Cefic views on the circular economy

The European chemical industry supports the transition towards a circular economy as part of a strategy to make Europe more resource efficient. This can be achieved both by avoiding unnecessary material and energy losses throughout the life-cycle of products and maximising value by keeping resources circulating in loops, after first usage, many more times than today. Environmental reasons and business arguments suggest doing so.

Over the past century, our industry has developed and scaled up new projects and technologies which have significantly improved resource efficiency across the value-chains of the most important sectors of our economies. Many further projects are currently under way.[1] Their success will depend on whether they bring tangible benefits and are economically viable.

We look to the Parliament, the Council and the Commission to support an ongoing evolutionary process, working with the market to encourage innovation and investments in economically viable solutions, removing regulatory, administrative and financial barriers, and supporting the businesses investing in new promising areas.

The chemical industry has the know-how and the capabilities to make Europe more resource efficient over time. To untap the full potential of a circular economy, we ask policy-makers to take into account the following principles.

1. **Life-cycle thinking.** The solutions to be provided should be the most environmentally benign, cost-effective and socially acceptable over the entire life-cycle. If keeping materials in the loop were to consume more resources (e.g. energy and water) than it saves, it would make no sense to pursue it.

2. **Holistic value-chain approach.** Creating partnerships across the whole value-chain (including e.g. chemical manufacturers, downstream users and consumers) is the right way forward.

3. **Safety first.** The circulation of resources in loops must be managed in a safe way for workers, consumers and the environment.

The chemical industry can make a contribution to the circular economy in all its phases: product design, production processes, waste management, and from waste to resources.

[1] For more information, please refer to SusChem's position paper, http://suschem.blogspot.be/2015/10/suschem-position-paper-on-circular.html

Product design

As part of our commitment to sustainable chemistry, we develop substances enabling high-performance products which are durable, easily recyclable and easily repairable. There might be trade-offs in doing so: for example recyclability could come at the expense of other performance characteristics. The overall balance of advantages in such cases can be assessed on the basis of a life-cycle approach that considers the benefits of use as well as the ease of recycling.

Promoting the consumption of products that involve high resource use or functionality losses in the use phase would be against the core principles of an innovative circular economy. A successful circular economy will be the outcome of a bottom up process based on the development of fruitful partnerships all along the value-chain. Consumers will, ultimately, decide which products to purchase.

Production processes

The circular economy will benefit from a diversified raw materials base. Mineral, fossil-based, renewable and secondary raw materials all have a place in a competitive circular economy, as do alternative feedstocks (e.g. CO_2 from industrial flue gases), and should be accessible at a competitive price.

High value added and resource efficient uses of biomass should be promoted, while taking into account the diversity in the availability and quality of renewables across Europe. We support an approach based on life-cycle thinking: cost-effective and environmentally benign solutions will be adopted in the selection between alternative uses and types of biomasses. To ensure the creation of a level playing field between different actors, subsidies and fiscal measures should not steer one use of biomass to the detriment of others. Nor should barriers (e.g. custom duties and technical barriers) prevent European businesses from having fair access to renewables. Therefore, we call on policy-makers to create a level playing field on the international market between European businesses and their global competitors with regard to access to renewables.

Innovative production processes aimed at maximizing efficient use of resources should also be encouraged. For instance, the European Commission should consider support for integrated production processes where products and by-products are used as raw materials for the next production stage (industrial symbiosis). The European chemical industry has already embarked on this path, but excessive administrative burdens arising from both EU and national legislation are hampering further development (see next section for more details).

Waste management

Moving from waste management to resource management should be the long-term objective of the circular economy. The first step would be to prevent valuable materials from being considered as waste altogether. All too often, materials which can be easily reintegrated in the production process, without any safety and pollution risks, are defined as waste. By imposing unnecessary costs on businesses seeking to keep resources in the loop, such a wide interpretation of waste is in contradiction with the core principles of a circular economy. Therefore, we urge policy-makers to clarify the concept of waste and

that of by-products under the Waste Framework Directive. The latter should not hinder further use of valuable materials.

Within the framework of the waste hierarchy, Cefic believes that an approach based on life-cycle thinking should be adopted to choose between different end-of-life management operations.[2] For instance, energy recovery could be the best solution in cases where recycling activities entail excessive environmental impacts, economic costs or when recycling is not deemed safe. Landfilling could be justified as a last resort solution for residual waste for which no alternative has been found so far (e.g. non-combustible industrial waste and asbestos waste).

From waste to resources

"Safety first" is and will continue to be our guiding principle. The recycling of chemicals of concern could be the solution when such substances can be managed in a safe and economically efficient way. The European chemical industry is fully committed to ensuring that the circular economy will abide by the same high standards embedded into the existing chemical and product legislation (e.g. REACH and CLP). Thus, we will explore pragmatic solutions enabling recyclers to safely handle chemicals of concern in a cost-effective manner while protecting confidential business information (CBI).

To create a truly European integrated market, we support the elimination of the artificial administrative barriers preventing a free flow of secondary raw materials across Europe. Secondary raw materials should not, however, receive preferential treatment compared to other equally valuable raw materials.

Key recommendations

1. Apply the **"safety first" principle** to the circular economy.
2. Clarify the concept of **waste** and that of **by-products** under the Waste Framework Directive. The latter should not hinder further use of valuable materials.
3. Remove the barriers (e.g. custom duties and technical barriers) preventing European companies from having **fair access** to renewables on the international market.

[2] The reference to life-cycle thinking is in line with the Waste Framework Directive (2008/98/EC), art. 4 (2).

How is the chemical industry contributing to a circular economy?

The following table presents a sample of contributions and innovations of the chemical industry to a circular economy, by using the Resolve framework elaborated by the MacArthur Foundation, Sun and the McKinsey Centre for Business and Environment. The main objective of this framework is to translate the concept of a circular economy into six concrete business actions: Regenerate, Share, Optimise, Loop, Virtualise, Exchange.

The table below includes samples that have been brought to the attention of Cefic by the companies or the national associations. Many more activities are ongoing in the chemical sector as can be witnessed from consulting chemical companies' websites and the trade press.

Resolve network	Examples	Examples in the chemical sector
REGENERATE	• Shift to renewable energy and materials • Reclaim, retain, and restore health of ecosystems • Return recovered biological resources to the biosphere	• The smart and efficient use of alternative and renewable feedstock (raw materials), such as biomass, biowaste, or CO_2, which can be captured and used to produce materials, chemicals and fuels, is another way to optimise resources. ○ https://www.kunststoffe.de/en/journal/archive/article/mass-balance-approach-for-renewable-resources-saves-oil-1039763.html ○ http://www.sabic.com/europe/en/news-and-media/news/2014/20140423--SABIC-launches-new-renewable-polyolefins-portfolio ○ Utilisation of CO_2 as an alternative carbon resource: http://www.covestro.com/en/Sustainability/Productions/Polyols.aspx ○ Insect biomass is being used as raw material: http://www.fi-sch.be/nl/overzicht-projecten/chitinsect/ ○ Chemical building blocks and value-added materials are being valorised from sugars and lignin streams: https://www.upmbiofore.com/eu-funding-for-biochemical-research-work/ ○ Ethanol production from agricultural residues: http://www.clariant.com/en/Solutions/Products/2014/10/16/16/16/sunliquid ○ Sustainable sediment management:

		http://www.clariant.com/en/Business-Units/Functional-Minerals/Sediment-Management ○ Production of aircraft deicing liquid from renewable feedstock through value-chain partnerships: https://www.youtube.com/watch?v=fBcL-OgQnJs
SHARE	• Share assets • Reuse/second-hand • Prolong life through maintenance, design for durability, upgradability, etc.	• Creation of industry heat clusters, delivering energy from waste to neighbouring industry: http://www.ecluse.be/homepage/ • New water savings are feasible by closing loops between industrial partners: http://www.cefic.org/Documents/ResponsibleCare/Awards2014/European_Responsible_Care_Awards_Winners_Leaflet.pdf • Cradle-to-cradle design with advanced materials to address many of the critical social, economic and environmental needs of society: http://www.sabic.com/corporate/en/newsandmediarelations/news/2016/all/20160120-Avanced-materials-for-the-circular-econmy-from-SABIC
OPTIMISE	• Increase performance/ efficiency of products • Remove waste in production and supply chain • Leverage big data, automation, remote sensing and steering	• Chemical additives allow for a 10 % of lighter board from recycled fibers, while retaining strength specifications: http://www.kemira.com/en/industries-applications/pages/fennobond.aspx • Company example showing that up to 25 % of raw materials can be supplied from recycled sources or industrial by-products, reaching even 80 % in one specific product group: http://www.kemira.com/SiteCollectionDocuments/responsibility/2015-kemira-circular-economy-position-paper.pdf • Polymer additives and modifiers are contributing to new – higher end – applications for recycled plastics: http://www.dupont.com/products-and-services/additives-modifiers/polymer-additives.html • Integrated production as the best-case example of the resource efficiency, waste management and industrial symbiosis in the chemical industry: https://www.basf.com/en/company/about-us/strategy-and-

		organization/verbund.html http://www.chemicalparks.com/parks/53/Seiten/default.aspx • Recovering Phosphorus from sewage sludge and use the sludge after extraction as raw material and energy resource for cement production: http://www.deutsche-phosphor-plattform.de/wp-content/uploads/2015/12/Pr%C3%A4sentationen_2.zip • Developing an industrial waste exchange to allow waste or by products of one industry to become inputs for another: http://www.solvakem.com/homepage.html
LOOP	• Remanufacture products or components • Recycle materials • Anaerobic digestion • Extract biochemicals from organic waste	• Innovative deinking chemicals allow up to 100% of recovered pulp in final products: http://www.kemira.com/en/industries-applications/pages/deinking.aspx • Innovative adhesive resin technology allows carpets to be designed for 100 % recycling and 95 % energy reduction during production: http://www.dsm-niaga.com/ • Molecules (Pd, I, …) are being recovered from waste streams: Watch the video • Recycling of Rare Earth Elements from wasted fluorescent lamps; up to 90% of phosphorescent powders can be revalorised: http://www.solvay.com/en/binaries/Solvay Loop Fr_En NUM-197429.pdf • "PolyStyrene Loop": HBCDD in EPS (Expanded Polystyrene) is recycled and recovered into bromine: https://www.plasteurope.com/news/RECYCLING_t232726/ • New recycling technology enabling 100% process water recycling reached demonstration level: http://us.pg.com/-/media/PGCOMUS/Documents/PDF/Sustanability_PDF/sustainability_reports/PG2015SustainabilityReport.pdf?la=en-US, page 35 • New technologies enable water re-use. Watch the video

		• Doing more with less: how to reuse paint material waste. Watch the video • CO_2 savings of up to 92 % are achieved when PVC is recycled: http://www.vinylplus.eu/recycling/pvc-a-flagship-for-the-circular-economy • Use of recycled cementitious and non-cementitious materials as gravel for fresh concrete: http://www.master-builders-solutions.basf.com/en-basf/functions-and-applications/producing-concrete/green-sense-concrete • Collection of organic waste for a) cleaner separate collection of waste streams thus promoting high-quality recycling, b) securing additional biochemical feedstock in line with Bioeconomy Strategy and cascading use of biomass / renewable resources, c) reduction of CO_2 emissions in line with achieving targets of the low-carbon economy, d) generation of valuable compost for further use in agriculture in line with fertilizer regulation, e) dissemination of best-practice in organic waste collection, e.g., with compostable and biodegradable plastic bags: http://www.plasticsportal.net/wa/plasticsEU~en_GB/portal/show/content/products/biodegradable_plastics/ecovio_projects • Chemical technology is being used to turn waste e.g. fishing nets into first grade nylon that can be recycled again and again into products (apparel, socks, flooring…): http://www.econyl.com/ • From municipal waste and biomass to chemicals requires teaming up with the right partners: Watch the video
VIRTUALISE	• Books, music, travel, online shopping, autonomous vehicles etc.	• Smarter process management: http://www.kemira.com/en/industries-applications/pages/control-monitoring.aspx • Precision farming is a key to best agricultural management practices. It enables farmers to add the specific nutrients needed for their crop, in exactly the right amount, at the right time: http://yara.com/sustainability/how_we_engage/green_growth/

		precision_farming_tools/
	• Replace old with advanced non-renewables materials • Apply new technologies • Choose new products/services (e.g. multimodal transport)	• Chemicals (acrylonitrile) are precursors for the lightweight material carbon fibre, seeing many fuel/energy saving applications: http://www.ineos.com/sustainability • Collaboration of two companies, one with high density products and one with low density products, resulted in considerably less traffic and CO_2 emissions: http://www.co3-project.eu/wo3/wp-content/uploads/2011/12/CO3-conference-Koen-PG-BIC-20140528.pdf

Source: Ellen MacArthur foundation, SUN, McKinsey Center for Business and Environment (2015), "Growth Within: A circular economy vision for a competitive Europe", p. 26.

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About Cefic
Cefic, the European Chemical Industry Council, founded in 1972, is the voice of 29,000 large, medium and small chemical companies in Europe, which provide 1.2 million jobs and account for 17% of world chemicals production.

Want to see your example included in the overview? Please contact Ann Dierckx, Sustainable Development Manager, Cefic
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