

Mapping of Skills

Safe-and-Sustainable-by-Design (SSbD) is a design concept that integrates safety and sustainability (environmental, social, and economic) aspects at early stages of the chemical, material, or product innovation. The focus is on providing the desired functionality, while avoiding volumes and chemical properties that may be harmful to human health or the environment and adopting a life cycle perspective. With the launch of the SSbD framework by the Joint Research Centre (JRC) of the European Commission (EC), current work in the field of SSbD is focused on enabling the uptake of this framework in industrial applications.

The IRISS project is a coordination and support action (CSA) funded under Horizon Europe and aims to connect, synergise, and transform the SSbD community in Europe and globally towards a life cycle thinking in order to meet the European Green Deal goals. One of the main objectives of this project is to map and assess the state-of-the-art of methods and criteria of existing SSbD approaches. The work presented in the Deliverable D1.5 'Mapping of skills' is part of this mapping activity and provides up-to-date information on needed SSbD skills and their availability in industrial and research practices, as well as in educational activities. Additionally, it includes an analysis of the available university education of the IRISS academic partners, which will later be used to support the transfer and/or translation of the required skills and knowledge into university and other educational curricula.

The methods applied to identify needed SSbD skills and their availability consisted of

- A literature review to identify needed SSbD skills,
- An internal IRISS co-creation session to identify additional SSbD skills,
- An analysis of university educational offerings of IRISS academic partners,
- An online survey to collect information on SSbD-related practices and needed skills from IRISS partners and stakeholders and
- Projects sheets to collect information on SSbD-related practices and needed skills from other ongoing EU projects related to SSbD.

The results obtained from the literature review highlight the interdisciplinary nature of the SSbD approach and provide an overview of the wide range of policy ambitions and regulations as well as scientific principles and disciplines of which SSbD actors need to be aware (e.g., European Green Deal, Chemicals Strategy for Sustainability, European Industrial Strategy, Responsible Research and Innovation, Sustainable Development, Sustainable Innovation, absolute sustainability considerations such as the planetary boundaries, Life Cycle Assessment (LCA), Risk Assessment, Green Chemistry, Green Engineering, Circular Chemistry, Sustainable Chemistry, Safe-by-Design, Sustainability Science). The implementation and application of SSbD in practice requires broad design and assessment skillsets as well as life cycle thinking already at the design stage. SSbD actors need to be aware of the entire life cycle of a novel chemical or material, from the supply chain of raw materials to the end-of-life of the final product. The results also show that data collection and access to appropriate tools are crucial to perform the required assessments at the design stage. SSbD cannot be done by single actors but is a team effort that requires strong collaboration and knowledge/data transfer across supply chains and along the entire life cycle. Therefore, also interpersonal or 'soft' skills are required to work in multidisciplinary design teams and to collaborate across supply chains and with stakeholders along the entire product's life cycles.

The survey results show that training on SSbD skills is urgently needed and that most of the respondents (85%) are interested in improving their skills in SSbD (Figure 1).

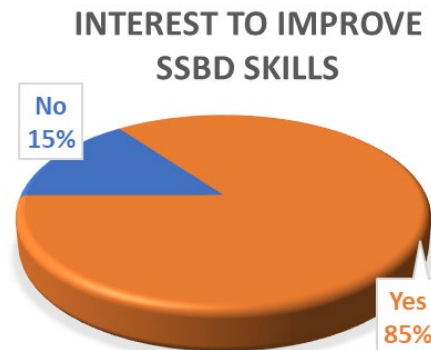


Figure 1: Interest of respondents to improve their skills in SSbD.

The knowledge and skills need identified by the IRISS consortium and its stakeholders highlight the importance of a systems thinking competence for SSbD, particularly life cycle thinking. There is also an urgent need for knowledge and skills related to understanding and implementing the JRC SSbD framework as it is currently not user-friendly and often difficult to translate to specific sectors. There is a demand for skills related to performing the required assessments, in particular LCA-related skills, and skills in using the available tools at the design stage (where there is often little data available). There is also a lack of understanding of how SSbD can bring benefits in practice.

In terms of industrial practices, the results from the survey show that safety aspects are more often considered in practice, especially in companies, than sustainability related aspects. In general, safety and circular economy aspects are more frequently applied in practice than social and environmental LCA aspects, and all aspects are more often applied by companies compared to all respondents (Table 1). Companies have a high chemical safety related skillset as they have had to comply with safety legislation for a long time, i.e., with REACH and CLP as well as sector specific legislation. The respondents also apply other sustainability principles or aspects not suggested by the JRC SSbD framework, e.g., green finance.

Table 1: Application rates of safety, social, environmental LCA, and circular economy aspects obtained from the survey results.

Aspect	Application rate	
	All respondents	Companies
Safety	70%/72%*	92%
Social LCA	62%	76%
Environmental LCA	64%	70%
Circular Economy	73%	78%

* 70% perform hazard assessments for new materials and chemicals applied in their products and 72% consider occupational health and safety (OHS) factors, human health, and environmental risks during the manufacturing or use-phase of new materials and chemicals

While the JRC SSbD framework itself focuses on chemical-by-chemical substitution, a desired service or functionality can also be achieved by applying alternative business models. The survey results show that these are only rarely considered or even applied by companies (Figure 2). Of the 37 responding companies, only seven indicated that they are considering or have experience with alternative business models, i.e., chemical leasing, service-based models, or circular models.

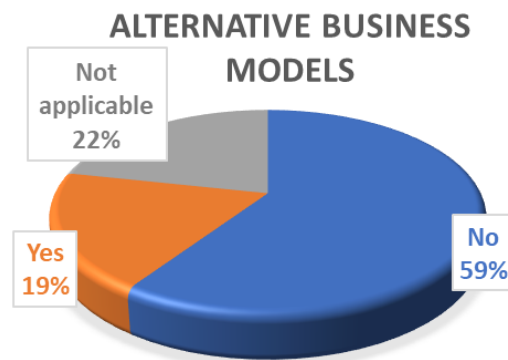


Figure 2: Experience of companies with alternative business models.

Regarding educational activities, the results show that a wide range of SSbD aspects (e.g., Benign by Design, LCA, modelling tools, circular business models) are well embedded in today's academic education, but there is little interaction between these aspects, which is necessary for the application of SSbD. The survey results show that around half of the companies answering the questionnaire perform in-house trainings on SSbD aspects, mainly by own staff (Figure 3). The trainings cover both safety and sustainability (including circularity) related aspects as well as regulatory requirements.

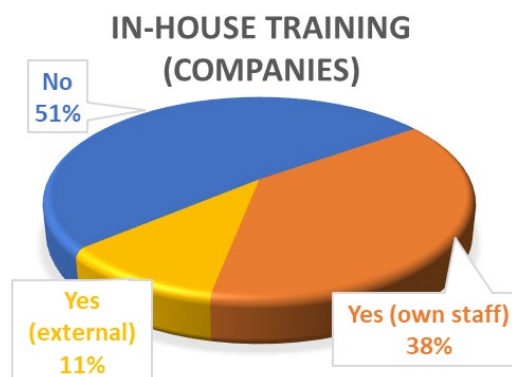


Figure 3: In-house training on SSbD aspects in companies.

The number of responding projects was rather small (17 projects in total) and not all of them are directly involved in any chemical, material, or product development. Generally, the project results show that a life cycle thinking is strongly implemented in current EU funded projects, while safety aspects are less in focus. The mentioned skills need highlight the requirement of training, especially tailored training for small and medium enterprises (SMEs), knowledge-transfer, and strong coordination to implement SSbD, together with a more user-friendly guidance and practical cases.

The results of this report will form the basis for the first training modules to be developed within IRISS to support the implementation of SSbD. The training modules will be tailored to SMEs and will support a better understanding of the benefits of SSbD (for the company and its customers) as well as a better understanding of the JRC framework itself and its implementation in specific sectors. There is a greater need for training on sustainability aspects than on safety aspects: in particular, training related to performing a LCA (mainly environmental, but also social and economic) very early in the development process and applying appropriate tools at the design stage is needed. Other activities of the IRISS network will support a strong coordination and knowledge transfer between SSbD actors to share relevant expertise, data and information, e.g., by implementing collaboration channels and value chain-specific hubs.

Disclaimer

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