

Individual, reliable, mission-focused

Sovereign value cycles in the chemical industry

Sustainable and sovereign chemistry – a task for society as a whole

Germany is faced with a huge transformation process to transition its economy and society to a circular system and reach a sustainable state by 2050. In its Sustainable Development Goal (SDG) 12, the United Nations addresses responsible consumption and production. At the European level, the Green Deal and the Circular Economy Action Plan, which was updated in 2020, have set out additional key guiding principles over the coming decades. These are not about developing individual regions, but about the principles of how economic activity is carried out and the associated measures of value in a market of 500 million people.

The chemical industry is characterized by a high level of organization and exceptional diversity, and is already in the process of meeting the targets of SDG 12 through voluntary commitments.

CIRCONOMY® – mission-oriented, industry-wide and supra-regional networking initiatives to transform the chemical industry

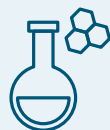
Existing networking initiatives mostly have a regional or technological focus. What is missing in practice is the mission orientation set out by the Commission of Experts for Research and Innovation (EFI) as a requirement in its 2021 report. Through the CIRCONOMY® brand, Fraunhofer is addressing this requirement and pooling R&D capacities and expertise in multi-disciplinary, multi-sector and mission-led networks, the CIRCONOMY® Hubs, which are not geographically limited in scope.

Individual, highly agile groups provide integral support to the chemical industry as a lead market in areas requiring urgent action, such as circular material flows, ensuring sovereignty of decision-making and economic and ecological sustainability. This drives crucial innovation policy objectives for Germany and Europe.

Sovereignty as a prerequisite for a resilient chemical industry

We need to rethink value chains: Traceability, sustainability and resilience are essential for ensuring that value cycles can be put into practice and accepted by society. Businesses have often delegated sovereignty over processes and products to global production systems. Not least during the Covid-19 pandemic, supply chain bottlenecks have exposed the vulnerability of the European economy to global trade routes. This became clear in part when it came to procuring specific, sometimes critical, rare or energy-intensive raw and other materials that are often produced and processed outside the EU.

Your path to the circular economy



1. Working together to shape the transformation of the chemical industry as a lead market
2. Establishing industry-wide, supra-regional networking
3. Mission-oriented, agile cooperation in a reliable data space
4. Tailored proposals for solutions

#WeKnowHow

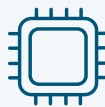
Electric and electronic waste as an example of action needed



Greenhouse gas emissions: The production of electronic devices accounts for around half of global greenhouse gas emissions. An EU-wide one-year product life extension for electronic devices by 2030 would save around 4 million t CO₂ per year.



E-waste in 2019: Approx. 53.6 million t globally (approx. 12 million t in Europe); a rise of 21 % in just 5 years. This figure has risen three times faster than the global population and 13 % faster than global GDP. Forecast for 2030: 74 million t.



Bottlenecks in electronics supply chains: The European share of global semiconductor production is just 10 %. Europe will need around 10 – 15 years to catch up with production levels in the United States and Asia.



E-waste as a proportion of global recycling is just 17.4 %: At least 5 % of used e-devices in Germany are exported to the Global South, where they put considerable strain on the environment and health (partly because of the heavy metals).



Around 200 million used cellphones in German drawers: These contain around 12,600 t of reclaimable metals, including 61 t of silver, 6 t of gold, 1,750 t of copper. The tantalum they contain is also a conflict resource.

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As well as the associated supply risks, globalized supply chains often lack transparency about whether environmental and health and safety standards are being met. Digitalization offers significant potential to shape supply chain management sustainably, and is integrated into CIRCONOMY® as a central optimization tool.

From the value chain to the value cycle – a holistic approach

In the chemical industry, cycle management faces a variety of techno-economic challenges. Quality standards, cheap raw materials and the current cost-intensiveness of producing high-quality secondary raw materials from used products are impediments to the systematic use of recycled materials.

The transformation of value chains into value cycles is a central instrument for conserving natural resources and reducing greenhouse gas emissions. The transition to a circular economy requires systemic innovations as well as a value system that takes into account not just the monetary aspects, but also the added ecological and social value of value cycles. The CIRCONOMY® Hubs address the multi-layered challenges of the future: They bring together a wide variety of research areas and stakeholders to put robust solutions, such as maximized use phases, high-quality recycling and upcycling, increasing the reuse/repair ratio and suitable methods for assessing sustainability, on the path to industrial use. This enables producers and consumers to make sustainable decisions.

Fraunhofer as a key partner for the chemical industry as a lead market

The industry-wide and cross-sector cooperative structures of the CIRCONOMY® Hubs produce fast, creative decision-making, agile, out-of-the-box collaboration, and digital access to state-of-the-art knowledge.

From detailed industry-specific issues to production systems using multiple technologies, our experts in the different institutes are able, thanks to our internal network, to deal with a wide range of concerns in the chemical industry. They cover a range of key areas of action, including the development of framework conditions for promoting innovation, the transfer of methods and expertise, dialog across the whole of society with stakeholders at all levels, support for political decision-making processes and selected R&D research projects.

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