in the loop". Today the chemical sector can contribute to emission abatement in other sectors by "absorbing" carbon and storing it in products[6]. In the longer-term (towards 2050), the chemical industry could contribute to removing CO_2 from the atmosphere with storage of biogenic carbon and Direct Air Capture either underground or in products.

[4] Geyer, Jambeck, Law Sci. Adv. 2017;3: e1700782

[5] According to Material Economics, in 2017 out of 35 to 45 Mtons of EU plastic waste, 20 to 30 Mtons were incinerated and not collected separately (Industrial Transformation 2050 - Pathways to Net-Zero Emissions from EU Heavy Industry P102).

[6] According to the initial findings of the iC2050 model, the amount of captured CO_2 used as feedstock would vary between 9 and 13 Mt by 2050.

- **All forms of biogenic carbon removals should be considered in the EU's carbon accounting framework**

Increasing the share of biobased products can play an important role in meeting the EU's climate-neutrality objective. The future carbon removal certification framework should clarify the rules applying to capture and storage of biogenic carbon. Under the current EU Emission Trading Scheme, there is no crediting foreseen to industrial installations if biogenic carbon is captured and stored underground, which creates uncertainty for investments into Carbon Capture and Storage projects. The scope of Article 9 under the LULUCF regulation should also be enlarged to innovative carbon storage products, so that they can contribute to the 2030 carbon removal target.

We also believe that gasification of biomass and reforming of biomethane and pyrolysis of biomass should also be recognized. Hydrogen and ammonia production approximately represent a quarter of the EU chemical industry's direct emissions. Considering capture and storage of CO_2 process emissions when biomethane is used for steam reforming would give reassurance that investment into carbon capture technologies and storage infrastructure can get a return on investment, even in the longer-term when the share of natural gas in the energy mix will go down.

- **The EU's policy framework should acknowledge emission abatements along the entire value chain**

Certain technologies like chemical recycling remain energy intensive and therefore do not lead to absolute GHG reductions if only considering the perimeter of chemical production facilities. These technologies will however reduce GHG emissions at the product's end-of-life generating benefits across the value chain. The ETS MRR alone will not provide a direct incentive for circular technologies, although they are crucial to avoid GHG emissions. A holistic framework needs to be developed to support these circular technologies and overcome differences between ETS and ESR treatment of waste.

- **The inclusion of waste incineration in the scope of the EU ETS could give a coherent signal on circularity**

Including waste incineration in the scope of the EU ETS, while ensuring the necessary exemptions for hazardous waste and sewage sludge, will provide a coherent signal on circularity as it creates an equal treatment of waste incineration inside and outside ETS installations regardless the permitting and facilitate the tracking of carbon until the end of the value chain. This could help to direct material away from incineration towards recycling. At the same time, appropriate measures should be put in place to prevent unintended consequences, whereby operators could have the incentive to redirect materials to landfill rather than to recycling.

- **The reuse and recycling of carbon stored in materials of (end of use) products should be included in the circular economy related legislative framework.**

The chemical industry is by default able to support reuse and recycling of materials and hereby enabling the reuse of carbon stored in products that after their (first) use, would otherwise be landfilled or incinerated. The chemical industry is doing great efforts in supporting product-related sectors in recovering and reusing valuable materials from used products, that otherwise would be wasted. Herewith not only recovering valuable resources, but also preventing the destructions of material investments and capital.

- **Supporting the development, demonstration and deployment of advanced technologies needed for sustainable carbon cycles**

In addition to funding schemes supporting the development of new technologies, risk-sharing measures through suitable instruments are critical to support investment in new technologies at demonstration plant level and first-of-its kind commercial plant level. Such instruments – with sufficient budget - should be designed as real risk-sharing measures with appropriate evaluation criteria and methodology to effectively support demonstration of new technologies and investment in large scale commercial production plants. In the chemical sector demonstration plants differ from the first large-scale commercial plants on various aspects such as production capacity, revenues and lifetime. Such differences have to be considered in the evaluation of related projects.

- **The inclusion of biogenic carbon uptake in cradle-to-gate assessments could drive procurement decision making in the right direction**

The current PEF methodology does not allow the inclusion of credits for the biogenic carbon uptake in cradle-to-gate, regardless if in a cradle-to-grave approach this credit would most likely be taken into account in the form of the end of life emissions.

This accounting issue could potentially lead to wrong purchasing decisions, and in addition makes communication of PEF much more difficult to understand. It prevents companies from generating emission reduction savings from the use of the biogenic carbon uptake AND at the same time savings from a potential circular solution, as the emissions at the end of use are assumed to be zero for bio-based materials. Therefore, it can be a disadvantage for bio-based circular solutions, as they would have to show-case a negative emission, which is again difficult to explain.

The consideration of biogenic carbon uptake at cradle-to-gate approaches provides a fair basis of comparison, and supports decisions that ultimately drive emission reduction. It is also easier to explain to internal stakeholders (e.g. Procurement Department), and allows credits from circular solutions to be considered.

The rationale for not allowing biogenic carbon uptake as a credit for bio-based materials is the fact that when you cut a tree the carbon absorbed during photosynthesis would be ultimately released into the atmosphere. But when one extracts fossil materials out of the ground, the rationale should be the same. Now circular solutions are allowing longer term carbon storage, therefore this accounting rule should be revisited.

Cefic recommendations

- ETS MRR should be revised to reflect emission avoidance resulting from the utilisation of captured CO_2 as alternative carbon feedstock for the production of chemicals
- Install a crediting system in the EU ETS for the capture and storage of biogenic carbon, including emissions related to reforming of biomethane and pyrolysis of biomass
- Incentivise investments into recycling technologies to acknowledge end-of-life emission avoidance and include waste incineration in the scope of the EU ETS, while ensuring the necessary exemptions for hazardous waste and sewage sludge
- Further deploy risk-sharing support measures with appropriate evaluation criteria and methodology to effectively support demonstration of new technologies and investment in large scale commercial production plants

- Ecodesign and waste related legislation should address the reuse and recycling of carbon stored in materials of (end of use) products
- Adjust PEF methodology to reflect the carbon removal in biomass at the cradle stage instead of at the final disposal stage, hence differentiating bio-based products from their fossil equivalents.

The use of natural sinks as a means of balancing hard-to-abate emissions is a valid, long-term perspective and will be necessary to achieve climate neutrality by 2050, as supported by the EU's and IPCC's scenarios work[7]. We welcome the Commission's approach, which foresees that in the longer term, new sectors that have (almost) exhausted their emissions reduction possibilities could be integrated under a combined instrument where residual emissions are offset by natural sinks. We believe it could be an appropriate solution to compensate industrial emissions, which cannot be eliminated or neutralised in the longer term due to the absence of suitable technological options.

The future legislative framework should bring together carbon farming and progress in the bioeconomy and we therefore support the enlarged scope of article 9 under the LULUCF regulation to innovative carbon storage products so that they can contribute to the 2030 carbon removal target. Incentivising investments to scale-up production of circular feedstock for the chemical industry and securing access to sustainable and competitive biomass, notably as alternative feedstock, is an important pre-requisite for reaching climate-neutral chemical production. According to the initial simulations of the Cefic iC2050 model, sustainable biomass feedstock will play a significant role in reaching a climate-neutral chemical industry by2050.

Carbon storage should not be limited to wood-based materials and products. There are other forms of long-life bio-based materials and products, like fibre-based textiles or bio-based polymers, which deserve similar recognition.

Certification should build on existing mechanisms

Energy Intensive Industries such as the chemical industry have long investment cycles and need clear investment signals. Therefore, it does make sense to refine the EU's definition of climate-neutrality in the context of the Climate Law and to develop a regulatory framework for the recognition of emissions avoidance resulting from carbon circularity and for the certification of carbon removals, as early as possible.

In our view, the main criteria defining the types of carbon removals that EU climate policies should incentivise are technology readiness, the potential for deployment on a large scale and the duration of carbon storage. A certain degree of flexibility will also be needed in order to cope with technological progress and scale-up.

A consistent approach is needed for certification mechanisms, building on existing regulation, ensuring a clear terminology with acknowledged definitions and robust methodologies.

We recommend that additional certification systems are only developed where relevant and providing added value.

[7] See the IPCC Special Report on the impact of global warming of 1.5 ºC

Cefic recommendations

Future certification rules should:

- be based on robust accounting rules: It is crucial that each removed CO_2 or avoided CO_2 is counted once, and only once. This can and should be done in existing accounting systems like ETS-MRR and ESR rules;
- draw lessons – in terms of feasibility and efficiency - from existing certification schemes for carbon removals;
- track carbon (accrediting for recycling of carbon, and keeping the materials as long as possible in the loop), taking into account the specificities of the technologies, products and their related applications, as well as End of use and circularity considerations;
- As the GHG emissions are accounted for either by the producer (for example fuels) or by the emitter (for example end-of-life CCU materials) **the duration of the storage and additionality are a non-relevant criteria in the recognition of carbon removals certificates**
- guarantee the sustainable integrity of carbon removals: consolidation of the EU Bioeconomy Monitoring System to provide trustworthy data and robust indicators in areas such as sequestration in soils, vegetation or bio-based materials and products.

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About Cefic
Cefic, the European Chemical Industry Council, founded in 1972, is the voice of large, medium and small chemical companies across Europe, which provide 1.1 million jobs and account for 15% of world chemicals production.