

The Safe and Sustainable by Design framework and the opportunities to improve the exposure information

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ECETOC-Elevating exposure science in chemical safety management

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- Policy context
- The SSbD framework
- Case studies and lessons learnt
- Opportunities to improve the exposure information
- Next steps

Policy context for SSbD

The EU Green Deal



Zero pollution



Climate neutrality



Circular economy

Chemicals Strategy for Sustainability (CSS)

Strengthen the protection of human health and the environment

- driving innovation to design and develop safe and sustainable chemicals and materials
- phase out the **most harmful substances** and
- substitute, as far as possible, **substances of concern**, and otherwise minimise their use and track them

CSS Action Plan

Develop safe and sustainable-by-design (SSbD) criteria for chemicals



SSbD in the EU CSS

- *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.***
- *Overall sustainability should be ensured by minimising the environmental footprint of chemicals and materials in particular in relation to **climate change, resource use, and protecting ecosystems and biodiversity, adopting a lifecycle perspective.***

(Definition adapted from EU Chemicals Strategy for Sustainability).

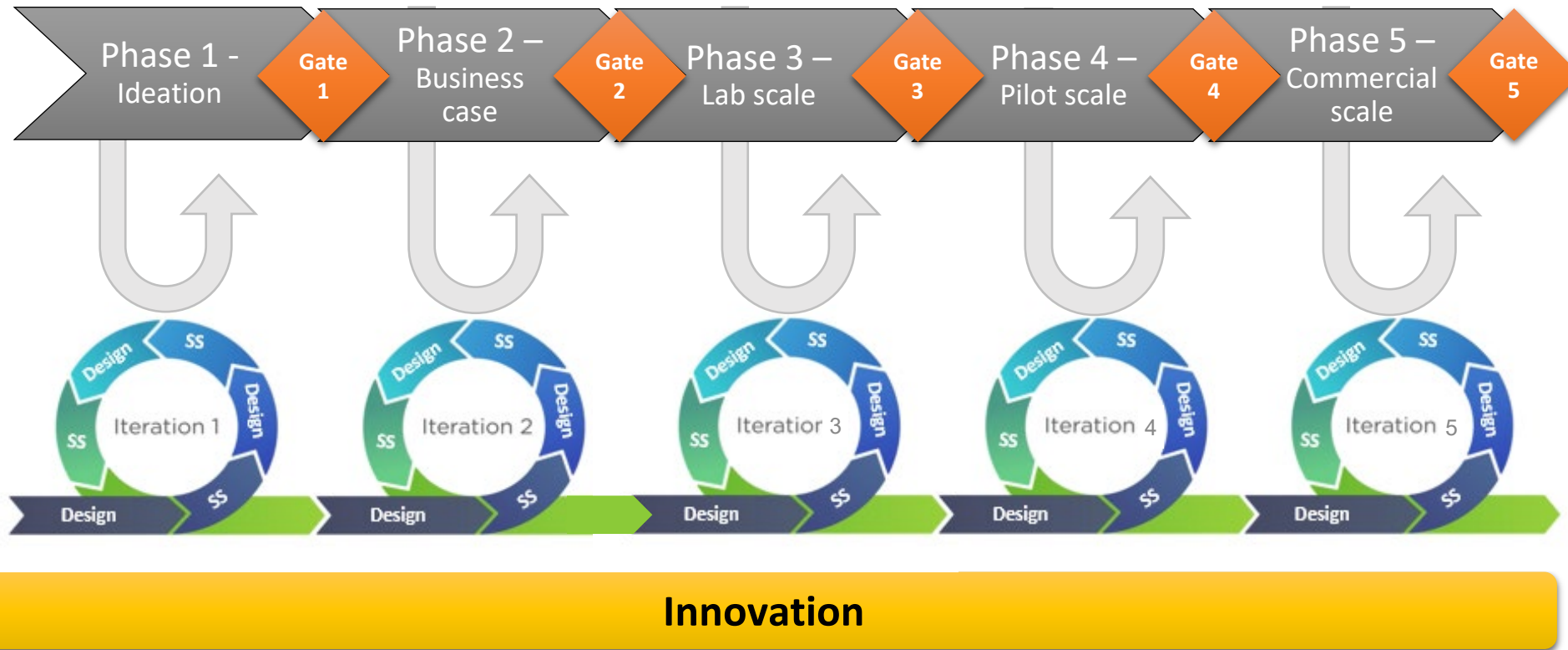
Framework to define safe and sustainable by design (SSbD) criteria for chemicals and materials that should **contribute to achieve the CSS ambitions, beyond current regulatory compliance.**

*Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. **Chemicals Strategy for Sustainability** Towards a Toxic-Free Environment COM (2020) 667
https://ec.europa.eu/environment/strategy/chemicals-strategy_en

SSbD framework: The objectives

- ✓ **Drive innovation toward Safe and Sustainable by Design **new** chemicals and materials**
- ✓ **Providing guidance** on criteria development for the design of **new** 'safe' and 'sustainable' chemicals/materials;
- ✓ **Minimising or, as far as possible, eliminating the impact on human health, climate and the environment** (air, water, soil) along the entire chemical's and material's life cycle;
 - Phase out the **existing** most harmful substances
 - Substitute, as far as possible, **existing** substances of concern, and otherwise minimise their production and use and track them
- ✓ **Enabling comparative assessment of **new/existing** chemicals and materials** based on safety and sustainability performance for a given function or application context.

SSbD framework: The (Re)Design



Strategies and principles can be followed such as:

- Green chemistry
- Green engineering
- Sustainable Chemistry
- Safe by design
- ...

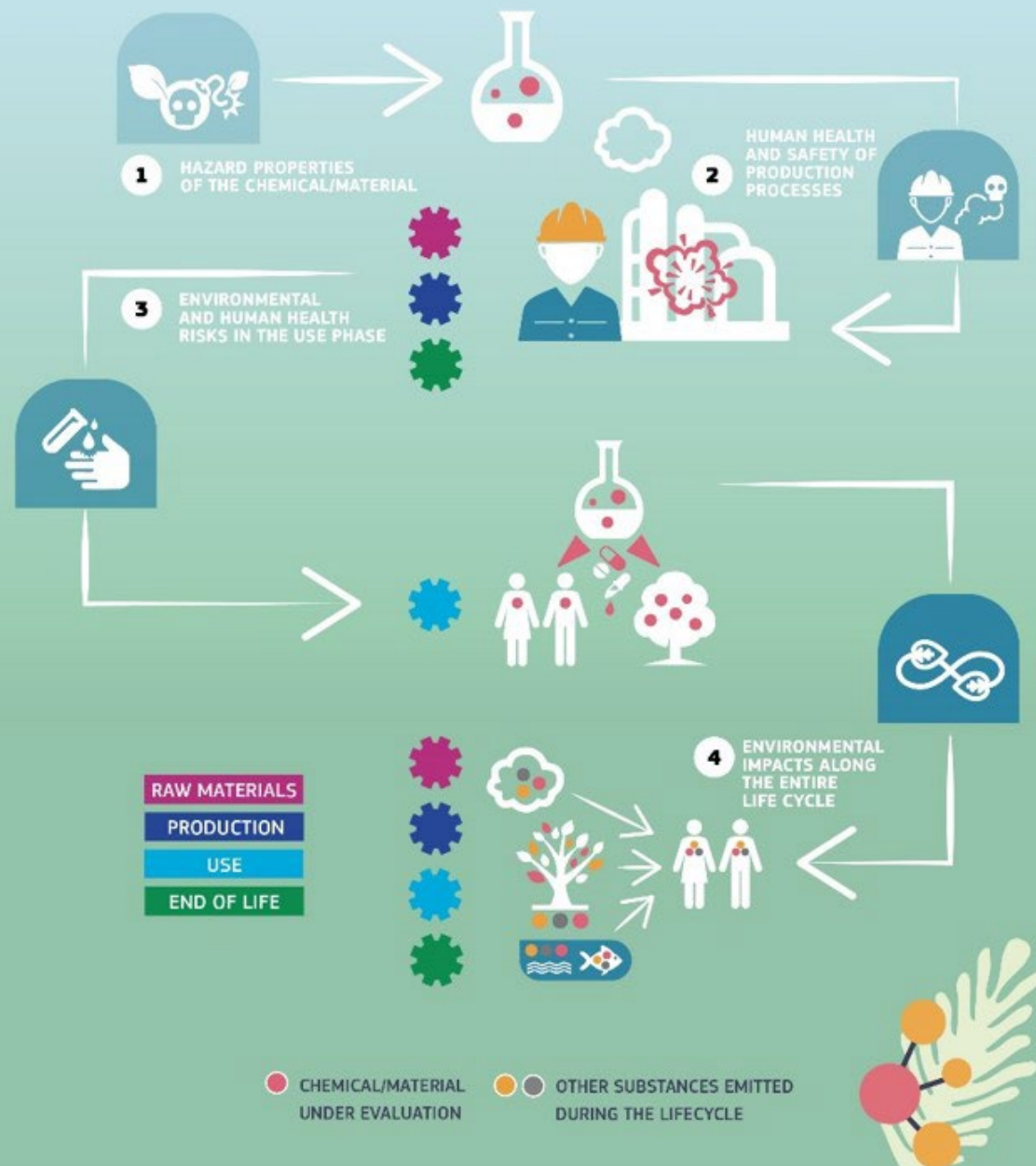
SSbD framework: The Safety and Sustainability

Sustainability could be formulated as the ability of a chemical/material to deliver its function without exceeding environmental and ecological boundaries along its entire life cycle, while providing welfare, socio-economic benefits and reducing externalities.

Safety in the context of chemical/materials it is related to the absence of unacceptable risk for humans and the environment, preferably ensured by avoiding chemicals with intrinsic hazard properties.

Safety is transversal to all sustainability dimensions (environmental, social and economic).

Safety and sustainability assessment



SSbD framework: The assessment

- The safety and sustainability assessment includes four steps:
 - **Step 1** - Hazard assessment of the chemical/material
 - **Step 2** - Human health and safety aspects in the chemical/material production and processing phase
 - **Step 3** - Human health and environmental aspects in the final application phase
 - **Step 4** - Environmental sustainability assessment

For each step the framework refers to:

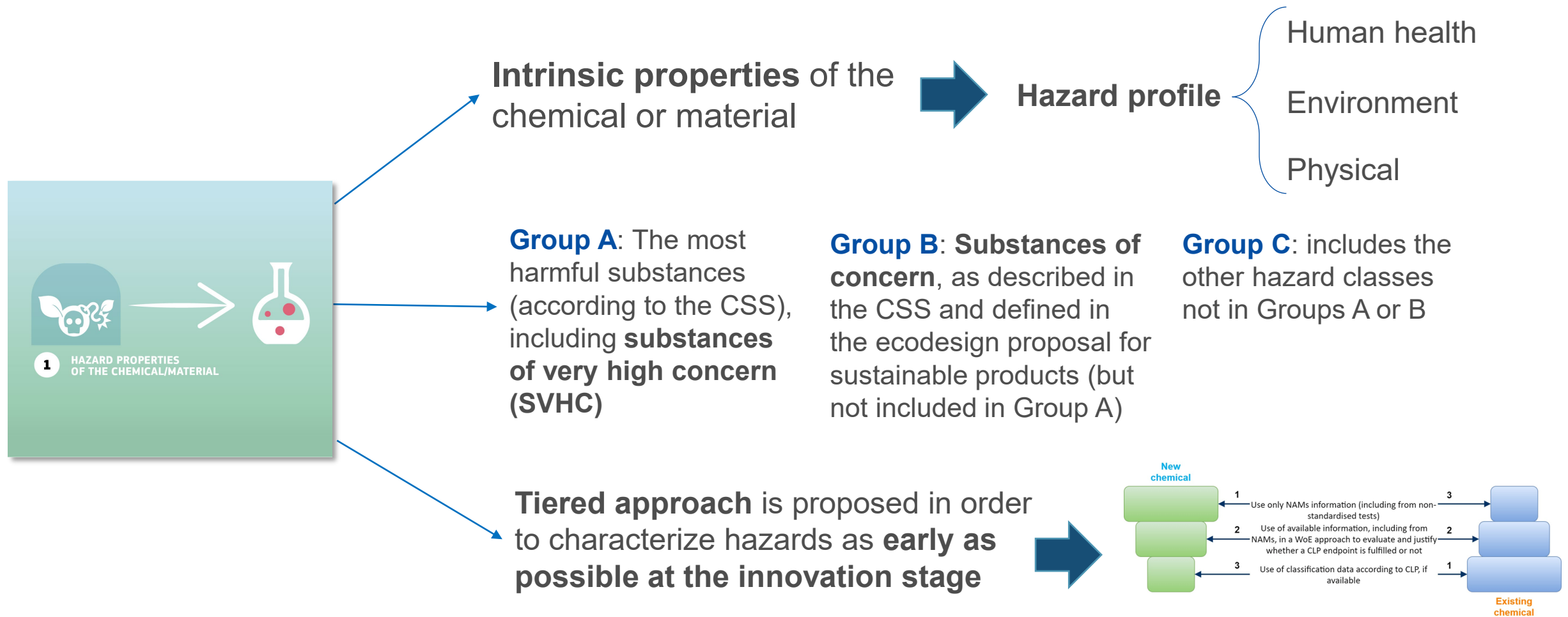
Aspects and indicators

Methodology and tools

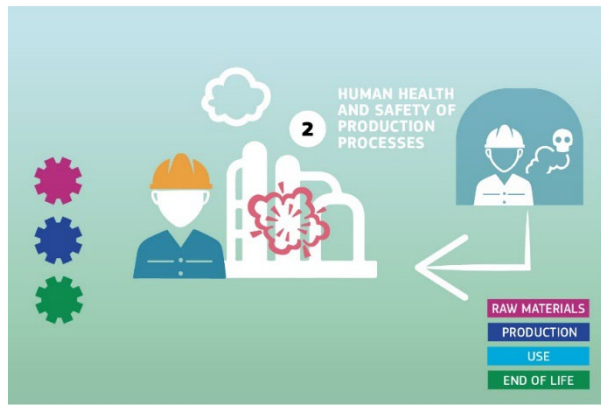
Proposal for the definition of criteria

Evaluation procedure

Step 1 - Hazard identification of the chemical/material



Step 2 - Human health and safety aspects in the chemical/material production and processing phase



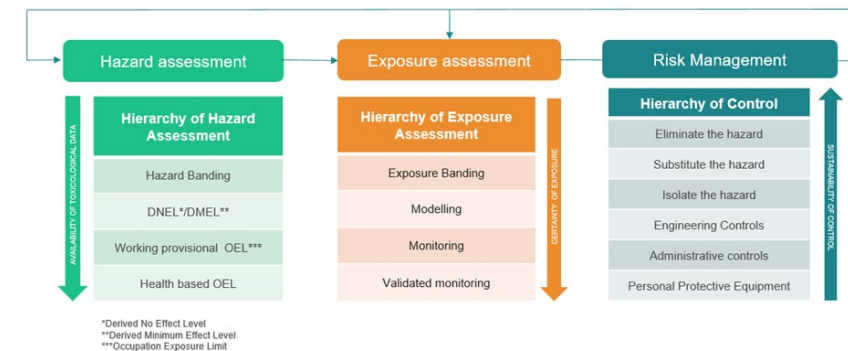
Occupational health and safety during the production and processing of the chemical or material (including EoL)

Hazards of chemicals used in the process
Derived threshold values for workers

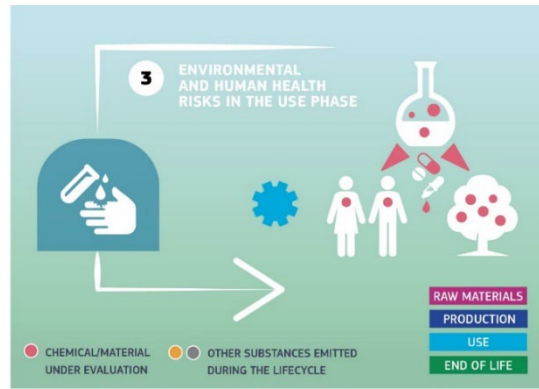
Physico Chemical properties
Chemical or material used (%)
Frequency and duration of exposure
Operational conditions (T, P...)

Risk management measures

- Local exhaust ventilation
- Enclosed system
-



Step 3 - Human health and environmental aspects in the final application phase



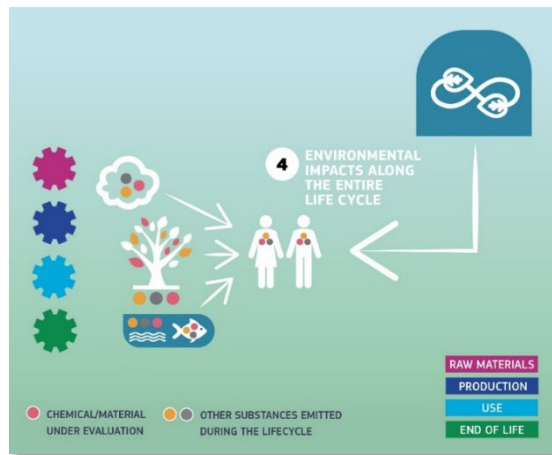
Risks of the final application of the material or chemical
Use-specific exposure to the chemical or material and the associated risks to the human health and the environment

Hazards of chemicals used in the process
Derived threshold values for general public

Physico Chemical properties
Chemical or material used (%)
Frequency and duration of exposure

Instructions of use

Step 4 - Environmental sustainability assessment



Environmental sustainability impacts along the entire chemical/material life cycle, by means of an LCA,

The environmental footprint impact assessment method (PEF) is recommended to be used that consists of a minimum set of impacts to assess:

- **Toxicity:** human toxicity and ecotoxicity
- **Climate change**
- **Pollution:** ozone depletion, particulate matter/respiratory inorganics, ionising radiation, photochemical ozone formation, acidification, eutrophication
- **Resources:** land use, water use, other resources use (minerals and metals, energy carriers)

Testing the framework: Case studies



CASE STUDIES <https://publications.jrc.ec.europa.eu/repository/handle/JRC131878>

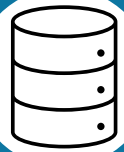
The Framework was tested with several case studies

- ✓ **Feasibility and applicability**
- ✓ **Challenges and limitations;**
- ✓ **Needs or gaps**
- ✓ **Overlaps between the steps**



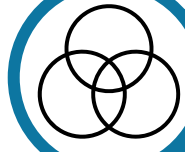
**Opportunities
to improve the
exposure
information**

Testing the framework: Opportunities



Methodologies and tools

- Application specific
- Functionality



Integration of safety and sustainability

- Consistency
- Tiered approach



Data Information

- Availability
- Communication



Expertise and resources

- Training

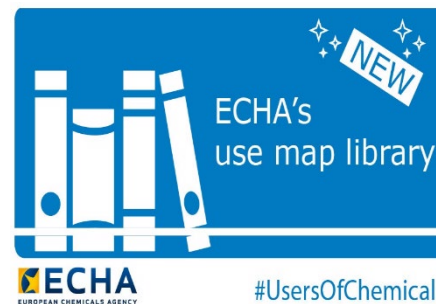


Simplification Fit for purpose



Standardization Harmonization

collaborative
efficient, realistic
harmonised format
typical uses
use map
sector map
common language
standard phrases
agreed
conditions of use



Use descriptor category	Related key element(s)
Life cycle stage (LCS)	Life cycle stage
Sector of use (SU)	Market description (sector of economy where the use takes place)
Product category (PC)	Market description (type of product), Contributing activities (consumers)
Process category (PROC)	Contributing activities (workers)
Environmental release category (ERC)	Contributing activities (environment)
Article category (AC)	Market description (type of article), Contributing activities (service life)

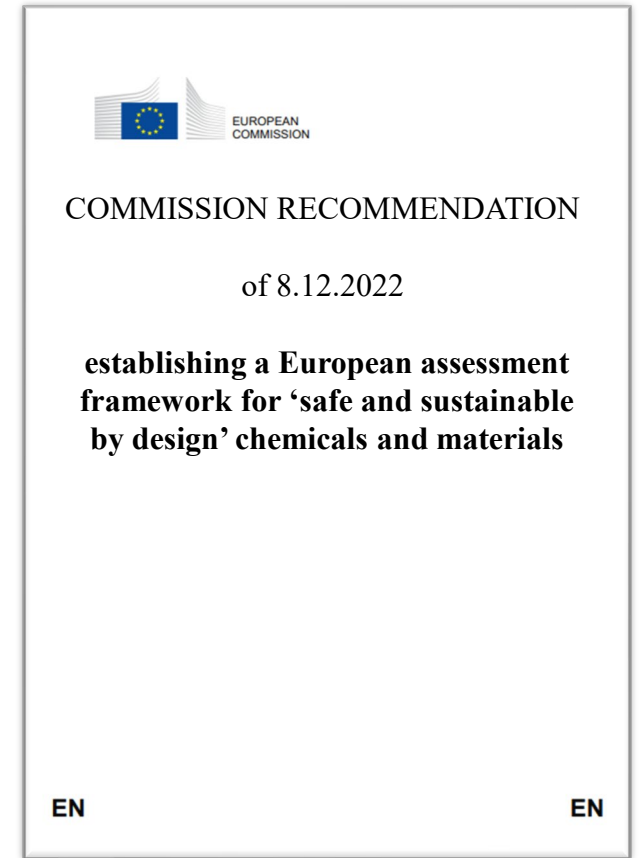
Testing the framework: Opportunities

EC Recommendation proposes a European framework for ‘safe and sustainable by design’ chemicals and materials for **R&I activities**.

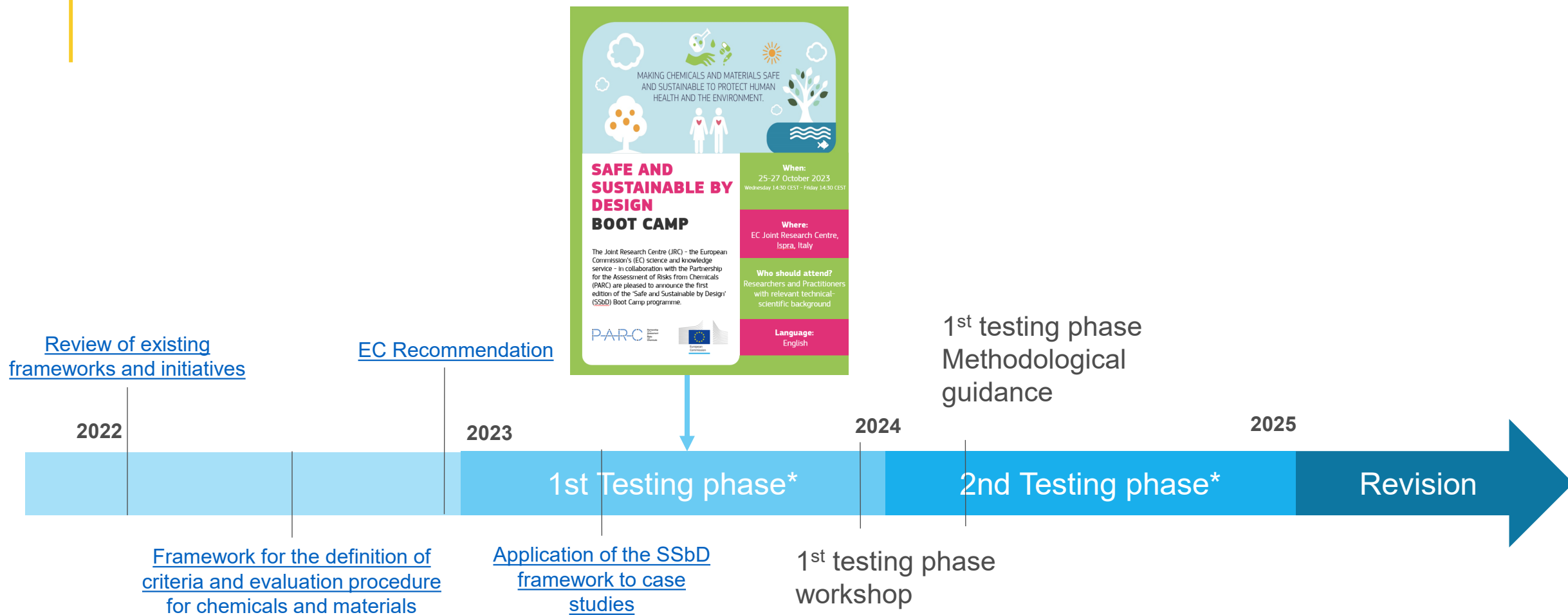
- The purpose of this Recommendation is to **test the framework** and get feedback to be able to improve relevance, reliability and operability.
- Results obtained from applying the framework will contribute to **revision of the framework and definition of criteria** for ‘safe and sustainable by design’ chemicals and materials

Horizon Europe calls

- Call HORIZON-CL4-2023-RESILIENCE-01-21 **Innovative methods** for safety and sustainability assessment of chemicals and materials
- Call HORIZON-CL4-2023-RESILIENCE-01-22 **Integrated approach** for impact assessment of safe and sustainable chemicals and materials
- Call HORIZON-CL4-2023-RESILIENCE-01-23 **Computational models** for the development of safe and sustainable by design chemicals and materials



SSbD Chronological overview



*For more information
[Safe and sustainable by design \(europea.eu\)](https://europea.eu)

Thank you

For more information about SSbD: [Safe and sustainable by design \(europa.eu\)](https://europa.eu/sustainable-by-design)

For updates on SSbD: RTD-SUSTAINABLE-BY-DESIGN@ec.europa.eu

Information about the testing period/reporting template: jrc-ssbd@ec.europa.eu

Information/applications to the Boot Camp: jrc-ssbd@ec.europa.eu



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