

SAFE AND SUSTAINABLE- BY-DESIGN: BOOSTING INNOVATION AND GROWTH WITHIN THE EUROPEAN CHEMICAL INDUSTRY

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This paper is not exhaustive on the topic and does not represent our final views on Safe and Sustainable-by-Design. Instead, it is a work in development and an invitation to you to discuss the concept, criteria, and the way forward on SSbD.



Summary

The Chemical Strategy for Sustainability (CSS) was launched by President Von der Leyen and Executive Vice President Timmermans on October 14th, 2020, as a core element of the Green Deal launched. Apart from a challenging regulatory agenda, the CSS also holds opportunities. The European chemical industry regards the Safe and Sustainable-by-Design (SSbD) approach in the CSS as lever to create business opportunities and growth. With the right enabling conditions in place, an environment could be created in which industry can transition while remaining world leaders in safe, innovative, climate and environmentally friendly chemical production. Predictability of goals within timelines that are ambitious yet feasible, and the availability of resources, financial and non-financial, are critical success factors.

Cefic has therefore identified four major areas for supporting measures when implementing the SSbD approach:

- 1** A clear and predictable **strategic direction and pathway** inserted into a **broader CSS framework and overarching vision** as well as **clarity on definitions of concepts and criteria**, and on **targeted chemicals**, coordinated across the European Commission DGs, and elaborated in close dialogue with industry partners throughout the value chain.
- 2** **Innovation support** by the European Commission that stimulates and encourages collaboration over the value chains and addresses collectively and faster application-specific priorities.
- 3** The **market uptake** of safe and sustainable chemicals in product applications needs to be incentivised within the single market, and a fair competition with the less sustainable incumbents should be guaranteed.
- 4** As the world's standard-setter, the EU should take the global leadership role to create a level playing field between different geographies and ensure **enforcement** of applicable EU legislation at its borders.

These are the views of the European chemical industry on the concept, and how it should be approached and implemented. It is not the industry's final word on the matter, but it marks continued engagement to make it work. This paper is the first in a series and is the basis for further outreach.





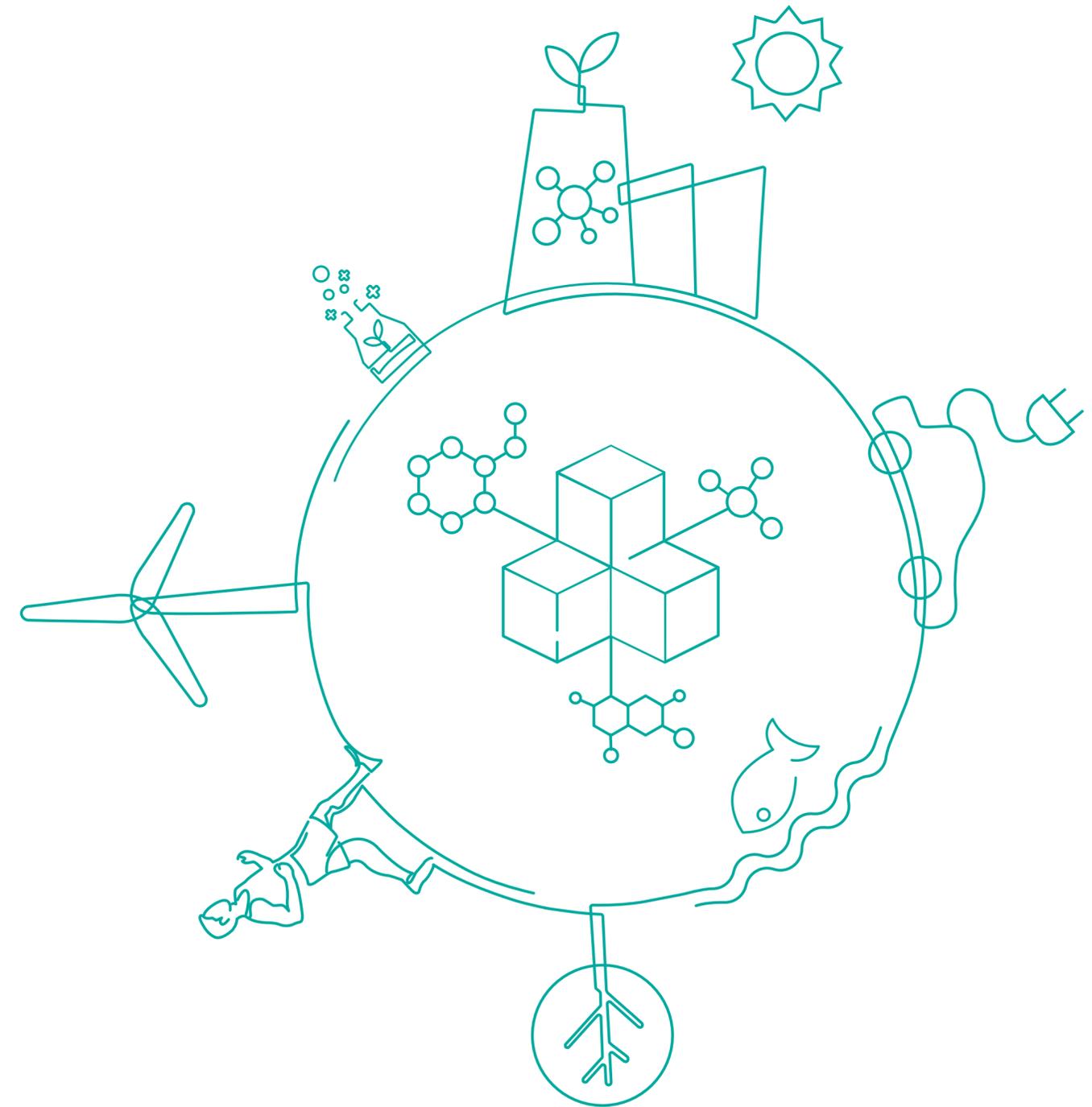
Background

The European Commission’s vision on Safe and Sustainable-by-Design ties in with the journey to more sustainability on which the chemical industry has embarked and many companies are developing towards.

We are already striving towards a future where “Chemicals are produced/ used in a way that maximises their benefits to society while avoiding harm to planet & people and production and use of safe and sustainable chemicals in Europe becomes a benchmark worldwide”, as put forward in the Chemicals Strategy for Sustainability.

Chemicals are a part of our daily life and play a fundamental role in most of our activities. They are recognised as being building blocks of low-carbon, zero pollution and energy- and resource-efficient technologies, materials and products. Most chemicals have intrinsic hazardous properties (e.g. irritant), but only some may cause harm to human health and the environment due to their severe hazardous properties and through exposure depending on the uses. To ensure safe use it is important that the well-established concept of scientific risk assessment is maintained as a central element for the application of the precautionary principle and for decisions in chemicals management. As the CSS sets out a vision for the EU’s chemical policy, to strive for a “toxic-free environment”, it thus calls for a transition to chemicals that are Safe and Sustainable-by-Design.

Defining what safe and sustainable means and how it will be assessed will enhance investor confidence in Europe and de-risk investment in less harmful alternatives, alongside protection of intellectual property. The Safe and Sustainable-by-Design concept can be turned into a mobilising power that makes business sense, drives innovation, and attracts tangible investments in the chemical sector as well as in the value chains we serve. It could accelerate the transition towards the SDGs in general and the circularity, climate-neutrality and “toxic-free environment” objectives of the Green Deal in particular, if well-designed.





Defining the concept

Almost all industrial ecosystems depend on chemistry for delivering on the Sustainable Development Goals globally and enabling the Green and Digital transition in Europe, which is a major preoccupation of the European Chemical Industry. Innovating towards chemicals that are safe and sustainable is one of the chemical's industry's key contributions towards these objectives and future business success will depend on those developments. The concept of sustainable chemistry and sustainable products is not new. OECD¹, ISC3², UN Environment³ described the sustainable chemistry concept and references to sustainable products have been made in many policy initiatives such as Ecodesign, Green Public Procurement, Ecolabels, etc.

Yet, a holistic approach is needed that captures all ongoing initiatives and policy objectives into a single framework and withgoing criteria. It should indeed 'become a guiding principle along the entire development chains in key sectors of the economy accelerating the transition towards safe and sustainable chemicals, products, materials and technologies'.⁴

The chemical industry defines Safe and Sustainable-by-Design as a process to innovate and put on the market chemicals, materials, products and technologies that are safe and deliver environmental, societal, and/or economical value through their applications. Those chemicals, materials, products and technologies enable accelerating the transition towards a circular economy and climate-neutral society and preventing harm to human health and the environment throughout the life cycle.

See Annex I for the definitions.

¹OECD, <https://www.oecd.org/chemicalsafety/risk-management/sustainablechemistry.htm>

²ISC3, International Sustainable Chemistry Collaborative Centre, <https://www.isc3.org/en/about-isc3/sustainable-chemistry.html>

³UN Environment Green and Sustainable Chemistry: Framework Manual, https://wedocs.unep.org/bitstream/handle/20.500.11822/35312/GSCF_ES.pdf?sequence=1&isAllowed=y

⁴Mapping study for the development of sustainable-by-design criteria, 2021, European Commission, Research and Innovation, https://ec.europa.eu/info/publications/mapping-study-development-sustainable-design-criteria_en



Principles taking the concept forward

The chemical industry has identified the following principles in taking the concept forward:

- 1 There cannot be a compromise on **chemical safety**, for humans and the environment. And **compliance** with existing regulations is a must.
- 2 SSbD is an iterative process **guiding innovation** towards new chemistries and processes, replacing the existing portfolio by ever more sustainable and broadly affordable solutions. SSbD has the potential to accelerate innovation towards climate neutrality, circularity as well as chemicals with a high positive impact on human health and the quality of life and ecosystems.
- 3 Chemicals with a proven concern for human health or the environment, or impeding recyclability of materials should be progressively prioritised to **innovate for alternatives**, whilst retaining or improving the performance and improving or avoiding to negatively impact the other sustainability dimensions.
- 4 Chemical products should always be assessed also in relation to their **application or use phase**, as the benefits and sustainability performance are in the end-product and can occur at any moment across the entire life cycle.
- 5 In setting **assessment criteria and assessing product-applications**, one needs to differentiate between industrial use, professional uses, consumer use and other uses (e.g. pharmaceutical ingredients, R&D).
- 6 **Safe** is defined on the basis of the hazards of a product in combination with exposure deriving the risk to the users and the impact to the environment, ensuring a scientifically validated threshold is not being exceeded. In doing so, the SSbD approach is aligned not only with the current requirements under REACH but also with the expected revisions to REACH and CLP.
- 7 In assessing and designing chemical products, a **full life-cycle view** needs to be taken, including the raw materials and end-of-life considerations.
- 8 SSbD aims to respect at least one or more principles of a **circular economy**: designing out waste and pollution, keeping products and materials in the cycle, and regenerating natural systems.
- 9 SSbD is **rooted in science**. Along the existing data requirements in REACH, it will require further data gathering and making related datasets publicly available.
- 10 Assessment of the **different sustainability dimensions** should make use of existing methodologies, tools, and standards (GHG protocols, LCA ISO standards, etc.) where applicable, but also acknowledge the emerging science and new tools. These **assessments will be made transparent**. Assessment methodologies can be qualitative as well as quantitative, depending on the needs within the development process and needs of the market.
- 11 Striking a balance between improving the **environmental, health and safety (EH&S)** profile, reducing the life cycle impact and maximising the function and performance requirements will be required.



From concept to assessment framework to criteria

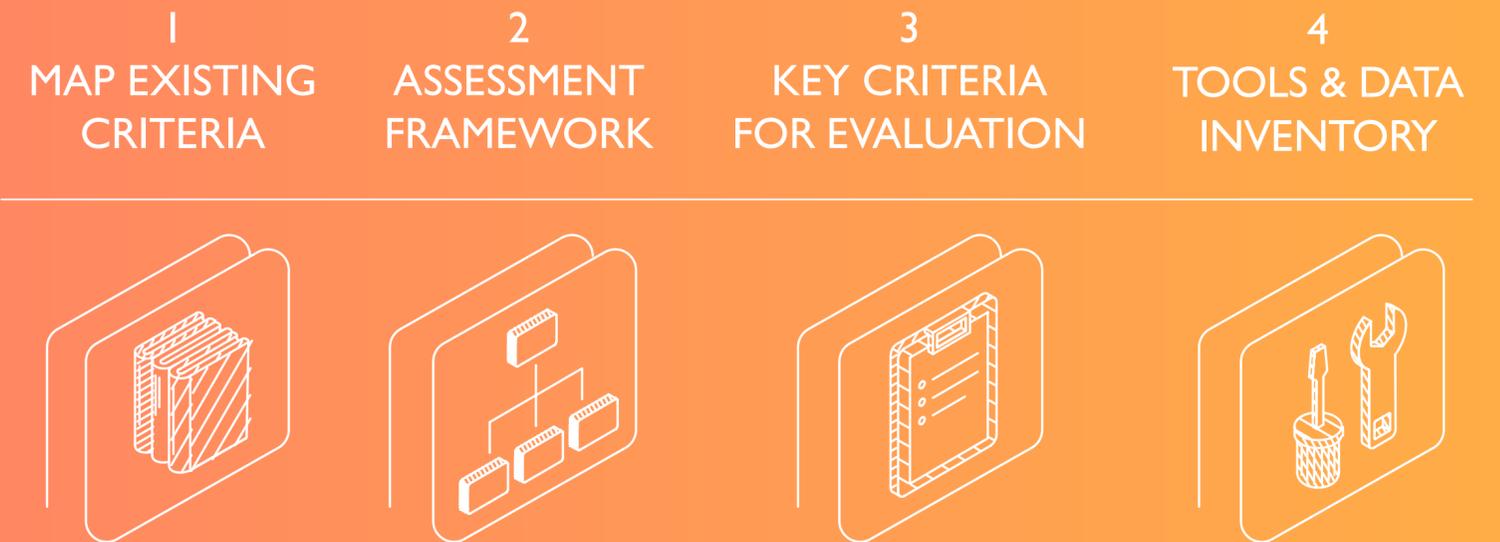
Taking the Safe and Sustainable-by-Design concept successfully forward will need a set of harmonised criteria and an assessment framework, commonly agreed by all stakeholders (throughout the value chain, policy makers, etc.).

The chemical industry has developed a first proposal building on the expertise of industry champions assessing sustainability of their product portfolio. Of particular interest is the roadmap for the Chemical Industry Methodology for Portfolio Sustainability Assessments launched by the World Business Council on Sustainable Development (WBCSD) in 2018, and other related work. Portfolio Sustainability Assessment is an industry-wide methodology to steer and develop companies' product portfolios towards improved sustainability outcomes on a single product level.

Innovating for SSbD is a stepwise process, which starts with defining the functional and performance requirement for envisaged product-application, followed by a mapping of the potential impacts of the solution under study throughout the life cycle. Throughout the innovation process more and more data are being collected, allowing to assess the sustainability performance against the key safe and sustainable dimensions. The final step is to assess the impacts against safe and sustainability goals; these can be minimum criteria or other comparison points.

Towards design criteria

Cefic proposes 4-steps to define criteria that can be used to assess the impact of a new or alternative process or product throughout an innovation process.





4-step process to define criteria

STEP 1

Map existing criteria

When designing products and placing products on the markets, the chemical industry intends to meet a performance need, determined by customers, the market and society. In doing so, the chemical industry is faced with a multitude of criteria and requirements.

In the current regulatory context, safety related criteria are already quite developed and clear, and further developments are ongoing. Increasingly, companies start competing on sustainability-related performances of their processes and products, being driven by the company's sustainability goals or enabling their customers to deliver on their sustainability-related commitments to fulfill the UN Sustainable Development Goals. Mapping these criteria constitutes a first step in the development of a SSbD approach.

STEP 2

Organise criteria in structured framework

To arrive at a workable framework, the criteria are structured around the key dimensions of safety and sustainability assessments. For the safety part, the baseline consists of the minimum regulatory safety requirements, and these will be complemented with functional, environmental, social and economic considerations, taking all life cycle stages into account and integrating circularity thinking.

STEP 3

Assign key criteria for evaluation

In a next step, criteria need to be assigned for safety and the key sustainability dimensions, requiring some methodological choices.

- 1 Key criteria are assigned for specific product-application combinations.
- 2 The regulatory safety requirements are to be considered as minimum requirements.
- 3 Criteria need to be material for the product-application and value chain under study (e.g. surfactant for a consumer detergent released to the environment versus a monomer to manufacture polymers).
- 4 Criteria are different over the different stages of the product or process innovation phase; at the early stages of development and for well-known and uncritical applications, qualitative approaches are justified.
- 5 Consumer-professional-industrial uses will result in a different set of assessment criteria.

STEP 4

Assessment tools, data inventory and 3rd party verification

Many tools exist today to assess the impact of products and process in the different areas identified. The chemical industry hereby strives to build as much as possible on widely accepted methodologies and guidance to allow for a fair comparison of sustainability claims, and to ease enforcement (ISO standards, GHG protocol, voluntary certifications schemes, WBCSD PSA Methodology and Social metrics, etc.).

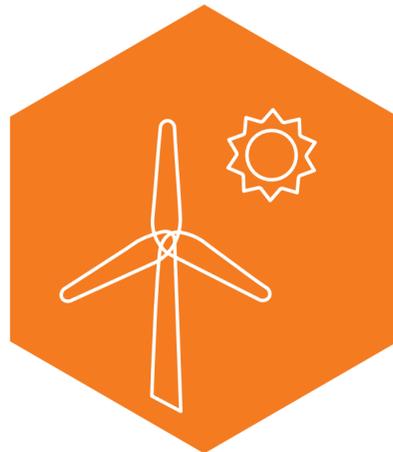
Depending on the stage of development, the expected impact, and other factors, one can choose between a qualitative or quantitative approach in applying the guidance and methodologies.



SSbD in practice

Chemical innovations which are Safe and Sustainable-by-Design are the future of chemistry. The European chemical industry invests approximately 9 billion in research & innovation annually. Through ChemistryCan we aim to show the results of these investments and how they deliver on the EU Green Deal.

Safe and Sustainable-by-Design is a theme that cuts across four areas:



Going climate neutral



Driving the circular economy



Enhancing the quality of life



Scaling up digital and tech

Discover the real life investments that have been and are taking place [here](#).



How to make sure that the SSbD concept gives the EU industry a competitive advantage?

Safe and Sustainable-by-Design is an innovation process to bring chemicals, materials, products & technologies to the market that are safe, bring environmental, economic and/or social value through their applications, are accelerating the transition towards a circular economy and climate-neutral society and prevent harm to human health and the environment.

Frontrunning companies concordantly confirm that taking an SSbD approach is better for the business performance. Nonetheless, working towards this triple goal presents an unprecedented challenge for the chemical industry. It will be important to flank this transition towards the “safe and sustainable chemicals” vision with enabling policy measures to ensure predictability of goals, within timelines that are ambitious yet realistic, and providing for the skills and resources – financial and non-financial – needed.

The SSbD concept should thus be rolled out and implemented in such way that it makes business sense and drives real tangible investments. Cefic has therefore identified four major areas for supporting measures when implementing the SSbD concept:

1 A clear **strategic direction** and pathway should be set by European institutions, well-coordinated across the European Commission DGs, and in close contact with industry partners. This should be inserted into a broader CSS framework and there should be an overarching vision to understand how it all fits together. A timely definition of what safe and sustainable means, a clear and easy-to-apply methodological framework to define criteria, and an upfront understanding on the use and further implementation of these criteria throughout the regulation will enhance investor confidence in Europe and de-risk investment in alternatives, alongside protection of intellectual property. This includes clarity on the targeted substances that are prioritized to innovate for alternatives. In addition, to safeguard the EU chemical industry's competitiveness, SSbD assessments should not lead to delays to product launches on the market.

2 **Innovation support** should stimulate and encourage collaboration over the value chain and address application specific priorities collectively and faster as identified by the market and civil society, beyond the boundaries of competitiveness. Innovation support should link up all partners at an early phase of the development, the users and consumer's needs included and stimulate joint skills development. Innovation is an iterative process and information becomes increasingly available over the development stages. Scaling innovation requires sufficient time and time pressure can lead to suboptimal substitution of chemicals, products and materials in applications. Sustainable use of chemicals requires consideration of their entire life cycle and the benefits and economics of their use, in addition to their impact on people and the environment. It will be beneficial to jointly prioritise innovation support by sectors with a high potential in contributing to the circularity and climate-neutral objectives, or by applications identifying and eliminating specific unacceptable risks.

3 The **market uptake** of safe and sustainable chemicals needs to be incentivised, application-specific, within the single market, and a fair competition with the less sustainable incumbents should be guaranteed. As products scoring higher on the sustainability ranking, can in the short term be more expensive or present additional technical and administrative hurdles for our downstream users, market pull instruments and financial incentives could be considered to facilitate market uptake. Reducing regulatory burden and taking an incentivising attitude towards safe and sustainable alternatives through e.g. fast-track procedures could be considered as well.

4 As the world's standard-setter, the EU should take a global leadership role, to create a level playing field between different geographies for similar product-application combinations. An efficient **enforcement** on this level needs to be installed, building on commonly agreed definitions, criteria, methodologies, and tools, testing, and assessing methodologies to measure compliance, especially with regards to imports.



Way forward: Opportunities for the chemical industry

In recent years, the world has been challenged by major, global and disruptive crises: an economic and financial, a health crisis, and we increasingly see signs of a climate and even nature crisis. A long-lasting sustainability is our way out of the subsequent crises.

A Safe and Sustainable-by-Design approach brings all the challenges – climate, safety, ecosystems, resource scarcity – together.

The European chemical industry is providing the majority of the industrial ecosystems with solutions in different applications and understands the pivotal role it can play in offering sustainable solutions. Through our products and processes, being so much upstream of any ecosystem, we can make a huge contribution. Setting sustainability standards on consumer goods will provide an even stronger market signal for sustainable products.

We are thus looking forward to an SSbD approach that provides clear policy signals and rewards an European industry making strides towards new innovative products for a sustainable future.

In full support of the SSbD transition approach, we invite all stakeholders – political authorities, our downstream users and civil society representatives – to join us in a pilot to exchange on scoping and defining the SSbD process, criteria, and hence, the outcome for all participants of the industrial ecosystem. A joint approach is needed to deliver valuable changes to the current functioning of society.





Annex I:

Definitions - Taken from [Mapping study for the development of sustainable-by-design criteria](#), 2021, European Commission, Research and Innovation

Substance (REACH definition):

means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

Mixture (REACH definition):

means a mixture or solution composed of two or more substances.

Chemicals:

means these substances and mixtures.

Material:

a term that is used to denote either substances or mixtures which may or may not yet fulfil the definition of an article under REACH and may be of natural or synthetic origin.

Product:

shall mean any product – including in the context of providing a service – which is intended for consumers or likely, under reasonably foreseeable conditions, to be used by consumers if not intended for them, and is applied or made available, whether for consideration or not, in the course of a commercial activity, and whether new, used or reconditioned.

When referring to Safe and Sustainable-by-Design products, this report covers only the products that can also be identified as chemicals or materials (as defined above). Thus, the term ‘product’ in the Sustainable-by-Design context is used as part of the term “chemical product” or “material product”, meaning chemicals and materials that are intended for consumers, or likely to be used by consumers. An example of a ‘chemical product’ is paint, and an example of a material product is ‘impregnated wood’.

“Chemical product” or “material product” as defined in this report are always to be understood and assessed as product-application combination, as the same chemical product can be used in various applications resulting different safety and sustainability assessment results.



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