Optimizing implementation of SSbD to better enable Sustainable Innovation

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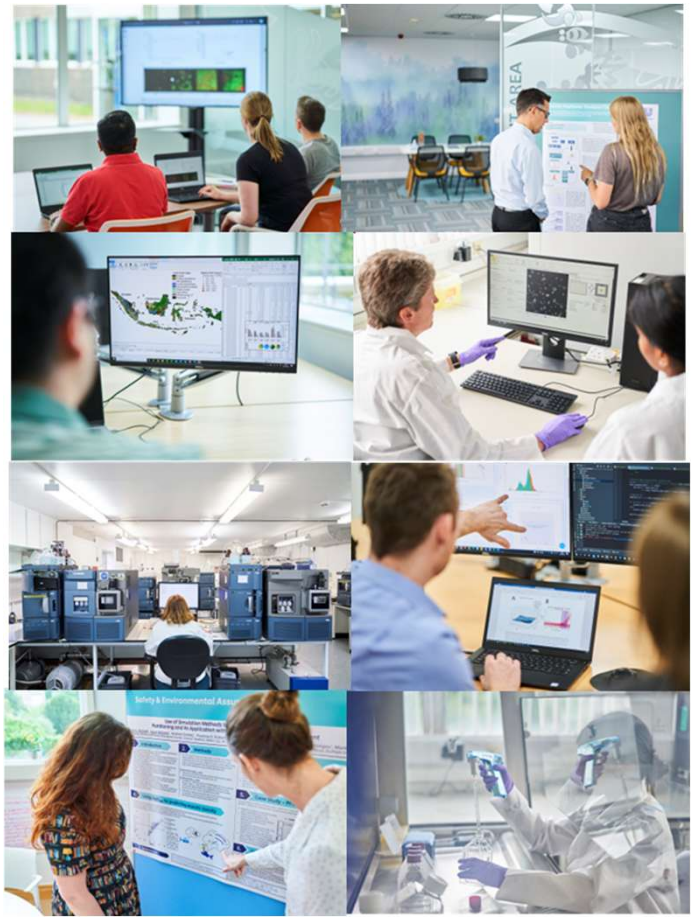

"Implementation of the SSbD concept for industrial impact" workshop, co-organized by ISC3 & IRISS, 10th Nov 2025, Zurich, Switzerland

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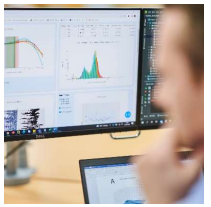
Safe and Sustainable by Design (SSbD): building safety & sustainability into product innovation



- We ensure that our products are safe for consumers and workers and help minimise their environmental impacts
- Unilever Safety, Environmental & Regulatory Science (SERS) experts provide input at every stage of a product's life:
  - New discover and design new concepts
  - New technologies in product innovations
  - Anticipate product use & disposal scenarios
- By being involved throughout the innovation process, SERS experts help design safety and sustainability into our products

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Safe & Sustainable Products without Animal Testing

What we believe

- **Every Unilever product must be safe for people and our environment**
- **Animal testing is not needed to assess ingredient & product safety** –wide range of non-animal approaches available
- **We work to accelerate the global adoption of animal-free cosmetic safety assessment approaches**

How we do it

40+ years of developing non-animal safety science

90+ collaborations

600+ publications





Novel Biosurfactant / Hand Dishwash case study: our SSbD framework


SAFE AND SUSTAINABLE BY DESIGN WITHIN UNILEVER

Application of Safe and Sustainable by Design Approaches for a Biosurfactant

June 2023

Ian Malcomber*, Sarah Sim, Florence Bohnes, David Mason, Gordon Riley, Clare Rodseth, Evita Vandenbossche-Goddard

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- Real consumer product innovation example using SSbD principles
- Renewable, biodegradable biosurfactant for inclusion in a hand dishwash product
- Novel, non-animal Next Generation Risk Assessment (NGRA) approach used to assess consumer, occupational, and environmental safety
- Environmental impact of novel biosurfactant assessed against existing hand dishwash surfactant ingredients.

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Novel Biosurfactant / Hand Dishwash case study: our SSbD framework


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Ingredient Discovery	Ingredient Evaluation	Development & Testing	Production & Launch
Several ingredient options - early-stage supplier information	**One or few ingredient options** - quantitative material and process data (ingredient pilot plant)	**Commercial specification of ingredient & product formulation** (product pilot plant)	**Full-scale production of final formulation** with markets & volume targets
• Evaluation of ingredient options • Preliminary prognosis & screening assessment • Limited safety & sustainability data	• Evaluation of lead ingredient option • Identification of significant risks and impacts • Data generation on ingredient performance, safety & sustainability	• Refined evaluation of lead ingredient option in formulation • Implementation of safety strategy • Data gap filling	• Final evaluation of lead ingredient in formulation • Safety & sustainability assessments support market launch • Integration of info & insights from all stages

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Insights from evaluation of available SSbD frameworks for consumer goods

- Our aim was to evaluate published SSbD frameworks & concepts to understand their utility for consumer goods product innovation
- For today, I'll focus on the European Commission DG JRC SSbD framework & guidance

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Perspective

Optimizing the implementation of safe and sustainable by design to better enable sustainable innovation

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SUMMARY

The concept of safe and sustainable by design (SSbD) combines considerations of human safety, environmental safety, and sustainability. The SSbD framework developed by the European Commission's (EC) Joint Research Centre (JRC) and the Safe(r) and Sustainable Innovation Approach (SSIA) developed by the Organisation for Economic Co-operation and Development (OECD) are two key examples of how SSbD concepts could be implemented in future regulatory frameworks. SSbD assessment can greatly aid the innovation process to ensure that new chemicals/materials, processes, and products are safe and sustainable throughout the life cycle. Unilever is a global consumer goods company that integrates the latest safety and sustainability science and SSbD principles in the innovation process. In this work, we review the JRC SSbD framework and OECD SSIA, taking into consideration the reflections of stakeholders through a review of published and gray literature, to evaluate to what extent they enable SSbD innovation. We make recommendations on how current gaps and challenges can be addressed to enable maximal uptake by all stakeholders across the value chain. The recommendations are mainly aimed at ensuring that the JRC SSbD framework and OECD SSIA are conceptually robust and addressing the practical elements in the use of the latest scientific methodology, availability of data, tools, guidance, and a standardized approach to interpreting results and decision-making, through short- and longer term efforts.

INTRODUCTION

The safe and sustainable by design (SSbD) concept aims to integrate human health, environmental safety, and sustainability considerations into product design processes.[1–3] The concept builds on the precautionary principle, aiming for early identification and mitigation of potential risks and impacts of a given chemical/material, process, and product. The SSbD concept borrows principles from related approaches intended to guide material and technology development, such as green chemistry, safe by design, sustainable chemistry, and circular chemistry.[1,4] Efforts to operationalize the SSbD concept have resulted in the development of several technical frameworks or approaches with anticipated application during the innovation process in industrial settings. Two principal proposals for implementation are the SSbD framework developed by the European Commission's (EC) Joint Research Centre (JRC) and Safe(r) and Sustainable Innovation Approach (SSIA) developed by the Organisation for Economic Co-operation and Development (OECD).[1,5–7] The JRC framework and the OECD approach have been widely discussed in the context of the innovation process through case studies and consulta-

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Recommendations to ensure SSbD frameworks support sustainable innovation:

1. Enable risk-based approaches & exposure assessment
2. Support use of latest non-animal safety & sustainability science
3. Explicitly address & manage trade-offs

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Proposed Revision of the Commission SSbD framework

	European Commission Safe & Sustainable by Design (SSbD) framework & guidance	**European Commission SSbD framework Draft 2025 Revision**
Policy context	European Green Deal & Chemical Strategy for Sustainability	EU industrial competitiveness & Chemicals Industry Action Plan
Types of Innovations	Substitution of existing chemicals	Existing, incremental & breakthrough innovations
Safety approach	Absolute Safety, hazard-based approach	Risk-based & hazard-based approaches
Sustainability approach	Absolute Sustainability is the ultimate goal	Benchmark-based approach - each chemical/process compared to virtual representative average-impact
Use of latest science?	None or limited to early stages of innovation	Yes, built to let practitioners adopt state-of-the-art safety and sustainability science as it emerges.
Data requirements	Extensive data requirements throughout the innovation process	Extensive data requirements throughout the innovation process
Trade-offs	No provision	Recognises & operationalises trade-offs

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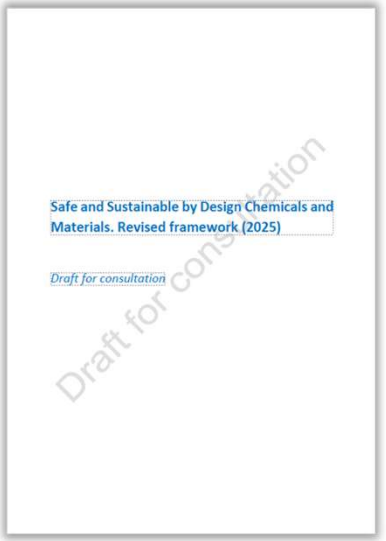
Recommendations to accelerate adoption of SSbD concepts:

1. Build global data ecosystem & digital infrastructure
2. Develop more sector- and technology-specific case studies
3. Create additional guidance & training for SSbD assessment



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SERS Partners

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