

# Commentary

## How to Enable the Transition From Fossil to Renewable Carbon in the Chemical and Material Sector

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### Renewable Carbon Initiative (RCI): From international brands to leading chemical and bioeconomy companies to innovative start-ups for CO<sub>2</sub> utilisation, companies are collaborating to guide a smart transition from fossil carbon to renewable carbon

The climate crisis is accelerating at an unprecedented pace, with global warming, greenhouse gas emissions and deforestation leading to food insecurity, global health problems and biodiversity loss. What is the primary cause of human-made climate change? The usual answer is: CO<sub>2</sub> and other greenhouse gases. But is CO<sub>2</sub> really the core of the problem? Might it not be more relevant to consider where CO<sub>2</sub> originates? Recent climate data indicates that about 70% of anthropogenic climate change comes directly from extracted fossil carbon from the ground, while the other 30% comes from agriculture and forestry – mainly land-use change and livestock production. The UN Secretary-General António Guterres warned that fossil fuels are destroying the planet, and that latest IPCC reports “must sound a death knell for coal and fossil fuels.”

In other words, CO<sub>2</sub> is not at the core of the climate problem. CO<sub>2</sub> can actually be cycled between atmosphere, biosphere and technosphere. Instead, the core issue is the additional fossil carbon that is taken out of the ground via crude oil, natural gas or coal, which is utilised in our technosphere and ultimately released in the atmosphere as additional CO<sub>2</sub> emissions. The conclusion is clear: in order to rapidly mitigate climate change and achieve our global ambition for greenhouse gas emission reductions, the inflow of further fossil carbon from the ground into our system must be reduced as quickly as possible and by high volumes. In the energy and transport sector, this means a vigorous and fast expansion of renewable energies, hydrogen and electromobility, the so-called decarbonisation of these

sectors. But the chemical and materials industries have a continuing and even increasing demand for carbon and are essentially only possible with carbon-based feedstocks, as most of their products cannot do without carbon. Unlike energy, these sectors cannot be decarbonised and a new strategy needs to be found.

The Renewable Carbon Initiative (RCI) ([www.renewable-carbon-initiative.com](http://www.renewable-carbon-initiative.com)) was created after observing the struggles of the chemical and material industry in facing the enormous challenges to meet the climate goals set by the European Union and the sustainability expectations held by societies around the globe. It was clear that the industry has to go beyond using renewable energy and also consider their raw materials. Because decarbonisation is not an option for the chemical and material sector, as it is entirely based on the use of carbon, an alternative strategy is required: defossilisation through renewable carbon – carbon from above the ground: biomass, CO<sub>2</sub> and recycling.

In light of the terrible war in the Ukraine, the renewable carbon concept becomes even more relevant. The defossilisation of our entire economic system is about more than climate protection only, it is also about the independence of economies that are not viable without fossil raw materials today.

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Eleven leading companies from six countries founded the RCI on 23 September 2020, with nova-Institute as the initiator, executive office and scientific backbone with more than 40 scientists from a wide spectrum of expertise. Three years later, RCI has grown to nearly 70 members and 11 partners, including well known large suppliers and brands.

The initiative aims to support and speed up the transition from fossil carbon to renewable carbon for all organic chemicals and materials. The RCI addresses the core problem of climate change, which is largely related to extracting and using additional fossil carbon from the ground.

The vision is stated clearly: By 2050, fossil carbon shall be completely substituted by renewable carbon, which is carbon from alternative sources: biomass, direct CO<sub>2</sub> utilisation and recycling. The members are convinced that this is the only way for materials, chemicals, plastics and other derived products to become more sustainable, more climate-friendly and part of the circular economy – part of the future. The RCI urges the industry to go beyond just using renewable energy and face the issue that ALL fossil carbon use has to end, as the carbon contained in the molecules of organic chemicals and materials is prone to end up in the atmosphere sooner or later as well. Only a full phase-out of fossil carbon will help to prevent a further increase in CO<sub>2</sub> concentrations. And this is a long and challenging journey, because today 93% of the carbon used in the European chemical industry comes from fossil sources, mainly oil and natural gas.

Michael Carus, CEO of nova-Institute and executive manager of the RCI: "This is about a fundamental change in the chemical industry. Just as the energy industry is being converted to renewable energies, so renewable carbon will become the new foundation of the future chemical and material industry."

For the first time since the industrial revolution, technology allows us to decouple chemical, plastics, fibre and other material industries from the use of fossil carbon. This is a fundamental game-changer, which inherits the potential for significant impact on climate protection since most of the embedded carbon in global commodities and consumer goods finds its way into the atmosphere.

The renewable carbon strategy unites all carbon sources from above the ground, providing a framework for future investments and a strategic direction to reduce dependency

on fossil carbon from below the ground. This renewable carbon transformation is driven by a mix of international brands, established suppliers, SMEs and start-ups and the concept allows them to think beyond established boundaries to stop the influx of fossil carbon from below the ground.

Transitioning to renewable carbon requires significant industry efforts, which must be supported by policy measures, technology developments, and major investments. A supportive policy framework is crucial to achieve a rapid and large-scale shift away from fossil carbon. Responsible carbon sourcing, considering planetary boundaries and societal foundations, is essential. A comprehensive carbon management strategy, tailored to regional and application-specific factors, is needed to determine the most sustainable carbon source within the renewable carbon family. This will facilitate the complex transition from fossil carbon to renewable energy and renewable carbon across all industrial sectors.

Michael Carus, founder and executive manager of RCI, focuses on the policies that will make the change possible: "It is clear what needs to be done, the technologies exist and many companies are willing to invest in renewable solutions. What is missing now are smart policies to build the bridge between now and 2050 for companies to remain competitive in the sustainability transformation."

#### **How can the lack of a regulatory framework be overcome?**

In a comprehensive member survey in summer 2023, the Renewable Carbon Initiative (RCI) has collected ideas and opinions on what is needed to enable the transition from fossil to renewable carbon in Europe. The feedback paints a clear picture and is a call to action.

#### **There is no policy to incentivise the shift from fossil to renewable feedstocks in chemicals and plastics.**

RCI members urge policy makers to develop an appropriate regulatory framework to promote the use of renewable carbon feedstocks. To drive this transition, the utilisation of non-fossil feedstocks must be made attractive to producers and consumers. When it comes to chemicals and derived materials, the European Union mostly approaches the sector via restrictive policies, for example via REACH or the Single-Use Plastics Directive. But such policies are hardly a viable tool to enable transformation strategies,

guide development towards long-term targets and promote innovation/uptake of renewable carbon. The EU should investigate and consider more incentive-focused policies as a necessary tool to enable a guided transition. This could greatly accelerate the transformation towards renewable carbon, perhaps like it is currently happening in the US and China with clear support for carbon capture and bio-based plastics through regulation. The RCI believes that the current policy approach, which is more focused on banning old technologies, should be adapted towards a more supporting framework that enables new technologies and solutions for the chemical industry. From regulations that aim to prohibit to regulations that enable.

### **Possible instruments and measures to accelerate the transition to renewable carbon**

RCI members identified several concrete instruments and measures to improve the economic framework conditions for the European chemicals and materials industry to develop into an innovative, strong, competitive and sustainable sector.

New technologies require new investment and, especially when economies of scale are not yet available, cannot compete directly with established fossil systems that have been optimised over decades. Therefore, policy guardrails are needed to make the transition happen – and to reduce or eliminate the huge and ongoing fossil fuel subsidies. Even the introduction of a fossil carbon tax on the chemical industry has been proposed by some RCI members.

One suggestion from many RCI members is minimum quotas for renewable carbon content in different application sectors, combined or specific quotas for recycling, bio-based and CO<sub>2</sub>-based content. Such quotas have been and still are successfully used for the bioenergy/biofuels sector in the Renewable Energy Directive – extending this concept to chemicals and materials could bring benefits to that sector as well. Creating demand for renewable carbon through the policy framework will lead to rapid investment and production. Other proposals called for a proper carbon accounting mechanism, CO<sub>2</sub> border adjustment and verified proof of sustainable production, all of which could make a

difference to fossil-based products, especially imports. Extended Producer Responsibility (EPR) might be another opportunity where the transition to renewable carbon could be supported, especially if Scope 3 emissions are included in CO<sub>2</sub> emissions.

Current assessment methods of and restrictions on sustainable carbon feedstocks that can be converted are another significant barrier to achieving the required volumes. In the case of biomass, it is the lack of acceptance of food and feed crops as a sustainable option; in the case of CCU<sup>1</sup>, the focus on biogenic point sources and the lack of recognition as a strategic key technology for a net-zero; and in the case of recycling, the slow acceptance of chemical recycling, without which the carbon cycle cannot be closed. For all production sectors, the supply of green energy at (industrially) affordable and (internationally) competitive prices is crucial. Solar and wind energy as well as green hydrogen should be massively expanded.

<sup>1</sup> CCU stands for Carbon Capture and Utilisation and is a process for capturing CO<sub>2</sub> from fossil or biogenic sources (such as power plants) or from the air (direct air capture) and using it as a feedstock for the chemical industry.