CIRCULAR ECONOMY IN THE BASIC MATERIALS INDUSTRY: OPPORTUNITIES AND REQUIREMENTS FOR A SUCCESSFUL TRANSFORMATION

– Summary –

Discussion paper by the working group on the circular economy

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OUR KEY MESSAGES

The concept of a **circular economy** is firmly established in the Sustainable Development Goals (SDGs) set by the United Nations and has the potential to make an important contribution towards achieving the objectives of the Paris Agreement. The model **keeps raw materials in circulation** and can therefore also play a substantial role in defossilisation.

The circular economy is a **whole systems approach** and must be implemented along the entire value chain in all sectors and industries.

Strategies such as reuse, remanufacture and design for recycling already exist for the down-stream value chain. But some **industries that produce basic materials** face the challenge of shifting to new **sources of raw materials** and ultimately closing the **material loop**. In the basic materials industry, primary raw materials can be replaced by secondary raw materials with the help of two complementary strategies:

- **Recycling** of pre- and post-consumer waste
- Cross-industry **utilisation of residual materials and by-products** from the **basic materials industry**

New collection, separation and recycling **technologies** are important sources of leverage when it comes to increasing high-quality recycling. They need to be linked to **digital solutions** for sharing information:

- **Cooperative relationships** along the utilisation pathways, e. g. in the form of **take-back systems**, can do more than simply increase the input volumes for recycling. They can also help to prevent different materials from being mixed during the collection process, making separation and recycling easier.
- In general, the more effectively different materials can be separated from each other, the simpler they are to recycle. In keeping with the principle of **“design for recycling”**, products must be developed in such a way that their components and different materials are easily separated from each other. Clever product design and the introduction of new sorting technologies can open up material streams that cannot yet be recycled. Or recycling technologies can be used that are less costly or energy intensive.
- Specific approaches that need to be further developed primarily relate to **separation**: separation of plastics according to type; precision separation of aluminium scrap into alloys; improved separation of metallic and organic components for steel recycling; separation of coarse aggregates, sand and hydrated cement in concrete recycling; and separating out ultra-fine particles for glass recycling.
- There is room for development in **recycling processes**, including concrete recycling and the chemical recycling of plastics.

The challenge of applying these strategies to existing processes is far from the only issue facing the **basic materials industry**. It will also have to cope with changes to its material streams (input and output) as part of the **industrial transformation towards climate neutrality**. There is already a need to develop concepts to maintain and further expand the existing **industrial symbioses** by incorporating the new material streams.

- In the **petrochemical industry**, fossil primary raw materials are being replaced by sustainable biomass and recycled materials, with the prospect of CO_2 being used in the future. This means that current by-products of petrochemical processes, such as petroleum coke for the aluminium industry, will no longer be available.
- The **conversion of steel production** to **direct reduction** has **consequences for other industries**. It means that coal tar from the coking plants is no longer available to make the carbon electrodes needed for the **aluminium industry and in electric-arc steelmaking**. The raw materials used in the **cement industry** will also change in the future. That is because the conversion of steel production to direct reduction and the increase in steel manufacturing via the secondary route will change the composition of the slag. In addition, the **energy transition** will mean that fly ash and gypsum from flue gas desulphurisation plants will no longer be available for cement production.
- The **lime industry** is also affected by the transformation of the energy sector, as quicklime is no longer required for flue gas cleaning in coal-fired power stations.
- There is **potential for development** in the **use of residual materials** – including "conventional" electrolysis tailings from the aluminium industry – blast furnace sludge, ladle furnace slag, refractory tailings and the slag products from the direct reduction process and secondary steelmaking, as well as waste process gases (CO, H_2, CO_2) across all sectors.

The **demand for basic materials** continues to **rise**, with the result that it will not be possible to completely meet this demand through secondary raw materials in the future. Primary raw materials will therefore still be needed. In addition, basic materials are often incorporated into long-lasting products and are exported as product, waste and scrap, which means they are **withdrawn from the regional material loop**.

The use of secondary raw materials as a building block for the circular economy has the potential to help **reduce CO_2 emissions** from the production of basic materials. It should therefore be included in the **funding guidelines** for the transition to a climate-neutral industrial sector. Germany's federal and state governments should make the circular economy an integral part of the **"Low-Carbon Emissions Industry" (IPCEI)** announced by the German Federal Ministry for Economic Affairs and Energy **(BMWi)** and **make funds available from their budgets to finance the projects**.

Establishing a circular economy will require corresponding **objectives and a clear framework from policymakers**. Compared with other important climate policy goals – such as the direct reduction of CO_2 emissions in production and usage – there are no **specific guidelines or key performance indicators** that companies can use for orientation when it comes to measures in support of a circular economy, nor have they been set any targets. In order to establish a circular economy, the political and administrative frameworks must therefore be structured in such a way that the waste management and environmental sectors, economic concepts and the need to ensure the supply of raw materials are combined to form a **holistic solution**.

Summary of the current obstacles facing a circular economy, the goals, and possible measures to support it

Inhibitors

…in the regulatory framework

- Insufficient focus on the CE in terms of policy
- No recognition in recycling rates
- Lack of adequate funding guidelines for technology development
- Inconsistent standards
- Standards for primary and secondary raw materials
- Little consistency in regulatory provisions

…in terms of material streams and technologies

- Low demand for recycled materials
- Poor supply of high-quality recycled materials
- Changing material streams

Goals

- Increasing competitiveness through regulatory framework
- Putting innovations into practice
- Embedding the CE in industrial and economic policy

Measures

- Adjustment of the German Circular Economy Act (KrWG)
- Recognition of chemical recycling in recycling rates
- Minimum rates of recycled content to drive demand for certain materials
- Standardisation
- Public procurement to drive demand
- Information provision through digitalisation
- Research funding for concepts not bound to specific technologies or materials
- Incentive system for secondary raw materials
- Consistent policy mix and exploitation of synergies

The full discussion paper in German is available to download from www.in4climate.nrw/ergebnisse/in4climatenrw/.

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