Event on Sustainable Chemicals and Safe and Sustainable-by-Design (SSbD)

Post-event report

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FPS Economy, S.M.E.s, Self-employed and Energy

Rue du Progrès 50
1210 Brussels
Enterprise number: 0314.595.348

0800 120 33 (free number)

SPFEco

@spfeconomie

linkedin.com/company/fod-economy (bilingual page)

instagram.com/spfeco

youtube.com/user/SPFEconomie

https://economie.fgov.be

Publisher:
Séverine Waterbley
Chair of the Board of Directors
Rue du Progrès 50 — 1210 Brussels

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Executive Summary

This report summarises the “Sustainable Chemicals and Safe and Sustainable-by-Design (SSbD)” event organised on 9 December 2024 by the Belgian Federal Public Service (FPS) Economy, S.M.E.s, Self-employed and Energy.

The event focused on a critical theme: Sustainable Chemistry and Safe and Sustainable-by-Design (SSbD) practices.

The event brought together a diverse range of stakeholders, including industry leaders, EU authorities, academia, and policymakers, all united by a common goal: to advance the conversation and action on sustainable chemicals.

Moderated by Dr Asli Tamer Vestlund, it featured keynotes and workshops to explore the latest developments in sustainable chemical practices and how the SSbD framework can drive innovation, mitigate risks, and support the transition to a circular economy.

The event welcomed 212 attendees and featured 12 distinguished speakers representing diverse industries, sectors, and professional expertise. As such, it provided an excellent opportunity for networking, knowledge exchange, and collaboration.

Plenary discussions highlighted the critical role of sustainable chemistry as a tool for environmental and economic sustainability. Speakers and laureates of the third call for projects published under the Belgium Builds Back Circular (BBBC) initiative presented innovative pathways for:

- Material reuse
- Safer chemical substitution
- Lifecycle management
- Emphasising collaboration as a cornerstone for progress

During breakout sessions, participants discussed:

- The value of multidisciplinary partnerships
- Aligning regulations with innovation and investment
- Adopting a more proactive approach to sustainable practices

The panel discussions emphasised the importance of harmonising existing European regulations and improving European-level integration in order to simplify processes and promote SSbD integration.

The event concluded with a call to action for all participants to support SSbD practices across sectors. By working together and fostering collaboration, stakeholders will be able to:

- Better manage their transition towards a model aligned with SSbD
- Accelerate the adoption of sustainable practices leading to successful substitutions
- Turn challenges into opportunities for growth and innovation that will lead tomorrow's markets.

Date of the event: 9 December 2024, Brussels

Organisation of the event: Prepared by the Sustainable Economy Unit - Directorate-General for Economic Analysis and International Economy

Date of report: 12 February 2025

1. Introduction: Sustainable Chemicals and Safe and Sustainable by Design (SSbD)

The 'Sustainable Chemicals and Safe and Sustainable by Design (SSbD)' event fostered innovation and collaboration in sustainable chemistry. Organised by the Belgian Federal Public Service (FPS) Economy in partnership with Apeiron Team, Change Chemistry, KUL and Essenscia, it brought together key stakeholders, including industry representatives, EU and national authorities, investors, research centres, universities, and more. This event served as a dynamic forum for discussing the transition to safer and more sustainable chemical practices.

This event also provided a unique platform to spotlight the laureates of the third Belgium Builds Back Circular (BBBC) call for projects, which aims to accelerate the transition to a circular economy in Belgium through the substitution of hazardous chemicals. This call is part of the National Recovery and Resilience Plan (NRRP) and is financed by a temporary European fund, NextGenerationEU. These projects, selected for their transformative potential, were presented not just as company achievements but as leading examples of contributions to a more sustainable chemical industry with real impact on its beneficiaries, among others, SMEs. Eight of the nine winning projects presented innovative approaches to circularity, safety, and sustainability, inspiring participants and driving momentum for change.

The event aimed to explore the role of the Safe and Sustainable by Design (SSbD) framework in enabling this transition, emphasising the integration of sustainability throughout the life cycle of chemical products. By fostering dialogue among industry leaders, researchers, NGOs, policymakers, and public institutions, the event goals were to:

- Highlight innovation by providing a platform for the 3rd BBBC call for project winners to act as sources of inspiration for the chemical industry.
- Strengthen synergies by encouraging constructive multi-stakeholder dialogue to identify concrete and collaborative solutions for a more sustainable industry.
- Support SSbD implementation by sharing insights, experiences, and best practices.
- Facilitate sustainability integration across chemical product life cycles, equipping participants with tools to effectively leverage associated opportunities.

Key sessions of the event included:

- A plenary session featuring presentations from representatives of a wide range of sectors involved in chemistry, ranging from industries, NGOs, European institutions, national governments, research centres, etc.
- The presentation of the nine laureates' projects of the Belgium Builds Back Circular call for proposals.
- A workshop session divided into three breakout sessions during which stakeholders from various sectors explored and provided insights into key areas concerning Safe and Sustainable by Design (SSbD).

A total of 212 participants registered for the event, with industry and governmental agencies accounting for over 45% of attendees. There was a total of 12 speakers drawn from various fields, including:

- Industry
- Governmental agencies
- Diplomatic missions to the EU
- Academia
- Consultancy companies
- NGOs
- Research centres
- European institutions
- Trade associations
- Others (freelancers, media, law firms, and more.)

2. Key Highlight

2.1. Plenary Session

Welcome Speech – Ms Séverine Waterbley (FPS Economy, S.M.E.s, Self-Employed and Energy)

"A sustainable chemical industry and making sure the transition happens is not only a possibility and a necessity, but also an opportunity for innovative Belgian companies and research institutes to provide the building blocks that will help other industries drive a more sustainable EU economy."

In her opening speech, Ms Séverine Waterbley, President of the FPS Economy, S.M.E.s, Self-Employed, and Energy, emphasised Belgium's chemical industry as a cornerstone of its economy while acknowledging the risks posed by hazardous substances. The President reaffirmed the Ministry's commitment to sustainability, stressing the importance of balancing economic resilience with the protection of health and the environment.

The speech highlighted **three key projects led by the FPS Economy**:

- Belgian Plan for Chemical Alternatives[1] - BEP4CAL study – A study on reducing the use of hazardous substances and exploring substitution policies.
- PFAS Market Study[2] – Research identifying sectors reliant on PFAS and strategies for their phase-out.
- Belgium Builds Back Circular (BBBC)[3] – A project call focused on funding Safe and Sustainable by Design innovations in the chemical sector aligned with the EU Green Deal.

2.1.1. *Keynote on Sustainable Chemistry* – Mr Rui Resendes (Change Chemistry)

"Collaboration is key"

In his keynote speech on enabling Safe and Sustainable by Design (SSbD), Rui Resendes, Director of Partnerships & Business Development at Change Chemistry (a membership-based organisation), emphasised the pivotal role of chemistry in addressing global sustainability challenges**.** He highlighted sustainable chemistry as a key enabler across various dimensions such as greenhouse gas reduction, pollution mitigation, circular economy, environmental justice and ecosystem protection**. SSbD** was presented as both a guiding principle and a process that integrates sustainability across all steps of the value chain, from biochemical feedstocks to product lifecycle optimisation and advanced recycling technologies.

The European Commission offers the following definition for SSbD:

- Steering the innovation process towards the green and sustainable industrial transition.
- Substituting or minimising the production and use of substances of concern beyond existing and upcoming regulatory obligations; and
- Minimising the impact on health, climate and the environment during sourcing, production, use and end-of-life of chemicals, materials and products.

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[1] Belgian FPS Economy, Belgian FPS Public Health - **Development of a strategic roadmap for the Substitution of SVHC as part of a Sustainable economy** - 2023

[2] Belgian FPS Economy, Belgian FPS Public Health - **PFAS in Belgian industry – market study** - 2023

[3] Economie.fgov.be - **Belgium Builds Back Circular 3: Substitution of Hazardous Substances** - 2023

Those elements make the two paradigms, sustainable chemistry and SSbD, highly complementary.

Mr Resendes outlined the fact that without adhering to those principles, we will not be able to achieve our sustainability objectives.

He also underlined the barriers to progress, including:

- Limited scalability of alternatives
- Insufficient drivers such as consumer demand and regulations
- Challenges in adoption

However, he also showcased the power of collaborative innovation projects to overcome these obstacles. These initiatives mobilise resources, share costs, and foster pre-competitive partnerships to develop and test sustainable alternatives to chemicals of concern, such as plasticisers and preservatives, with active engagement from stakeholders across industries and geographies.

The keynote further stressed the importance of engaging the financial sector to drive investment in sustainable chemistry and aligning policies to incentivise adoption while complementing necessary restrictions. Education was also identified as a key enabler, with a call for broader awareness of chemistry's role in consumer goods, industrial sectors, and sustainability. Mr Resendes addressed misconceptions about bio-sourced and biodegradable materials, urging stakeholders to make informed decisions.

The session concluded with a strong call to action, emphasising that transitioning to safe and sustainable chemistry is not a choice but an imperative. This transition demands meaningful collaboration among stakeholders, including retailers, manufacturers, policymakers, academia, and advocacy groups, and continuous improvement to overcome challenges and achieve long-term goals. Mr Resendes underscored the need to celebrate small wins and maintain a 20-year vision to ensure progress towards a healthier, more sustainable future.

2.1.2. *Substitution Planning* – Mr Otto Linher (European Commission - Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs)

"Bring regulation on substitution of hazardous chemicals closer to innovation and investment efforts (...)"

"Instead of proving why a substance can't be substituted, efforts should go into joining forces to establish what can be done to substitute targeted substances with safer and more sustainable alternatives."

Mr Otto Linher introduced the European Commision's study on Substitution Planning as a key initiative to address challenges in replacing hazardous substances, particularly in complex substitution cases. These cases often involve diverse use patterns, lengthy testing and scaling processes, and regulatory hurdles, such as airworthiness or pharmaceutical approvals.

Mr Linher emphasised the disadvantages of current approaches, including:

- **Uniform phase-out deadlines**, which risk being either too early (causing disruptions) or too late (delaying innovation).
- **Tailor-made regulations**, which are resource-intensive, create delays and often result in uncertainty for companies.

To address these issues, he proposes Substitution Planning as a more **flexible and collaborative approach**:

- Developing **substitution plans** with industry, leaving more flexibility for the continued use of substances where necessary in exchange for engagement to invest in alternatives and substitute the substance where possible.

- Taking into account a broader set of criteria beyond chemical risks alone, including the Recommendation on Safe and Sustainable by Design chemicals and materials.
- Strengthening cooperation between authorities, substance users, and alternative providers by creating a network of substitution centres and linking them to funding programs.
- Leveraging **EU substitution centres** to provide expertise, support innovation, and foster collaboration.
- Turning regulatory delays into proactive opportunities for investment and innovation, aligning efforts with the **Safe and Sustainable by Design (SSbD) framework**.

The pilot phase of the project will include feasibility studies and testing on specific substances and uses, focusing on practical solutions and real-world applications. Through this initiative, the project aims to promote innovation, enhance regulatory efficiency, and drive sustainable progress in the substitution of hazardous chemicals. The study will be completed by the end of 2024, with a follow-up pilot project launching simultaneously—one lot on the role of a network of substitution centres and three lots on applying substitution planning to specific substance uses.

2.1.3. *European SSbD Framework* – Ms Irantzu Garmendia Aguirre and Mr Giulio Bracalente (European Commission – Joint Research Centre (JRC))

"Safe and Sustainable by Design can be defined as a pre-market approach to chemicals and materials design that focuses on providing a function (or service) while avoiding volumes and chemical and material properties that may be harmful to human health or the environment, in particular groups of chemicals likely to be (eco)toxic, persistent, bio-accumulative or mobile."

The presentation by Joint Research Centre (JRC) representatives provided an overview of the **state of play of the SSbD framework at the European level**[4], specifically on the latest advancements in its **implementation**.

After outlining the political context, the speakers traced the evolution of the framework since its publication, followed by recent improvements, including methodological guidance[5]. They also provided insights into the scoping analysis and the tiered nature of the framework, as well as the different steps of the assessment process.

The speakers also shared key insights from the second testing phase of the SSbD[6] Recommendation, anticipated during the stakeholder workshop on 5 and 6 December 2024. Among the main findings:

- Stakeholders' interest in testing and applying the SSbD Framework is increasing, with 48 case studies submitted in 2024, compared to 27 in 2023.
- The first SSbD Methodological guidance and the SSbD Framework received mostly positive feedback.
- Remaining challenges include workability (data availability, staff training, skills, technical resources) and methodology itself (for example, trade-offs and support to decision-making).

The presentation concluded by providing an overview of the JRC's ongoing activities related to the revision of the Framework, expected in 2025.

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[4] Joint Research Centre.ec.europa.eu - **Designing safer and more sustainable chemicals and materials: a methodological guidance** - 2024

[5] Joint Research Centre.ec.europa.eu - **Safe and Sustainable by Design chemicals and materials - Methodological Guidance** – 2024

[6] Research and innovation.ec.europa.eu - **Safe and sustainable by design** - 2022

2.1.4. *PARC SSbD Toolbox & the Development of SSbD in the Netherlands* – Mr Jaco Westra (Dutch National Institute for Public Health and the Environment)

"SSbD Framework is a general approach to steer innovation towards safe and sustainable chemicals and materials throughout the entire life cycle."

Mr Jaco Westra, representing the Dutch Institute of Public Health and the Environment (RIVM), provided an insightful update on developments related to Safe and Sustainable by Design (SSbD) within the European Partnership for the Assessment of Risks from Chemicals (PARC)[7]. He also highlighted key SSbD policy initiatives underway in the Netherlands.

The presentation focused on three **fundamental SSbD principles**:

- Innovating the innovation process.
- Adopting a lifecycle perspective.
- Applying a holistic approach that balances safety, sustainability, functionality, and socio-economic impact.

He spotlighted **two PARC-led initiatives**:

1. The SSbD toolbox[8] – Designed to assist the industry in conducting SSbD assessments. While still in its early development stages, it is already available for testing.
2. The knowledge sharing platform[9] – A resource providing comprehensive information on a range of SSbD-related topics and facilitating discussions among stakeholders.

Mr Westra also shared updates on national SSbD policy initiatives led by the Dutch Ministry of Infrastructure and Water Management. The ministry has initiated exploratory research into the feasibility of establishing a European SSbD Centre of Expertise, collaborating with other EU member states through the SPINE network.

Additionally, Jaco highlighted **two recent outputs designed to support SSbD adoption**:

3. An SSbD information map[10] - A tool offering businesses a clear overview of SSbD principles and processes.
4. A collection of essays[11] – A compilation of European stakeholders providing diverse perspectives on SSbD and its implementation.

2.1.5. *Thought-Starter on Strategies to Promote Substitution* – Mr Simon Cogen (FPS Economy, S.M.E.s, Self-Employed and Energy)

"The evolution in regulatory approach not only requires a shift in industry mindset but also calls for public administrations to take on a more proactive role in supporting substitution."

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[7] Eu-parc.eu

[8] Parc-ssbd.eu - **SSbD Toolbox** – 2024

[9] PARCopedia.eu

[10] Government of the Netherlands - **Information Map 'Safe and Sustainable by Design' of chemicals and materials** - 2022

[11] Government of the Netherlands - **Redesigning Chemical Innovation - Essays on Safe and Sustainable by Design** - 2024

Mr Cogen highlighted the significant evolution of the EU regulatory approach over the past few years, emphasising three key shifts:

- Adopting a group approach to regulate substances instead of on a substance-by-substance basis.
- Transitioning towards non-toxic material cycles.
- Extending the generic approach to risk management.

These evolutions in the regulatory approach not only require a shift in how industry deals with the associated challenges related to the substitution of harmful substances but also the extension of the type of support governments provide companies to ensure timely compliance with extremely complex regulatory measures.

The FPS Economy and FPS Public Health and Environment commissioned the BEP4CAL study[12] to answer **four research questions aiming at promoting the substitution of harmful substances** considering the changing regulatory approaches:

- Which SVHCs (Substance of Very High Concern) are being used in Belgium, and for which application?
- Which of these substances could be a priority for Belgium?
- Which policy measures could effectively support the substitution?
- What are the socio-economic effects of these measures?

The resulting potential measures from the BEP4CAL study[13] are presented in the table below.

Policy Measure no.	Broad category of measure	Policy measure name	Scenario 1 ranking	Scenario 2 ranking	Scenario 3 ranking
1	Use notification Substitution action plan, SVHCs fee	Mandatory notification of use	10	10	10
2		Substitution action plan	9	7	7
3		Non-financial support for the use notification and/or the substitution action plan	2	3	2
4		Subsidy for the substitution action plan	1	2	1
5		Annual fee on the use of SVHCs	5	1	3
6		Modular annual fee system for the use of SVHCs	8	4	4
7	Awareness creation and networking	Awareness creation and facilitation of networking	4	6	6
8	Methodology and structure to achieve sustainable substitution	Development of methodology and structure to support the sustainability-focused analysis of alternatives	6	8	8
9		Direct support of companies involved with a subsidy for advisory services (version 1)	7	9	9
10		Direct support of companies involved with a subsidy for advisory services (version 2).	3	5	5

Scenario 1: All attributes equal, Scenario 2: Effectiveness more important, Scenario 3: Effectiveness priority, but more weight on competitiveness. Assessed attributes: Effectiveness - Financial impacts - Health, environment, sustainability – Practicability – Wider and distributional impacts

[12] Belgian FPS Economy, Belgian FPS Public Health - **Development of a strategic roadmap for the Substitution of SVHC as part of a Sustainable economy** - 2023

[13] Belgian FPS Economy, Belgian FPS Public Health - **Development of a strategic roadmap for the Substitution of SVHC as part of a Sustainable economy** - 2023

When attempting to translate this into a potential National Plan on Substitution, the speaker outlined the following **guiding principles**:

- Fostering a proactive mindset instead of a reactive one (both industry and governments).
- Avoiding measures that can lead to regrettable substitution.
- Promoting "Safe and Sustainable-by-Design" (SSbD).
- Combining regulatory obligations with far-reaching supportive measures.
- Balancing stakeholder needs: Providing legal certainty for the industry but also making sure that they take on their societal/corporate responsibility and ensure society is sufficiently protected.

Based on the above, the following **potential measures** were presented:

- BE Chemical Priority: A transparent and evidence-based prioritisation protocol was briefly presented, as well as an example algorithm to automate part of the process.
- BE Chemical Data: The need for high-quality and granular information was stressed, and mandatory notification of SVHC use was proposed. The creation of a BE Chemical Data platform to aid in the prioritisation process and as a communication tool was briefly discussed.
- BE Chemical Transition Fund: The need for increased spending on R&D was stressed and several questions were raised on how to most efficiently and effectively support companies with limited means.

Mr Cogen then elaborated on **why a Substitution Centre can be considered the ideal governance tool to promote the substitution of harmful substances**. The key advantages include:

- Avoiding complex constitutional issues (especially relevant for Belgium).
- One-stop shop for all things related to substitution (especially important for SMEs).
- Building trust since it would be separate from institutions dealing with policy.
- Can (more) easily take on tasks which public entities are usually unfit for or that require a wide variety of expertise.
- Can take on the responsibility for the measures BE Chemical Priority, BE Chemical Data, and BE Chemical Transition Fund and could also provide:
  - Separate funding for SMEs to get assistance in substitution.
  - Guidance and training on Analysis of Alternatives.
  - Guidance and training on SSbD.
  - Guidance and training on substitution plans.
  - Support in creating and managing collaborative networks between companies, companies and research centres.
  - Specialised scientific services.

2.1.6. *Regional Substitution Strategies as Inspiration for Other Regulators* – Mr Hans Reynders (Flemish Government)

"By 2030, there will be a favourable trend in the environment-related disease burden of Flemish people."

Mr Hans Reynders, Coordinator for Substances of Concern for the Flemish Government, delivered an inspiring keynote on regional strategies for **managing hazardous substances and their potential to guide broader regulatory frameworks.** Using the 2021 PFAS crisis as a catalyst, he stressed the need for collaboration across Flanders, federal authorities, and the EU, alongside a clear policy vision for addressing substances of concern under REACH Article 57,[14] including:

[14] European Chemicals Agency - **Candidate List of substances of very high concern for Authorisation**

- Carcinogens
- Mutagens
- Reproductive toxins
- Endocrine disruptors

Mr Reynders outlined Flanders' goals to reduce pollution risks by 2050 and achieve significant health improvements by 2030, supported by a comprehensive policy plan. He emphasised alignment with the EU's "Safe and Sustainable by Design" (SSbD) framework, focusing on stakeholder collaboration, research prioritisation, and tool development to integrate safety and sustainability into chemical production. He also highlighted the potential of the revised Industrial and Livestock Rearing Emissions Directive[15], which mandates hazardous chemicals inventories and risk assessments to encourage safer alternatives.

By drawing on lessons from the collaboration with the Partnership for the Assessment of Risks from Chemicals (PARC)[16], Mr Reynders showcased how Flanders is implementing SSbD through collaboration, education, and innovation.

2.1.7. *PFAS in the Belgian Industry – Market Study* – Ms Daphné Hoyaux (FPS Economy, S.M.E.s, Self-Employed and Energy)

"The Belgian market analysis revealed that PFAS have high usage in medical devices, deemed essential but mainly as secondary components with few alternatives. This highlights the urgent need for viable alternatives, an area ripe for innovation and collaboration."

The environmental and health toxicity of PFAS (per- and polyfluoroalkyl) substances has been proven for several years. Due to their high chemical, thermal, and weathering resistance, these "forever chemicals" persist in the environment (water, soil, and subsoil). For the same reasons, PFAS are still widely used in highly diverse applications covering almost all industrial sectors in Europe and Belgium.

As part of the National Recovery Plan, the FPS Economy and FPS Public Health requested an in-depth technical and economic study on the PFAS market in Belgium[17] to develop a strategy and targeted means of public support for developing sustainable alternatives in the territory. The market study of the use of PFAS in Belgium was based on literature and interviews. A workshop was organised for the three priority sectors (medical devices, technical textiles, and HVACR).

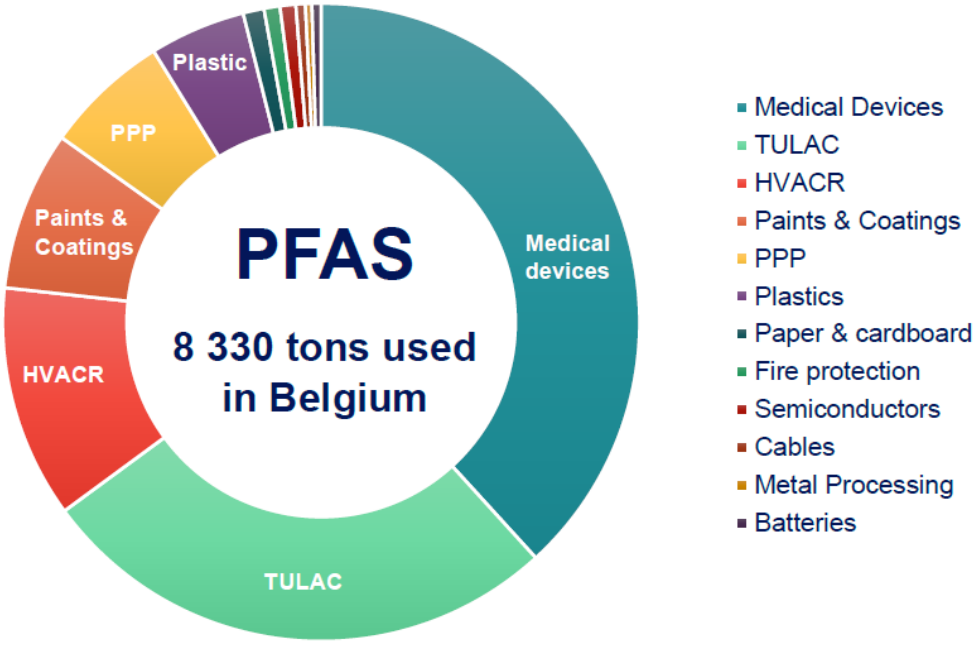
The Belgian market analysis revealed that **PFAS have high usage in medical devices, deemed essential but mainly as secondary components with few alternatives**. This highlights the urgent need for viable alternatives, an area ripe for innovation and collaboration.

The study classified the Belgian PFAS market into 12 different segments covering nearly all PFAS uses and applications. The review of the 12 different markets revealed heterogeneous contexts with a different awareness of PFAS uses, penetration of alternatives, or economic importance. Volumes of PFAS also largely differ, with three segments (Medical, TULAC & HVACR) capturing more than 75% of all the estimated PFAS volume used in Belgium (i.e., 8 330 t/y).

[15] European Commission Environment - **Industrial and Livestock Rearing Emissions Directive (IED 2.0)** - 2024

[16] Eu-parc.eu

[17] Belgian FPS Economy, Belgian FPS Public Health - **PFAS in Belgian industry – market study** - 2023



Some industrial companies and R&D laboratories have been investing in PFAS alternatives for many years. In many cases, the developed or tested alternatives lead to products with shorter lifespans and/or inferior performance. However, in some cases, successful substitution has been achieved. Substitution is well underway in some industries, such as paints & coatings, packaging, or polymer processing aids, but in others (medical devices, personal protective equipment), there is still a way to go. This is due to a lack of awareness of PFAS use in the supply chain, lack of knowledge about viable alternatives, or lack of viable alternatives even at low maturity.

The barriers to the development of alternatives vary depending on the industry and application. While PFAS-free solutions are emerging withing Belgium, more viable alternatives are more likely to come from European (or even global) efforts. Consequently, there is no one-size-fits-all policy that can help the acceleration of substitution away from all PFAS. The proposed public policies that would promote the phase-out of PFAS in Belgium are directly linked to the maturity level of the available alternatives.

Proposed public policies include (i) increasing consumer / producer information on PFAS content, (ii) short term subsidisation to encourage users to switch system, (iii) ensuring the easy availability of technical information on the alternatives for users, (iv) ensuring that there is sufficient competent and trained staff to install and maintain these systems and (v) placing increasing restrictions on PFAS use by way of environmental permits.

Proposed public policies include (i) subsidies to R&D to accelerate innovation, promote collaborative R&D, facilitating (antitrust-compliant) information exchange (ii) subsidies to encourage switching to alternative products providing a similar function and (iii) subsides to CAPEX (investments to buy, maintain, or improve fixed assets).

Proposed public policies include (i) support measures to reduce emissions of existing PFAS systems until they can be replaced. (ii) establishment of priority alternative substances for R&D for certain applications and (iii) subsidies to R&D.

Depending on the case, different public policies can be rolled out to accelerate substitution away from PFAS. In some cases, the process of finding viable alternatives will be a long-term task, even with the aid of these policies. Specific public policies are proposed for the priority sectors in the report.

2.2. European Resilience and Recovery Facility: Results of the Third Call for Projects Belgium Builds Back Circular (BBBC)

The third call for projects of the Belgium Builds Back Circular (BBBC) initiative, launched under the European Resilience and Recovery Facility, selected nine innovative projects to receive subsidies. These projects, initiated by companies or consortia of companies and/or research centres, aim to develop safe and sustainable alternatives to hazardous chemicals and promote circularity in various industrial sectors. A total of 9 million euros will be allocated to these projects, with implementation beginning in summer 2024 and continuing until July 2026.

The selected projects focus on:

- Developing sustainable materials
- Enhancing the recyclability of products
- Substituting harmful chemicals with safer, bio-based alternatives

These projects align with the European Green Deal, contributing significantly to the EU's goal of reducing pollution and advancing the green transition.

Eight projects pitched their proposition during the event:

5. **LEGACY** (VITO - Flemish Institute for Technological Research)

The LEGACY project aims to replace fossil-based bisphenols in epoxy resins with biobased alternatives, addressing both the environmental and health impacts of bisphenol A (BPA), especially in heavy-duty construction applications. BPA is widely used in epoxy resins but poses risks due to its endocrine-disrupting properties. The project will develop novel BPA-free epoxy formulations that ensure high performance and minimal surface degradation. LEGACY will focus on producing biobased resins using lignin, which will be treated, depolymerised, and modified to create lignin-based coatings. The project will scale up lab production while ensuring sustainability through rigorous testing and a Safe and Sustainable by Design (SSbD) approach. Biobased coating prototypes will be tested on various substrates, emphasising concrete, demonstrating strong adhesion and a protective barrier against external agents such as radiation, moisture, and chemicals. Finally, the biobased coatings will undergo industrial cleaning to verify that no BPA leaches from the surface.

1. **SSbD4SME** (VITO - Flemish Institute for Technological Research)

The SSbD4SME project aims to create an easy-to-use digital tool for SMEs to conduct Safety & Sustainability assessments throughout a product's life cycle. The tool will enable users to score new products based on SSbD principles (Safe and Sustainable by Design) and compare these scores with their existing products. The tool consists of several modules that evaluate the majority of safety and sustainable aspects as outlined in the JRC framework. It will connect with a proprietary database of sustainable alternatives, use a set of specific questions, employ smart web searching via RAG (Retrieval Augmented Generation), and link with relevant databases. Tool modules are designed to assess the hazards of chemicals/materials, evaluate human health and environmental aspects, and conduct an environmental sustainability assessment. The outcome is a list of individual scores for each aspect in the value chain and a final SSbD class to guide safe & sustainable innovation.

2. **BIOSUPHYOL** (Celabor & Sirris)

The project BIOSUPHYOL aims to develop non-toxic, BIO-based (>80%) alternatives to PFAS for applications requiring both SUPerHYdrophobicity and OLephobicity. The primary focus will be on paper-based packaging and textile applications, as these are significant sources of PFAS release into the environment, but the technology could also be adapted for other applications. To achieve the desired performance levels, the coating will combine low-surface-energy bio-based compounds (e.g. fatty acids, hydrophobic proteins) with optimal microscale roughness provided by cellulose microfibers. For applications requiring mechanical and chemical durability (e.g., high resistance to abrasion and/or washing), an additional cross-linking step will be implemented. The resulting materials will not only be safe and compliant with upcoming regulations, but they will also be more sustainable thanks to improved recyclability and reuse potential due to the absence of toxic compounds.

3. **Cleanlube** (Sopura)

The CLEANLUBE project focuses on developing a new range of conveyor lubricants that are free from environmentally harmful components or substances that pose long-term health risks. The goal is to create lubricants with at least the same level of effectiveness as existing products while also improving water savings during their application. The new lubricants will be designed to be safe from accidental food contact and will not cause corrosion to conveyor systems. Collaborating with partner universities, the project will explore the use of locally sourced (European) raw materials to replace harmful substances in current formulations. The focus will be on biobased, easily biodegradable ingredients that do not negatively affect downstream water treatment plants, thus improving the potential for wastewater reuse in industrial processes. CLEANLUBE is part of Kersia, a company dedicated to food safety across the entire food supply chain. Kersia provides solutions to prevent diseases and contamination in both animals and humans. The project specifically addresses the critical role of conveyor lubrication in the beverage industry, ensuring the smooth transport of beverage containers on conveyor belts during bottling processes, reducing the risk of containers falling, and ensuring safe operations.

6. **PFAS-Free** (Centexbel, UCLouvain, ULiège, UGent)

PFAS-FREE aims to develop safe and sustainably performing textile water-repellent solutions that are superior to commercially available 'PFAS-free/fluorine-free' solutions. The focus on fluorine-free hydrophobic products is motivated by their lower impact on the environment (PFAS are persistent, bioaccumulative, and toxic (PBT)), lower impact on human health (e.g. cancer), and their economic importance (50-80 tonne of PFAS are used annually in the EU for functional applications in the textile sector) and the lack of environmentally sustainable, performing and economically viable alternatives. To develop these solutions, Centexbel and UCLouvain will combine bio-based materials and substrate surface engineering. To select materials and application methods, an inclusive Safe and Sustainable by Design study will be conducted by ULiège and UGent.

4. **BisGO** (Sciensano, KU Leuven, UGent)

Bisguaiacols are promising alternatives to Bisphenols in producing polycarbonate plastics and epoxy resins. Three major advantages of bisguaiacol are reduced toxicity, renewable source production, and Zeolite catalysis-assisted synthesis. The development of bisguaiacol is testimony to Belgium's commitment to a more circular economy. BisGO, a joint commitment of Sciensano, the University of Leuven, and Ghent University, will advance Safe and Sustainable by Design bisguaiacol-based alternatives through the lower TRLs. BisGO fills toxicological data gaps early in the development process by combining standardised tests and new approach methodologies with advanced omics. The bisguaiacol portfolio will be expanded, guided by machine learning. BisGO will assess the short and long-term impact of bisguaiacol on aquatic ecosystems. The generated technology will contribute to the rationalised development of chemicals to avoid regrettable substitution.

5. **FONT: Flame Retardants from Natural Feedstocks for Textiles** (Apeiron-Team, KU Leuven, Centexbel, CTF2000)

The objective of the FONT project is to test the process of early-stage (TRL 1-3) development of a chemical as a sustainable alternative. This is based on a concrete case of an alternative flame retardant for textiles. The context within which safety and sustainability are assessed is the SSbD framework as developed by JRC. The alternative will be developed using the bio-based platform of chemical building blocks developed by KU Leuven. For the toxicological assessment, a new evaluation method is also being developed by KU Leuven. The technical requirements for the flame retardant are provided by the supply chain partner of the project CTF2000 (Flamaway Group). The formulation and technical testing of the flame retardant will be done by CENTEXBEL, who will develop a test that allows evaluation with small volumes of samples. CENTEXBEL will also evaluate the impact on the recyclability of the textile product with the alternative flame retardant. Apeiron-Team will coordinate the project and the SSBD assessment itself. The feasibility of an SSBD assessment in this context of honest stage development will also be evaluated. As such, the project will provide input to JRC's evaluation of the SSbD framework.

6. **CIRCATEX** (Sirris, Capilano, Demeyere, UGent)

The CIRCATEX project is developing a circular alternative to PFAS-based non-stick coatings and applying it to non-stick frying pans and the sliding side of ski slats. The project explores the potential of laser texturing and innovative blast treatments to create non-stick properties in stainless steel to eliminate the use of PFAS-based coatings and waxes. It examines how texturing affects adhesive behaviour and the correlation between different parameters. This allows for the creation of the highest-performing textures and blast treatments. Neither process adds material to the products. As a result, there is no risk of harmful effects on humans and the environment during the entire life cycle. Reapplication of the texture allows multiple reuses, and at the end of its life, the base materials can be recycled. The project is a collaboration between Sirris, Ghent University, and Demeyere CommV. (producer of cookware) and Capilano bv (producer of circular ski slats).

The summaries of the nine funded projects (including the project Aquaveg) can be found here.

Impact and Contribution to Sustainable Chemical Innovation

The BBBC3-funded projects reflect Belgium's commitment to driving sustainable innovation within the chemical sector and across industries. By developing safer, more sustainable alternatives to hazardous chemicals, these projects contribute to the EU's objectives of achieving a circular, low-carbon economy.

The BBBC initiative also demonstrates the potential of Belgium's research and industry sectors in the transition towards safer and more sustainable practices and the critical role of collaboration between all stakeholders.

More than anything, the third BBBC call for projects centred on the substitution of hazardous substances demonstrates that the chemical sector is far from a niche industry; it is a broad and integral part of our daily lives, influencing a wide range of sectors from food to textiles, construction, and beyond. The wide scope of these projects highlights the importance of the chemical sector in achieving circular economy initiatives. These initiatives demonstrate how the sector can lead in innovation, providing solutions that benefit not just industries but society as a whole. The third BBBC call for projects is a clear reminder that sustainable chemistry is fundamental to building a safer, healthier, and more resilient future for all.

2.3. Safe and Sustainable by Design (SSbD) Workshop

During the three breakout sessions, stakeholders from various sectors were invited to explore and provide insights into key areas concerning Safe and Sustainable by Design (SSbD).

2.3.1. Keynote Presentation: *Chemistry Under the Fourth Industrial Revolution: The Next Growth Frontier* – Mr Rafael Cayuela (Dow)

"Under the Fourth Industrial Revolution, we will restore the balance between nature and humans explore the molecular universe, design the molecules of the future and our sustainable future."

In his keynote speech, Mr Rafael Cayuela explored the role of chemistry in the context of the Fourth Industrial Revolution, highlighting how sustainability, digitalisation, and social inclusivity will shape the future. He underlined the critical need for innovation to address global challenges that we faced and are still facing such as the COVID-19 pandemic, economic recessions, climate change, and biodiversity loss.

The speaker stressed that, alongside ongoing global challenges, innovation is essential for navigating the next decade. A significant wave of innovation is expected, which will be crucial in transforming industries and responding to global crises.

The discussion presented sustainability as not only necessary for survival but also as a major growth and business opportunity. The global trajectory towards doubling the population and emissions by 2050 calls for rethinking the traditional GDP model, which fails to account for environmental and social impacts. Mr Cayuela suggested that economic models need to evolve to integrate planetary boundaries.

The future will see a shift towards Net Zero, fully circular economies, and creating systems that are safer and healthier. Chemistry was highlighted as essential in addressing the challenges of the Fourth Industrial Revolution, with a focus on decarbonisation as well as rethinking molecules and materials to ensure sustainability.

"*The Covid-19 pandemic reinforced the power of nature*" and the need to restore the balance between humans themselves with a focus on diversity, equity, and inclusion (DEI), humans and the environment, as well as humans and technology.

2.3.2. Applications of SSbD

Use of SSbD from an Academic Perspective - How the SSbD Framework Can Guide the Development of Future Chemicals – Dr Laura Trullemans (KU Leuven)

Academia stakeholders were invited to explore and provide insights on how academic research and innovation could influence the widespread adoption of SSbD principles.

The key takeaway was that the biggest hurdle for the development of new SSbD chemicals is the limited knowledge of the SSbD framework and its rules, compounded by the existence of only a small amount

of good practice case studies, uncertainty in defining safety, and insufficient data availability to assess the long-term impacts of chemicals accurately. Additionally, there is a need for a shift in mindset to prioritise sustainability and safety in chemical design.

Use of SSbD from an Industrial Perspective – Sustainable Portfolio Management: Identifying Innovation Opportunities and Translating Outcomes into Action – Mr Bruno Van Parys (Syensqo)

Industry stakeholders were invited to explore and provide insights into three key areas concerning Safe and Sustainable by Design (SSbD):

1. **Drivers for SSbD Integration:**

Participants were asked to identify their primary drivers for integrating safe and sustainable considerations when (re)designing substances, products, materials, and processes. Initial feedback highlighted factors such as regulatory compliance, health, and safety as significant drivers.

2. **Benefits of an SSbD Framework:**

The group discussed the potential advantages of having a structured SSbD framework. Responses emphasised transparency and comparability as central benefits.

3. **Support and needs for SSbD Adoption:**

Industry representatives also shared their perspectives on the types of support needed to implement an SSbD approach effectively. Suggestions included access to targeted guidance, time, incentives, and money.

Use of SSbD in Wider Substitution – Ms Elke Van Asbroek (Apeiron Team)

The session brought together a diverse audience, representing a wide range of expertise and interests in sustainable chemicals.

- **Participant Breakdown by Field of Work:**
  - Research: **26%**
  - Industry: **11%** (Small-to-Medium Enterprises: **2%,** Multinational: **6%**)
  - EU Member State Authorities: **21%**
  - EU Policy Making: **2%**
  - NGOs: **4%**
  - Trade Associations: **8%**
  - Consulting: **15%**
  - Others: **6%**
- **Familiarity with the SSbD Framework:**
  - 53% of participants indicated a **basic understanding** of the Safe and Sustainable by Design (SSbD) framework.

Participants submitted a range of critical questions, highlighting both the complexities and the opportunities surrounding the SSbD framework. These questions provided valuable insights into the priorities and concerns of participants:

- The implementation challenges of the SSbD approach and its practicality.
- The regulatory and legislative context, namely the integration of SSbD into EU legislation, coordination across member states, and established deadlines.
- The current adoption of SSbD in the chemical industry, ways to incentivise both users and producers of alternatives, and the added value for companies already engaged in substitution efforts.

- The priority and definition of minimal health and environmental requirements, identification of target molecules for SSbD, and development of frameworks to balance trade-offs between safety and broader sustainability impacts.
- The importance of sharing scientific advancements in recycling technologies, strengthening collaboration with industry and downstream users and ensuring data aggregation aligns with decision-makers' priorities.
- The inquiry about the timeline for SSbD to become the gold standard, strategies for effectively communicating its benefits to the public, and the status of SSbD adoption in the U.S.

3. Engagement, Interaction and Lessons Learned

Overall, the event was well received by the 212 participants, who appreciated the engaging discussions and the diverse perspectives shared by representatives from industry, academia, and government. The morning presentations, particularly those on the Safe and Sustainable by Design (SSbD) concept and promoting substitution, were considered informative and thought-provoking. The afternoon sessions also generated strong interest, with inspiring contributions on the Fourth Industrial Revolution and the use of SSbD in wider substitution, as well as valuable discussions on the regulatory implications of SSbD.

There was clear enthusiasm for this type of event and a general interest was expressed towards the desire to continue discussions on SSbD, particularly about practical implementation and regulatory alignment. A **general interest was expressed towards the desire for future gatherings**, including a focus on topics such as the ESPR (Eco-design for Sustainable Products Regulation) Directive, concrete examples of successful substitutions, a review of the REACH framework (Registration, Evaluation and Authorisation of Chemicals), broader implementation examples with input from WBCSD representatives (World Business Council for Sustainable Development), and an even stronger focus on sustainability.

Appendix: Agenda of the Event

9:00 am	*Welcome Speech* Ms Séverine Waterbley – FPS Economy, S.M.E.s, Self-Employed and Energy
Plenary Session	
9:15 am	*Keynote Speech on Sustainable Chemistry* Mr Rui Resendes – Change Chemistry
9:35 am – 12:30 pm State of Play on the European Commission's Plans to Foster Substitution of Hazardous Chemicals	
	Substitution Planning Mr Otto Linher - European Commission - Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
	European SSbD Framework Ms Irantzu Garmendia Aguirre and Mr Giulio Bracalente – European Commission – Joint Research Centre (JRC)
	PARC SSbD Toolbox & the Development of SSbD in the Netherlands – Mr Jaco Westra - Dutch National Institute for Public Health and the Environment

European Resilience and Recovery Facility: Results of the Call for Projects Belgium Builds Back Circular (BBBC)	
An Overview of the Belgian Activities on Sustainable Chemicals	
	Thought-Starter on Strategies to Promote Substitution Mr Simon Cogen - FPS Economy, S.M.E.s, Self-Employed and Energy
	Regional Substitution Strategies as Inspiration to Other Regulators Mr Hans Reynders - Flemish Government
	PFAS in the Belgian Industry – Market Study Ms Daphné Hoyaux - FPS Economy, S.M.E.s, Self-Employed and Energy
1:45 pm – 5:15 pm Safe and Sustainable by Design (SSbD) Workshop	
	Keynote: *Chemistry Under the Fourth Industrial Revolution: The Next Growth Frontier* Mr Rafael Cayuela – Dow
	Use of SSbD from an Academic Perspective - How the SSbD Framework Can Guide the Development of Future Chemicals Ms Laura Trullemans – KU Leuven
	Use of SSbD from an Industrial Perspective – Sustainable Portfolio Management: Identifying Innovation Opportunities and Translating Outcomes into Action Mr Bruno Van Parys – Syensqo
	Use of SSbD in Wider Substitution Ms Elke Van Asbroek - Apeiron Team
5:30 pm – 7:30 pm	Conclusions and Walking Dinner

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