Safe and Sustainable-by-Design and Horizon Europe

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European Commission, Joint Research Centre

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The JRC: Science for policy

Joint Research Centre: Our mission

As the science and knowledge service of the European Commission our mission is to support EU policies with independent evidence throughout the whole policy cycle.

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Today's focus:
Safe and Sustainable by Design and Horizon Europe

HQ in **Bruxelles,** scientific sites in **5 Member States:**

- Belgium (Geel)
- Germany (Karlsruhe)
- **Italy (Ispra)**
- The Netherlands (Petten)
- Spain (Sevilla)

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Policy context

The EU Green Deal

Cutting pollution ("zero" pollution)

Climate neutrality

Circular economy

Chemicals Strategy for Sustainability (CSS)

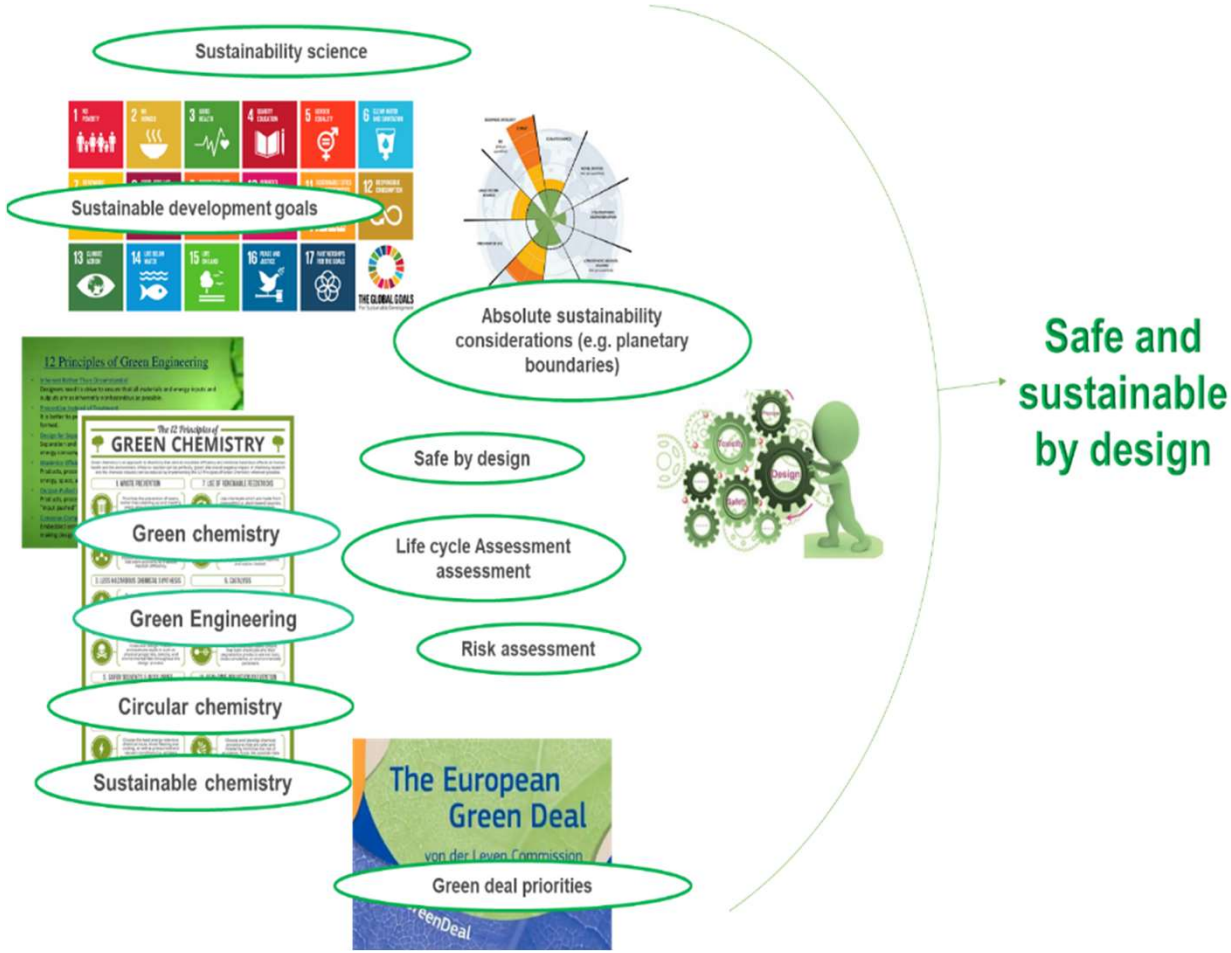
- **boost innovation** for **safe and sustainable** chemicals
- **phase out the most harmful** (not only SVHCs) **substances** and
- **substitute**, as far as possible, **all other substances of concern**, and otherwise minimise and track them.

New approaches to tackle releases and emissions across all life cycle stages, and move towards zero-pollution for air, water, soil and biota.

CSS Action Plan

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

Methodological integration: **Safety and Sustainability**



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Milestones on the SSbD framework

2022

2023

[Review of existing frameworks and initiatives]

[Framework for the definition of criteria and evaluation procedure for chemicals and materials]

[EC Recommendation]

[Application of the framework to case study]

- *Caldeira et al. (2022).* ***Safe and Sustainable by Design chemicals and materials Review of safety and sustainability dimensions, aspects, methods, indicators, and tools.*** https://doi.org/10.2760/879069
- *Caldeira, et al. (2022).* ***Safe and Sustainable chemicals by design chemicals and materials - Framework for the definition of criteria and evaluation procedure for chemicals and materials.*** https://doi.org/10.2760/487955
- *Caldeira et al. (2023).* ***Safe and Sustainable by Design chemicals and materials - Application of the SSbD framework to case studies.*** https://doi.org/10.2760/329423
- *European Commission. (2022).* ***Commission recommendation of 8.12.2022 establishing a European assessment framework for 'safe and sustainable by design' chemicals and materials. Brussels, 8.12.2022 C(2022) 8854 final*** https://eur-lex.europa.eu/eli/reco/2022/2510/oj

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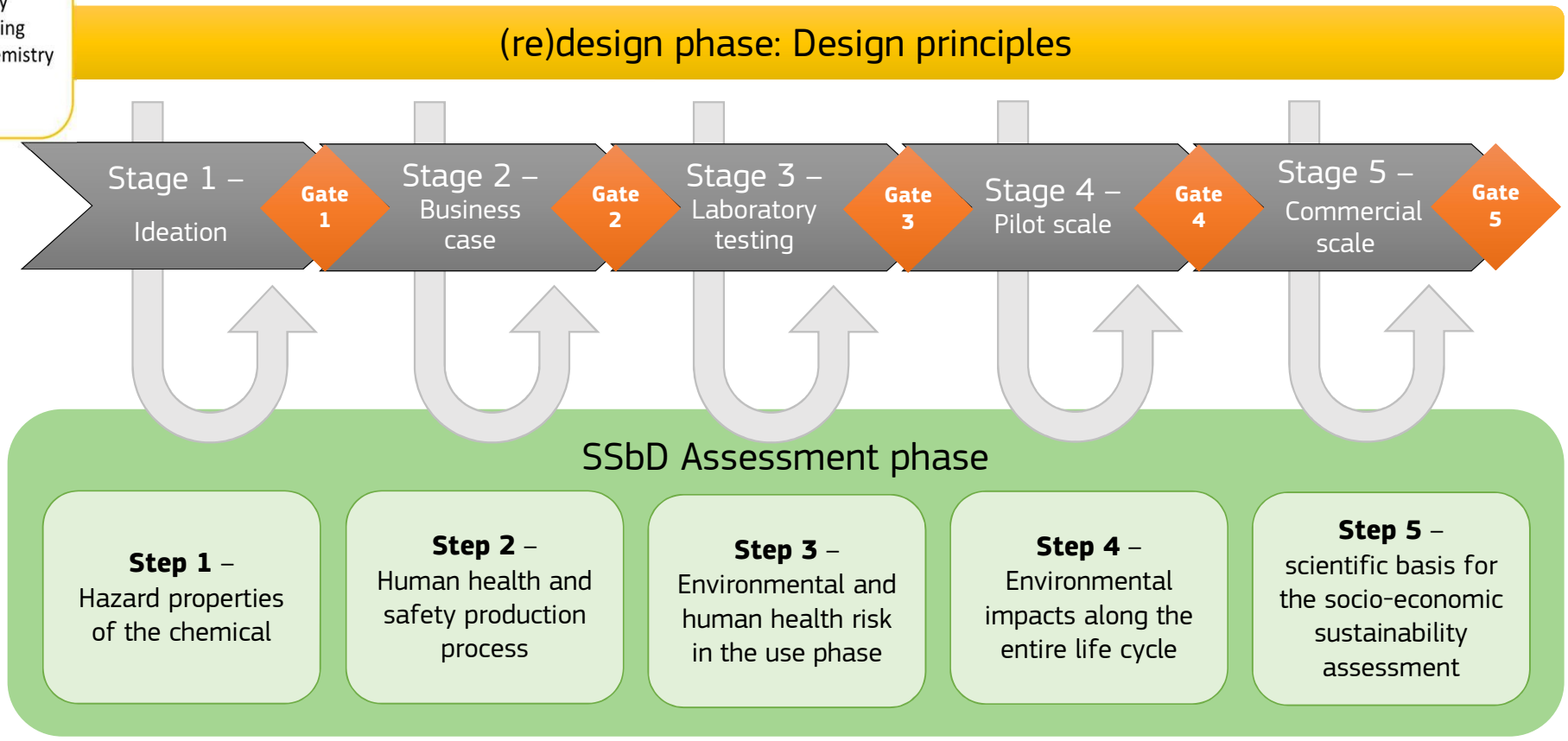
Structure of the framework: a stepwise approach

Strategies and principles can be followed such as:
- Green chemistry
- Green engineering
- Sustainable Chemistry
- Safe by design
- ...



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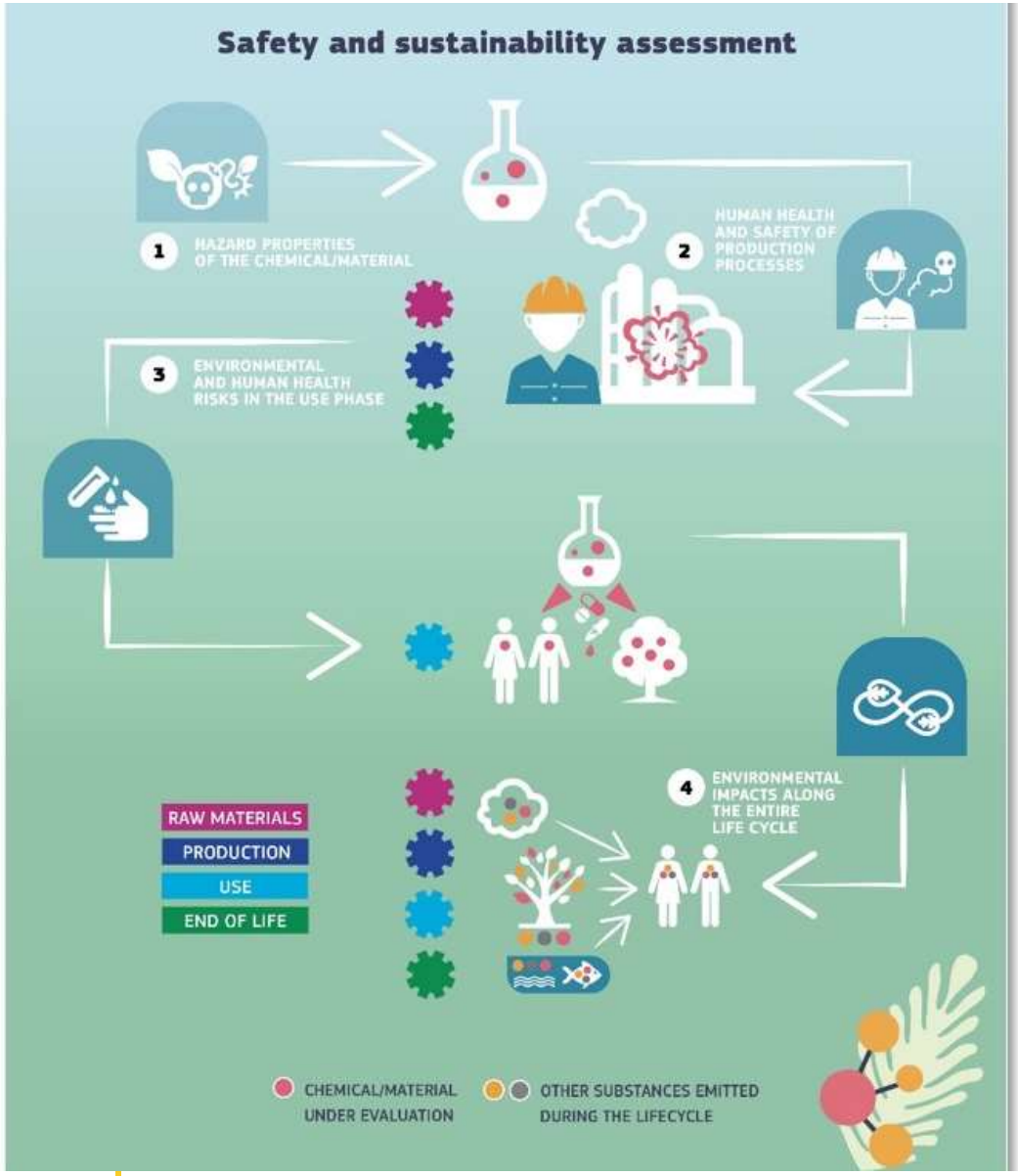

SSbD framework: The assessment

- 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

Caldeira, et al. (2022). ***Safe and Sustainable chemicals by design chemicals and materials - Framework for the definition of criteria and evaluation procedure for chemicals and materials.*** https://doi.org/10.2760/487955
European Commission. (2022). ***Commission recommendation of 8.12.2022 establishing a European assessment framework for 'safe and sustainable by design' chemicals and materials. Brussels, 8.12.2022 C(2022) 8854 final*** https://eur-lex.europa.eu/eli/reco/2022/2510/oj

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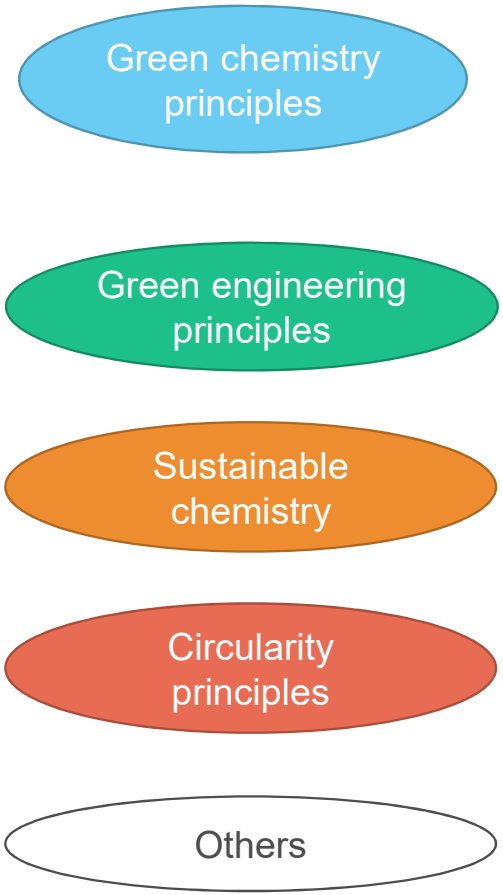
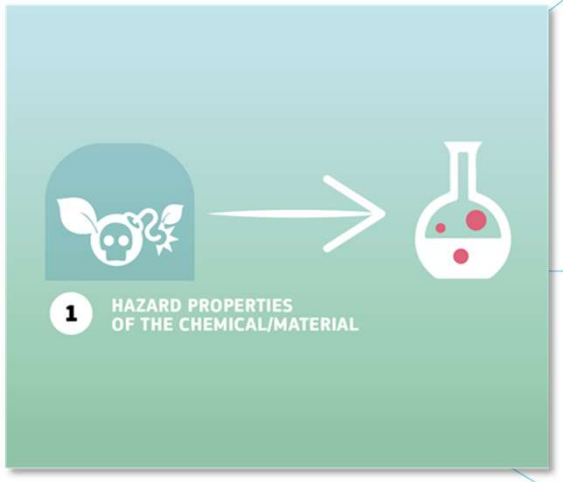
(Re)Design phase: Design principles



	SSBD principles
SSBD1	Material efficiency
SSBD2	Minimise the use of hazardous chemical/materials
SSBD3	Design for energy efficiency
SSBD4	Use renewable sources
SSBD5	Prevent and avoid hazardous emissions
SSBD6	Reduce exposure to hazardous substances
SSBD7	Design for end-of-life
SSBD8	Consider the whole life-cycle

Step 1 - **Hazard assessment** of the chemical/material



Intrinsic properties of the chemical or material → **Hazard profile**
- Human health
- Environment
- Physical

Group A: The most harmful substances (according to the CSS), including **substances of very high concern (SVHC)**

Group B: **Substances of concern**, as described in the CSS and defined in the ecodesign proposal for sustainable products (but not included in Group A)

Group C: includes the other hazard classes not in Groups A or B

Tiered approach is proposed in order to characterize hazards as **early as possible at the innovation stage**

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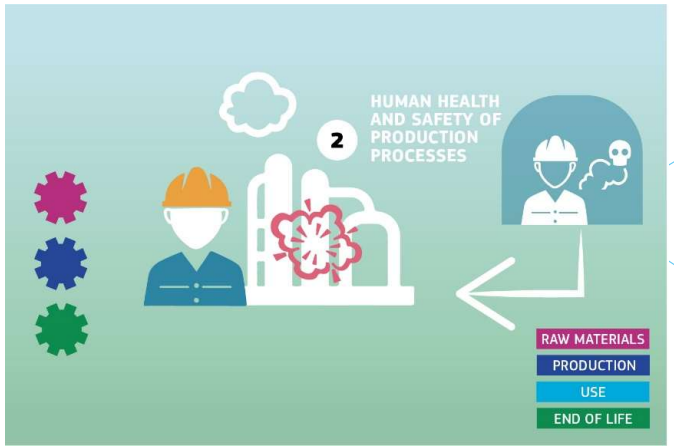
Step 2 - Human health and safety aspects of the chemical/material in the **production and processing** phase



Occupational health and safety during the production and processing of the chemical or material

- For the assessment the hazards and workers exposure are considered.:
  - Physical properties of the chemical or material
  - Hazards of chemicals used in the process
  - Amount of the chemical or material used
  - Frequency and duration of exposure
  - Operational conditions
  - Risk management measures

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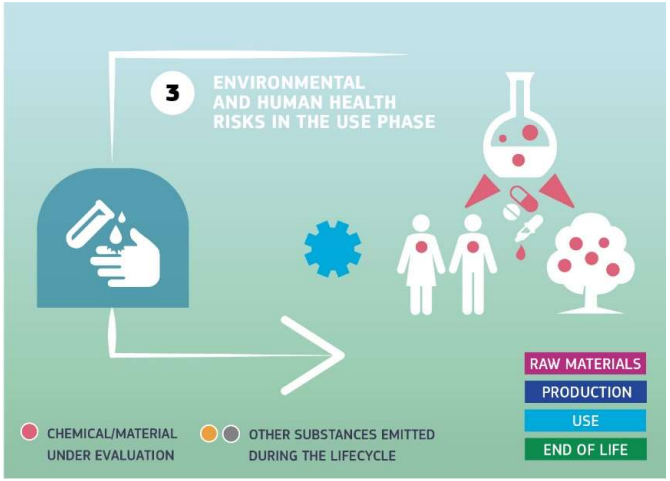
Step 3 - Human health and environmental aspects in the **final application** phase



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 chemical or material
- Physical-chemical properties
- Concentration of the chemical or material in the application
- Use conditions
- Frequency and duration of use

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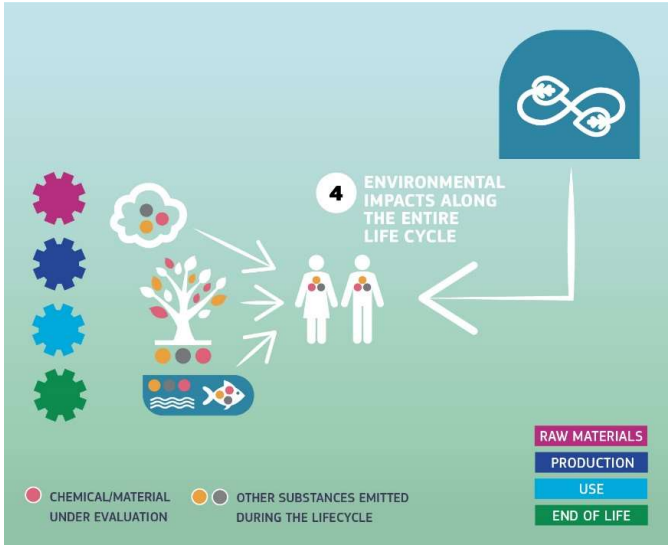
Step 4 - **Environmental sustainability** assessment



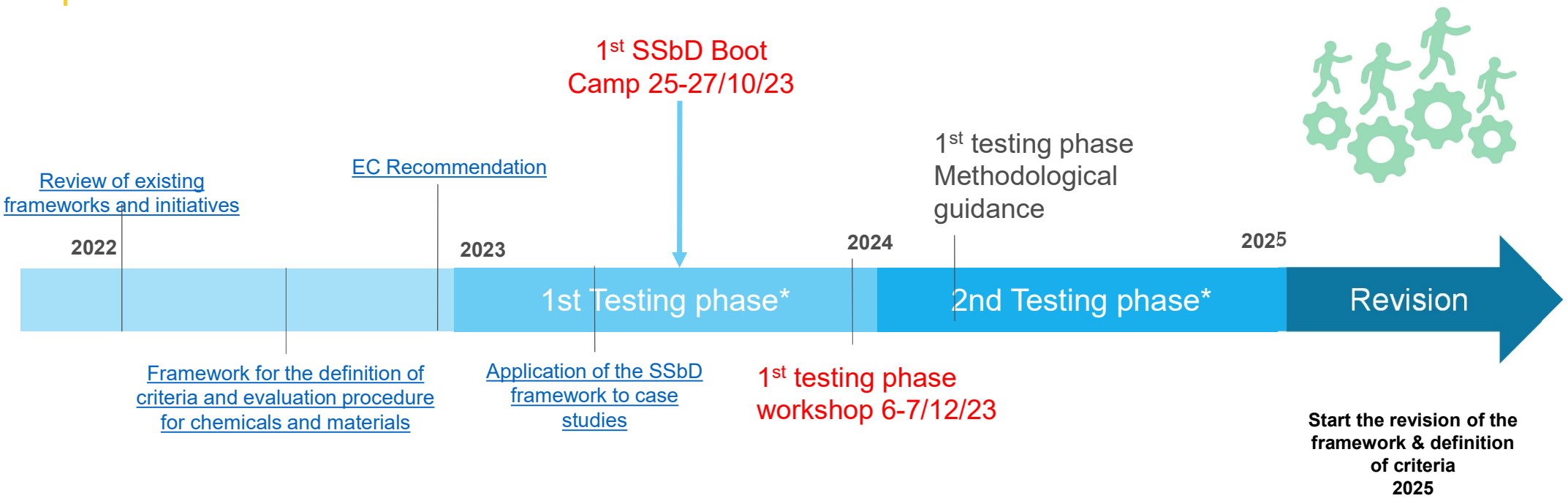
Environmental sustainability impacts along the entire chemical/material life cycle, by means of an LCA,

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)

PEF: https://op.europa.eu/en/publication-detail/-/publication/c43b9684-4521-11ed-92ed-01aa75ed71a1/language-en

SSbD Chronological overview



*For more information: Safe and sustainable by design (europa.eu)

*https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/key-enabling-technologies/chemicals-and-advanced-materials/safe-and-sustainable-design_en

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Thank you

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