Safe and sustainable by design chemicals and materials – current state of play

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„Innovation and Governance of Advanced Materials“

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What we want to achieve

Policy comes before regulation

Policy context of SSbD

CSS Action Plan

Climate neutrality

Cutting pollution
("zero" pollution)

Circular economy

The Chemicals Strategy aims to:

- strengthen the **protection** of human health and the environment from hazardous chemicals
- drive **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

It is a first step towards the zero pollution ambition for a toxic-free environment announced in the Green Deal

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

https://environment.ec.europa.eu/strategy/chemicals-strategy_en

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The SSbD framework

SSbD in the EU CSS

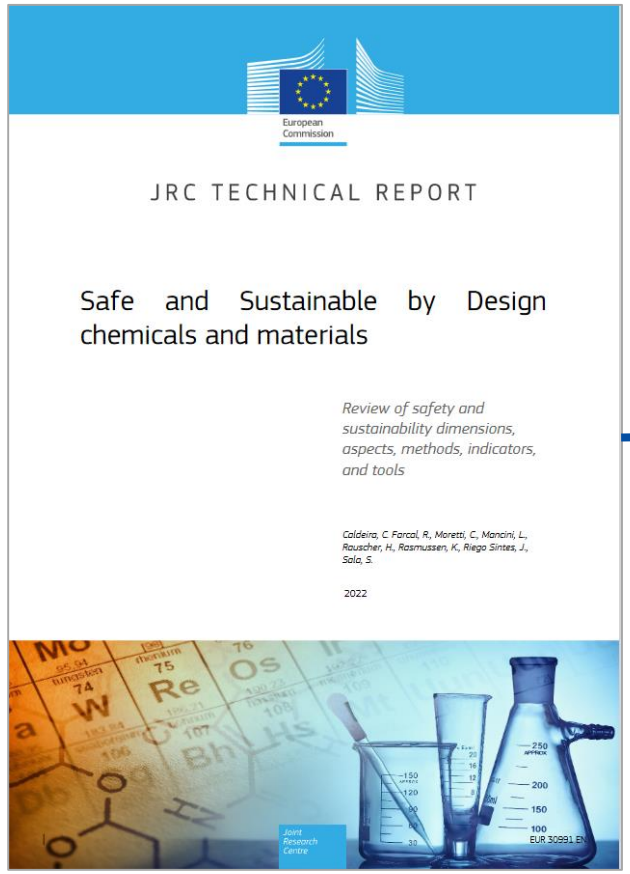
- ***Safe and sustainable by design can be defined*** *as a* ***pre-market approach*** *to chemicals and materials design that focuses on providing a function (or service), while* ***avoiding volumes and chemical and material properties that may be harmful to human health or the environment, in particular 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.***

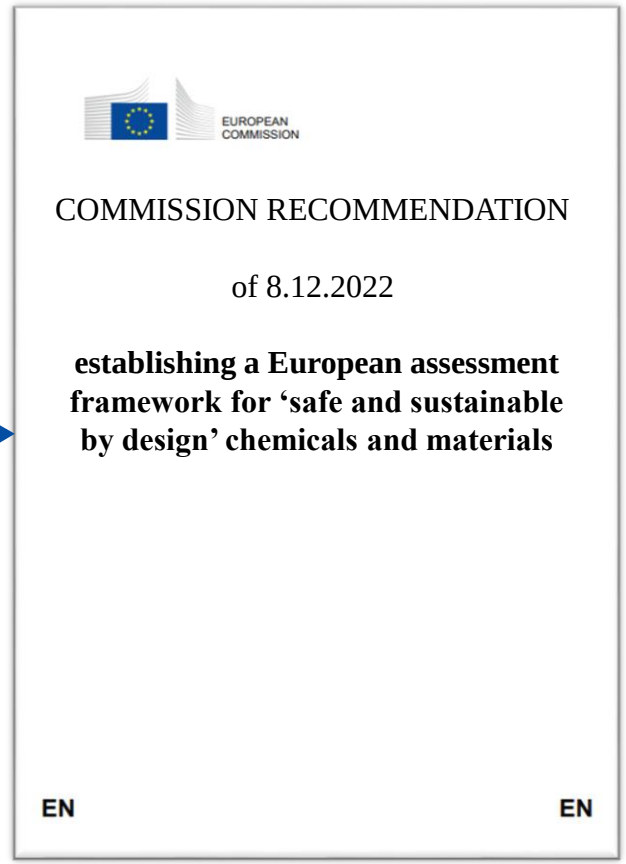
(Definition adapted from EU Chemicals Strategy for Sustainability).

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

Safe and sustainable by design chemicals and materials





REVIEW https://publications.jrc.ec.europa.eu/repository/handle/JRC127109
FRAMEWORK https://publications.jrc.ec.europa.eu/repository/handle/JRC128591
RECOMMENDATION https://research-and-innovation.ec.europa.eu/system/files/2022-12/Commission%20recommendation%20-%20establishing%20a%20European%20assessment%20framework%20for%20safe%20and%20sustainable%20by%20design.PDF

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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;

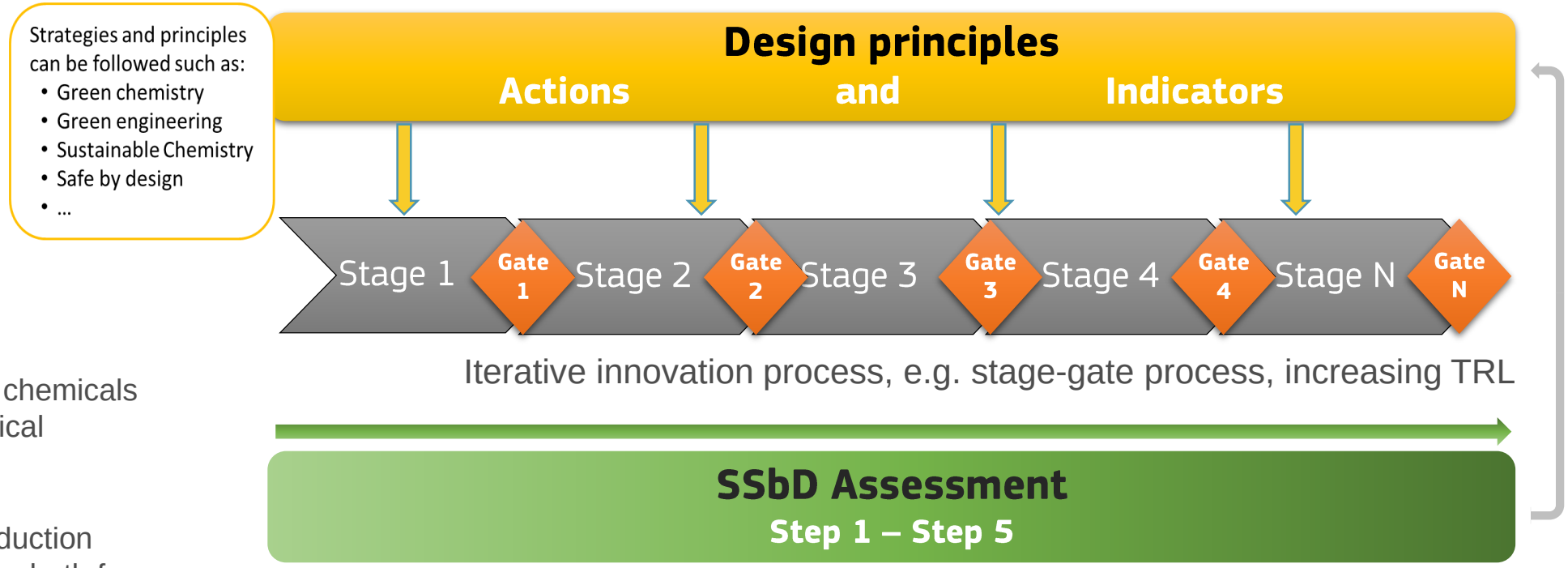
Minimising or, as far as possible, eliminating the impact on human health, climate and the environment (air, water, soil) along the entire chemical's and material's life cycle;

- 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.

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.

The SSbD framework entails **two** components: (re-)design and assessment



Term '**by design**':

Molecular design - to design new chemicals and materials based on their chemical structure

Process design - to make the production process safer and more sustainable, both for chemicals and materials being developed and for existing chemicals and materials

Product design - where the results of the SSbD assessment support the selection of the chemicals or materials to meet the functional demands of the final product in which they are used

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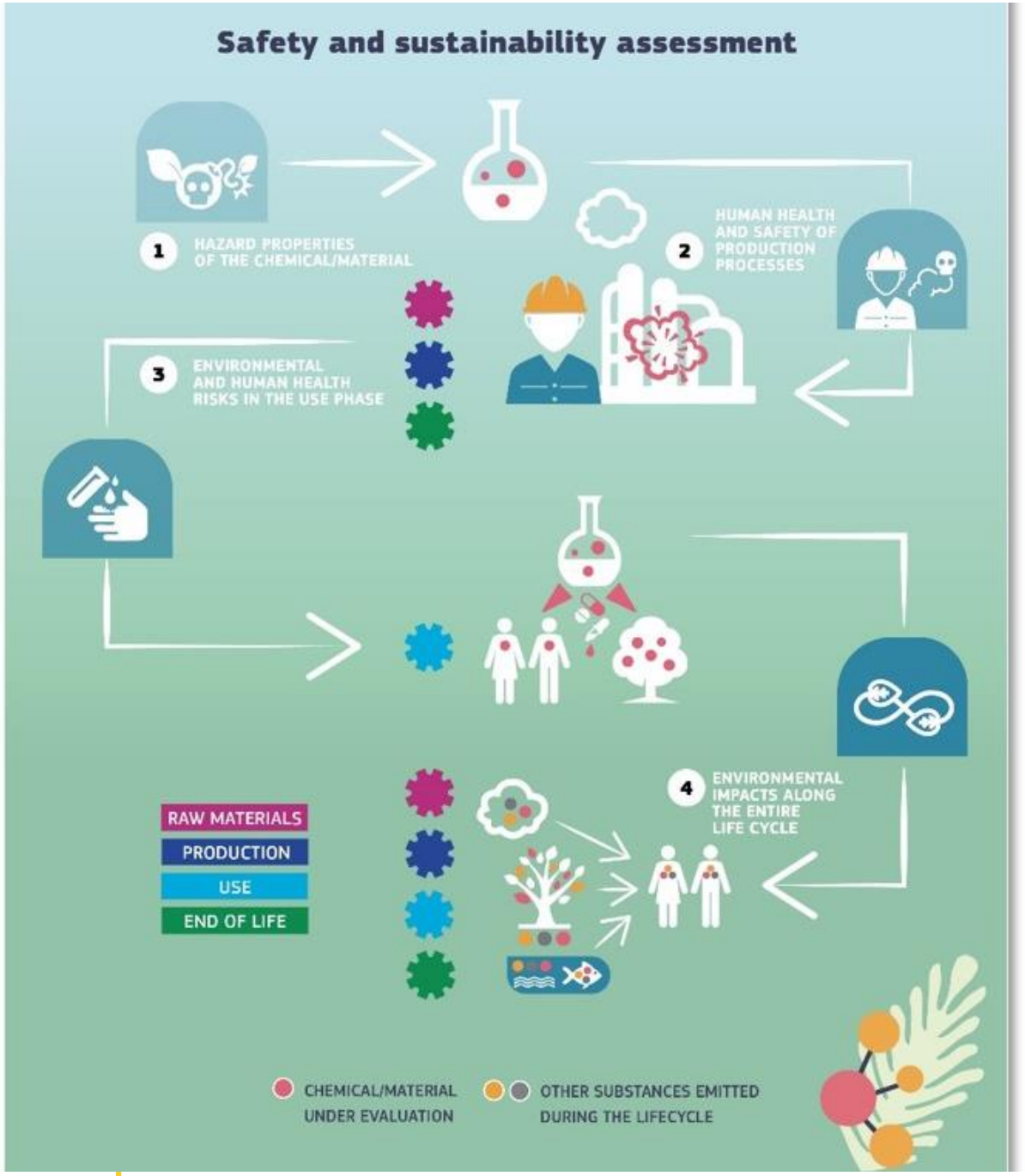

SSbD framework: The assessment

- 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
  - [Step 5 – Social and economic sustainability assessment]

For each step the methodology refers to:

- aspects and indicators
- methodology and tools
- a proposal for the definition of criteria
- an evaluation procedure

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Step 1 - Hazard assessment of the chemical/material

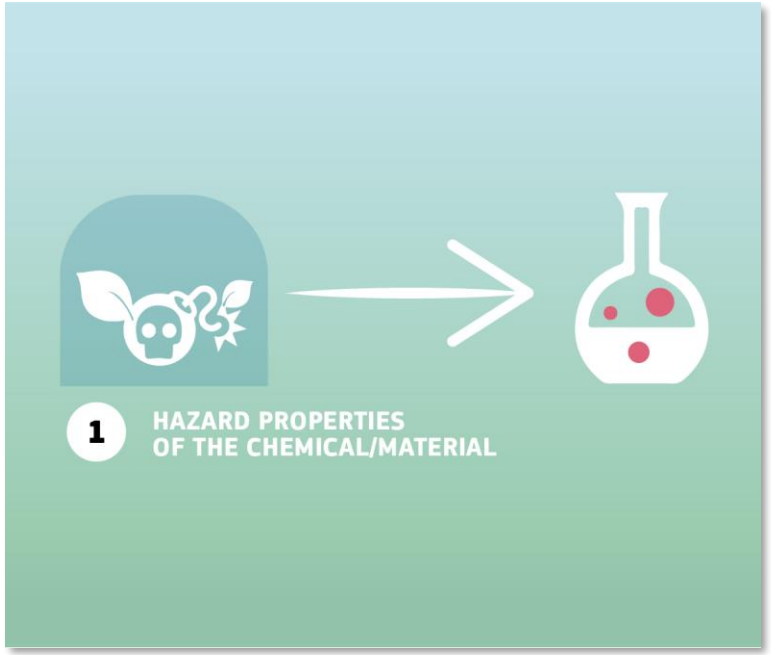
This step looks at the **intrinsic properties** of the chemical or material in order to understand its **hazard profile** (human health, environment and physical hazards)

Three groups (criteria) are proposed:

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

Group B: includes 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



For the assessment, depending on the data availability, a **tiered approach** is proposed in order to characterise hazards as **early as possible at the innovation stage** by using, for example, new approach methodologies (NAMs) to generate data and knowledge.

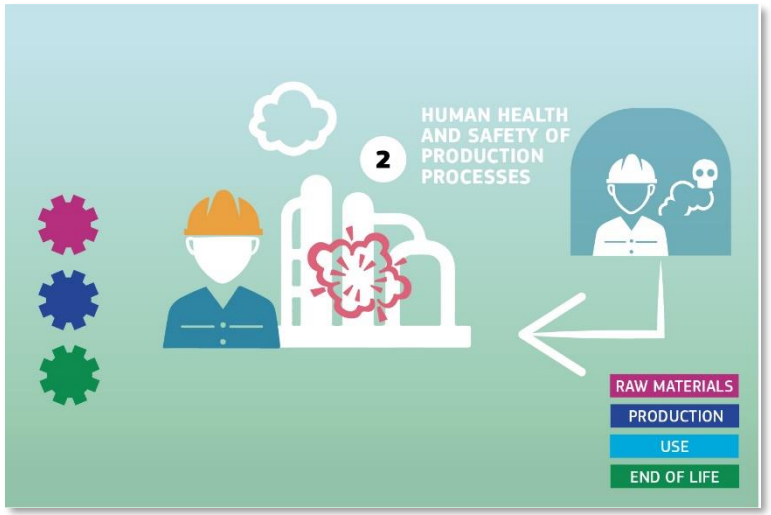
Step 2 - Human health and safety aspects in the chemical/material production and processing phase

This step assesses the **occupational health and safety during the production and processing** of the chemical or material

This includes the processes from **raw material extraction** to production of the chemical including also **recycling or waste management**

For the assessment the hazards and workers exposure are considered.:

- Hazards of chemicals used in the process
- Frequency and duration of exposure
- Amount of the chemical or material used
- Physical properties of the chemical or material
- Operational conditions
- Risk management measures



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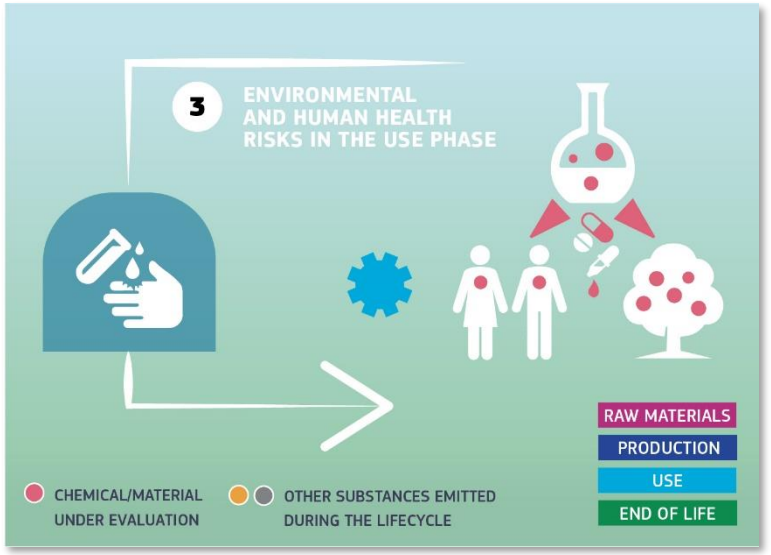
Step 3 - Human health and environmental aspects in the final application phase

This step assesses the **risks of the final application** of the material or chemical

It covers **use-specific exposure** to the chemical or material and the **associated risks to the human health and the environment**

For the assessment the hazards and consumer exposure are considered.:

- 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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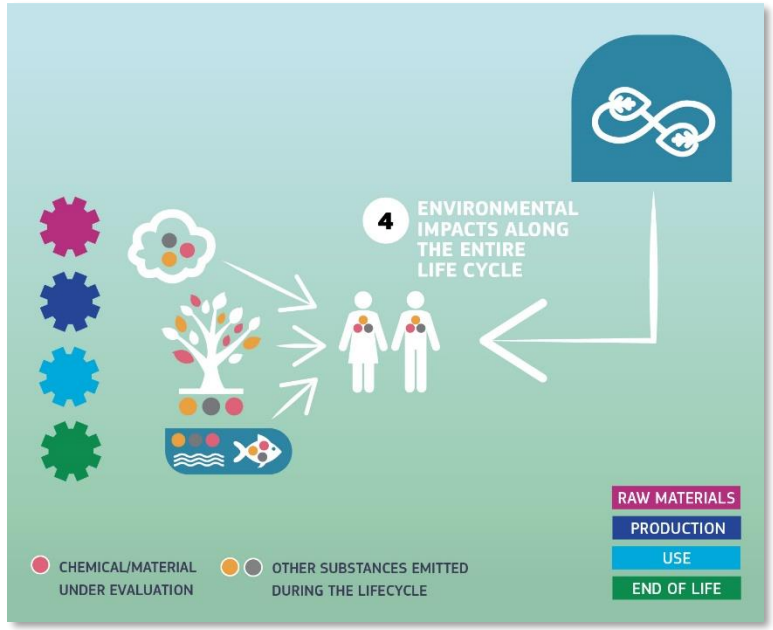
Step 4 - Environmental sustainability assessment

In this step **environmental sustainability impacts along the entire chemical/material life cycle** are considered by means of an LCA, assessing several impact categories

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

The aspects taken into consideration include:

- **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

Implementation: Case studies

Objectives of the case studies

- **Evaluate the feasibility and applicability of the framework** to assess selected chemicals.
- **Identify challenges and limitations** in the application of the framework to be considered in future developments.
- Pave the way to address **knowledge gaps** and to **further refinement** of the framework while **advancing on SSbD criteria definition**
- It **was not the objective** of the case studies to **classify the chemicals**

SSbD case studies to test the framework

Case study 1: Non-phthalate plasticiser in FCM

→ Developed by JRC with support of different organisations

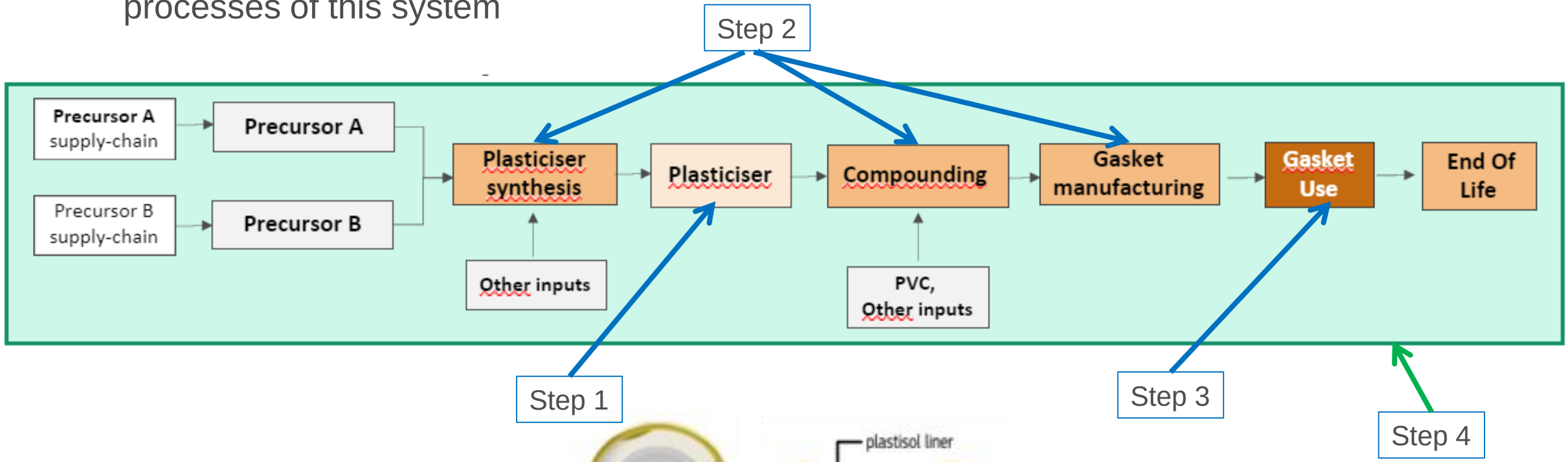
Case study 2: Non-halogenated flame retardant in ICT products

Case study 3: Enzymes in textiles scouring

→ Developed by industry with JRC support

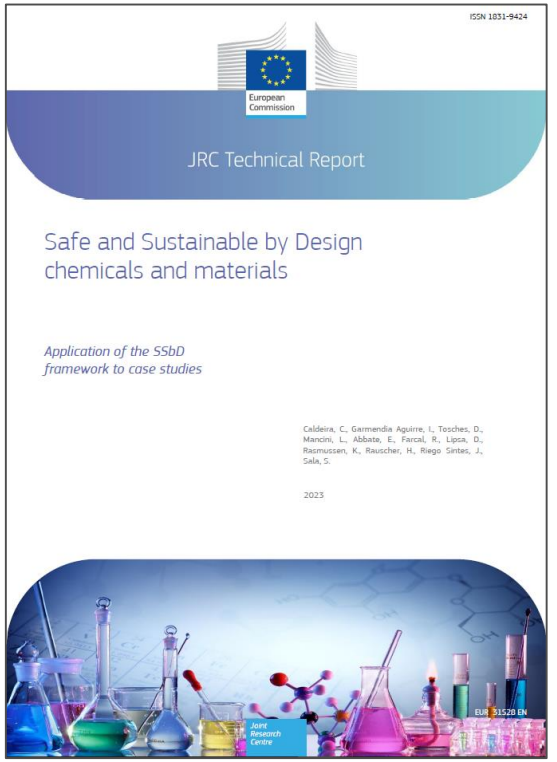
SSbD assessment along chemicals life cycle stages

The SSbD framework aims at covering all the life cycle stages of the chemicals and materials under scrutiny. However, each steps of the framework cover different processes of this system



Testing the framework:
Challenges and opportunities

- Integration of safety and sustainability
  - Consistency
  - Definitions/terminology
  - Scope/system boundaries
  - Overlaps/complementary
- Data/information
  - Availability and quality
  - Communication
  - NAMs
- Tools/methodologies – challenge to identify them
- Expertise/Skills/Training needed
- Report on the case studies is published*



*https://publications.jrc.ec.europa.eu/repository/handle/JRC131878

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EC Recommendation and next steps

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Commission Recommendation on the SSbD Framework (8/12/2022)

- Proposes **a European framework** for the SSbD chemicals and materials **applicable to research and innovation activities**
- Scientific basis developed by the JRC
- Addressed to **Member States, Industry and Research and Technology Organisations**
- Purpose of the Recommendation: **test the framework** and get feedback to be able to improve relevance, reliability and operability.
- Results obtained from applying the framework will make it possible to define ‘safe and sustainable by design’ **criteria**.

EUROPEAN
COMMISSION

Brussels, 8.12.2022
C(2022) 8854 final

COMMISSION RECOMMENDATION

of 8.12.2022

establishing a European assessment framework for ‘safe and sustainable by design’ chemicals and materials

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022H2510

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Testing the framework

Reporting on the implementation of the Recommendation

- The SSbD Recommendation **encourages** Member States, industry, academia, research organisations, etc. to report to the Commission on the implementation within a **voluntary reporting mechanism**
- To facilitate this, a **reporting template** is available*
- During the **testing phase** of the framework, the template should be used to collect the input and feedback from stakeholders
- First testing/feedback phase closed 30 June 2023, evaluation ongoing
- Second testing/feedback phase will open May-June 2024

- *https://ec.europa.eu/eusurvey/runner/SSbD_Reporting_Upload*

Outlook

See also EC SSbD website:
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

1st SSbD Boot Camp
organised by the JRC in collaboration with PARC

25 – 27 October 2023, Ispra, Italy

- Two full days of a highly engaging and interactive programme
- a unique opportunity to get fundamental insights in SSbD thinking
- learn about the SSbD framework from experts in the field
- breakout sessions for discussion on specific topics
- share knowledge and experience
- become part of the growing SSbD community
- Applications closed, more camps are planned

Thank you

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